Essays in Honor of Marvin Goodfriend: Economist and Central Banker

Edited by Robert G. King and Alexander L. Wolman

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Photograph of Marvin Goodfriend courtesy of Carnegie Mellon University

Biography

Marvin Goodfriend (1950-2019) joined the Research Department at the Federal Reserve Bank of Richmond in 1978 after graduate study at Brown University. He was director of research from 1993 to 1999 and senior vice president and policy advisor from 1999 to 2005. After joining Carnegie Mellon University as a professor of political economy, he became a leading academic figure in international central banking circles.

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Introduction

Robert G. King and Alexander L. Wolman, editors

Marvin Goodfriend inspired many with his ideas about central banking and economics. This memorial project, sponsored by the Federal Reserve Bank of Richmond, begins with three personal reflections by central bankers who knew him well: Al Broaddus, Don Kohn, and Bill Poole. Marvin joined the Richmond Fed in 1978 after studying with Poole at Brown University, rising to be Broaddus's senior policy adviser. Combining research excellence with a knowledge of both the Fed's history and its contemporary challenges, Marvin was passionate about Richmond's contributions to the Federal Open Market Committee meetings in Washington. Attending these meetings at Broaddus's side in the 1990s and early 2000s, Marvin developed a friendship — based on mutual respect rather than complete coincidence of views — with Kohn. After Marvin joined the Carnegie Mellon faculty in the fall of 2005, his presence in international central banking circles, sometimes as an adviser, only grew.

An online collection gathers two dozen of Marvin's best-known papers with 18 topical essays based on these papers by his colleagues and contemporaries in central banks and academia. The personal reflections and topical essays are collected in this volume.

Since Marvin's analyses were frequently unconventional and at times controversial, the authors of these essays did not always agree with him at the time and do not always agree with him now. But many describe how they have been stimulated by his thinking and through personal interactions over many years.

Building this memorial project led us to invite contributions from a group of influential and busy economists. As we did so, a remarkable pattern emerged: acceptance was immediate, and we were thanked for creating the project as well as for the invitation to participate. In itself, that is a tribute to Marvin Goodfriend as a person and a researcher.

We had the good fortune to work with Marvin in various ways over many years. It is our hope that this volume and the online collection will help readers gain new insights both from Marvin's work and the related essays.

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Personal Reflections

Marvin Goodfriend at the Richmond Fed: Recollections

J. Alfred Broaddus Jr.

Marvin Goodfriend joined the Richmond Fed Research Department as an economist in 1978, in the middle of the Great Inflation, and worked there until his retirement in 2005, when he became professor of economics at Carnegie Mellon University. He viewed the 20th century monetary policy experience as an "odyssey" from the gold standard to today's inconvertible paper standard supported by a credible Fed commitment to price level stability.[1] While in Richmond, Marvin participated meaningfully in the latter stages of that odyssey and the substantial progress it represented. I was privileged to work closely with him for most of the time he was in Richmond. I'm happy to have this opportunity to share a few memories of what our Reserve Bank achieved in those years with Marvin's extraordinary intellectual and personal leadership along with a few details of how we achieved it.

I think I can recall the exact time and place I first met Marvin. It was Wednesday, December 28, 1977. Bob Hetzel and I were in a room in the NY Hilton interviewing candidates to join us in our Richmond Fed Research Department. Bob stepped out for a minute. When he returned, he looked at me and said, "G. William Miller." A big question mark must have appeared in a bubble over my head, so Bob added that President Carter had just nominated Miller to succeed Arthur Burns as Fed chair. We returned to interviewing candidates. Little did I know that one of the most important and fortunate events of my life and in the history of the Richmond Fed as a policy unit was about to occur.

When the final candidate of the day knocked on the door, it was getting dark in Manhattan, and I remember being weary. Marvin was the candidate. I don't recall for sure, but I'd bet he was wearing a beige and brown argyle patterned sweater vest. I do recall clearly that my first impression of him was altogether positive. There was none of the

[1] Goodfriend (1997).

awkwardness or resume padding that often characterizes these interviews. I remember thinking "with this guy, what you see is what you'll get." I liked what I saw, and Bob did as well. At the time, we were hiring with the objective of strengthening our department's ability to contribute meaningfully to Fed monetary policy; we wanted the significant resources we were devoting to policy research to be justified by increased influence in the broader policymaking process. We were therefore talking to a number of very well-qualified people that we knew would be hard to attract to Richmond. In the interview, Marvin expressed some interest in what we were doing, but as he left, I recall thinking our chances of attracting him were slim.

What a pleasure to learn not long after that Marvin would accept our offer. I would have been even happier had I known then that he would stay almost 30 years and that my Richmond colleagues and I would enjoy the extraordinary stimulation he would bring to the department's intellectual environment throughout those years.

The central theme that motivates virtually all of Marvin's work is the overarching importance of credibility in conducting monetary policy successfully. To achieve credibility, Marvin thought it essential to keep the Fed independent within the government so that its policy decisions and actions were well separated from fiscal policy, Treasury actions outside the Fed's purview, and partisan politics. As I see it, this theme — which was firmly aligned with Marvin's core personal values — was not only a guiding principle but an enabler in practice of most of his policy positions and proposals. Credibility was not a soft concept to Marvin but a critical precondition of effective monetary policy that should be built into the expectations components of policy models. These views are conventional now, but Marvin embraced them well before they became standard and argued for them relentlessly throughout his career. More compactly, in his own words,

> Fed (and other central bank) policies only have lasting effectiveness if the policies are credible to the public, i.e., the public is confident that the Fed's actions are free of political influence or manipulation and seek consistently to advance attainment of the Fed's central mandates of maintaining price stability and promoting maximum sustainable economic growth.[2]

This theme was a natural and powerful elaboration of the policy positions advocated by Robert Black, Richmond Fed president when Marvin arrived in 1978. It came to encapsulate the Bank's permanent overall position on how the Fed should pursue its mandates

Gearing up

Marvin's arrival required some adjustments by all of his colleagues in the department — essentially a higher bar for our policy research and advice to Black. Actually — and fortunately — an initial round of such adjustments was occasioned by the arrival of Bob Hetzel about four years earlier, fresh from writing a PhD thesis under Milton Friedman. I will be forever grateful to Bob for helping get me ready for Marvin.

In the years following their respective arrivals, both Marvin and Bob argued persuasively that influencing broader Fed monetary policy positions meaningfully would require articulating our Bank's views more forcefully and visibly to economists — inside and outside the Fed — focused on monetary policy. The department initiated a concerted, continuing effort to attract recent PhD graduates from university economics departments recognized for their effective research and influence on monetary policy issues. We set an expectation that all economists would produce high-quality and relevant policy research, seek its publication in top professional journals, and present it at influential meetings and conferences inside and outside the Fed. We also began to hire leading monetary and banking economists as consultants and gathered them in Richmond for several weeks during the summer. Through seminars, lunch roundtables, and office visits with our economists, the consultants strengthened our research and broadened our contacts in the profession.[3] (They also helped Marvin grow and thrive in Richmond, I believe, despite the absence of the richer economic

[2] Goodfriend (2010).

[3] Many prominent economists participated in this program including Bennett McCallum, Robert King, and Douglas Diamond.

research environments enjoyed by Reserve Banks in larger cities such as Boston, New York, and Chicago.)

It took some time to build, but over the course of the late 1970s and 1980s, a critical mass of research bearing the Richmond Fed imprimatur was produced and the Bank's influence and recognition in the policy arena increased. This reflected in significant part Marvin's own research since his arrival, and it provided a suitable platform for what was to come.

Research and Preparation for FOMC Meetings

While the department's policy team recognized the need to broaden the Bank's influence, it also understood that the central channel through which any Reserve Bank influences monetary policy is the Bank president's participation in meetings of the Federal Open Market Committee (FOMC), the Fed's principal monetary policymaking body. Even before Marvin's arrival, the department had developed an effective procedure for preparing the president for these meetings including a "pre-FOMC" briefing attended by the president and the full policy team late in the week before a meeting and a subsequent final briefing on Sunday afternoon. The Sunday briefing was attended by the president and the research director — traditionally the president's principal advisor, who typically attended FOMC meetings with him — and two or three other senior members of the policy team.

Over the years, as he gained greater experience with the FOMC, Marvin raised the level of these preparatory meetings substantially, especially after he became my principal advisor when I was appointed Bank president in 1993. Team members presented high-quality memos on various topics relevant to the upcoming meeting. Some of these memos addressed matters expected to be the principal focus of the meeting. Some of the most valuable, however, provided broader relevant background on issues like the inflation process, operating procedures used in conducting monetary policy, and labor and financial market conditions.[4] I attended these pre-FOMC briefings throughout

[4] The department's distinguished historian of economic thought, Tom Humphrey, often provided relevant insights from the broader, long established economics literature. Especially important contributions were made in the pre-FOMC briefings by Tim Cook. Tim retired shortly after I became Bank president in 1993. Before that, he worked closely with me, Marvin, and others keeping Black abreast of developments regarding the Fed's operating procedures for implementing monetary policy — particularly the Volcker "monetarist" policy framework inaugurated in October 1979. Tim wrote or coauthored several important papers on the relationships between Fed policy actions and financial markets, and he had a significant influence on Marvin's and my thinking about operational policy issues.

my term as president and benefited greatly from them not only for their content, but also because the interaction reinforced my relationships with individual members of the Research Department and the policy team. These initial stages of our FOMC preparations were central to our ability to participate effectively in FOMC meetings and constructively influence their outcomes.

The heart of our Bank's policymaking process occurred after the pre-FOMC briefing, culminating in the Sunday afternoon session. During my tenure, Marvin led these meetings. Before the meeting, he would prepare a draft proposal for the statement I would make at the upcoming FOMC meeting. This statement summarized our Bank's view of the economic outlook and our recommendations for the policy that would be implemented following the meeting.[5] The team members and I would then discuss Marvin's draft in detail and hone it to a "final" product.[6] The discussions were lively and expert. By the latter stage of my tenure, Marvin had established himself as a widely respected macroeconomist and constructive critic of Fed policy. He spent substantial time drafting the statement and did not readily agree to modifications. I, in turn, pushed for modifications I thought were necessary for me to present our positions comfortably and effectively to the FOMC. A typical exchange went like this:

> Broaddus: Marvin, I think we'd be more persuasive if we said such and such rather than what you have.

[5] In this period, participant statements in FOMC meetings tended to be scripted to a greater degree than in the post-Greenspan era.

[6] In addition to Marvin and me, team members who participated regularly in the Sunday meetings included Bob Hetzel, Roy Webb, and Jeff Lacker. Alex Wolman and Andreas Hornstein also attended during parts of the period as did Mike Dotsey before his departure to the Philadelphia Fed.

> Goodfriend: You can make that change if you want to, Al, but it will gut the whole point I'm trying to make.

After some good-natured but serious back and forth, we'd reach an agreement Marvin could live with. These brief but sometimes intense fine-tunings played to our respective strengths and, in my view, contributed greatly to our effectiveness in the FOMC meeting "go-around" discussions. They were reinforced by innumerable one-on-one discussions with Marvin, during walks in Richmond or Washington or late at night in one of our offices, where we hammered out our joint positions on core monetary policy issues.

Following the FOMC meeting in Washington, Marvin would grade my performance on the drive back to Richmond — always fairly, but as anyone who knows Marvin would expect, no punches Marvin felt were needed were pulled. There's no question in my mind, though, that these critiques served me well and elevated my ability to represent the Bank and present its positions effectively.

Making the case to the FOMC — some examples

Against this background, the following sections describe several experiences over about a quarter-century that I recall especially well, where Marvin and our Richmond policy team sought to convey some of Marvin's core policy themes persuasively to the FOMC and the broader Fed's policymaking staff.[7]

a. *Policy Transparency and Marvin's Secrecy Paper*

The first of these experiences was the writing and eventual publication of Marvin's seminal paper on transparency, "Monetary Mystique: Secrecy and Central Banking."[8] If memory serves, Marvin began thinking about this paper not long after arriving in Richmond. As many readers are probably aware, early drafts of this paper made some people in the

[7] Other team members such as those mentioned in the preceding footnote also made important contributions, but Marvin was the dominant and unifying force.

[8] Goodfriend (1986). Lars E.O. Svensson covers the paper in detail in his essay in this volume.

Fed uncomfortable, not least in Richmond. At the time, the cultural consensus inside the Fed was that it was inherently and continuously exposed to often politically motivated external scrutiny and attack. Many felt the wagons needed to be circled pretty much all the time. Moreover, it was generally recognized that responsibility for protecting the Fed and the part of the public interest the Fed served resided primarily with the Fed Board of Governors in Washington.

Marvin's paper challenged important aspects of this consensus when an early version was sent to the Board for review. In brief, the 1979 Merrill lawsuit forced the Fed — more precisely the FOMC — to provide an explicit defense of its routine delay (i.e., secrecy) in releasing policy directives after FOMC meetings.[9] Marvin scrutinized this defense rigorously using relevant tools of economic analysis, including rational expectations. His paper caused discomfort, I think, because the FOMC's defense of its secrecy took the form of affidavits submitted during the litigation by one of the Board members and senior staff at the Board. Therefore, Marvin was directly (and potentially publicly) challenging these statements and their authors, albeit in a balanced and professional manner. Board positions had certainly been challenged before, by the St. Louis Fed in particular, but not as directly and forcefully by us.

Over time — a fair amount of it, actually — things worked out. Marvin never wavered, and the department's and the Bank's leaders consistently supported making the paper available to the public. It was published in 1986 in the *Journal of Monetary Economics* and played a significant role in the advancement of transparency in Fed monetary policy. It also permanently set a higher standard for our Bank's effort to contribute meaningfully to monetary policy.

b. *Preemptive Policy in 1994*

A second experience Marvin and our policy team shared was our especially active participation in FOMC meetings in 1994. This was an eventful year for the FOMC and for us. It was my first year as a voting

[9] *Federal Open Market Committee v. Merrill*, 443 U.S. 340 (1979).

FOMC member and Marvin's first accompanying me to Washington as my official advisor. That last point might suggest to some that Marvin reported to me. But most readers of this article are probably aware that on matters of monetary policy, in most respects effectively, I reported to Marvin. In any case, I was now positioned to present and advocate Marvin's views, often edited by me to soften their hardest edges to make them more palatable to my colleagues at the FOMC table. My statements typically included Marvin's thoughts, along with my own, on immediately current policy issues, but also Marvin's longer-term core principles summarized above. He sat directly behind me, and I felt a strong need to convey these principles accurately, frequently, and convincingly.

Several issues arose during the year. The first was whether the Fed would act promptly and with sufficient force to preempt any material increase in inflation or, equally importantly, emerging inflation expectations as the economy completed its recovery from the 1990-91 recession. Marvin had been greatly impressed by the preemption of inflation that Chair Volcker had overseen in 1983 and 1984, when for the first time the Fed had increased its policy federal funds rate materially without a sustained prior increase in inflation. With long-term Treasury bond rates rising since October 1993, signaling a rise in inflation expectations, Marvin wanted a preemptive encore in 1994. To that end, we argued for relatively aggressive tightening at each meeting throughout the year, which occurred, although not as aggressively as we wanted at the September meeting, when I dissented for the first time.[10]

Marvin believed that the FOMC's preemptive policy rate increases in 1994 anchored inflation expectations in the US and prevented the increase in actual inflation that appeared possible, even likely, at the beginning of the year. This was a substantial accomplishment for the

[10] The federal funds rate rose from approximately 3 percent to approximately 6 percent over the course of 1994.

FOMC, and I believe that Marvin's advocacy of this strategy, through my FOMC statements and other channels, played an important role in making it happen.

The year 1994 was also the year in which, at Marvin's instigation, we argued strongly against Fed involvement in Treasury initiatives to lend money to Mexico to assist the country in dealing with its peso crisis and prevent Mexico's problems from destabilizing broader international financial markets.[11] While persuasive arguments were made supporting such actions, Congress had explicitly declined to authorize them, and Marvin was appropriately concerned that Fed involvement would threaten the Fed's independence. Later in the year Marvin pushed me to dissent against renewal of the Fed's foreign exchange swap lines because they facilitated foreign exchange market intervention, which he felt undermined monetary policy credibility. He also believed they didn't work well, as illustrated especially clearly by an unsuccessful joint intervention with several countries in June of that year to support the dollar. Marvin insisted that I repeat the language of that dissent verbatim, annually, for the remainder of my time at the Fed. I would object, annually, that the FOMC had already heard it more than once. With a hint of annoyance, he would tell me, in effect, to "play it again, Sam."

c. *What Assets Should the Fed Buy if Treasury Bonds are in Short Supply?* In 2001 and 2002, not long before both Marvin and I left the Fed, tax revenues arising from the late 1990s technology boom produced federal budget surpluses. Remarkable as it seems now, Treasury debt outstanding was declining and the FOMC began to worry about what it would do in the event there were insufficient Treasury securities available for the Fed's routine open market purchases. An FOMC subcommittee led by Don Kohn and Peter Fisher suggested several potential ways to address the problem.

[11] Our broader views on the Fed's foreign exchange operations are presented in Goodfriend and Broaddus (1996).

As he made clear in his proposal later for an "Accord" on Federal Reserve credit policy, Marvin believed passionately that the Fed should avoid putting private assets on its books.[12] Consequently, faced with the prospect of a shortage of bonds, at the January 2001 FOMC meeting I summarized in detail Marvin's proposal for having the Treasury issue additional bonds to keep the Fed's operations "Treasuries Only." Chair Greenspan, true to his jazz band accounting experience, wanted to know what the Treasury would do with the proceeds of such bond issuance.[13] Wouldn't the *Treasury* then have to buy private assets? I mumbled something; Greenspan repeated the question. Marvin, clearly alarmed that I was about to blow the opportunity, raised his hand and asked if *he* could respond. I said "sure," but I wasn't sure what the chair would say. In almost 30 years of attending FOMC meetings, this was the only time I ever saw a Reserve Bank advisor intervene in an FOMC meeting without an invitation to do so. I suppose I should have been embarrassed since it revealed who was driving policy in Richmond, at this meeting certainly. But I was proud of Marvin, and the point that needed to be made was made — that the Treasury would either need to buy private assets or the proceeds would have to be eliminated by increasing government spending or reducing taxes. I was also impressed that Greenspan showed no displeasure at the deviation from protocol and had a brief but natural exchange with Marvin.

d. *The Initial Inflation Targeting Debate in the FOMC, 1995-98*[14]

As indicated above, the progress toward bringing inflation down began with Chair Volcker's decisive actions in the early 1980s. While it took well over a decade, by the late 1990s there was at least an implicit consensus within the Fed that we were in the neighborhood of "price stability."

[12] Goodfriend (2008).

[13] Greenspan was a musician in Henry Jerome's dance band for several years early on. He also kept the band's financial books and helped other band members with their taxes.

[14] This section closely follows Marvin's description of the early debate regarding inflation targeting in the FOMC in Goodfriend (2010), pp. 17-23.

At this point, naturally enough, questions arose. First, what should the ultimate numerical objective for the desired steady-state inflation rate be? Second, and related, with inflation now persistently at historically low levels with market interest rates trending downward, was there a level below which a further decline in inflation might harm the economy?

Attention thus turned to the idea that the Fed should consider setting an explicit numerical inflation target.[15] Not surprisingly, Marvin viewed inflation targeting favorably as a way of reinforcing a central bank's credibility for low inflation, and he pushed me to indicate our Bank's support for the concept when I became an FOMC member/participant in 1993. When the idea gained traction among some members of Congress, Chair Greenspan asked then Fed Governor Janet Yellen and me to lead a discussion of the pros and cons of inflation targeting at the FOMC meeting in January 1995.

In the week preceding this meeting, Marvin enthusiastically drafted the case for targeting that I delivered at the meeting. There, I summarized the benefits that a credible Fed precommitment to low inflation via a target would foster, most notably higher economic growth and employment. In particular, I argued that the greater credibility resulting from a target would reduce the sacrifice ratio:

> What it would do – and this is probably the most important thing I'll say today – is discipline us to justify our short-term actions designed to stabilize output and employment against our commitment to protect the purchasing power of our currency.[16]

[15] Inflation targets had been established in New Zealand in 1990, Canada in 1991, the UK in 1992, and subsequently in many other countries.

[16] FOMC Transcripts, January 31-February 1, 1995, pp. 39-41.

Governor Yellen made the case against a target, which she believed would downgrade the Fed's high employment goal.[17] She also doubted that a target would increase the Fed's credibility and thereby reduce the sacrifice ratio, i.e., the loss in jobs and output required to resist short-run increases in inflation.

In the discussion that followed, the committee was about evenly divided on the desirability of a target. A subsequent discussion at the July 1996 meeting, however, briefly encouraged Marvin and me at one point when it appeared that the committee was approaching a consensus on "holding the line" at the then current 2 percent inflation rate (as measured by the Fed's preferred personal consumption expenditures (PCE) price index), which would have locked in the significant reduction in inflation already achieved. Our hopes were dashed when the discussion ended without an explicit recognition of the progress just achieved toward consensus on the issue. Marvin was especially disappointed.

With Marvin's encouragement, I again proposed an inflation target at the February 1998 FOMC meeting. At this point, the core PCE inflation rate had declined to below 2 percent and concerns about "unwelcome disinflation" and the risk of deflation had begun to arise. With this in mind, we argued for an explicit *lower bound* for any inflation target that might be put in place. This was a precursor of Marvin's subsequent, influential work on conducting monetary policy at the zero lower bound (ZLB).[18]

[17] In my opening statement favoring a target, I recommended defining it in the terms of the earlier Neal Amendment, which omitted a numerical target and defined price stability as a condition where expectations regarding future inflation do not play a significant role in economic decisions. My hope was that softening the proposal in this way would increase its acceptability to the committee. My recollection is that Marvin agreed with this strategy but with reservations. Yellen, in contrast, was arguing specifically against any proposal that made price stability the sole objective of policy, which appeared to include any proposal that included a numerical target.

[18] The FOMC adopted an explicit 2 percent inflation target in 2012, initially as a standard point target. In August 2020, the committee modified the target to an "Average Inflation Target." See Williams (2021).

e. *Monetary Policy at the ZLB*

As just discussed, the almost 20-year effort to achieve credibility for low inflation appeared to bear fruit in the late 1990s. Attention began to turn — slowly at first — to the challenges posed for monetary policy by persistently low inflation and short-term interest rates approaching the ZLB. Marvin was at the forefront of path-breaking research about these challenges and ways to deal with them.[19]

In October 1999, at a Fed conference in Woodstock, Vermont, Marvin presented the results of his initial research in this arena, "Overcoming the Zero Bound on Interest Rate Policy."[20] In the paper, he described three approaches to retaining the ability of monetary policy to cushion a deflationary downturn in the price level and economic activity: a "carry tax" on cash balances and two forms of "quantitative" policy actions, either large-scale purchases of longer-term government securities (or similary illiquid private assets), or direct transfers of money to the public. At the January 2002 FOMC meeting, Marvin was invited to summarize his two quantitative policy alternatives. Both alternatives derive from the idea that long-term government securities offer what Marvin calls "broad liquidity" services in that they can be converted to liquid assets or used as collateral to borrow liquidity. Consequently, Marvin argued, the Fed (or any central bank) can affect the economy by purchasing broad liquidity assets and thereby affecting their yield.

While I did not participate directly in Marvin's preparation for this meeting, I was present and listened attentively to his presentation and the discussion that followed. Participants generally indicated interest in his results but seemed to view them as preliminary and academic rather than of immediate relevance to the policy issues of the day. Their relevance soon became apparent, however, during the financial crisis of 2008-09 and its aftermath, as Marvin's ZLB research provided a starting point for the Fed and other central banks as they confronted the radically different policy environment that emerged following the crisis.

[19] For an engaging summary of Marvin's contributions in this area, see Williams (2020).

[20] Goodfriend (2000). Ben Bernanke covers the paper in detail in his essay in this volume.

Against this background, it is interesting and satisfying to consider Marvin's views regarding the role of Fed credibility in conducting policy at the ZLB, thus returning full circle to his core credibility principle discussed at the beginning of this article.[21] As Marvin indicates, the quantitative policy approaches described above are likely to increase, significantly, the public debt and the monetary base. Therefore, in resisting excessive disinflation or a deflation, the Fed may create a risk of a rapid reemergence of inflation. Its willingness to mount a successful defense against *deflation*, then, requires that it sustain, permanently, its credibility against *inflation*. As Marvin put it to me (and to many others), full credibility against deflation requires continuing full credibility against inflation. It was at this moment, late in my career at the Fed, that I grasped fully the comprehensive power of Marvin's credibility principle for monetary policy.

Concluding comments

Hopefully the preceding discussion has conveyed adequately the range and depth of Marvin's contributions to Federal Reserve monetary policy and central banking more broadly. All of us who worked with Marvin at the Richmond Fed are proud that our Reserve Bank was the setting for much of his most important research. We are also grateful for what he did to raise the standing of our Bank and enrich our individual careers. By the same token, I know also from conversations with Marvin that he greatly appreciated the supportive research environment he enjoyed in Richmond just as he appreciated Chair Greenspan's willingness to foster a collaborative culture across the Federal Reserve, understanding that each strengthened his research and made

[21] See especially Goodfriend (2016).

it available to a broad international audience. Most importantly, I hope that what I've summarized here will confirm again what I and many others, inside and outside the Fed, have long believed: that among those who have labored to improve the conduct of American and global monetary policy, Marvin Goodfriend is a giant.

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The Federal Reserve's New Monetary Policy Framework

Donald Kohn

I very much appreciate the opportunity to participate in this volume honoring Marvin Goodfriend's contributions. Marvin and I interacted often as we both served in the Federal Reserve System, comparing notes on developments in macroeconomics and monetary policy at numerous conferences and in informal contacts along the margins of Federal Open Market Committee (FOMC) meetings and elsewhere. Marvin had a huge influence on the study and practice of monetary policy within the Federal Reserve and more widely. Even where his ideas took time to filter into actual policy, he often framed the debate, forcing the skeptics to examine their arguments more closely.

For many years, I was one of those skeptics when it came to explicit inflation targeting. In fact, conference organizers liked to position Marvin and me as the pro and con on this topic. While I shared Mavin's objective of anchoring inflation and expectations around 2 percent, I saw advantages in keeping the goal implicit rather than explicit; expectations were becoming anchored at close to 2 percent in any event, and an implicit target might afford greater flexibility to respond to some types of shocks.

These debates were great learning opportunities for me. Marvin marshalled empirical evidence and embedded that evidence in the theory and practice of central banking over history. Marvin was open and honest about his views and the supporting evidence. And however much you might have differed, you couldn't doubt his focus on and devotion to bringing his considerable intelligence and deep learning to serving the interests of the Federal Reserve and the United States.

In the end, Marvin's analysis prevailed. In the aftermath of the financial crisis, I was won over to the view that the benefits of an explicit inflation target would exceed its costs. In 2012, after I left, the Fed adopted a 2 percent target.

My conversion and the explicit target emerged from the threat of the Federal Reserve missing both its employment and inflation targets on the low side, rather than from building the bulwark against high inflation that mostly animated Marvin's advocacy over the years. The major risk to inflation expectations as the country slowly recovered from the global financial crisis of 2007-09 was that they would fall below 2 percent, reducing nominal rates and limiting the scope for policy easing in the future. I saw an explicit target as helping gain support for additional monetary policy action from the members of the FOMC who feared that unconventional policies might cause much higher inflation down the road.

But the essence of Marvin's vision has been realized. The Federal Reserve has made an explicit public commitment to achieving 2 percent inflation over time, which should help discipline policy and firm up expectations against deviations from the target in either direction.

Importantly, the inflation target that Marvin advocated for rested on two closely related pillars of his analysis. First, that economic welfare was fostered by effective price stability and by public expectations that prices would remain stable (avoiding "inflation scares"). Second, that those expectations would be more durably anchored, and democratic accountability better served, by central bank transparency about its targets and its plans for meeting them.

Clearly the Federal Reserve has embraced both of those propositions. In addition to the explicit inflation target, policymakers have taken a number of steps in recent decades to be more open about their analysis and rationale for policy. In his essay introducing Marvin's paper on "Monetary Mystique" in this volume, Lars E.O. Svensson outlines what the Federal Reserve has done to realize Marvin's objective of transparent policymaking. The major actions include: (1) announcing policy decisions immediately (1994); (2) publishing quarterly the projections of FOMC participants for output growth, inflation, the unemployment rate, and the appropriate path of the federal funds rate to achieve the FOMC's legislated objectives for "maximum employment and stable prices" (2008-2012); and (3) adopting and publishing a "Statement on Longer-Run Goals and Monetary Policy Strategy" (2012)

that outlines the FOMC's view of its objectives and how it intends to pursue them.

Goals may be largely fixed by legislation, but strategies and the communication around them need to adapt to changing circumstances. In recent years — before the Covid pandemic — the Federal Reserve had been wrestling with how to adapt its targets, strategy, and transparency to a world in which central banks, including the Fed, struggled with getting inflation **up** to the 2 percent target in an environment of persistent disinflationary pressures. Those disinflationary forces were marked by weak demand, the effects of globalization and technology on costs, and surprisingly muted responses of inflation to low unemployment rates. During this time, very low equilibrium nominal interest rates raised pressing questions about whether existing policy strategies could be consistently successful in achieving the Fed's legislative objectives when the zero lower bound (ZLB) on rates could frequently limit the scope for easing policy in response to negative demand shocks.

The constraint on policy easing presented by the ZLB creates a potential asymmetry toward missing both the inflation and employment goals on the low side on average over time if, as in the strategy adopted in 2012, policy is always aiming just at its 2 percent inflation target. That bias may not be reliably overcome using unconventional policy measures, like asset purchases and forward guidance. In fact, inflation had persistently fallen short of the Fed's goal in the decade from 2009 through 2019, despite interest rates at zero and substantial asset purchases over much of that period. Moreover, inflation misses on the low side occurred even with unemployment rates that had declined to much lower levels than previously thought consistent with maintaining price stability. To be sure, the inflation misses were generally small, but they also were accompanied toward the end of this period by a downward drift in some measures of inflation expectations, raising questions about whether these expectations would continue to be anchored around the 2 percent target.

In response to this experience, the Federal Reserve ran a very public and transparent process to assess how it should alter its monetary

policy framework — its monetary policy strategy, tools and communications — to raise the odds on achieving its legislated price stability and maximum employment objectives more consistently in this low natural rate environment. It announced the results in August 2020 in a revised version of its "Statement on Longer-Run Goals and Monetary Policy Strategy" and in a speech by Chair Powell that explained the changes and their rationale.[2]

Lars E.O. Svensson touches on the new framework at the end of his essay. In this piece I will dig a little deeper, evaluating it through the prism of the two pillars of Marvin's work previously cited — sustaining price stability and being very transparent about how that will be achieved.

The new framework

With respect to the objectives of monetary policy, the new framework retains the critical elements of the old framework. It kept the 2 percent inflation target as its definition of its price stability mandate. With respect to maximum employment, it continued to acknowledge that specifying an explicit numerical goal is unwise because the level of maximum employment consistent with stable prices is not directly measurable, is not under the control of the Federal Reserve, and changes over time for reasons unrelated to monetary policy.

[2] See https://www.federalreserve.gov/monetarypolicy/review-of-monetary-policy-strategy-tools-and-communications.htm for an explanation and background material. The following description is based on the "Statement of Longer-Run Goals and Monetary Policy," https://www.federalreserve.gov/monetarypolicy/review-of-monetary-policy-strategy-tools-and-communications-statement-on-longer-run-goals-monetary-policy-strategy.htm, and on Chair Powell's speech introducing the new framework, https://www.federalreserve.gov/newsevents/speech/powell20200827a.htm. At its meeting on January 25, 2022, the FOMC unanimously reaffirmed the statement adopted in August 2020, https://www.federalreserve.gov/newsevents/pressreleases/monetary20220126b.htm.

But responding to the 2009-19 experience, the FOMC made some key changes in the specification of the maximum employment goal and the strategy for achieving its objectives. The previous statement hadn't defined maximum employment, but many observers, including many members of the FOMC, gave heavy weight to the unemployment rate and looked at the historical relationship of this variable to changes in inflation to gauge how close the economy was to this goal. Reflecting this approach, the old statement gave the median of FOMC members' recent estimates of the normal long-run rate of unemployment as an example of a measure of maximum employment. Because the history of this relationship had not been a good guide to future inflation in recent years, the new statement dropped this reference to the unemployment rate and added that "the maximum level of employment is a broad-based and inclusive goal." Although the old statement said that the FOMC looked at a "wide range of indicators" of labor market tightness, the new statement and its exposition by a number of FOMC participants has seemed to suggest not only a de-emphasis of the unemployment rate, but also increased attention to a wider array of other indicators, including labor market outcomes across population subgroups.

In addition, the monetary policy strategy for dealing with labor markets was altered in an important way. Policy would take account of shortfalls from maximum employment (e.g., unemployment rates above the estimated normal level), but not necessarily of estimated overshoots (e.g., unemployment rates below the estimated normal level).[3] That's because in the 2009-19 period policy had been tightened in low unemployment periods to head off inflation, but experience had been that inflation would be quiescent at much lower levels of unem-

[3] "… the Committee's policy decisions must be informed by assessments of the shortfalls of employment from its maximum level…" The old statement had said that policy would be informed by "assessments of the maximum level of employment," implying attention to both sides of the level. And later in the new statement: "In setting monetary policy, the Committee seeks to mitigate shortfalls of employment from the Committee's assessment of its maximum level and deviations of inflation from its longer-run goal."

ployment than had been expected. The FOMC continued to acknowledge that policy affected employment and inflation with a lag, but it would not run a tight policy to preempt projected inflation overshoots based only on actual and projected labor market conditions. Tight policy — interest rates being moved above the estimated neutral rate — would depend on already seeing unsatisfactory inflation outcomes.

On the inflation goal itself, the FOMC's new statement emphasized the importance of keeping inflation expectations well-anchored at its goal of 2 percent, but it worried that periods of below-target inflation would be more prevalent than above-target inflation given the ZLB problem, which would tend to pull expectations under 2 percent. To avoid this outcome, it would now seek to achieve inflation that averaged 2 percent over time. That means that when inflation has been running below 2 percent, monetary policy will aim to achieve inflation "moderately above 2 percent for some time." This has been labeled flexible average inflation targeting, or FAIT.

Sadly, we cannot know what Marvin would have thought about the new framework. I suspect he would have been very pleased with how the review was conducted: the process for arriving at the new framework and statement was announced ahead of time; the Fed held public "FedListens" sessions to get input from the public and from academics; it reported on the progress of its deliberations in the minutes of the FOMC; some members of the FOMC used speeches to keep us informed about the evolution of their own thinking; and, simultaneously with the rollout of the new framework, it published the staff analysis that the FOMC had as it considered its options. I also suspect he would have liked the emphasis on keeping inflation expectations anchored at the 2 percent target and the explicit rejection of raising the target, as some academics had been suggesting.[4]

[4] For example, see the paper by Eberly, Stock, and Wright at the FedListens conference in June 2019, https://www.federalreserve.gov/conferences/conference-monetary-policy-strategy-tools-communications-20190606.htm.

Beyond these key elements I will not try to guess at how Marvin would have reacted. Below, in examining the new strategy, I will channel the principles he imbued in the Federal Reserve for securing price stability and enhancing transparency. But I know that my analysis would have been much stronger had I been able to benefit from the give and take with Marvin that was so important to the evolution of my thinking and that of countless others at the Fed.

Anchoring inflation expectations at 2 percent

As noted, the new framework grew out of a period in which inflation fell short of the 2 percent target and inflation expectations drifted down, despite very low interest rates and much lower unemployment than had previously been thought consistent with low, stable inflation. Keeping expectations from moving below 2 percent is especially important when the real equilibrium interest rate appears also to be quite low, making the ZLB an increasingly salient policy constraint.[5]

The FAIT framework is well designed to counter the disinflationary bias imparted by policy being constrained by the ZLB from time to time. FAIT promises to make up for inflation below 2 percent by aiming to run it "moderately above 2 percent for some time" — a flexible form of price-level targeting. That implies easier policies for longer than if the Fed were simply aiming to return inflation to 2 percent without the makeup. The point of the averaging is to make sure expectations are indeed anchored at 2 percent. In effect, deliberately aiming for inflation to exceed 2 percent for some time and likely allowing the overshoot of maximum employment necessary to achieve that results in an upward inflation bias that offsets the downward bias arising from the ZLB.

[5] Several reasons have been given for a very low natural real rate of interest (r-star). They include weak investment demand in a more service-dominated economy with slower growing populations; increased saving as populations age, as governments of developing countries accumulate reserves as a precaution against sudden stops of capital flows, and as people downshifted consumption in the wake of the global financial crisis; and slowed productivity growth after 2005. The r-star estimates of the Laubach-Williams model are given at https://www.newyorkfed.org/research/policy/rstar.

But there are other asymmetries in the new framework — beyond the makeup for actual undershoots — that also lean toward taking upside risks on inflation and raise questions about how well adherence to the framework would anchor expectations in circumstances in which inflation wasn't so quiescent.

One key problem is that the strategy does not address what is to happen if there are persistent overshoots of the 2 percent target. It reaffirms that "the Committee seeks to achieve inflation that averages 2 percent over time" but follows that statement with the aim of making up for undershoots and doesn't address the opposite situation. Making up for overshoots would be required if persistent inflation over 2 percent resulted in longer-term inflation expectations rising above 2 percent. It would involve difficult economic decisions as it implies a need to deliberately run the economy below its sustainable potential for a time to lower inflation and inflation expectations.

One suspects the FOMC might opt for "opportunistic disinflation" in such circumstances — waiting for an external shock, rather than monetary policy, to create slack and lower inflation. That was the view of many members of the FOMC in the 1990s when inflation exceeded 2 percent, but at that time the FOMC was working in the context of an implicit target, not an explicit one, which afforded a greater degree of flexibility. In any event, a framework that addresses making up for undershoots but not overshoots would seem to risk a bias toward inflation over 2 percent if circumstances differ materially for a time from the disinflation pressures of 2009-19.[6]

[6] At his press conference of January 26, 2022, Chair Powell appeared to confirm the one-sided character of the make up in the new framework — though still with some ambiguity since he also emphasizes having inflation average 2 over time:

> MICHAEL MCKEE: ……ask you, as you start to reverse policy, what your goal is. Are you going to be raising interest rates until you get inflation to 2 percent? Do you want to go below 2 percent so that, on average, you get a 2 percent inflation rate? ….
>
> CHAIR POWELL: So, no. There's no — there's nothing in our framework about having inflation run below 2 percent so that we would do that, try to achieve that outcome. So the answer to that is, is "no." What we're trying to do is get inflation, keep inflation expectations well anchored at 2 percent. That's, that's always the, the ultimate goal. And we do that in the service of having inflation — we get to that goal by having inflation average 2 percent over time.

A second upside inflation bias arises from the asymmetry of the response to deviations of labor markets from estimates of maximum employment. Shortfalls of employment from estimated maximums weigh on the side of accommodative policy, but actual or projected overshoots, by themselves, do not call for tight policy. In the past, the FOMC had increased the federal funds rate by enough to head off possible future inflation when projections suggested that declines in the unemployment rate in the absence of tightening were likely to result in future above-target rates of inflation — even before inflation or inflation expectations had risen into unacceptable territory. Lags in the effects of monetary policy made such preemptive moves desirable to avoid having to impose future output losses to bring inflation back down. In the new framework, the FOMC will continue to get ahead of unwelcome declines in inflation by running accommodative policy when it judges there to be slack in labor markets, but its scope to head off future unwanted increases in inflation would appear to be more constrained, risking overshoots of the target under some circumstances and the resulting greater variability in output.[7]

The choice of this asymmetric reaction function grows out of the experience from 2009-19 when the committee had overestimated the unemployment rate consistent with low stable inflation and in retrospect felt that had it waited to tighten more jobs would have been created more quickly with inflation still contained. If the relationship between slack and inflation is as attenuated as it seemed to be from 2009-19, then waiting to see actual inflation rise might not be very costly in terms of unanchoring expectations on the upside, because any rise in inflation would be small. But a steeper Phillips curve, say because of greater uncertainty and eroding credibility around the 2 percent target or a larger decline in unemployment relative to the natural rate, would impart a more definite inflation bias to policy.

[7] To be sure, the new framework does not rule out *tightening* policy — raising the funds rate toward its equilibrium rate — when employment is rising toward its maximum sustainable level, but it does seem to rule out *tight* policy — r above r* — unless actual inflation is already unacceptably high.

The forward guidance on interest rates provided during the pandemic implemented this asymmetric response to labor markets in a particularly aggressive way. In September 2020, the FOMC adopted language that promised to keep interest rates close to zero "until labor market conditions have reached levels consistent with the Committee's assessments of maximum employment and inflation has risen to 2 percent and is on track to moderately exceed 2 percent for some time." This meant that short-term rates would remain deeply negative even in the run up to full employment with inflation at the target and predicted to rise further, leading to a likely overshoot of maximum employment and continued upward pressure on inflation. This was more aggressively easy guidance than required by the new framework, which only called for policy to be accommodative before the economy had reached maximum employment, but it reflected the new emphasis on reaching full employment and not projecting increases in inflation.

As I write in early 2022, the economy has rebounded from the initial shock of shutdowns in the wake of the onset of the Covid-19 pandemic, inflation has surged to levels well in excess of the 2 percent target, and the labor market has tightened considerably faster than expected. That surge has reflected both strength in demand and Covid-related constraints on supply.[8] The situation is complex and unprecedented, containing elements of adverse supply shocks that are always difficult for monetary policy to navigate.

To the credit of the Federal Reserve, as the persistence of inflationary pressures became increasingly evident, it pivoted quite rapidly toward an accelerated removal of the extreme accommodation it had put in place in the initial stages of the pandemic. It began to reduce its

[8] Demand has been boosted by highly supportive fiscal policy, very accommodative monetary policy and its associated effects raising equity prices and wealth, and by spendable household savings accumulated from fiscal payouts and limits on opportunities to spend on services. On the supply side, waves of Covid-19 infections have adversely affected the supply chains for the goods so much in demand. Early retirements along with health concerns, child care and school disruptions, and Covid-19 infections of workers and their families have limited the rebound in labor force participation, leading to very tight labor markets.

purchases of securities sooner and more rapidly than it had previously expected, and it is clearing the way for beginning to raise its target interest rate in March 2022, also much sooner than it or many observers had expected as recently as summer 2021. Although measures of short- and medium-term inflation expectations have risen to well above 2 percent, longer-term expectations remain anchored at levels consistent with 2 percent, suggesting the Federal Reserve retains credibility for achieving its long-run objective over time.

Still, this experience suggests that the asymmetries of the new framework could risk an upward drift from the 2 percent inflation anchor when the surrounding macroeconomic circumstances deviate from the damped demand, low-inflation environment of 2009-19. The Federal Reserve needs to consider and then spell out its approach to achieving its price stability goal if the prior disinflationary forces do not reemerge. To be sure, the FOMC can never anticipate and discuss all the situations it might face in the future. But it should be able to describe in a general way how it would expect to react if, for example, inflation persisted above its target and expectations began to drift higher despite estimated slack in labor markets or if wages and prices suggest that labor markets are approaching a level of "maximum employment" that is lower than previously expected.

Transparency

As indicated by the previous discussion of asymmetries and changing circumstances, the new framework is more complex than the old one, in which monetary policy was always targeted at 2 percent inflation and goal conflicts posed by supply shocks were subject to a "balanced approach" to both goals based on deviations on either side of inflation from target and of employment from the estimate of maximum.

Complexity challenges transparency. As Marvin emphasized, transparency is critical for policy effectiveness — the more accurately the public can predict what the central bank is going to do, the more rapidly the economy is likely to move toward central bank objectives. Transparency is also critical in a democratic society for accountability

and preserving central bank independence. The previous regime could be approximated by relatively simple policy rules that could serve as benchmarks and guides for the FOMC and its observers. In the new framework, policy responses depend on how long the policy rate has been pinned at zero and inflation has fallen short of target and whether "maximum employment" is being approached from above or below, greatly complicating the explanation of strategy.

Although the process of coming up with and rolling out the new framework was very open, in some respects the new framework is a step back in transparency. To an extent, this is an understandable consequence of the inherent complexity and lack of experience with the new framework. And some of the lack of transparency results from a deliberate attempt to preserve flexibility.

Yet, I am convinced that the Federal Reserve can improve the transparency of policy under the new framework.

First, as I've already discussed, it needs to outline how it will deal with circumstances that differ materially from those that prompted the rethink — for example, adverse supply shocks, persistent and material inflation overshoots, and the waning effects of the disinflationary forces of the 2009-19 period. A crucial question is how monetary policy strategy would evolve in the framework if the problem becomes one of reducing inflation rather than getting it up to target.

Second, the new framework has redefined its "maximum employment" goal in ways that are less transparent. Both the old and new statements note that maximum employment isn't under Fed control but rather is "defined by nonmonetary factors that affect the structure and dynamics of the labor market." The previous statement, however, gave the most recent estimate of participants for the long-term unemployment rate consistent with its mandates as a reference point. To be sure, that estimate had to be interpreted along with other data on labor markets, wages, and prices to get a sense of whether the unemployment rate consistent with stable prices was shifting, but the long-term unemployment rate provided a guidepost.

The current statement characterizes maximum employment as a "broad-based and inclusive goal that is not directly measurable and changes over time" and omits the reference to participants' projections of the sustainable unemployment rate. The FOMC has yet to define what measures are encompassed by "broad-based and inclusive," with some participants emphasizing that they will be paying close attention to the labor market experience of low-wage and minority groups without discussing how that view intersects with the FOMC's price stability mandate. If economic agents are to understand and accurately anticipate monetary policy, the FOMC needs to spell out more clearly what it means by broad-based and inclusive.

Third, another aspect of the new strategy that would benefit from additional explanation is how flexible average inflation targeting will work in the real world. I have considerable sympathy with the "flexible" piece of FAIT — it's in line with my position on inflation targeting in my discussions with Marvin that an implicit target gave the FOMC greater scope to deal with unexpected and unusual shocks arising, for example, from financial market developments. But the FOMC has an explicit target — 2 percent inflation over the longer run — and emphasizes the gains for both parts of the dual mandate from having expectations anchored at that level. In the circumstances that the framework was designed for — avoiding a downward drift in expectations from persistent undershoots of the target — the committee has said that if inflation did fall persistently short of target, it would "aim to achieve inflation moderately above 2 percent for some time."

As inflation came to exceed 2 percent over the course of 2021, market participants were struggling to gauge the FOMC's definitions of "moderately" and "for some time." I wouldn't expect precise definitions of those words — that would take the F out of FAIT — but some guidance would be a useful enhancement of transparency. Are there ranges around the level of inflation or the length of its persistence over 2 percent that would stretch the definition of these words too far? Also, after "some time" of "moderate overshoots" would the FOMC resume targeting 2 percent inflation, or would it be content with inflation moderately over 2 percent and count on future shortfalls at the

ZLB to bring the average back to 2 percent? How would FAIT work over time — what's the end game once the average has been secured at 2 percent?

Conclusion

The new framework is well adapted to the circumstances that faced monetary policy from 2009 through 2019. But it is complex and incomplete, with a deliberate lean toward taking upside inflation risks to offset the downside risks inherent in very low interest and inflation rates. It has been implemented initially in a global pandemic that is unprecedented in modern times, which has had complex and difficult-to-predict effects on aggregate demand and supply and prompted extraordinarily expansionary fiscal and monetary policies. These forces — the virus and the policy response — have produced very high and persistent inflationary pressures, much higher and more persistent than the Federal Reserve or most mainstream economists had predicted or had been contemplated in the new statement. To the Fed's credit, the FOMC has reacted relatively quickly to the emergence of those pressures by beginning to dial back its highly accommodative policy.

The Federal Reserve has said that it will review the new framework after five years. That review and the opportunities to clarify the framework in the next few years should be used to address the work that still needs to be done to meet Marvin's objectives. They were to assure that policy would act to keep inflation expectations anchored at 2 percent under a wide variety of circumstances and that the Fed would gain the full benefits of transparency for policy effectiveness and democratic accountability. We honor Marvin's memory by trying to live up to his high standards for analysis and policy. We can best contribute to the public welfare by applying his ideas and identifying ways to narrow the inevitable gap between Marvin's standards and actual policy practice.

What Does the Fed Know, and When Does it Know It?

William Poole

Marvin Goodfriend was my student at Brown University; he was awarded his PhD in 1980. I am pleased to contribute an essay to honor his memory.

When I was appointed to the Council of Economic Advisers (CEA) in 1982, I immediately reached out to Marvin and persuaded him to spend a year on the CEA staff in 1984. During my time as president of the Federal Reserve Bank of St. Louis (1998-2008), Marvin and I crossed paths regularly. We often chatted briefly at Federal Open Market Committee (FOMC) meetings before he left the Richmond Fed in 2005.

Shortly after returning to the Richmond Fed from the CEA, Goodfriend began working on a paper evaluating the Fed's case for secrecy.[1] He picked apart the arguments the Fed presented as it attempted to fend off the FOIA suit brought by David R. Merrill in 1975. That litigation found its way to the Supreme Court and back to Federal District Court before being finally concluded in 1981. That paper of Marvin's is my motivation for this essay.

As St. Louis Fed president I attended every meeting of the FOMC between March 1998 and my final one in January 2008. The committee often grappled with the wording of policy statements, as anyone can see from reading transcripts of the meetings. For example, at the end of my first meeting in March 1998, Ned Gramlich, a Fed governor appointed in 1997, interrupted the roll call vote on the policy directive. As reported in the transcript of the meeting:

> MR. GRAMLICH. Do we have to have the "slightly lower" phrase? Am I out of order? [Laughter]
>
> CHAIRMAN GREENSPAN. That is the conventional rhetoric.

[1] Goodfriend (1986). See the essay by Lars E.O. Svensson elsewhere in this volume.

> MR. GRAMLICH. Yes, but—
>
> CHAIRMAN GREENSPAN. We have been butchering the English language in this directive for years, but let's not change it just yet. Why don't you bring that up at a later meeting? [Laughter]
>
> MR. GRAMLICH. On that advice, I vote "yes." [Laughter]

During my entire tenure we struggled with how best to communicate with the markets and the general public. I gave several speeches on the subject (see Poole [2003] for an example). By 1998, when I arrived in St. Louis, the case for secrecy in the abstract was dead but saying that does not per se make a case for disclosure. Disclosure of what, and when? We agreed that putting the FOMC meeting on C-SPAN made no sense because doing so would inhibit a full discussion of the policy issues the committee faced and would simply move the real discussion into the hallways.

Most of the literature on Fed communication is normative — what should the Fed disclose, when, and why? As illustrated by Ned Gramlich's question, the issue was how we could best communicate the policy issues we faced and why we made the decisions we did. Goodfriend examined the Fed's case for secrecy; my purpose in this essay is to approach the policy communication issues by first concentrating on what the Fed knows and when. When does the Fed have an information advantage, or disadvantage, relative to the market? What is the nature of the advantage, or disadvantage, and why does it matter? This essay is more along the lines of a positive than a normative analysis of the role of information in the Fed's monetary policy.

Proposition 1: *Absence of a systematic Fed information advantage*. The Fed has a minimal advantage, if any, in terms of knowledge of facts. The Fed chair gets the unemployment report through the chair of the CEA late Thursday afternoon, just a few hours before the Bureau of Labor Statistics releases the data publicly on Friday at 8:30 a.m. This same "advantage" of a few hours is true of all the data released by federal statistical agencies. Today, the Fed, governments at all levels, and private firms are wrestling with COVID-19. It is hard to believe that the Fed has a COVID-19 information advantage over other entities; the

Fed has made this point clear on many occasions as it has discussed the pandemic.

Federal statistical data are the raw material of macroeconomic and financial analysis. While it is true that Fed economists can tap directly into employees at the statistical agencies for additional insight, it is also generally true that private economists and analysts can reach the same experts. As a close approximation, the Fed has no advantage whatsoever over the private market in access to data. It is laughable to believe that the Fed has an inside track on future fiscal policy when the federal government itself seems so obviously dysfunctional in planning just about everything. All too much of what the federal government does is a consequence of last-minute deals brokered among many competing interests. Relative to political experts, the Fed is probably at a disadvantage in predicting what will happen.

It is also true that certain private parties sometimes have access to data that the Fed does not. An example is the story spun by Michael Lewis in *The Big Short*.[2] Lewis explains how a few hedge fund managers developed a firm conviction that many housing-related securities would crater in a financial crisis. It is not infrequently the case that industry experts understand developments that will make an important difference to the macroeconomic environment in the months and quarters ahead. Another example might be the expansion of oil and gas production through fracking. That expansion affected the outlook for energy prices and, through those prices, the direction of the international economy. Yet another example might be the development of COVID-19 vaccines. The companies involved understood the process and prospects much better than the Fed. Because of insider trading restrictions, pharmaceutical firms had to be very careful about the release of information.

I have long held the view that the best way to think about the arrival of new information is to assume that the market and Fed get the information at the same time. Since the rational expectations revolution in macroeconomics in the early 1970s, it has been standard to model

[2] Lewis (2011).

new information as "innovations" that push the state of knowledge one way or the other from previous expectations for every variable in the economy.

This view of the information process motivated my 1999 speech, "Synching, not Sinking, the Markets." In that paper, I argued that the Fed ought to think of policy in the context of how to change the federal funds rate in response to arriving information. With Fed clarity and transparency, one of its goals should be leadership and, through disclosure, alignment with private sector reactions to incoming information.

Proposition 2. *Absence of a systematic Fed processing advantage*. Analysts must process the flow of raw data to develop useful ideas as to what new data might mean for the direction of the financial markets and the economy. The Fed has a very large and expert staff. Does the Fed have a processing advantage over the private market? Can the Fed's experts distill knowledge out of raw data more quickly and more accurately than the private market?

My instinct is that the Fed does not, overall, have a processing advantage. Fed economists and private economists read the same professional papers and attended the same graduate schools. They go to the same conferences. Fed and private sector economists move back and forth in their employment. The literature on the accuracy of economic forecasts does not suggest that Fed forecasts are clearly more accurate than private forecasts.[3]

Obviously, there are occasions when the Fed is ahead of the private market and some when the Fed is behind. In thinking about the normative aspects of information sharing and secrecy, both the average situation and the special cases are relevant. My general proposition is that the Fed and the markets have the same information base and the same ability to process that information.

[3] Chang and Hanson (2015); Stephen K. McNees of the Boston Fed had earlier written several papers on the topic. By now, the literature is voluminous.

Obviously, not everyone in the market has the same information and the same skills in processing information. And that is also true of Federal Reserve officials. What makes sense to me is that it is best to assume, absent evidence to the contrary, that market prices accurately reflect implications of available information for all the reasons discussed at length in the rational expectations and efficient markets literature.

The Fed does have one power the market does not — the power to print money. In the short run, the Fed can set almost any interest rate on government securities at almost any level it wants, and the same is true for foreign exchange rates. "At almost any level" is obviously an exaggeration, but it is not far off if we think in terms of basis points for a few weeks rather than percentage points for a few years. Basis points for a few weeks are of critical importance to market speculators.

However, the Fed does not have the power to set real variables, except real interest rates temporarily, at any level it wants. This proposition goes far back in the monetary theory literature. Its corollary is that an effort by the Fed to set real variables, such as the unemployment rate, will fail. Moreover, a determined Fed effort to set real variables at levels materially different from market equilibrium levels will create large problems.

Illustrative examples

The terrorist attacks on Tuesday, September 11 illustrate these themes. Neither the Fed nor the private market anticipated the attacks. Here was an information innovation writ large. Because the government shut down air travel, the Fed was forced to shut down the clearing of checks. At that time, the Fed clearing process involved shipping physical checks by air from Fed processing facilities in Reserve Banks and their branches across the country to Reserve Banks and then by van to banks on which checks were written. Commercial banks make payments from accounts that have received funds. With no funds coming in, banks could not honor checks written on accounts on which firms were making payments. The Fed made clear to banks that they could borrow from the Fed whatever amounts they needed to be able to honor checks on September 12 and later.

The Fed's power to print money prevented the terrorist attacks from creating a financial disaster. No private entity could have done what the Fed did. A similar and more familiar story arose after the failure of Lehman Brothers in September 2008. The Fed established several special facilities, and expanded others, to provide funds in vast amounts to the markets. The Fed does have powers that permit it to respond to information in ways the market cannot. That said, the Fed's powers are not indefinitely large.

There is a flip side to these examples. When the Korean War broke out in June 1950, the Fed found itself stuck with the World War II policy of pegging yields on long-term Treasury bonds. That policy was unsustainable as the market began to dump bonds on the Fed in massive quantities. Looking at the *Federal Reserve Bulletins* for June 1950 and January 1951, we see that the Fed's holdings of government securities at the end of 1950 were 28 percent above the level at the end of May 1950. In March 1951, the Fed was able to negotiate the Treasury-Fed Accord that discontinued the Fed's obligation to peg Treasury bond rates. Clearly, the Fed must be very careful about the commitments it makes or implies. As I write, the Fed needs to find a way to extract itself from its announced plans to buy bonds and hold the fed funds rate near zero.

My personal view at this time is that waiting until spring 2022 to *begin* the process of raising the federal funds rate increases the risk, dramatically, that 2021's surge in inflation will continue. More generally, though, isn't this situation of exactly the sort that led many economists to favor an announced inflation target? I will return to this question below.

A somewhat similar process to the one in 1950 occurred in the late 1970s, as the Fed attempted to hold down interest rates as inflationary pressures blossomed. The inflation accumulated to the point of creating a variety of ills in the economy. The Fed's power to print money was then the problem and not the solution. The Fed had no information advantage or processing advantage over the private market. It took Paul Volcker's leadership advantage to deal with the growing inflation turmoil. No private entity could fix the inflation problem.

A more recent Fed processing failure is worthy of comment, especially since it illustrates my own failure to understand what was happening with the house price bubble that ran from 2000 to 2006. I was a member of the FOMC during those years and still have a vivid memory of the special FOMC study of the housing situation. It is a sobering exercise to review the FOMC transcript of the meeting of June 29-30, 2005. By coincidence, this was also the last FOMC meeting that Marvin attended, as Chairman Greenspan noted at the beginning of the meeting.

The staff analysis of the housing situation, and my own contributions to the FOMC debate, demonstrate how wrong the FOMC can be. I had given several speeches, as had Greenspan, worrying about the potential for financial chaos should Fannie Mae and/or Freddie Mac find themselves approaching insolvency. They did become insolvent in 2008, but the problem was easy to fix. All the government had to do was to take them into conservatorship, making the implicit guarantee explicit.

A much more serious problem was the accumulation of weak mortgage paper on the books of investment and commercial banks. There was not a word of that development in the FOMC record until 2008, and even then the severity of the problem was not understood, at least from my reading of the FOMC transcripts of this period. The private market understood the developing problem before the Fed did. The Fed and the Treasury did eventually deal with that problem by recapitalizing major banks and taking other steps familiar to students of the 2008 financial crisis. However, there was no satisfactory way of dealing with the insolvency of several million households that defaulted on mortgage and other debt. The FOMC and its staff seemed not to have a clue about these risks until they arose.

Market speculation on what the Fed knows

I am often amused by press accounts guessing as to what the Fed knows that the private market does not know. During most of my tenure in St. Louis, I was fortunate to have Robert Rasche as research director. Bob and I had known each other for many years, and he was

a full coauthor on most of my speeches, many of which were mini research projects.

Particularly after a Fed surprise policy adjustment, Bob and I would joke, before release of the news, about the likely effects on the markets. I wish I had kept a record of what we guessed would be the impact on the stock market. We generally got the direction right but neither of us had confidence as to the magnitude of the effect. I doubt that any member of the FOMC or its staff then or since has a better track record than we did. The Fed's lack of ability to forecast the effects of its policy changes was one of the reasons I was always opposed to the Fed creating policy surprises.

Given that private participants in financial markets are deeply knowledgeable and highly motived to understand the significance of Fed policy adjustments, the observation just made should be a warning. If market experts cannot figure out the likely effects of Fed policy adjustments, why should economists and other outside observers believe that the Fed itself has a good idea about the effects of its policy adjustments?

One of the complications Fed policymakers face is that some market participants interpret policy adjustments as evidence that the Fed knows something the market in general does not know. As already emphasized, that view seems to me to be mistaken most of the time.

Market participants sometimes interpret Fed policy adjustments as "sending a message" of some sort, or "priming the market." That interpretation is probably correct on occasion, but it is an example of the Fed's failure to explain its policy clearly. Fed words and policy actions should be consistent with one another to avoid confusing the market.

Application to current policy situation

Marvin's 1986 paper concerns interactions with the markets of Fed statements, policy actions, and stance on disclosure. The Fed's adoption in 2012 of a formal inflation target was a new phase in its communication with the markets.[4]

In 2012, the FOMC settled on a target of 2 percent annual increase measured by the annual change in the price index for personal consumption expenditures. In August 2020, the FOMC changed the target to be an undefined average over time: "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." How moderate and how long? The problem is not that the Fed won't provide an answer, but that it does not know the answer.

Why the change in the inflation target? I'll offer a speculation. The Fed wanted to pull out all the stops to make clear that it was doing everything possible to fight the COVID-19 pandemic. Easy money was the only tool it had. However, the Fed badly miscalculated the inflation risk. As the months passed, how could the Fed backtrack without appearing to give up its battle against the pandemic or admitting that it had miscalculated the inflation risk?

As many have noted, by changing to an ill-defined average over time the FOMC has debased the clarity of the original target. Also, the committee's turn to vague language has walked away from one of the important original arguments for an inflation target — providing discipline to the FOMC itself. As I write, with an Excel spreadsheet in front of me, I see that (using continuous compounding) the average annual percentage change over the past 36 months of the Fed's favorite inflation gauge is 2.5 percent for data through October 2021. The three-year average breached 2 percent in June 2021, and yet the FOMC continues to buy assets and continues to hold the federal funds

[4] Shapiro and Wilson (2019) provide a convenient short history of FOMC deliberations on the subject.

rate near zero. The Fed has achieved its objective — real interest rates are now substantially negative.

The Fed, by taking variance and uncertainty out of the financial markets with its policy of asset purchases and near-zero fed funds rate, has increased variance and uncertainty in both quantities and prices in the goods and labor markets. Fifty years ago, I published a paper[5] on this exact topic. FOMC members who are especially concerned about the real economy have the story upside down — Fed policy has increased, not reduced, variance and uncertainty in the goods and labor markets. Why should they be so terribly solicitous of the financial markets while ignoring what is going on in the goods and labor markets?

The June 2021 FOMC meeting was June 15-16. By that time the committee knew that its previous projections had gone seriously wrong. On June 10, the BLS had released data for the consumer price index for May, which showed a year-over-year increase of 5.0 percent and ex food and energy of 3.8 percent. The index for used cars was up a remarkable 29.7 percent. On May 28, the BEA had released data on the personal consumption expenditures price index for April, showing a year-over-year increase of 3.6 percent (3.1 percent ex food and energy).

The median of the FOMC's inflation projections (PCE price index) for 2021, released December 16, 2020, were already obsolete. The FOMC had projected for all of 2021 an increase of 1.8 percent. In June 2021, the projection for the full year was 3.4 percent. By December 2021, the projection was 5.3 percent. Yet, at that time, the FOMC continued to purchase billions of dollars of bonds and continued to maintain a near-zero fed funds rate.

Without question, COVID-19 has created a severe disturbance. That said, we should not forget that the start of the great inflation in the mid-1960s also saw severe disturbances. The Vietnam War and President Johnson's efforts to prevent disputes over the war from disrupting his plans for expansion of Great Society programs were active Federal Reserve concerns.

[5] Poole (1970).

Anyone who doubts that statement should spend time studying the detailed economic history of this era. I was an economist on the Fed's Washington staff from May 1969 through June 1973. I used to commute to the Fed on Rock Creek Parkway and remember antiwar demonstrators throwing park benches off overpasses onto the parkway.

In 1965 and thereafter, the Fed was also concerned with the solvency of the savings and loan industry. Pushing up interest rates would lead to disintermediation. Then, in 1971, Nixon imposed wage-price controls. Then, in October 1973, OPEC's oil embargo sent petroleum prices surging. I was among those who had problems finding an open gas station. And then there was the Watergate affair. Pumping money into the economy did not help to resolve any of these nonfinancial disturbances.

I do not mean to downplay the importance of COVID-19, which has killed an estimated 800,000 Americans as of this writing. That number may be compared with about 50,000 Americans dead from the Vietnam War. The point is that the Fed cannot affect a real variable — the number of vaccinated Americans — by monetary expansion. Nor will monetary expansion alleviate supply chain problems. The economy is very liquid. Bank credit is readily available for any trucking company that wants to buy more trucks to get goods off Pacific Coast docks. Eighteen wheelers going down the highway are traveling billboards for trucking companies trying to hire more drivers.

A policy of drift, month after month, for one reason after another, created the Great Inflation of 1965-80. The same policy today is likely to yield the same outcome.

Continuing to pump cash into the economy will not encourage more vaccinations and will not alleviate supply chain disruptions. As I write this just before Christmas 2021, the Federal Reserve is at least six months behind in responding to the flow of formal data and the many anecdotal observations familiar to anyone who is looking. Help wanted signs are everywhere, and employee turnover is the highest in the history of the JOLTS data. Residential property prices month after month have been rising at a rate higher than the peak rate during the house price bubble before the 2008 financial crisis.

So far, inflation expectations data suggest that the market has not lost confidence in the Fed. The risk is there, however; Goodfriend explained the process in his 1993 and 2007 papers, and elsewhere.

Knowledge of this history, in the United States and abroad, led many economists (including me) to advocate a Federal Reserve commitment to an announced inflation target. The announced target would communicate more clearly with markets and — very importantly — constrain the Fed to act as it had promised. The literature on inflation targeting is voluminous; I will refer to just one paper, by David Archer (2000).

Archer — assistant governor at the Reserve Bank of New Zealand at the time — begins his paper with four observations about the New Zealand inflation targeting regime.

1. A nominal variable (such as the price level or the inflation rate) is recognized as the sole achievable medium-term objective for monetary policy.

2. An attempt to drive policy directly at the medium-term objective via a tightly specified inflation target, rather than indirectly via an intermediate target.

3. An institutional structure that clearly articulates the respective roles and responsibilities of the key actors (the central bank and the government).

4. Heavy reliance on transparency to support the arrangement and cover the "weak points" in the institutional structure.

In the context of Goodfriend's work and this essay, points (3) and (4) are especially relevant. Just following the above points, Archer refers to, "the interactions of 'public choice' incentives and expectations." The US experience of 1965-80 displays these interactions in spades. The Federal Reserve today faces the same sorts of issues. The public debate about how best to deal with COVID-19 is confused. The Fed, of course, has expressed its commitment to do "whatever it takes" — to use all the "tools" at its disposal. The public and the Fed itself seem baffled as

to what these phrases mean. Has the Fed published a list of the tools it can use to tackle COVID-19?

If the Fed had not confused matters by fuzzing up its inflation target in August 2020 — walking away from transparency — it would have been in a position in mid-2021 to end asset purchases immediately and to begin to raise its fed funds rate target. The Fed could have said that the situation was extremely difficult with the new delta variant and the best monetary policy was not clear. The Fed could have said that given the inflation data and its commitment to an inflation target, it was time to begin raising rates. If the increase in rates turned out to be premature, the policy adjustment could be reversed in the future.

Some will be reminded of the quote attributed to Keynes: "When the facts change, I change my mind. What do you do, sir?" As a bit of research will reveal, there is controversy over whether the quote is accurate, but it fits here anyway. By June 2021, the facts had changed dramatically.

I am also reminded of the legend of Odysseus. "The technique is called Odyssean self-control, and it is more effective than the strenuous exertion of willpower, which is easily overmatched in the moment by temptation."[6] In August 2020, the Fed cut the ropes by which it had lashed itself to the mast, and now all of us will pay for that mistake.

An economist who discusses his outlook is always risking ridicule in retrospect. That understood, I have put my cards on the table. I am well aware of the first law of forecasting: if you name a number, do not name a date; if you name a date, do not name a number. I say "here goes" because the only true test of any empirical proposition intended to be taken seriously is an out-of-sample forecast. My outlook is dependent on the data I have observed and on Federal Reserve statements about its policy. I believe that the inflation rate in 2022 will be at least as high as the 2021 rate.

[6] Pinker (2021), p. 55.

My sense of the policy environment as I write in the fourth quarter of 2021 is that the Fed has created a generalized asset price inflation. At the time of the FOMC's December 2021 meeting, stock prices were high, as measured by P/E ratios. Bond prices were high — interest rates low — as compared with data over past decades. Residential property prices were rising at a more rapid rate than at any time during the house price bubble of 2000-06. The second derivative of house prices — the speed with which house price inflation year over year has increased — is higher than at any time in the history of the broad repeat-sale house price indexes. Farmland prices are increasing. However, gold prices — a traditional measure of inflation concerns — have not moved by much.

Here I am writing in late December 2021, and at best the Fed has indicated that it might begin to increase the federal funds rate in the middle of 2022. I am well aware that I am offering pointed criticism of the Fed in a volume to be published by the Federal Reserve Bank of Richmond. Marvin Goodfriend spoke his mind, as evidenced especially in his paper on the Merrill case, which was highly critical of Fed leadership. It was gutsy for him to write this paper while he was in the Research Department at the Richmond Fed.

I would like to think that a small fraction of his approach to policy came from his old professor with the initials WP. I am honored that I was invited to contribute a paper to this volume.

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Perspectives on Policy and Research Contributions

Central Bank Lending and Incentives

Kartik Athreya and Stephen D. Williamson

Marvin Goodfriend was a remarkably original thinker and did much to advance the science of monetary policy. We both benefited not only in key ways from Marvin's published work in economics, but also just as much from his contributions at seminars, conferences, and over lunch or dinner. Our essay primarily concerns Marvin's work with Jeff Lacker, in Goodfriend and Lacker (1999). It analyzes the roles of central bank lending and central bank credit policy, describes what can go wrong with central bank lending, and suggests how to fix these problems.

Central bank lending

Lending to the financial system has been a critical feature of central banking for a very long time. Typically, central banks are constrained to hold assets to back their liabilities, and those assets include loans to the private sector. Indeed, in some central banking systems, the principal mechanism by which the central bank controls the quantity of its liabilities in circulation is through lending to private banks. Notably, at its inception in 1914, the Federal Reserve System was constructed as an organization of semiautonomous regional banks that financed lending to member banks by issuing currency. These regional Federal Reserve Banks became the sole issuers of circulating currency. Each regional Reserve Bank in turn held the liabilities of its member banks to back the currency. Government debt was not initially a key asset in the Fed's portfolio, and open market operations were not an important component of Fed activities until the 1920s. Today, the European Central Bank intervenes primarily through central bank lending to banks in the euro area, by way of the ECB's main refinancing operations. So, one possible design for central banks includes the use of central bank lending in day-to-day or week-to-week financial market intervention. But — and this is the most important aspect of Marvin Goodfriend's research that we want to address — lending to financial institutions is

a key component of central bank crisis intervention. The lender of last resort role for central banks was essentially invented by the Bank of England (BoE), as documented for example in Bagehot (1873). In the later 19th century, the BoE was a private institution, which had been granted a special place in the British financial system. It had a different financial structure from a typical private bank in the United Kingdom at the time and had been granted a monopoly on currency issue by the Crown through Peel's Bank Act of 1844.

The BoE had also built a reputation for safety by the late 19th century. So, during the recurring financial crises in the UK in the later 19th century, consumers and firms typically fled from bank liabilities, perceived to have increased in their riskiness, to BoE liabilities, and this inflow of funding at the BoE was then used to finance lending to Banks. But the BoE was presumably more well-informed than the general public about which banks were insolvent and which were merely illiquid and so could profit from judicious lending under Bagehot's (1873) principles: lend freely, at a high rate, against good collateral.

In the United States, a principal objective of the authors of the Federal Reserve Act of 1913 was preventing, or at least mitigating, the effects of the banking panics that occurred in the US in the late 19th century and early 20th century. Central bank lending to private banks was seen as the principal crisis mechanism at the Fed's disposal. This was a key element in research done under the National Monetary Commission leading up to the Federal Reserve Act legislation in 1913. But Fed policy during the Great Depression is typically viewed as a failure,[1] in part because the Fed did not lend adequately to the private banking system. Seemingly, Fed leadership absorbed the lessons of the Great Depression in subsequent years, and the global financial crisis was a quite different story. Indeed, Ben Bernanke has argued that much of the Fed's lending policy during the global financial crisis was motivated by Bagehot's principles.[2] The argument for central bank crisis lending generally rests on advantages the central bank might

[1] See for example Friedman and Schwartz (1963).

[2] See Bernanke (2017).

have relative to the private sector. For one example, the central bank could have superior information on banks' creditworthiness, due to its supervisory role in the banking system. For another, the deep pockets of the central bank are important, given the backstop of the federal government's power to tax.

There were at least two unusual elements in the Fed's lending strategy during the global financial crisis. The first was lending through the Term Auction Facility (TAF). An undesirable feature of lending through the Fed's discount window is that a bank's discount window borrowings can send a signal to the market that the bank on the receiving end of the loan is distressed. This "stigma" can deter borrowing, which works against the intent of central bank lending in a crisis.[3] Stigma can occur because, even though the details of discount window lending are not public, it may be possible to infer which banks are borrowing at the discount window, particularly if the banks are large. So, the goal of the TAF program was to auction off discount window funds to member banks willing to post the appropriate collateral. The assumption was that both distressed and nondistressed banks would be on the receiving end of TAF funds, thus eliminating, or at least mitigating, the stigma effect.

A second example of unusual lending during the global financial crisis was the extension of Fed loans to financial institutions that were not commercial banks. In historical banking panics prior to the founding of the Fed, for example, those that occurred in the US in the late 19th and early 20th centuries, the key problem was massive outflows of deposits from commercial banks that caused the disruption of payments, bank failures, and the forced sale of bank assets. Such negative effects, where they occurred in solvent but illiquid banks, could in principle have been mitigated by central bank lending to commercial banks if there had been a US central bank during this period. The global financial crisis was different, however. Early on, panics appear to have occurred at the wholesale level, for example, when asset

[3] Ennis (2019).

portfolios of asset-backed securities were funded by rolling over overnight repos. The perception that some asset-backed securities were much riskier than previously thought generated the withdrawal of funding for such "shadow-banking" entities, in part inducing fire sales of assets. Later, problems involved systemic risk, which had been latent until 2008. For example, the Fed's direct lending to American International Group (AIG) — primarily an insurance company — was intended to address a novel crisis problem not directly related to retail banking. That is, through the sale of financial derivatives, AIG had made itself highly sensitive to aggregate risk and had thus created a threat to the entire financial system. Whether the Fed has a legitimate role in lending to nonbank financial institutions is not clear. For example, it seems harder to make the case that the central bank has an information advantage in lending to financial firms that it does not regulate, or that the Fed somehow has an advantage relative to large private financial institutions in such lending.

Goodfriend-Lacker and central bank lending

Crisis lending by the central bank might on its surface appear straightforward. The basic nature of banking is captured nicely by the classic model of Diamond and Dybvig (1983). Banking, by its nature, involves the transformation of illiquid assets into liquid ones. Such transformation is socially useful, as retail payments work efficiently if consumers and firms can trade the widely acceptable liabilities of third parties — here, banks — for goods and services. These third-party liabilities are viewed as highly liquid, despite the underlying assets held by banks being difficult to exchange for goods and services. But in conducting liquidity transformation, banks leave themselves open to runs, as shown by Diamond and Dybvig (1983). If each depositor anticipates that all other depositors will run to the bank to withdraw their deposits, then the bank — which would otherwise be solvent — cannot satisfy all requests for withdrawal and it fails. Though a key motivation for establishing the Federal Reserve System was to prevent or mitigate banking panics through central bank crisis lending, the banking theory literature appears to have given central bank lending short shrift. For example, though the Diamond-Dybvig (1983) model

has received much attention, it does not directly address the role of central bank crisis lending. Thus, Goodfriend and Lacker (1999), while not making a contribution in a formal modeling sense, use available theory to analyze the incentive problems inherent in central bank lending to private financial institutions and provide useful recommendations for improving this aspect of central bank policy.

Goodfriend and Lacker (1999) recognize that, while we know less than we would like about the pitfalls of central bank lending, we know a lot about how private loan commitments work. And in some ways private loan commitments are not so different from central bank lending. For example, discount window arrangements between the Fed and private commercial banks are essentially loan commitments. The Fed specifies the terms under which banks can borrow, including interest rates, admissible collateral, and collateral haircuts, and then commits to lending to banks on these terms, with some restrictions. The key difference, however, is that private banks making loan commitments are concerned with their own profits, while the central bank has public policy goals in mind, for example, the systemic implications of the failure of large financial institutions. But since the Fed's loan commitments to banks are in part insurance, Fed loan commitments are subject to the same moral hazard issues as private loan commitments, with no profit motive for the Fed to motivate structuring its lending to deal with this moral hazard.

But what could central banks learn from the structure of private loan commitments? First, as with borrowing from the central bank, borrowing from a private bank under a loan commitment may become desirable when a firm is under financial stress. For example, a large firm may normally have access to the commercial paper market, but if it becomes widely known that the firm's financial state is precarious, borrowing by way of commercial paper may become more costly or impossible. Under these circumstances, taking down a loan commitment may be desirable for the firm. Loan commitments may have implications for the commercial paper market, ex ante, as well. That is, a firm may obtain more favorable terms in the commercial paper market because it has a standing loan commitment with a bank. Subsequently, in the event of financial distress on the firm's part, loans under the

commitment from the bank could serve to insure the holders of the firm's commercial paper.

Of course, the bank making a loan commitment does not want to be in such a position. So typically, as Goodfriend and Lacker (1999) point out, loan commitment arrangements have terms that give the firm incentives not to take out loans — or prevent the firm from taking out loans — if the firm has a high probability of defaulting. First, collateral can play an important role, both in insuring the bank against losses in the event of the firm's default and giving the firm the incentive not to default. Second, covenants in the loan commitment can allow the bank not to lend to the firm given the firm's financial state or limit lending in various ways. Third, the bank can have the right to monitor the firm's activities, which, in conjunction with covenants, could serve to limit lending in particular circumstances.

For central banks, the incentive problems are similar to those with private loan commitments, with some caveats. First, the central bank's lending behavior has implications for other bank creditors, though in the case of a regulated bank, this is muted by the existence of deposit insurance. However, lending by the central bank to a precarious commercial bank can provide a window of time when uninsured depositors can conveniently exit. Effectively, the central bank acts to provide implicit insurance to the *uninsured* depositors. But the central bank's lending behavior can ultimately change the payoffs to the stakeholders in important ways in the event of a bank default. The Fed protects itself by requiring that banks pledge good collateral against central bank loans, but that implies that this collateral cannot be used to pay off the bank's other creditors in such an event. Further, if the Fed lends to a bank that ultimately fails, the Fed becomes a senior creditor, which matters for the other regulator, the Federal Deposit Insurance Corporation (FDIC). Once the FDIC steps in to resolve the failed bank, it pays off the bank's debt to the Fed. Though the FDIC then retains the collateral pledged against the central bank loan, this may not cover the loss.

Second, the central bank, like private banks making loan commitments, may want to commit to limiting central bank lending under particular circumstances. It is well-accepted, for example, that lending

to insolvent banks is a bad idea, and that central bank crisis lending should be limited to cases where there is just a liquidity problem. Of course, it may be difficult to tell the difference between an insolvent bank and an illiquid one, but the Fed is in a good position to discriminate, given the information it acquires through its supervisory role in the commercial banking system. But commitment to limit central bank lending may be difficult nevertheless, and Goodfriend and Lacker (1999) are particularly pessimistic about this. When push comes to shove, they argue, the Fed will typically opt for the path of generous lending except in the most egregious cases. The key issue is that moral hazard problems associated with borrowing by banks are accentuated as actual insolvency becomes more likely for an individual bank. But, in general, the probability of bank insolvency is related to aggregate activity, so many banks will be in a precarious state at the same time. This is exactly the type of circumstance where the Fed is likely to lend freely, rather than cutting off banks that are likely on the brink of insolvency.

We highlight a particularly prescient passage in Goodfriend and Lacker (1999, p. 15):

> The financial stability mandate can create pressure to expand the scope of central bank lending to nonbank financial institutions. Nonbank financial intermediaries are capable of amassing sizable financial market positions. The liquidation of these positions could be seen as a threat to the stability of asset prices and the solvency of many other financial institutions, including insured banks. A central bank with no formal authority to lend outside a narrowly defined set of institutions is, of course, well positioned to resist influence. Otherwise, we might see a tendency to expand the range of institutions receiving central bank line-of-credit assistance.

This is an accurate prediction of part of what happened during the global financial crisis, when the Fed expanded its lending beyond the commercial banking sector. For example, after the Fed extended a large loan to AIG, Goldman Sachs and Morgan Stanley became bank holding companies and thus eligible for Fed lending. Of course, a key difficulty is that it can be easy to see the short-term gains but hard to

see the long-term costs of central bank crisis intervention that goes beyond the commercial banking sector. In theory, we understand the implications of moral hazard in central bank lending for excessive risk-taking and the expansion of already-large, too-big-to-fail financial institutions. But these effects can be difficult to measure in practice.

Dealing with moral hazard in central bank lending

As we have argued, the view of Goodfriend and Lacker (1999) is that there are issues in Fed lending to the private sector that need to be addressed. So, what to do about it? One possibility they consider is that the Fed could forgo lending to the private sector entirely and focus instead on facilitating the easing of liquidity problems in large financial institutions and on orderly resolution in the event of large financial failures. A few examples in the past two decades, however, suggest that this would be a radical alternative.

The role of the Fed in coordinating privately financed emergency lending and support in the financial sector is an aspect of the use of the Fed's "good offices." For example, in 1999, the New York Fed participated in the effort to prevent the failure of a hedge fund, Long-Term Capital Management (LTCM). At the time, LTCM was viewed as a systemically important financial institution that was encountering liquidity problems and thus faced a potential forced sale of assets. That is, LTCM was in a position that several large financial institutions would find themselves in during the global financial crisis in 2008. The Fed did not participate financially in propping up LTCM, but it helped facilitate an arrangement by which a group of private financial institutions recapitalized the troubled hedge fund. Was the Fed's intervention during this episode necessary? Was there risk to the Fed in injecting itself into negotiations over the potential failure of a private hedge fund that was well outside the Fed's normal supervisory purview?

An instance where the Fed's intervention with respect to a large troubled financial firm outside the commercial banking sector moved from mere facilitation to key financial participation was the Bear Stearns failure in spring 2008. As discussed in more detail in Goodfriend (2011), the Fed facilitated an orderly resolution in the Bear Stearns failure by setting up a limited liability company, Maiden Lane I,

which then proceeded to purchase troubled assets then held by Bear Stearns, with funding coming from a loan from the Fed. This made it more attractive for JPMorgan Chase to take over what remained of Bear Stearns. The motivation for the Fed's Bear Stearns intervention was similar to that for the LTCM intervention, in that Bear Stearns was a systemically important financial institution and a disorderly failure would potentially have much wider effects in the financial sector. But this illustrates what happens when the Fed becomes involved in negotiations involving large troubled financial institutions. In such negotiations, the Fed is the elephant in the room and can end up more financially involved than it initially intends, left holding the bag by private financial institutions or passing on losses to taxpayers.

As Goodfriend and Lacker (1999) point out, the Fed may protect itself by requiring good collateral with appropriate haircuts to secure central bank lending, but safety for the Fed in this respect can be to the detriment of the FDIC and a bank's uninsured creditors. Potentially, there could be stricter capital thresholds for closing distressed banks, though this is problematic due to the subjective nature of asset valuation. Goodfriend and Lacker (1999) also suggest that the Fed might choose to be "constructively ambiguous." This means the Fed could be deliberately vague about the conditions and terms on which it will lend. Presumably, this could limit the quantity of lending, reducing moral hazard, and causing banks to bear less risk. But this would have to be balanced against the increase in perceived risk faced by the banking system due to the Fed's unpredictable behavior.

During the global financial crisis, the Fed not only intervened in important ways with respect to large nonbank financial institutions — Bear Stearns and AIG in particular — but it made large loans to large banks, Citigroup and Bank of America. The latter two banks certainly fall in the too-big-to-fail category and are therefore important examples of the moral hazard problems associated with central bank lending, as discussed by Goodfriend and Lacker (1999). Much of the lending to large financial institutions — nonbanks and banks alike — during the financial crisis fell under Section 13(3) of the Federal Reserve Act, which gave the Fed very broad lending powers. In line with Goodfriend and Lacker's (1999) emphasis on limits to Fed lending,

the Dodd-Frank Act of 2010 included provisions to constrain the Fed's powers under Section 13(3). However, Goodfriend and Lacker (1999) might suggest we worry about the array of Fed lending programs introduced during the COVID-19 pandemic, which included lending to nonfinancial businesses (the Main Street Lending Program), to state and local governments, and to money market mutual funds. In most cases, there were explicit arrangements for the Treasury to absorb potential losses, but this raises some of the key issues discussed in Goodfriend and Lacker (1999), relating to moral hazard and the redistribution of creditor losses.

Finally, using an analogy to inflation control, Goodfriend and Lacker (1999) argue that the Fed could establish a reputation for limiting its lending to financial institutions, and that this could ultimately curb the moral hazard problem associated with Fed lending. Unfortunately, inflation control as a central bank goal has the advantage of simplicity — for example a 2 percent inflation target — and it is relatively easy for people to evaluate the Fed's success in achieving the goal. With respect to Fed lending, it is much more difficult both to establish what the goal is and to evaluate the Fed's performance relative to the goal. Perhaps the only limits on Fed lending that can have force are those specified explicitly in the Federal Reserve Act.

Other approaches to dealing with moral hazard in central bank lending

It is possible that the key problems discussed by Goodfriend and Lacker, associated with moral hazard and central bank lending, could be solved by simple (though perhaps radical) changes in institutional structure. We will consider two: one that changes central bank interventions that we term "repos only," and another that reforms private financial institutions that is conventionally called "narrow banking."

One simple approach would involve a central bank lending policy that restricts intervention to the repo market. Under this setup, the central bank sets a target for the overnight interest rate and then achieves that through two standing facilities, a repo facility and a reverse repo facility, both involving fixed rate and full allotment

auctions. As the Fed has learned since establishing a floor system for monetary policy following the global financial crisis, intervention in the overnight repo market — on either side of the market — proved important for achieving the Fed's overnight interest rate target. So, under the proposed system, the Fed would choose the size of its balance sheet and the target for the overnight interest rate, and then the two standing facilities would look after the rest. Thus, the Fed could conduct balance sheet policy independent of interest rate policy.

Such a system appears to solve some of the problems discussed by Goodfriend and Lacker. In particular, discretion would be removed from central bank lending, which would be done at arm's length through third parties. Thus, lending would be limited, and any lending to troubled banks would be made on the same terms as by private repo market lenders. Perhaps a defect of such a system is that collateral would be restricted relative to what is normally acceptable for discount window lending, although this might be what Goodfriend and Lacker had in mind.

The Standing Repo Facility, established by the Fed in July 2021, is related to this proposal in that it increases the likelihood of regular central bank lending. However, lending through this facility is currently at the same rate as the discount rate, which is set above the interest rate on reserves, whereas our proposal would have lending at the policy rate. Note also that the Standing Repo Facility accepts only a restricted set of collateral — Treasuries, agency securities, and agency mortgage-backed securities.

Another simplified approach would be narrow banking. Proposals for narrow banking have existed since at least the 1930s, as put forward by the Chicago Banking School.[4] A key proponent of narrow

[4] See, e.g., Hart (1935) and Irving Fisher (1935), among others.

banking was Milton Friedman, who argued in 1960 that monetary control would be improved if all private transactions accounts were backed 100 percent by reserves. In general, a narrow bank is a financial intermediary that backs all liabilities used as means of payment with safe assets, typically central bank reserves or safe government debt. Such safe backing could be a legal restriction or it could be an unconstrained choice of the bank. A useful survey of narrow banking proposals is in Pennacchi (2012).

Generally, narrow banking separates money from credit. For example, under a narrow banking proposal requiring that all means-of-payment liabilities be backed 100 percent by central bank reserves and government debt, much of the structure of banking regulation could be eliminated. There would be no need for capital requirements, leverage requirements, or deposit insurance, for example, as all means-of-payment liabilities of banks would be essentially risk free. There would of course be other financial intermediaries holding risky asset portfolios but, according to narrow-banking proponents, the liabilities of such institutions would be efficiently priced and not subject to flights to safety.

There are two standard issues with narrow banking. One is that a narrow banking structure potentially increases the demand for safe assets, in that banking would no longer be about transforming risky assets into safe ones, but guaranteeing the safety of bank deposits by backing those deposits with safe assets only. This would be particularly problematic in the current environment, in which the world is suffering a scarcity of safe assets.[5] The second issue is that narrow banking potentially causes disintermediation effects in crowding out the risky assets that are currently held by regulated banks.

In addition, narrow banking (as well as the simplified, repo market approach to monetary policy outlined previously in this section) would not solve all the problems discussed by Goodfriend and Lacker. In particular, if the central bank is still permitted to lend outside the banking sector, there is nothing in the proposal to prevent the Fed

[5] See Andolfatto and Williamson (2015).

from lending excessively to financial institutions deemed to be systemically important. Anticipating that, those systemically important financial institutions will behave in suboptimal ways.

Both proposals in this section have the flavor of the ideas in Goodfriend and King (1988), who argue that most of the goals of the central bank can be accomplished through conventional monetary policy. Goodfriend and King (1988), for example, cast doubt on the value of crisis intervention, arguing that such lending is prone to moral hazard problems, and thus dominated by indirect injections of liquidity in a crisis, through open market operations.

Conclusion

Much of Marvin Goodfriend's work was both innovative and prescient. That certainly applies to his work with Jeff Lacker in 1999. Nine years before the financial crisis, Marvin and Jeff grappled with issues of moral hazard and central bank intervention that would be key to how the crisis unfolded in 2008-09. They may not have seen the global financial crisis coming, but their analysis helped provide important background for policymakers during the crisis and afterward.

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Marvin Goodfriend and the Zero Lower Bound

Ben S. Bernanke

The zero lower bound (ZLB) on short-term interest rates has become a central issue in contemporary monetary economics. Fundamentally, the ZLB exists because households and businesses can choose to hold cash, which pays zero nominal interest, rather than accept a negative return on their short-term investments.[1] (Other considerations, including concerns about the possibly adverse effects of negative rates on the financial system, have also made some central banks unwilling to cut short-term rates below zero or very far below zero.) Together with long-term global declines in the so-called neutral rate of interest — the interest rate consistent with full employment and price stability — the ZLB has significantly reduced the ability of monetary policymakers to ease policy through traditional short-term interest rate cuts.

For example, the Fed's reaction to a typical recession before 2000 was to cut its target for the federal funds rate by 5 to 6 percentage points. Today, in contrast, the Fed's scope for rate cuts is probably at most 2 or 3 percentage points on average — even less in Europe or Japan. The reduction in policy "space" available through traditional methods has led central banks to experiment with alternative tools, including quantitative easing and detailed forward guidance. Central banks have also developed new policy frameworks aimed at mitigating the effects of the ZLB, such as the Fed's flexible average inflation targeting approach.

[1] With the advent of modestly negative rates in some jurisdictions, the lower bound is now commonly referred to as the *effective lower bound*. Here I'll stick with the older ZLB terminology.

During the decades following World War II, the ZLB was treated by most economists as a Depression-era curiosity. However, it became relevant again in the 1990s, when the Bank of Japan — in the aftermath of the collapse of the country's stock and real estate markets — struggled with deflation and the lower bound with little success. Many at the time saw the Japanese economy as quite different from that of the United States. Its monetary institutions and practices differed from ours, and key structural features — including high saving rates, slow population growth, and a sharp slowdown in productivity — were conducive to a lower neutral interest rate. Nevertheless, the Federal Reserve was sufficiently interested in the implications of low rates of inflation and interest to organize an October 1999 conference in Woodstock, Vermont, on the subject of "Monetary Policy in a Low-Inflation Environment." Then an academic, I was fortunate to attend. It was a stimulating few days, full of untrammeled discussions and new and sometimes radical ideas. Our debates, in the formal sessions and informal get-togethers, plumbed deep issues in monetary theory. I suspect that most of the attendees enjoyed the blue-sky thinking at the conference but underestimated the practical significance that those discussions would have a few years later. I know that I did.

Marvin Goodfriend's paper at the Woodstock conference, "Overcoming the Zero Bound on Interest Rate Policy," was a highlight. Marvin's article — which would appear in 2000 in the *Journal of Money, Credit and Banking* — anticipated a number of the approaches that central banks would use (or contemplate) during and after the global financial crisis. Like Irving Fisher, John Maynard Keynes, Silvio Gesell, and other great economists who had thought about these issues in earlier eras, Marvin did not hesitate to recommend radical institutional reforms — notably changes that would eliminate the constraint on monetary policy posed by the availability of currency. He would return to these issues in a number of subsequent writings, including in a paper presented at the August 2016 Jackson Hole conference, entitled "The Case for Unencumbering Interest Rate Policy at the Zero Bound." Rereading these papers today, I am impressed by their prescience and insight. I am also struck by Marvin's conviction that his job was to get the economic analysis right, without concern about the politics.

A general approach to overcoming the ZLB, favored by some economists, is to try to manage inflation or inflation expectations directly, through forward guidance or by announcing changes to the central bank's policy framework. For example, raising the central bank's medium-term inflation target — if fully credible — should also increase the neutral nominal interest rate and thus increase policy space. As Marvin pointed out in his 2000 paper, though, even putting aside issues of credibility, this tactic is inefficient. Raising the target (and assuming the new target can be reached) imposes higher inflation at all times but benefits the economy only at times when the ZLB would otherwise bind. Moreover, it reduces but does not eliminate the adverse effects of the ZLB in severe recessions, in which deeply negative real interest rates are needed. Alternative policy frameworks that are at least theoretically more efficient, though also more complex, depend on the central bank's ability to vary inflation and inflation expectations according to the state of the economy, for example, through price-level targeting (Wolman, 1998; Krugman, 1998; Eggertsson and Woodford, 2003).

Marvin was skeptical of monetary policymakers' ability to manage expectations in this way, especially since the theoretically optimal policies are typically time-inconsistent and thus may not be credible. His preferred approaches instead involved concrete policy actions or institutional changes whose effectiveness does not depend on convincing the public and markets that the central bank's future policy strategy has changed.

Marvin's 2000 paper proposed several specific policies that could loosen the constraint of the ZLB. An idea that particularly appealed to him — he would reconsider related issues in detail in his Jackson Hole paper 16 years later — was for the central bank to impose a variable charge on bank reserves to create what would effectively be a negative short-term interest rate on that asset. Following the imposition of a charge, banks' efforts to substitute into alternative liquid assets should lead the negative rate to spill over into money markets and perhaps to longer-term assets as well. Indeed, this approach would ultimately be successfully adopted by several central banks, including the European

Central Bank and the Bank of Japan, and actively studied by others, including the Bank of England.

However, monetary theorist that he was, Marvin worried that the effectiveness of taxing bank reserves would be undermined by depositor arbitrage. If banks tried to pass on their negative returns to depositors, say by imposing new fees on checking accounts, people would have an incentive to hold cash instead of deposits, thus disintermediating the banking system. That arbitrage in turn would limit the central bank's ability to impose negative rates. In his 2000 and 2016 papers, Marvin proposed three possible solutions to this problem.

First, simply abolish cash (or large bills, which are easiest to store). That would solve the problem, presumably, but Marvin worried about the social costs — increased transactions costs for the unbanked, for example — of such a step. Incidentally, this solution would later be explored in detail by Rogoff (2016), who emphasized that the social costs would be balanced by important gains, including the reduction of money laundering and tax evasion.

Second, impose a carry tax on cash, allowing a negative return on currency at times when a negative rate was needed to support economic activity. In his 2000 paper, Marvin suggested that the carry tax be implemented through magnetic strips attached to bills, which at the time seemed technologically implausible. Today, the Federal Reserve is discussing the possibility of creating a central bank digital currency (CBDC). If a CBDC were to bear a variable interest rate, and if it supplanted physical currency, it would bring Marvin's idea into the realm of technical feasibility.

Finally, in his 2016 paper, Marvin suggested that the Fed eliminate the fixed one-for-one exchange rate between currency and bank deposits and instead allow the exchange rate to be determined by market conditions. By varying the supply of currency, the central bank would then be able to keep the return on currency close to the return on deposits during periods of negative rates. This approach sounds strange to modern ears, but there is historical precedent. Before the creation of the Fed, when bank runs led to the suspension of convertibility of deposits into cash, bank deposits and currency often traded at varying, market-determined rates.

One can only be impressed by the intellectual rigor and creativity of these ideas. With the benefit of hindsight, though, it does not seem that any of these additional measures are needed to achieve meaningfully negative rates (though I take Rogoff's point about the negative social externalities caused by the circulation of large bills). If anything, Marvin underestimated the effectiveness of his proposal to impose a variable charge on bank reserves, without supplementary steps to limit currency hoarding. In recent years, central banks have been able to push beyond the ZLB without provoking the hoarding that Marvin worried about. In part, that reflects the fact that banks rely substantially on wholesale funding markets. The costs to lenders in those markets of holding assets in physical cash is substantial, taking into account security, insurance, and the inconvenience of making large payments to global counterparties in cash. Banks have thus been able to pass on negative returns to many of their largest funders, even if not to all retail depositors.

Also with the benefit of hindsight, two other issues would have to be addressed before adopting any of Marvin's proposals regarding currency. First, much of the recent discussion about negative rates has centered on possible risks to financial stability. If significantly negative rates make banks, money market funds, or other institutions unprofitable or unstable, it is possible that there is a "reversal" interest rate below which rate cuts are no longer beneficial.[2] Neither of Marvin's papers mention this issue. Personally, I am less alarmed than some about this risk: Negative rates, at the levels we have seen them, appear to have eased broad financial conditions without creating serious problems for financial institutions, over and above the effects of low rates in general. But this issue is one that would require more study before rates were cut much more deeply.

[2] Brunnermeier and Koby (2018).

The other barrier to the implementation of Marvin's proposals is the difficulty of gaining political support. Changes to the currency, even regarding (economically) trivial matters like whose face is on the bill, can be highly controversial. The Fed is independent, but Congress has ultimate control over the currency and will oppose unpopular measures. Here is my opportunity to praise Marvin's intellectual integrity. The proposal in his Woodstock, Vermont, paper to impose a carry tax on currency created a media firestorm, which was soon followed by a statement from the Libertarian Party and a proposed bill from Congressman Ron Paul (R-TX) to prohibit fees on currency. The Federal Reserve Board staff had to assure legislators that research by Fed economists is conducted independently and does not necessarily represent the views of the Federal Reserve System. I have been told (though cannot document) that Marvin received threats to his personal safety. Marvin believed in free intellectual inquiry and was not dissuaded. He made similar recommendations in the high-profile Jackson Hole meeting in 2016.

Even though Marvin's work on the ZLB focused on the constraint imposed by the availability of zero-interest cash, he looked at other possible approaches to overcoming the constraint, again always with thoughtful prescience. In his 2000 paper, beyond negative rates, Marvin anticipated another key tool used by all major central banks at the ZLB — namely, purchases of longer-term securities, or what today we call quantitative easing (QE).

Marvin's early exposition of how QE might work had a more monetarist flavor than most modern accounts. But he did not make the error of assuming that adding liquidity — in the narrow sense of assets useful primarily as transactions media — when the economy is in a liquidity trap would have much stimulative power. He instead took a broader view of the liquidity services provided by longer-term securities such as Treasuries, including not only the ease with which they can be turned into cash, but their usefulness as collateral and in providing other services. He saw central bank purchases of longer-term securities as affecting the convenience yields of those securities (as reflected in term premiums) and their close substitutes, in a manner very similar

to the portfolio balance channel emphasized by Bernanke (2020) and most contemporary discussions of QE. In particular, by raising the values of assets broadly, Marvin saw QE as raising borrower net worth and thus reducing the external finance premium — the wedge between the safe rate of return and the cost of borrowing — in the sense of Bernanke and Gertler (1995).

Does QE have costs as well as benefits? In his 2000 paper, Marvin focused primarily on the fiscal risks of the central bank holding long bonds. The possibility of losses on the central bank's portfolio is indeed a concern for monetary policymakers but mostly for optical and political reasons. Losses on securities bought in QE programs are not first-order social costs, any more than are the losses that arise when the maturity mix of new securities issued by the Treasury turns out not to have been cost-minimizing. Moreover, any paper losses on central bank portfolios should be set against the benefits of QE for economic growth and thus for tax revenues. Finally, central banks can continue to operate with losses or low levels of capital, so agreements with the Treasury to replenish central bank capital — as we have seen in the United Kingdom, for example — relate more to questions of governance and independence rather than to the feasibility of QE policies.

The fiscal and political concerns about QE are shared by many central bankers. More puzzling is Marvin's view, stated in 2000 and reiterated in his 2016 paper, that QE risks becoming "inflationary finance." In the depressed conditions that followed the global financial crisis, and with the ZLB binding, the use of QE proved insufficient to get inflation even up to target, much less to uncomfortable levels. In particular, with rates very low, the velocity of money fell significantly during the post-crisis period. Marvin was perhaps concerned that QE would not be slowed or reversed after the economy no longer required support. It is true, at least, that unwinding a QE program without disrupting markets too much can take some time, during which the central bank's securities holdings continue to provide stimulus.

Finally, Marvin's 2000 paper considered yet another strategy for defeating the ZLB — so-called helicopter money, Milton Friedman's term for money-financed tax cuts. Helicopter money — or monetary transfers, in Marvin's language — is a combination of tax cuts and QE, a combination we have seen in many countries during the recent pandemic. We have good reasons to expect that transfers and tax cuts, on the one hand, and central bank securities purchases, on the other, will stimulate the economy. The question is whether the combination of the two policies is any more powerful than the policies taken separately, that is, whether monetary-fiscal coordination buys anything in this instance. Marvin appreciated in 2000, very early in this debate, that the answer may be no. Unless the public sees monetary-fiscal coordination as changing the goals of the central bank in the medium term — for example, by increasing the amount of inflation it is willing to accept — the stimulus provided by the combined policies will be roughly the same as that of the two policies taken separately. For helicopter money to have extra stimulative power, there must be either a real or perceived increase in fiscal dominance (loss of central bank independence), which the public believes will lead the central bank to accept higher inflation than it otherwise would, at least for a time.

The effects of the ZLB, and strategies for overcoming it, was just one of many critical issues in monetary theory and policy that Marvin Goodfriend tackled in his career. He was an extraordinary economist. He was also an extraordinarily kind person, with the gift of telling you that you are completely wrong while making you feel good about it. I, among his many friends, will miss him.

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Federal Reserve Structure and Economic Ideas

Michael D. Bordo and Edward S. Prescott[1]

Marvin Goodfriend's essay, "The Role of a Regional Bank in a System of Central Banks," was written for the November 1998 Carnegie-Rochester conference series on public policy.[2] The title of the conference was "Issues Regarding European Monetary Integration," which focused on the European monetary union experiment that was just underway at the time.[3] Marvin's essay was about the institutional design of the European monetary institutions. His strategy was to describe the partially decentralized structure of the Federal Reserve System, laying out the respective roles of the headquarters in Washington and the regional Reserve Banks, and then to use the American experience to provide lessons for the newly formed European system. The analogy was apt due to the strikingly parallel structure of the nascent European monetary institutions with a headquarters institution — the European Central Bank in Frankfurt — and numerous regional institutions in the form of the preexisting national central banks.

While ostensibly about the design of the European monetary system, the essay is also a statement of Marvin's views about the proper role of a central bank and a defense of the federal structure of the Federal Reserve System. The decentralized structure of the Federal Reserve periodically comes under attack from various interests who want a centralized, less federal system. Marvin's essay provides an important antidote to these attacks by laying out the many advantages of the federal system.

[1] We would like to thank the editors, Bob King and Alex Wolman, for helpful comments.

[2] See Goodfriend (1999a). Marvin's essay was also reprinted in the Federal Reserve Bank of Richmond's annual report in 1999 (Goodfriend, 1999b).

[3] The conference agenda is available at https://www.sciencedirect.com/journal/carnegie-rochester-conference-series-on-public-policy/vol/51/suppl/C.

In the essay, Marvin stated his philosophy of how a central bank should operate,

> The overarching principle is that a central bank should provide the necessary monetary and financial stability in a way that leaves the maximum freedom of action to private markets. In keeping with this principle, monetary policy is implemented by direct means, with an interest rate policy instrument rather than with direct credit controls. In the banking sphere every effort is made to minimize as far as possible the regulatory burden associated with financial oversight.[4]

He also stated what a central bank needed to operate in this way. Marvin believed that a central bank needed independence, credibility, and an ability to learn about economic ideas and markets. Furthermore, for the United States, he argued that the Reserve Banks played an important role in meeting these needs. He discussed how the Fed's decentralized structure enhanced credibility and supported independence because "… the diffusion of power makes it more difficult for outside pressures to be brought to bear on a central bank."[5] He also believed that the regional structure helped gather information and disseminate information to the various regions of the United States and helped with bank supervision. Finally, he argued that "… a system of regional banks led by the center institution harnesses competitive forces to encourage innovative thinking within the central bank."[6]

In this essay, we discuss Marvin's last point. The other benefits of the Reserve Banks, while important, are already well known. However, the idea that the decentralized structure encourages innovative thinking is less appreciated, but it is, we think, one of the System's biggest strengths. In his essay, Marvin planted the seed for this idea.[7]

[4] Goodfriend (1999a), p. 51.
[5] Goodfriend (1999a), p. 52.
[6] Goodfriend (1999a), pg. 53.
[7] See also Wheelock (2000).

Furthermore, when it comes to innovative thinking, there is no better person to be honoring than Marvin. As we both know from personal experience, and many others know as well, Marvin was full of ideas. He thought for himself, followed economic logic to its conclusions, and was willing to advocate for his ideas even if they challenged central bank orthodoxy.

Marvin's intellectual contributions to central banking and monetary economics are well known and many of them are described in companion essays in this volume. What we want to emphasize is how the semi-independence of the regional Reserve Banks allowed a creative thinker like Marvin to flourish and led to a transformation in thinking about policy both in the System and among central banks more generally. The key elements provided by a Reserve Bank were direct exposure to policy problems, via a Reserve Bank's role on the Federal Open Market Committee (FOMC) and in the banking and payment systems, and enough independence from headquarters so that ideas that challenged an existing orthodoxy could be developed, explored, and supported over time.

The most striking example of this institutional dynamic with Marvin's work is his 1986 *Journal of Monetary Economics* paper in which he derived from economic principles the costs and benefits of FOMC transparency.[8] While transparency is now taken for granted, it was not at the time. The prevailing central bank view was that secrecy was valuable for central banking, and, consistent with that view, the reaction from the Board in Washington to this publication was strong disapproval. However, by being at Richmond, which supported him, his career in the Federal Reserve was not slowed down and he was able to flourish. The subsequent change in views by the Federal Reserve and the central banking community on transparency is a testament to the value of Marvin's insights and a prominent example of how an idea can develop from a Reserve Bank, gestate, and later lead to good reforms for the institution.

[8] See the essay by Lars E.O. Svensson in this volume.

It was no accident that during his time at the Richmond Fed, that bank developed a reputation for being independent within the System and its presidents dissented on numerous FOMC votes. Indeed, a creative economist like Marvin would probably have contributed far less to monetary policy if he had worked at a highly centralized institution. At a monolithic central bank, Marvin might not have even thought of proposing these ideas because they would likely have been stopped before seeing the light of the day.

While it is not unusual for an institution to have internal debate, it is unusual for an institution to allow some of that debate to appear in public. For this reason, we think there is some value to describing how the System evolved to the point where the public competition of ideas could exist and flourish.[9] In this evolution, the Richmond Fed was one of the early innovators.

The Federal Reserve was designed as a decentralized institution in 1913 with 12 privately chartered Reserve Banks and a Federal Reserve Board in Washington, DC, that had limited oversight. The structure was explicitly designed to distribute power throughout the country. However, as with many other federal institutions, power was centralized by the Roosevelt administration during the Great Depression. The Banking Act of 1935 moved monetary policy primarily to the Board of Governors by creating the FOMC and increased the oversight of the Reserve Banks. However, Congress retained a role for the Reserve Banks by giving them, on a rotating basis, five of the 12 votes on the FOMC. Furthermore, they left the Reserve Bank's corporate structure with its unique quasi-public governance relatively untouched.[10]

For the next 15-20 years, the Reserve Banks, other than New York, played a relatively minor role in monetary policy. This was partly because the Federal Reserve had become subservient to the Treasury in the 1930s under Secretary Morgenthau and Chairman Eccles, who believed in fiscal dominance. And partly because during World War II,

[9] The subsequent analysis is based on Bordo and Prescott (2019).

[10] See Bordo and Prescott (2019) for details on Reserve Bank governance.

the Fed accommodated Treasury's war expenditures by setting a low interest rate peg.[11] The subservience was ended by the Treasury-Fed Accord of 1951 that gave the Federal Reserve monetary independence and made William McChesney Martin the chairman of the FOMC.[12]

While the Accord reasserted the Federal Reserve's independence, the role of Reserve Banks (other than New York) for monetary policy remained relatively minor. The FOMC met infrequently, and most decisions were made by an executive committee consisting of the chairman, the New York Fed president, and a few other members. For a variety of reasons, including a battle for control over monetary policy with the New York Fed, Chairman Martin instituted reforms to the FOMC in the mid-1950s in which the executive committee was eliminated and decisions were made by the entire FOMC. This change in operating procedures gave the presidents of the non-New York Reserve Banks a more prominent role in monetary policy. Previously, their responsibilities focused on providing banking services and supervising banks in their regions.[13]

The other development at this time was external. Starting in the late 1950s, and even more so in the 1960s, the economics profession was becoming increasingly professionalized. Keynesian ideas for macroeconomic policy were developing in academia, young PhDs were bringing these ideas into the Federal Reserve, and more formal analysis was being used by the FOMC. Furthermore, the Council of Economic Advisers under the economist Walter Heller was pushing to appoint Keynesian economists to the Board of Governors.[14] The result was an increased role for economists in leadership positions throughout the Federal Reserve.[15]

This change in the internal and external environment created the conditions that encouraged a Reserve Bank to innovate on monetary

[11] Meltzer (2002).

[12] For more information about the Accord, see Hetzel and Leach (2001a and 2001b) and Meltzer (2009).

[13] *Business Week* (1956).

[14] Bremner (2004).

[15] Whittlesey (1963).

policy. The first innovator was President D.C. Johns of the St. Louis Fed. Johns felt that he and the other presidents were being ignored by the Board, so in 1958 he hired Homer Jones, who had taught Milton Friedman, and soon that bank became closely tied to monetarist ideas on monetary policy.[16] The bank served as a conduit for the monetarist ideas of prominent economists like Karl Brunner, Milton Friedman, Allan Meltzer, and Anna Schwartz, but it also made important monetarist contributions such as Andersen and Jordan (1968) on monetary versus fiscal policy. A sequence of presidents and the research department leadership provided enough organizational continuity that the St. Louis Bank was able to support monetarist ideas through at least the 1990s. A progression like this could exist only with enough separation from Washington to develop and maintain independent ideas.

The next innovator was the Minneapolis Fed, which, starting in the 1970s, became closely associated with and contributed to the rational expectations and dynamic stochastic general equilibrium revolution in macroeconomics. Even more so than St. Louis, Minneapolis was actively involved in the development of academic ideas, particularly rational expectations. Much of this work was done jointly and in partnership with the University of Minnesota, which was only about two miles away from the bank. There are three especially notable examples. Tom Sargent and Neil Wallace worked on rational expectations while professors at the University of Minnesota and consulting with the Minneapolis Fed.[17] Ed Prescott's real business cycle methodology (developed with Finn Kydland) led to important changes in macroeconomic methods, and their identification of time consistency problems with optimal macroeconomic policy led to a renewed emphasis on monetary policy credibility and the role that institutional structure plays in providing that credibility.[18] Chris Sims developed pathbreaking time series methods.[19]

[16] See Melzer (1989). Following D.C. Johns, President Daryl Francis, who served 1966-1976, championed monetarist ideas at FOMC meetings.

[17] See, for example, Sargent and Wallace (1975, 1981).

[18] Kydland and Prescott (1977, 1982). Alesina and Summers (1993) showed that independent central banks did a better job of controlling inflation.

[19] Sims (1980).

The monetarist ideas associated with St. Louis and the rational expectation ideas associated with Minneapolis gained increased attention in the 1970s due to the high inflation and other failures of the Keynesian ideas of the time. It was during this period of intellectual and economic ferment that Marvin was hired by the Richmond Fed in 1978. The late 1970s was a particularly auspicious time for an energetic and creative economist like Marvin to start at the Fed. Inflation was over 8 percent in 1978 and would reach 14 percent in 1980. Paul Volcker would become chairman in 1979 and the FOMC would then start to dramatically raise the fed funds rate. The Monetary Control Act of 1980 would change the role of the Federal Reserve in the payment system, and the increasing number of thrift and bank failures would highlight the importance of bank regulation, deposit insurance, and Federal Reserve lending facilities. It was an exciting time intellectually to work on money and banking research and it was an exciting time to do policy, both at which Marvin excelled.

The environment in Richmond when Marvin arrived was not that of a modern research department with an emphasis on academic publications, but it was moving in that direction. The intellectual interest was there. The president at the time was Bob Black, who was trained as an economist and had become sympathetic to monetarist thinking. His colleagues in the department included Al Broaddus, who led the macroeconomists and later became research director and then president; Bob Hetzel, who was a student of Milton Friedman's and a monetarist; and Tom Humphrey, who, with his background in history of economic thought, was resurrecting intellectual interest in the Fed's role as lender of last resort by studying lessons from Henry Thornton and Walter Bagehot. When Marvin joined, the spark was lit for the department to take off.

With the support of an ambitious institution and amid the exciting intellectual debates at the time, Marvin thrived. Anyone who worked with him will remember his excitement when discussing economic ideas, or monetary policy operating procedures, or just about any

other topic associated with the Fed. In these discussions, he consistently linked research and monetary policy.[20] Relative to St. Louis and Minneapolis, Richmond's innovation was to closely integrate research and the policy process. During Marvin's tenure there, this was best represented by the team he made with Al Broaddus, who was president from 1993 to 2004. As Mark Gertler mentions in his essay in this volume, at the time he may have been unique within the System in both actively doing research while being the senior monetary policy advisor.[21]

The value of the St. Louis, Minneapolis, and Richmond models have been recognized within the System. Today, virtually every Reserve Bank has a thriving research department and to varying degrees policy and research complement each other in the way that Marvin exemplified.[22] Some Reserve Banks partner with local universities, and all interact with academics. There is a regular flow of ideas within the Fed and with the outside, and research results are actively part of FOMC discussions. For example, at a 2005 FOMC meeting, San Francisco Fed President Janet Yellen stated,

> A considerable body of research — most conducted within the Federal Reserve System — has examined the possibility that the last recession and recovery were characterized by unusually large structural shifts, resulting in an exceptional degree of mismatch in the labor market. If an unusually small fraction of the currently unemployed are qualified for existing or emerging job vacancies, the true degree of slack in the labor market is overstated by measured unemployment. In effect, the NAIRU has risen. This possibility motivates one of the alternative simulations in the Greenbook. At the AEA [American Economic Association] meetings in Philadelphia last month, I chaired a session in which four teams of Fed economists subjected this structural-shifts hypothesis to close scrutiny. I emerged from this session a skeptic. I see this recent research as casting considerable doubt on the hypothesis that the jobless recovery was a period of pronounced economic restructuring.[23]

[20] While Marvin is most associated with monetary policy, he also wrote on banking and payments policy (Goodfriend and Hargraves, 1983, and Goodfriend, 1990).

[21] We don't want to give the impression that other Reserve Banks didn't develop ideas during this period as well. For example, in the late 1980s, Chicago became associated with deposit insurance reform and Cleveland became associated with inflation targeting. For more details and other examples, see Bordo and Prescott (2019).

[22] Marvin's innovations were also recognized internationally. For example, the European Central Bank asked him to undertake a review of their research activities (Goodfriend, König, and Repullo, 2004).

As we said earlier, Marvin took some controversial stands. In his case, we can see the important role of Fed structure in supporting debate and differing views. His transparency work challenged the orthodox view at the Board at the time, and his work would likely not have been published if he had worked in a more centralized institution. However, due to the Reserve Bank's structure, each with its own president and Board of Directors, the bank was able to support him and keep him at Richmond, which was to the long-term benefit of the Richmond Fed and the System as a whole.

What is striking in rereading Marvin's essay is that his ideas are not just abstract arguments weighing the pros and cons of the System's structure. Instead, they are based on what he observed and experienced during his career. For those of us who were fortunate to have been able to talk over these and so many other topics with him, we deeply miss him.

[23] FOMC Meeting Transcript, February 1-2, 2005, p. 87. https://www.federalreserve.gov/monetarypolicy/files/FOMC20050202meeting.pdf.

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Banking Policy and Monetary Policy[1]

Douglas W. Diamond

Marvin Goodfriend was a great economist.[2] He had a deep understanding of formal theory, but he was also very intuitive and policy oriented. He was rigorous, but he did not use large amounts of math in his theoretical work. One of Marvin's especially insightful and influential papers was Goodfriend and King (1998), hereafter referred to as GK. It discusses a framework for determining if monetary policy, implemented with open market purchases of Treasury securities, is a necessary and sufficient response to a banking crisis. The other possible response is banking policy. Banking policy in GK, whenever it is not redundant, is lending to banks at a rate below the one they could obtain in the market (especially lending to banks that cannot borrow in the market). Marvin later labeled such interventions as a component of "credit policy," but I stick to the earlier terminology and consider the specific interventions discussed in GK. This essay discusses the ideas and contributions of GK and relates it to some of Marvin's other research on banking and monetary policy.

Core elements of GK and my own perspectives

GK provides what is almost a Modigliani and Miller (1958) theorem for banking policy. GK gives conditions under which banking policy has no beneficial effects. The result has two parts: one for idiosyncratic banking policy and the other for system-wide banking policy. The first part deals with lending to individual banks experiencing idiosyncratic funding problems (lending to banks that cannot raise enough deposits or interbank loans to survive). GK outlines a proof that there is no social benefit to this (given an appropriate monetary policy) if individual bank failures can be treated like individual business failures. This is true in partial equilibrium and it seems to me that this is true more generally if individual bank failures generate no externalities.

[1] I am grateful to Bob King, Alex Wolman, and Luke Zinnen for helpful comments on an earlier draft.

[2] I met Marvin when I was an undergraduate and will discuss my interactions with him more fully at the end of this essay.

Banking policy is a special form of credit policy that targets the rescue of individual banks, primarily by lending to them when the market will not. This is a case of lending to (bailing out) the exogenously insolvent that are worth more dead than alive and is consequently undesirable.[3] Even worse, when anticipated, it requires ex-ante regulation to prevent excessive ex-ante risk-taking that takes advantage of its subsidized bailout.

The second part of the paper is about banking policy in system-wide financial crises. It is very short but makes several important points. It argues that monetary policy implemented by open market operations is necessary and sufficient to respond to some types of banking crises. The basic model is close to the one implicit in the celebrated Great Contraction chapter in Friedman and Schwartz (1963), which describes the period around 1929 in the United States. In essence, Friedman and Schwartz (1963) views a system-wide banking crisis as a temporary increase in the demand for currency. A monetary policy that provides an elastic currency response to the demand increase (via open market operations expanding the supply of high-powered money) will prevent such crises from bringing down the banking system. In Friedman and Schwartz (1963), the macroeconomic losses from a crisis are due to the implications of the induced fall in the stock of money due to bank failures.

GK considers more general reasons for social losses. I read the GK analysis to include the fire-sale losses from selling assets that arise when the supply of currency is too small to meet the crisis-induced demand. The key conditions for the sufficiency of open market operations are fully integrated markets for government bonds, bank deposits, and interbank loans. Injecting bank reserves into these integrated markets will offset increases in the demand for currency that cause a banking crisis.

As a part of this analysis, GK shows that the United States Federal

[3] If the authority conducting a bailout could have better information than depositors, GK points out that the argument becomes more nuanced.

Reserve System's interest rate smoothing policy (providing an elastic currency to offset all temporary shocks to the demand for currency) will work just as well as Bagehot's lender of last resort policy. Bagehot allows moderate spikes in interest rates (spikes consistent with bank solvency) when borrowing from the lender of last resort. Much of this part of GK is under the assumption that banking crises are caused by an increase in the demand for currency relative to deposits and that there are no other real shocks. GK shows that monetary policy is necessary and sufficient to offset these monetary shocks.

GK also considers a real, nonmonetary shock: a temporary increase in the real rate of interest. This shock could cause bank failures that monetary policy (without banking policy) could not prevent. In essence, an increase in the real rate required by bank deposits can cause a run by making some banks insolvent. No amount of liquidity can overcome this insolvency because the problem is a real shock and not a shock to the demand for currency versus deposits. They argue that the bank failures could cause economic dislocations, but that these are similar to the dislocations caused by the effect of solvency of industrial firms. This makes bailouts via banking policy somewhat unlikely to be desirable. The desirability of banking policy is a cost-benefit analysis based on magnitudes. An alternative view of the implications of an increased real rate of interest described in GK is that many banks might be on the border between full insolvency and insolvency only due to the illiquidity of their assets — these banks are solvent but illiquid. A real rate shock pushes some banks over the insolvency border. If there is incomplete information on the exact value of the individual banks, it could lead all banks near the border to fail in a crisis. If the problem is this incomplete information about which banks are fully solvent, GK suggests that it could be beneficial to have detailed ex-ante supervision and monitoring of banks to determine in advance which ones are insolvent.

I have a somewhat different view of the desirability of banking policy and favor a lender of last resort policy that goes beyond open market operations. Nonetheless, the analysis in GK greatly clarifies the important issues in understanding banking policy. In my view, the

case for saving a just-insolvent bank is almost identical to a bank that is slightly solvent if there are large social and external costs to bank failure. I view illiquidity and solvency as part of a general equilibrium effect with externalities, as in Diamond and Rajan (2005, 2012). In addition, a forecast of a run can be self-fulfilling if enough depositors believe that no one will lend directly to the bank or banking system, as in Diamond and Dybvig (1983). One way to approximate these two points in the GK framework is that bank failures themselves could have an impact on the real rate of return that depositors require on bank deposits and other assets. An open market operation to buy Treasury bills with high-powered money in response to a banking crisis will not work if the holders of the high-powered money or currency are not willing to lend to the banks at an interest rate that leaves the bank solvent.

If the bad effects of bank failures are very large, then banking policy can be desirable ex-post. GK notes that banking policy is a form of desirable insurance beyond the insurance against money demand shocks provided by open market operations.[4] Because a lender of last resort that goes beyond open market operations provides a discretionary injection of subsidized funds with ex-post benefits to society, it (like monetary policy) faces a problem of limited commitment. Marvin and Jeff Lacker provided a very nice analysis of this in Goodfriend and Lacker (1999)[5]; see also, the related analysis in Diamond and Rajan (2012).

GK notes that insurance that provides a subsidy generally requires ex-ante pricing and regulation. GK does not discuss deposit insurance, but it would be interesting to understand how their perspective applies to this pervasive feature of modern banking systems. Unlike a lender of last resort, deposit insurance is explicit and contractual. This commits the deposit insurer and avoids the discretionary element of lender of last resort policy.

[4] A recent analysis of lender of last resort policy as explicit insurance is presented in Mervyn King (2016).

[5] See the essay by Athreya and Williamson elsewhere in this volume.

Later work on banking policy, monetary policy, and macroeconomics

Marvin was one of the pioneers who brought ideas from banking theory into macroeconomics. I thought it was a sad situation when "Money and Banking" (the former name for this field of research) became a completely inaccurate description of the current research in macroeconomics.[6] Many know Marvin best from his work on monetary economics, but I found him to be aware of developments in banking, both practical and theoretical. Marvin did continue to work on banking topics intermittently, and I briefly comment on two later, related contributions. Goodfriend (2005) describes how frictions in the banking sector can impact the effect of shocks to the economy and also influence the information content of various interest rates as indicators of macro shocks. Goodfriend and McCallum (2007), GM hereafter, took these ideas and made them quantitative. It has very useful implications for monetary policy, providing a different approach to using yield spreads as measures of economic conditions than those provided in Bernanke, Gertler, and Gilchrist (1999).

GM introduces a wedge between banking markets and Treasury markets and studies the interest rate spread between bank rates and Treasury rates. Marvin had an open mind. He believed that open market operations were the right way to implement monetary and banking policy, with the least moral hazard, but that bank liquidity services and the collateral role of banks complicated the argument. He viewed the banking sector as important, along with the final goods production sector, because loan production was subject to a moral hazard problem as in Diamond (1984).

The GM model allows differentiated financial products where loans differ from bonds and where collateralized bank deposits are different from uncollateralized liabilities. GM's integrative model features New Keynesian sticky price frictions and a deposit in advance constraint (similar to a cash in advance constraint).

[6] As I describe below, Marvin had previously encouraged me to attempt to bring more of banking theory into macroeconomics.

GM does not assume that currency, government bonds, bank deposits, and bank loans are in an integrated market as in GK. There are separate markets for each, with separate shocks to supply and demand. There can be yield spreads between them, which could be time varying. Open market operations would be sufficient to offset any shock in the markets, but the size of the intervention cannot be determined by examining a single rate of interest. For example, interest rate smoothing of government bonds would not be sufficient to offset all shocks. The central bank also needs to look at the various yield spreads to determine the economic shocks that require a monetary policy response.

GM does not consider banking policy, but it does generalize the framework of GK. The focus in GM is on the measurement needed to calibrate an appropriate monetary policy. Implicitly, an appropriate open market operation can deal with any bank funding problems that need to be addressed.

Reviewing the GM framework, I have some similar reservations as those I expressed earlier about the GK setup. I'd prefer a framework that could allow bank failures or runs to temporally impact the real rate of interest required by those individuals and institutions funding banks. My view is that the supply of short-term funding to banks and other financial institutions is not sufficiently integrated with the market for Treasury securities (substitution across the markets is too limited) for increased purchases of Treasuries to substitute for a lender of last resort lending directly to all or most banks using bank loans as collateral. It might even be possible that lending to them in times of crisis could be profitable for a central bank and could result in smaller disruptions than an alternative policy that is restricted to open market operations in Treasury security markets.

Marvin as a wonderful colleague

I have had many long discussions with Marvin about research. I met Marvin at Brown University in 1974 or 1975 when he and Bob King were graduate students and I was an undergraduate student taking graduate macroeconomic and monetary theory courses with Herschel

Grossman and Bill Poole. I did not know either of them well, and these banking issues were not ones that any of us were then thinking about. Much later, I talked to Marvin many times when he was a visiting professor at the University of Chicago, and to both Marvin and Bob after 1990 when I became a long-term visiting scholar at the Federal Reserve Bank of Richmond. Marvin was an incredibly kind person who was very generous with his time. In addition to his outstanding skill as an economist, he was a great electric guitar player.

Marvin said to me many times that he saw important insights for macroeconomics in the microeconomic theory of financial intermediation, but that the theories needed to be embedded into the standard quantitative macroeconomic models in order to actually have that impact. He encouraged me to work in this area, but I did not have the skills or the inclination to undertake this integration. But working alone and with Ben McCallum, Marvin later provided his own approach to this integration, as described above.

Summing up

Marvin Goodfriend had deep insights into money and banking. I regret that Marvin did not continue to work to integrate the analysis in GM with the study of a lender of last resort as in GK, but, of course, there are opportunity costs in research as elsewhere. His combination of a clear theoretical perspective, a detailed understanding of institutions, and an open mind led him to make major contributions to economic policy analysis.

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Interest Rate Smoothing

Michael Dotsey, Andreas Hornstein, and Alexander L. Wolman

The concept of interest rate smoothing behavior by central banks is now standard, but it was not when Marvin Goodfriend wrote in the early 1980s.[1] His "Interest Rate Smoothing and Price Level Trend Stationarity" made the concept into a distinct phenomenon to be explained, first in working papers that appeared in 1983 or earlier and then in a 1987 publication in *Journal of Monetary Economics*. At the time, the conduct of monetary policy as well as the interest rate and inflation outcomes produced by it were changing rather dramatically.

We begin with a summary of Marvin's "Interest Rate Smoothing" paper. We then use the paper as a window into the changes that were taking place, and continued to take place, both in the practice and the analysis of monetary policy. Next, we discuss how the literature on interest rate smoothing evolved after Marvin's work and reflect on how the practice of interest rate smoothing seems to have evolved in recent years in the US. In the concluding section, we offer some personal recollections from our time working with (and for) Marvin at the Richmond Fed.

Summary of the paper

In the early 1980s, the US economy was emerging from a period of high and volatile inflation, accompanied by high unemployment and low output growth — the so-called stagflation of the 1970s. This was fertile ground for studying why the Fed made the policy choices it

[1] A Google search on "interest rate smoothing" turns up only a handful of references that predate Marvin's paper. Most of those are also by Marvin and coauthors, the exception being an NBER working paper version of Ben McCallum's classic paper (1981) on price level determinacy with an interest rate instrument. But smoothing is not a central component of McCallum's analysis.

made, and how those choices determined the behavior of inflation and influenced the behavior of real variables. A large part of Marvin's career was devoted to studying these issues.

In "Interest Rate Smoothing," he focused specifically on the nontrend stationarity of the price level: amid calls for constant money growth rules that would presumably guarantee price-level trend stationarity as well as limit inflation, Marvin asked why was such a policy not chosen?

As a student of central banking, Marvin believed it unlikely that failure to follow a constant money growth rule was due to ignorance on the part of the central bank. Thus, to answer the question, Marvin developed a simple model where the monetary authority can choose a rule for money growth that may or may not result in a trend-stationary price level. He shows that if the monetary authority is only interested in stabilizing the macroeconomy, then the optimal policy will indeed result in a trend-stationary money stock and price level. But if the authority also cares about financial market stability, then they would accept random drift in the money stock and the price level would no longer be trend stationary.

His theoretical foundations were those of the times: a linear rational expectations model with a Lucas supply curve, a Fisher equation for nominal interest rates, and a money demand equation. Each one of the model's three equations is subject to an iid shock. The monetary authority observes the current interest rate but not the current price level or output, or the current shocks for that matter. The monetary authority chooses the parameters of a money supply growth rule that responds to contemporaneous interest rate surprises. In addition, the monetary authority can choose to offset last period's unanticipated money stock change that follows from the response to surprise movements in the interest rate. The objectives of the monetary authority relate to the stabilization of the macroeconomy and the financial sector. Instability of the macroeconomy is represented by the variance of price-level surprises and the variance of expected inflation. Instability of the financial sector is represented by the variance of nominal interest rates.

First, Marvin shows that if the monetary authority is only concerned with macroeconomic stability, the optimal policy will exactly offset any past surprise money stock change such that the money stock becomes trend stationary. With a trend-stationary money stock, the price level is also trend stationary. In particular, the price level is an iid random variable, so unconditional expected inflation is zero. Conditional on observing the current price level though, expected inflation is the opposite of the current price-level surprise, and therefore the variance of expected inflation and the price-level surprise are the same. The monetary authority's optimal contemporaneous response to the interest rate surprise is then set such that there is no expected price-level surprise. That is, based on the monetary authority's current information, the expected price level is the same as the unconditional expectation of the price level, which then implies that expected inflation is also zero.[2]

After showing that optimal macroeconomic stabilization indeed implies trend stationarity of the money stock and the price level, Marvin then demonstrates that adding the additional objective of financial market stabilization — which translates into smoothing nominal interest rates — introduces random drift into the optimal money stock and the price level. To understand this result, first note that the Fisher equation determines the nominal interest rate as the sum of expected inflation and the stochastic real rate, which is iid. With the previously optimal trend-stationary policy, expected inflation conditional on the observed interest rate is always zero. This means that the observed nominal interest rate reflects the conditional expectation of the real rate shock. Now suppose that the nominal interest rate is above average and the inferred real rate shock is positive. Then the monetary authority could reduce the nominal interest rate by creating expected deflation, that is, an expected reduction in next period's price level. To reduce the price level, the monetary authority would reduce the money stock by more than expected; that is, it would more than offset

[2] Conditional on their information set, the monetary authority always expects next period's inflation rate to be zero. However, the monetary authority knows that in the current period it is offsetting last period's price-level surprise. This means that the monetary authority generally expects current-period inflation to be nonzero conditional on their information set, which does not include the current price level.

last period's unanticipated money stock change. But this introduces drift into the money stock. Optimal policy then trades off reductions in interest rate volatility against increases in expected inflation volatility.

The monetary authority's objectives are crucial for Marvin's account of the stochastic drift in the price level under optimal policy. Given the reduced-form nature of the model, these objectives don't arise from the economic environment as in modern macroeconomics, but as a student of central banking Marvin motivates them by referring to expressed or inferred preferences of central banks. Minimizing the variance of price-level surprises is related to stabilizing employment, which seems reasonable in the context of the Lucas supply curve.[3] Minimizing the variance of expected inflation is motivated by a reference to central banks' concern arising from imperfect indexation of nominal contracts. Finally, minimizing the variance of nominal interest rates is motivated by central banks' preference for "smooth nominal interest rates to maintain 'orderly money markets.'" Note that such behavior has the central bank working against "natural rate" movements to some degree, rather than simply tracking them, as in Goodfriend and King (1997) and much subsequent analysis with New Keynesian models.[4]

Marvin's evolving views about monetary policy

Marvin's paper provides a window, circa 1985, into how he thought about monetary policy and into the tools that were widely used for studying monetary policy. Both the conduct of monetary policy and the analytical tools changed substantially over the course of Marvin's career. As discussed in other essays in this volume, Marvin's work at the

[3] On the other hand, Woodford (2003a, p. 92) notes that price-level trend stationarity is more attractive if the monetary authority's objective is the variance of *long-horizon* price-level forecast errors. In this case, the desire to smooth interest rates may well be consistent with trend stationarity, because otherwise the variance of long-horizon forecast errors is increasing with the horizon. Marvin does acknowledge that low variance of long-horizon forecast errors might be desirable since it reduces the real rate of return variance of long-term nominal assets.

[4] Goodfriend and King (1997) is the subject of an essay by Michael Woodford elsewhere in this volume.

intersection of theory and policy put him at the center of these changes. We think it's interesting to use the paper as a departure point for a brief discussion of how the practice and analysis of monetary policy changed from the time Marvin began work on "Interest Rate Smoothing" to the early 21st century.

The monetary policy instrument

Although the title of Marvin's paper refers to "interest rate smoothing," it is notable that the money supply is the policy instrument in his model. This may suggest that Marvin's analysis reflects large differences in the way monetary policy was implemented in the 1980s compared to today. It is more likely though, that it reflects Marvin straddling the boundary of academic monetary economics and central bank practice.

At the time, there was much less transparency about policy than there is today (see Goodfriend, 1986, and Lars E.O. Svensson's essay in this volume). To the extent that the Fed did make public statements about policy, those concerned broad target ranges for money supply growth and the federal funds rate.[5] Subsequently, policy has become much more transparent, and — at least away from the zero bound — policy decisions are framed in terms of short-term interest rates. Attention to the money supply gradually faded until it essentially disappeared from policy discussions by the early 2000s, if not earlier.

But it is also true that most academic research on monetary policy at the time treated the money supply as the central bank instrument. In particular, Marvin's paper is all about why optimal monetary policy would deviate from one leading optimal policy prescription, which called for a constant money growth rule. There was also an ongoing debate over whether the choice of the interest rate as a policy instrument would lead to instability, especially in the case of interest rate pegs, for example, in Sargent and Wallace (1975) and McCallum (1981). At the same time, as we noted above, Marvin was an avid student

[5] See, e.g., the record of policy actions from February 1983 https://www.federalreserve.gov/monetarypolicy/files/fomcropa19830209.pdf.

of central banking, and he saw that actual US monetary policy was implemented by means of an interest rate instrument. In fact, footnote six in "Interest Rate Smoothing" previews the main themes of his 1991 paper, "Interest Rates and the Conduct of Monetary Policy."[6] There, Marvin writes that the Fed has "*always employed either a direct or indirect Federal Funds Rate policy instrument*."

The meaning of interest rate smoothing

Clearly, even in 1987 Marvin viewed interest rate smoothing as being related to the adjustment of the interest rate instrument over time. But the absence of any true dynamics in his theoretical framework constrained him to identify interest rate smoothing with minimizing the variance of interest rates. The development of New Keynesian dynamic stochastic general equilibrium models, with nominal rigidities and interest rate rules for monetary policy, allowed for an expanded analysis of interest rate smoothing.

Subsequent literature on smoothing

Over time, central banks moved to explicit interest rate policy and became more transparent. As analytical tools were developed, a large literature arose using the broader notion of interest rate smoothing as representing high persistence of policy interest rates. That the fed funds rate target is highly persistent at a quarterly frequency, in the sense of first-order autocorrelation, is an established fact. The interpretation, however, is not obvious. The more recent literature has addressed theoretical explanations for this persistence and then attempted to evaluate those candidate explanations with empirical studies.

Why make interest rates persistent?

Subsequently, in Goodfriend (1991), Marvin considered additional reasons for why central banks might want to smooth interest

[6] Goodfriend (1991) is the subject of an essay by John Taylor elsewhere in this volume.

rates besides financial stability considerations. One of the reasons is Mankiw's (1987) observation that it is optimal to smooth the inflation tax and thus make inflation a random walk. Barro (1989) analyzed how a central bank would implement such a policy. Although the idea of an optimal inflation tax is intriguing, we know of no evidence that US monetary policymakers ever considered smoothing the Treasury's revenue stream as an important consideration for policy.

More persuasive is Marvin's observation that it is longer-term interest rates that primarily influence macroeconomic behavior, and having a substantial impact on longer-term rates generates a desire for persistence in short-term rates. Because financial markets are forward looking, inertial behavior by the central bank can translate a small change in the current funds rate into meaningful changes in longer-term rates of longer maturities. This feature is also highlighted by Sack and Wieland (2000). Not wanting to "whipsaw" financial markets based on every new piece of information also can explain why rates tend to be adjusted gradually and unidirectionally. Affecting market behavior at longer horizons is also part of the reason that starting in the early 2000s the FOMC has increasingly resorted to forward guidance.

Other potential reasons for interest rate smoothing involve the facts that data are imperfectly measured and often revised. Additionally, some of the important underlying variables such as the output gap and the natural rate of interest are not directly observable. A number of researchers have shown that these data features generate a rationale for interest rate smoothing, as can the presence of model uncertainty.[7]

In addition to these heuristic motivations for interest rate smoothing, Woodford (2003b) has shown that even if the policymaker merely wants to minimize interest rate volatility, interest rate persistence

[7] See, for example, Sack and Wieland (2000). The effects of model uncertainty are sensitive to the details; if the policymaker has a preference for robust policies (minimizing the probability of the worst outcomes), model uncertainty tends to work in favor of more aggressive policy.

may arise through history dependence of optimal policies with commitment. And it is history dependence that allows policy to influence views about the far future and therefore allows less aggressive policy to achieve desirable outcomes.

Woodford also shows that in the absence of full commitment, introducing an additional preference for low volatility of changes in the interest rate leads to time-consistent policies that achieve outcomes close to those that can be achieved by full commitment. Thus, far from being an unduly timid policy, interest rate smoothing can enhance the conduct of monetary policy.

Woodford's work builds on Marvin's insights, formalizing some of the ideas in "Interest Rate Smoothing" and Goodfriend (1991). Woodford argues that another reason for preferring low interest rate volatility, besides a preference for orderly markets, is to reduce the likelihood of very high interest rates (and their associated distortions) and the likelihood of hitting the zero lower bound. Of course, the latter consideration was not on the horizon of policymakers when Marvin originally wrote his paper.

Empirics: purposeful smoothing or inherited persistence?

Broadly speaking, the theories rationalizing interest rate smoothing can be classified as purposeful vs. incidental.[8] In the latter case, the central bank has no inherent preference for smoothing, and the observed persistence reflects the nature of the data to which the central bank responds (with some of those data being perhaps unobserved by the researcher). Two notable attempts to sort out these issues are Rudebusch (2006) and Coibion and Gorodnichenko (2012).[9]

Rudebusch (2006) characterizes the problem in the context of a Taylor-style rule for monetary policy. He asks: Is the lagged interest

[8] Rudebusch (2006) refers to the former as endogenous and the latter as exogenous.

[9] See also Bernanke (2004) for a useful survey.

rate an argument of that rule (purposeful smoothing) or is there a persistent error term representing some misspecification (an omitted variable that is persistent)? As he explains, this is a classic econometric problem, and it is notoriously difficult to distinguish the two cases without auxiliary information.[10] Rudebusch brings in auxiliary information from the yield curve and argues that purposeful smoothing would show up as predictability in short-term rates to a greater degree than is evident in the term structure. He thus concludes that persistence of short-term rates is inherited from other variables to which the policy rate responds.

Coibion and Gorodnichenko (2012) conduct an exhaustive study broadly in the same spirit as Rudebusch but reach a different conclusion. They first take a direct approach, using a more general specification of both the policy rule and shock persistence, and find that the evidence favors purposeful smoothing. With respect to the yield curve, they find that predictability may be reduced if the public has different information about the economy or policy than the Fed. They also show that Federal Reserve Board staff forecasts more accurately predict future interest rates than private sector forecasts. Their summary of the evidence favors purposeful smoothing, and they support this conclusion with narrative evidence from the public and private comments of FOMC members.

Narrative evidence and recent policy history

The statistical analysis in Coibion and Gorodnichenko (2012) is impressively thorough. And yet, given the fundamental challenge described by Rudebusch (2006), it is conceivable that another study could push the dial back toward inherited persistence. For this reason, narrative evidence — of which there is a plethora — has great potential to inform the debate. By narrative evidence we mean material such as speeches by FOMC members and transcripts of FOMC meetings, which are released with a five-year lag.

[10] Marvin himself studied this econometric issue in the context of money demand equations (Goodfriend, 1985). See Mark Watson's essay in this volume.

Coibion and Gorodnichenko summarize the narrative evidence up to approximately 2011. Since then, 10 more years of FOMC transcripts have become available. In addition, over that period, the observed persistence of policy rates has been unusually high: the fed funds rate target range remained at its lower bound until December 2015, and then the Fed raised that range in nine 25-basis point increments from December 2015 to December 2018. On the surface, this certainly looks like purposeful smoothing, with Federal Reserve policy becoming more persistent as opposed to economic fundamentals becoming more persistent. Increased persistence on the part of the Fed is probably related to its experience with the effective lower bound. With rates constrained by the lower bound for some time, the FOMC then kept rates at that lower bound until it was nearly certain that the appropriate funds rate was positive. And once it lifted off, it behaved cautiously to avoid having to reverse course and once again be constrained by the lower bound. One does not need to comb the transcripts to find support for this view: from December 2015 to May 2018, the FOMC statements contained slight variations on the following sentence: *The Committee expects that economic conditions will evolve in a manner that will warrant only gradual increases in the federal funds rate; the federal funds rate is likely to remain, for some time, below levels that are expected to prevail in the longer run*.

As longtime Federal Reserve economists, we view narrative evidence as important and as supporting the view that the FOMC does purposefully impart persistence in the short-term rate. A simple way to make this case is to consider the following question: Does the FOMC view the short-term interest rate as a meaningful "state variable"? If there is not purposeful interest rate smoothing, then the answer should be "no."

To us, the answer is unambiguously "yes." Virtually all policy discussions (when the interest rate is in play) are of the form "how much – if at all – should the policy rate rise or fall?" If there were no concern for smoothing, then the discussion would be about the proper *level* of the interest rate, not how much of a change is appropriate.

Concluding remarks

The three of us worked with Marvin at the Richmond Fed for a collective total of almost 40 years. He played a role in hiring each of us. We can't stress enough his role in guiding policy work and setting the tone for the research environment at the Richmond Fed, first as an economist and then as research director and policy advisor. If we had to sum up that tone concisely, it would be that research and policy work are complementary. Along with much of Marvin's work, "Interest Rate Smoothing" exemplifies that complementarity.

The lunch table was an important forum for Marvin. During his many years in Richmond, conversations with as many as 12 people crowded around a table meant for six were a critical ingredient in creating the unique mix of a policy and research environment. And Marvin as much as anyone else facilitated those conversations. Marvin's contributions were wide ranging, sometimes heated, sometimes bewildering, and always with his tie tucked into his shirt (when we still wore ties).

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Paying Interest on Bank Reserves[1]

Huberto M. Ennis and John A. Weinberg

Since the 2008 financial crisis, the Fed's main tool for exercising control over short-term interest rates has been the rate it pays on the now large reserve balances held by banks. This new approach marks a substantial change from the Fed's previous operating regime, in which the supply of reserves was tightly controlled to ensure that the equilibrium rate in the federal funds market was at, or near, the Fed's target. In 2002, well before this change and before the idea was under active consideration by the Fed, Marvin Goodfriend set out a proposal for such an approach to policy operations in the Federal Reserve Bank of New York's *Economic Policy Review*. This proposal served as a cornerstone for planning and discussions around the System leading up to implementation of an interest on reserves mechanism in October 2008. While interest on reserves, as implemented in the US, has yielded some surprises, Marvin's discussion remains an important benchmark.

In this essay, we review Marvin's 2002 proposals and provide some perspectives on the evolution and implementation of those ideas. In particular, we recount the 15-year history of interest on reserves at the Fed, showcasing the influence of Marvin's ideas. We document how those ideas were adapted as policymakers learned from the actual implementation of policy.

The issues identified by Marvin in the early 2000s remain central today to the assessment of an operating regime based on the management of interest on reserves. One particular set of issues — having to do with preserving independence of monetary policy from political motivations — has only grown in relevance.

[1] We would like to thank Todd Keister, Bob King, Beth Klee, Jeff Lacker, and Alexander Wolman for comments. All errors are our own.

Interest on reserves

Bank reserves are balances held by depository institutions in their accounts at the corresponding Reserve Bank. Reserves are freely convertible, dollar-for-dollar, into currency and play a critical role in the settlement of financial transactions intermediated by banks. Banks trade reserves in the fed funds market.

The idea of paying interest on bank reserves first arose as a tool for reducing the distortions from the tax on money (as modeled by Lacker [1997]). Central bank money that is dominated in rate of return will still be held by economic agents because of its privileged role in the payment system. Eliminating the tax on currency is the motivation behind the Friedman rule.[2] In his *Program for Monetary Stability*, Friedman (1959) also proposed paying interest on reserves held by banks.[3]

Evolution of an idea: implications for conduct of monetary policy

Goodfriend's (2002) paper goes beyond this public finance perspective to a concern for the operational conduct of monetary policy. At the time of his writing, major central banks around the world had adopted the approach of conducting monetary policy by manipulating short-term interest rates and reserves earned zero interest. The supply of reserves was one of the main levers used for affecting short-term interest rates. By contrast, Marvin's proposal was to peg the fed funds rate by paying a positive interest on reserves and assuring a plentiful reserve supply. An important argument in Goodfriend (2002) is that paying interest on reserves could allow the central bank to separately manage short-term interest rates and the supply of monetary liabilities.

Goodfriend (2002) traces his thinking on this topic to his earlier 2000 paper on monetary policy at the lower bound on nominal interest rates,[4] which proposes supplementing a policy rate set at its effective

[2] Friedman (1969).

[3] See also, Ireland (2019).

[4] Elsewhere in this volume, Ben Bernanke discusses Marvin's initial work on the zero lower bound, Goodfriend (2000) and a follow-up Jackson Hole paper, Goodfriend (2016).

floor with the expansion of reserves. With the short-term rate at its lower bound and reserves abundant, he argued, the convenience yield on money goes to zero — making reserves and fed funds lending perfect substitutes. With the demand for reserves thus satiated, the banking system will hold whatever quantity the Fed supplies.[5]

At the lower bound, Goodfriend characterized expanding the supply of reserves as an alternative means of policy accommodation when interest rate reductions are off the table. More generally, in his interest-on-reserves (IOR) paper,[6] he argued that interest rate and reserves policy could operate independently, serving different objectives. By setting its interest rate on reserves, the Fed could conduct interest rate policy in much the same way central banks had grown accustomed to doing, systematically responding to economic conditions to maintain price stability.

Separation of interest rate and balance sheet policy

Importantly, once reserves were large enough to ensure that demand is satiated at the IOR rate, further adjustments to reserve supply could respond to liquidity conditions in broader money markets. Marvin dubbed this "managing the supply of broad liquidity."[7] Here, he recognized the possibility of frictions affecting the efficiency with which market participants might exchange alternative short-term instruments. Importantly though, his view of the central bank's role in responding to such frictions was limited to managing the overall supply of liquidity by creating reserve balances through open market operations. Inherent in this view is a belief that markets will do a reasonably good job of distributing the liquidity that the central banks supply — money market problems are adequately addressed by managing that overall supply.[8]

[5] Keister and McAndrews (2009).

[6] Goodfriend (2002).

[7] Keister et al. (2008) provides a detailed discussion of these ideas.

[8] Goodfriend and King (1988). See the essay by Douglas Diamond elsewhere in this volume.

The separation of interest rate and balance sheet policy was an important part of Marvin's vision for an IOR operating regime. Marvin, of course, had made significant contributions to our understanding of how modern central banks achieved and maintained low inflation by systematically adjusting short-term rates in response to macroeconomic conditions.[9] So being able to continue reacting to the economy in the same manner was vitally important to him. Note that an implication of the separation of interest rate and balance sheet policy is that if the Fed expanded reserves in response to a perceived need for liquidity in money markets, there would be no expectation that interest rate moves — in particular, rate increases, if economic conditions warranted them — would need to wait for an unwinding of the reserves expansion. This observation is consistent with the Fed's approach to allowing a very gradual balance sheet run-off while at the same time raising interest rates.

Desirable features of an IOR regime

One particular virtue of an IOR operating regime, according to Goodfriend (2002), is that central bank interest rate control would be more robust to technological changes in the payment system that reduce the demand for central bank balances as a means of settlement. Marvin argued that the traditional Fed approach could become increasingly difficult in the face of such changes. This is because the traditional approach involved manipulating the supply of reserves so that the market-determined fed funds rate settled near the target. By contrast, in a regime in which the opportunity cost of holding reserves was eliminated, banks would be willing to hold the reserves supplied by the Fed, independently of the role of reserves in payment settlement.

Goodfriend (2002) also noted that the abundant reserves in such an operating regime could reduce the need for central bank credit that can arise when banks face unexpected payment flows. Historically, in the US interbank system, such credit extensions took the form of both

[9] Elsewhere in this volume, John Taylor discusses Goodfriend (1991) and Michael Dotsey, Andreas Hornstein, and Alexander Wolman discuss Goodfriend (1987).

intraday overdraft allowances and overnight discount window loans.[10] Goodfriend had elsewhere expressed the view that modern money markets could function with less reliance on central bank credit.[11] So, he saw a reduced reliance on Fed lending as a means to solidify the separation of monetary and credit policies. The IOR regime, then, could also serve as a means of facilitating that goal.

IOR and Fed income

One potential difficulty that Goodfriend (2002) anticipated involved the effects of reserve remuneration and larger Fed balance sheets on the Fed's income.[12] However, he expected that under normal conditions, the Fed would continue to earn a positive spread on its balance sheet. The Fed's assets would have an average maturity well above the overnight maturity of reserves and so would usually bear a yield greater than IOR. Also, he took as given that (non-interest-bearing) currency would remain a nontrivial part of the Fed's liabilities for the foreseeable future. While the Fed's net interest margin would be reduced by paying a positive rate on reserve balances, that spread would be earned on an expanded balance sheet.

So Goodfriend did not see paying interest on reserves as a fundamental problem for the Fed's income, on average. That said, he did see the possibility of periods with negative Fed income when appropriate monetary policy called for relatively quick and significant increases in short-term interest rates.[13] He was nervous that such episodes would mean that the Fed would have to go to Congress or the Treasury to obtain funding to cover operating costs. That is, such a situation could

[10] In Ennis and Weinberg (2007), we investigate formally the link between excess reserves and intraday credit. For the link between reserves and discount window lending, see Ennis and Klee (2021).

[11] Goodfriend and King (1988) and Goodfriend and Lacker (1999).

[12] For a recent thorough study of this issue see Carpenter et al. (2015).

[13] Goodfriend (2014).

threaten the political independence of monetary policy. While acknowledging the risk, he saw it as manageable so long as the Fed carried an appropriately sized capital buffer or surplus account.[14]

Interest on reserves at the Fed

In 2006, Congress enacted a collection of regulatory relief measures for banks and other financial institutions. As part of this package — the Financial Services Regulatory Relief Act of 2006 — the Fed was granted authority to pay interest on the reserves held by banks.[15] Part of the motivation for this provision was to reduce banks' incentives to engage in costly account management practices that served only to reduce reserve requirements. This practice involved automated procedures for shifting customer overnight balances out of reservable deposit accounts and into other instruments that did not carry reserve requirements — so-called sweep accounts. Changes in sweep account practices were a focus of the Congressional Budget Office's (CBO) analysis of the likely implications of this provision for the federal budget.[16]

Key aspects of the 2006 act

The language in the act (Section 201) is very brief, but there are a few specific conditions worth noting. First, the possibility of interest on reserves was not made available to all holders of reserve balances with the Fed — only to depository institutions. Importantly, this left out government sponsored enterprises (GSEs) such as Fannie Mae, Freddie Mac, and the Federal Home Loan Banks. These entities hold significant balances with the Fed and are typically lenders of overnight funds in the fed funds market and other segments of the short-term

[14] Reis (2015) provides a good overview of central bank solvency and its relationship with independence. In the years after Marvin wrote his piece, a number of political actions by Congress have called into question the ability of the Fed to independently manage its surplus account (Fessenden, 2015; and George, 2020). Indeed, in later writings, Marvin expressed greater concern about the independence consequences of cash flow volatility and about the true availability of future unencumbered seigniorage (Goodfriend, 2014).

[15] This essay only discusses the experience with IOR in the US. For an international perspective, see Bowman et al. (2013) and the references therein.

[16] Available here: https://www.congress.gov/congressional-report/109th-congress/senate-report/256.

money market. The distinction between banks and GSEs would prove significant for the eventual workings of the IOR regime in ways not fully anticipated.

Second, the act specified that the rate paid by the Fed was not to exceed the general level of short-term market rates. At the time, this seemed like an innocuous requirement. In the model Goodfriend used to discuss his proposal,[17] the rate paid by the central bank essentially becomes the market rate. This is because the demand for reserves is satiated, and interest-bearing central bank balances replace interbank loans for the most part. A market rate above the rate on reserves would tend to arise in other systems in which reserves remain scarce and there is still an active interbank market. So, standard analysis at the time did not foresee the possibility of markets rate *below* IOR. Indeed, the CBO's analysis assumed a rate on reserves that was on average 10 to 15 basis points below overnight money market rates. The experience since implementation of IOR has been quite different, in large part due to the behavior of the GSEs in the money markets.

Finally, the 2006 act gives the authority to set the rate paid on reserves to the Federal Reserve Board of Governors, as opposed to the monetary policymaking body — the Federal Open Market Committee (FOMC). Congress likely saw the provision as more of an operational modernization — to reduce adverse incentives created by the tax on reserves — than a fundamental change in the way monetary policy would be implemented.[18] Yet, in the proposal put forward by Goodfriend (2002), the rate on reserves becomes the instrument for interest rate policy. The act's designation of decision-making authority creates the need for potentially delicate coordination among different bodies within the Federal Reserve System.

Consideration by a Fed workgroup

The 2006 act set 2011 as the start date for the Fed's new authority, giving the Fed time to work out the details of using this tool. Shortly

[17] Poole (1968).

[18] Ireland (2019).

after its enactment, the Fed created a System workgroup, consisting of staff from the Board of Governors and the Reserve Banks, to study the issue and prepare a number of alternatives to be considered by policymakers. A central question in designing an implementation regime was whether the Fed would continue to target an interbank rate by manipulating the supply of (relatively scarce) reserves. Doing so would result in a so-called *corridor* system, in which the target rate was above the rate paid by the Fed (and typically below the rate charged by the Fed for discount window loans).

The main alternative to this approach, as proposed by Goodfriend, is typically referred to as a *floor system*. In such a system, the Fed would provide enough reserves to essentially eliminate the need for interbank lending. Movements in short-term interest rates would be driven by the rate on reserves, and moderate fluctuations in the quantity of reserves would have little to no effect on those short-term rates.

The workgroup examined the relative merits of floor and corridor systems (as well as some hybrids). A technical appendix to the workgroup report provided an analytical framework for this comparison (and was later published as Ennis and Keister [2008]). The workgroup also devoted attention to an array of technical details, including the mechanics of monitoring reserve requirements and the treatment of different categories of reserves (required, clearing balances, and excess reserves).[19]

Accelerating the implementation of IOR

The Fed intended a long deliberative process before it implemented IOR. But by the time the workgroup presented its analysis to policymakers in early 2008, attention had shifted to dealing with the unfolding financial crisis. The Fed's crisis response led directly to an accelerated adoption of IOR. Beginning in late 2007, the Fed dramatically expanded the provision of central bank credit in various forms. In the

[19] The document produced by the workgroup for the Board and the FOMC is available at https://www.federalreserve.gov/monetarypolicy/files/FOMC20080411memo01.pdf.

interest rate targeting regime it maintained at the time, the Fed could not let credit expansions increase the size of its balance sheet and the supply of reserves. Accordingly, it offset its growing book of loans by selling Treasury securities from its portfolio (and in that way *sterilizing* that credit growth). When the crisis deepened in October 2008, around the time of the failure of Lehman Bros. and the bailout of AIG, the rapid rise in credit extensions overwhelmed the Fed's ability to sterilize — it risked running out of Treasuries to sell.

Partly to address this issue, the Fed asked for and received permission to accelerate its authority to pay interest on reserves — and in that way control interest rates without sterilizing the credit programs.[20] In October 2008, then, the Fed started paying interest on reserves. The conditions under which this happened were not ideal for a test of using the rate paid on reserves to target and control market rates. With the extreme market volatility at the time, and with the Fed both rapidly expanding its balance sheet and taking its interest rate target to its effective lower bound, the choice between a corridor and a floor soon became trivial. Indeed, with the beginning of quantitative easing programs in 2009, it became clear that it would be some time before there was a relevant option to make reserves anything other than abundant.

A surprise: the overnight rate below the floor

As the Fed entered the regime of interest paid on abundant reserve balances, something else became clear. The theoretical floor on market overnight rates provided by the rate on reserves turned out not to be a firm floor. When the Fed moved its policy rate to the effective lower bound, it started targeting a range instead of a given number. From December 2008 until December 2015, the FOMC target range for the effective fed funds rate was 0 to 25 basis points and IOR was fixed at the top of the policy range. During this period, the effective fed funds

[20] See Ireland (2019) for a critical assessment of the policy of paying interest on reserves. Somewhat ironically, the motivation for paying interest on reserves as a way to finance credit programs is in sharp contrast with Marvin's thinking — he suggested that the ability to adjust the amount of excess reserves could actually reduce the urge of central banks to pursue other more objectionable credit policies.

rate consistently traded *below* IOR by, on average, 10 to 15 basis points. And, while theory would predict that with abundant reserves fed funds trading would vanish, activity did decline significantly but did not disappear.

These surprising facts are due primarily to the participation of the GSEs in the fed funds market. Since they could not earn interest on their reserve balances, there was an opportunity for them to lend those balances to banks that could earn interest from the Fed. While one would expect competition among borrowing banks to bid the rate on those loans up close to the rate on reserves, at least two market features are thought to have limited this arbitrage. First, a bank borrowing reserves from a GSE to earn overnight interest incurs costs from expanding its balance sheet. One direct source of costs is that banks pay FDIC premiums on the overall size of their balance sheet (not just on their insured deposits). This places a cap, below the yield on reserves, on what a bank would be willing to pay to a GSE. Second, competition may not even have driven fed funds loan rates as far as the ceiling implied by the cost of balance sheet expansion. One explanation for this is that the GSEs, holding market power in fed funds lending, were restrictive in which banks they would lend to and how much. The resulting small number of bidders, then, resulted in imperfect competition that may have further held down the effective fed funds rate.[21]

The prospects of liftoff and a new facility

Still, for the first several years of IOR, there really was no opportunity to assess the Fed's ability to conduct interest rate policy exclusively (or primarily) through manipulating the rate paid on reserves. Eventually, though, the likelihood of a rate increase being necessary became more apparent. In 2012, when the Fed began including the policy interest rate as one of the variables in the *Summary of Economic Projections*, a majority of participants anticipated that some rate increases would be appropriate by the end of 2015. As the FOMC discussed prospects for lifting its target rate off of its effective floor, some members and senior staff expressed uncertainty as to whether simply lifting the rate on

[21] Bech and Klee (2011).

reserves would reliably pull up the broader array of short-term rates that were seen as important for affecting economic activity. This lack of confidence ultimately led to the creation of the Overnight Reverse Repurchase Agreement facility, or ON RRP.[22]

The ON RRP facility allows an expanded set of counterparties to exchange excess cash for securities held by the Fed in an overnight transaction that pays a rate to the cash lender that is a bit below the rate paid on bank reserves. The expanded set of counterparties includes, importantly, the GSEs that are also active lenders in the fed funds market. Their access to the ON RRP was intended to place a more reliable floor under the fed funds rate — as a GSE would presumably not want to lend reserves to a bank at less than it could earn by doing a repo transaction with the Fed.

The liftoff and transition to a new policy

When the FOMC did eventually begin raising rates near the end of 2015, market rates generally followed its increases in the rate paid on reserves.[23] As to whether the extra precaution of the ON RRP proved to be a necessary tool for interest rate control, the evidence is somewhat mixed. Most of the time, overnight market rates remained above the ON RRP floor. But at ends of months, it was common for market rates to fall to that floor. Correspondingly, those dates would see significant pick up in volume for the Fed's ON RRP facility. This pattern appears to have been due to incentives created by calendar-based reporting requirements for many of the financial institutions that participate in these markets.

Once rate increases were underway, the FOMC returned to the question of how it would implement its interest rate policy over the longer run. Would it maintain the abundant reserves regime that had emerged during the crisis response, in which the rate paid on reserves is the main tool for influencing market rates? Or would it move to a regime in which the supply of reserves was more restricted, so that

[22] Frost et al. (2015).

[23] See, for example, Haltom and Wolman (2016).

an active interbank funds market would emerge, and market rates would depend both on the rate paid by the Fed and the supply of reserves? And what would be the implications of this choice for the size of the Fed's balance sheet?

These discussions led to the January 2019 "Statement Regarding Monetary Policy Implementation and Balance Sheet Normalization." There, the committee stated its intent to continue to operate with an "ample" supply of reserves, so that rate control would be achieved "primarily through setting the Fed's administered rates." It also said that it would continue to use the target range for the federal funds rate to express the stance of its interest rate policy.

Relative to the approach proposed by Goodfriend, this use of the funds rate range might seem like an unnecessary complication. Why not simply use the administered rate — the rate paid on reserves — as the policy rate? Here, the rate governance created by the legislation allowing interest on reserves might have come into play. Recall that the enabling act gave the Fed's Board of Governors the authority to set the rate on reserves. The January 2019 statement, by contrast, emphasized the rate decision made by the FOMC. This statement can be seen as a reassurance that adopting a regime in which administered rates are the main tool does not move authority for interest rate policy from the FOMC to the Board of Governors.

After describing its plan for how it would proceed to implement monetary policy, the committee made a series of announcements about the intended size of its balance sheet and the supply of reserves. The Fed intended to allow the balance sheet to run down through the redemption of securities without reinvestment of the proceeds. This process was made gradual and predictable by capping the amount of unreinvested redemptions. The Fed's announcements generally avoided projecting a specific number for the ultimate size of its balance sheet. They did indicate that the average level of reserves would likely be "somewhat above the level of reserves necessary to efficiently and

effectively implement monetary policy."[24] In the context of the January 2019 statement on implementation plans, an interpretation is that reserves supply would remain large enough so that the fed funds rate would remain at or below the rate paid on reserves.

Turbulence and renewed expansion of the balance sheet

Turbulence in money markets in September 2019, including spikes in repo rates and in the fed funds rate, led some to question whether the Fed had already taken the supply of reserves too low relative to its stated intentions. As a result, the Fed ended its runoff of the balance sheet and began a modest pace of growth in reserves. In its October 2019 announcement, the Fed included a plan to build back reserves at least to their level before the market stress of September. This plan was intended to extend through "at least the second quarter" of 2020. The Fed did not change the character of its long-run plans (as expressed earlier in 2019), but perceptions about how large the supply of reserves would need to be on an ongoing basis did change some.

Monetary policy implementation after COVID-19

The Fed's intent remained to operate with reserves no larger than necessary to effectively and efficiently conduct monetary policy.[25] Yet, money markets events in September 2019 produced a reassessment of the desired long-run level of reserves. Further, with the onset of the COVID-19 pandemic in early 2020 and the economic disruption that followed, the normalization process for the Fed's balance sheet was again interrupted. The uncertainty caused by the public health crisis led many money market yields to rise as investors sought to hold only the safest, most liquid assets (in a so-called "dash for cash" episode). The Fed's response included an array of credit facilities as well as a substantial increase in the pace of asset purchases. At the same time,

[24] See the March 2019 Fed press release, "Balance Sheet Normalization Principles and Plans" (https://www.federalreserve.gov/newsevents/pressreleases/monetary20190320c.htm).

[25] See, for example, the Fed's online press release from January 30, 2019. For a detailed discussion of monetary policy implementation in a system with "ample" reserves, see Ihrig et al. (2020).

the Fed brought the interest rate paid on reserves to its lowest level to date.

The Fed's pandemic actions brought its balance sheet size to new highs. Recently, take-up in the ON RRP facility also rose to more persistently high levels.[26] As of this writing (January 2022), the Fed has begun to taper its asset purchases, but there has been little discussion as yet about when the Fed will begin to let its net holdings of assets run down and whether the envisioned long-run level of reserves remains the same as it did pre-pandemic.

A new repo facility

In the wake of the pandemic, the Fed has added another standing facility to its toolbox for interest rate control. It created the Standing Repurchase Agreement (repo) Facility (SRF) that lends cash overnight to a broad set of counterparties against Treasury and agency securities. By lending at a rate somewhat above the rate on reserves, this facility is expected to limit the kinds of money market rate spikes experienced in September 2019. It is still an open question whether the SRF will become heavily used when the Fed normalizes the size of its balance sheet. Interestingly, earlier discussions of a standing repo facility included the argument that such a facility would permit the Fed to operate effectively even with a lower level of reserves.[27] It seems unclear that this is the current intent of the SRF.

So, the current regime is somewhat more complicated than the one laid out by Goodfriend in 2002, which saw rate control as being adequately accomplished by managing the rate paid on reserves. Now, out of an abundance of caution, the Fed has added supports in the form

[26] Initially, the ON RRP facility was envisioned to function mainly as a backstop in short-term secured credit markets (Frost et al., 2015). However, with the current configuration of interest rates and the very large Fed balance sheet, the ON RRP has become heavily used — and functions as a way for the Fed to pay interest directly on cash reserves held by money market funds and other financial institutions (such as the GSEs), which are eligible to use the ON RRP but are not eligible to receive IOR. This situation seems to be hardly something that Marvin (or we) would have recommended or even anticipated.

[27] Andolfatto and Ihrig (2019).

of standing facilities in the repo market.[28] While we of course cannot be sure, it seems likely to us that the supply of reserves will remain for some time well above levels that Marvin would have viewed as necessary for implementing an effective IOR regime.[29]

Conclusion

As on many topics related to modern central banking, Goodfriend's discussion of interest on reserves as a tool for monetary policy has proved to be prescient. The issues he identified as potential areas of concern have all remained relevant, and his thinking has influenced the learning process of policymakers every step of the way. For instance, his consideration of the implications for the demand for reserves of payment innovations — written at a time when an array of payment tools now common were barely in use, if at all — identified legitimate concerns that are being voiced today by those studying the merits of a central bank digital currency.[30] His conclusion — that an IOR regime diminishes the concern by making reserves an interest-bearing asset and hence rendering their payment settlement role less dominant — suggests that monetary control might survive the advent of digital currencies.

It is important to stress that Goodfriend's proposal was offered in a context where the credibility of the central bank was unquestioned. In such an environment, inflation expectations are firmly anchored. But when there is more uncertainty about the central bank's goals and its likely conduct of interest rate policy in pursuit of those goals — as some have argued coming out of the pandemic crisis — the possibility of drifting inflation expectations can be more of a concern. In this context, as Ennis and Wolman (2010) noted, the consequences of an interest rate policy that falls "behind the curve" can be magnified by

[28] See Ennis and Huther (2021) for a discussion.

[29] It has become a real concern that the Fed will deem it necessary to go back to quantitative easing policies before the size of its balance sheet has had the time to fully normalize from its very high current level. This possibility of a "ratchet effect" suggests to us that normalization should become a priority as soon as conditions allow it.

[30] See, for example He (2018) and Benigno (2019).

the existence of large excess reserve balances. This provides another reason to be mindful of the overall size of reserve balances.

Among the most salient issues discussed by Goodfriend (2002) are those related to the possibility of negative Fed net income, especially as that might affect its independence to conduct appropriate monetary policy.[31] The Fed's relationship to the legislative and executive branches of government was a central concern in much of Goodfriend's work.[32] While in his 2002 article he saw the income and expense challenges created by interest on reserves as being manageable, his vision was certainly of a much smaller balance sheet. He also advocated a regime in which the Fed's intervention in money markets was simpler than one with multiple standing facilities. Again, we cannot be sure, but we think that on those issues our insightful and experienced colleague would be more concerned now than he was in 2002.

As a larger balance sheet and greater involvement in the money markets raise the risks to Fed independence, another common theme from Marvin's work is worth remembering. In many instances, Marvin advocated creating formal understandings between the Treasury and the Fed delineating the central bank's autonomy and accountability. He would often link these proposals to the 1951 Fed-Treasury Accord that ultimately allowed the Fed to conduct the independent interest rate policy to which we have become accustomed.[33] As the Fed's operating regime expands in its reach, an accord that establishes reasonable and commonly understood limits to Fed activities could be a useful tool.[34]

[31] As a purely technical matter, negative cash flow does not create a problem for the Fed, as it can use reserves to pay its interest expenses. The Fed has discussed accounting for such a practice by means of a "negative liability" account to the Treasury representing the withholding of future remittances until the effects of the negative cash flow are offset. Still, as Marvin has noted (Goodfriend, 2014), the optics of creating reserves to pay interest on reserves could stress both the Fed's credibility for low inflation and its political independence.

[32] George (2020).

[33] See the 2001 issue of the Richmond Fed *Economic Quarterly* on this topic, particularly Lacker's (2001) introduction.

[34] Elsewhere in the volume, Charles Plosser independently makes a specific proposal for such an accord.

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Reconsidering the Case for Price Stability

Vitor Gaspar and Frank Smets

From the beginning of the Economic and Monetary Union (EMU) in 1999, Marvin Goodfriend was a frequent visitor at the European Central Bank (ECB). As the ECB started its operations, his advice — grounded in long policy experience as well as innovative and highly relevant research — was sought after by ECB policymakers and researchers alike.

The Treaty on European Union gives the ECB the primary mandate of maintaining price stability. The quantitative formulation of the price stability objective was, however, left to the ECB's Governing Council. In its original monetary policy strategy at the start of EMU, the ECB defined price stability as "a year-on-year increase in the Harmonised Index of Consumer Prices (HICP) for the euro area of below 2 percent."[1]

It was thus natural when the ECB organized its first central banking conference that the topic should be "Why price stability?" The ECB sought to discuss with a diverse group of economists what price stability should be taken to mean. In their contribution to the conference, Marvin Goodfriend and Robert King (hereafter referred to as GK) made the case for literal price stability.[2] This conclusion built on the general equilibrium optimal taxation literature in the spirit of Ramsey (1927) and Lucas and Stokey (1983). Following earlier work,[3] they used a general equilibrium model augmenting the approach of the real business cycle literature with imperfect competition and costly price setting.[4] To connect to the optimal taxation literature, GK interpreted the imperfect competition wedge between price and marginal cost — the markup — as analogous to a tax rate.

[1] ECB (1999), p. 46.

[2] Goodfriend and King (1999).

[3] Goodfriend and King (1997).

[4] GK called this approach the "New Neoclassical Synthesis" and their 1997 paper is discussed by Michael Woodford in another contribution to this volume.

They then explored under which circumstances this markup should be uniform across time and across states of nature, concluding that optimal policy stabilizes real marginal costs within their model in most circumstances. Moreover, given their presumed link between marginal cost and inflation, such policy also stabilizes the price level. Therefore, GK suggested that a central bank would stabilize markups by credibly maintaining price stability and thus deliver optimal policy. The basic intuition is that markup constancy corresponds to "tax smoothing" over the business cycle or, more generally, to the case for uniform taxation in public finance.

The ECB's original definition of price stability did not exclude such literal price stability or a zero inflation target. However, in the 2003 strategy review, the ECB introduced an inflation aim of "below, but close to 2 percent" within the price stability definition.[5] Three economic factors were viewed as relevant for justifying a small inflation buffer: i) the existence of downward nominal price and wage rigidities; ii) the persistence of sustained inflation differentials across euro area countries; and iii) the constraint imposed by the zero lower bound (ZLB) on nominal interest rates.

While this formulation of the price stability objective was effective in maintaining long-term inflation expectations close to 2 percent in the inflationary environment of the first decade of EMU, it was problematic in terms of anchoring expectations when disinflationary forces prevailed following the Global Financial Crisis (GFC) in 2008 and the sovereign debt crisis in 2010-2013. In the new ECB monetary policy strategy, announced on July 8, 2021, this formulation was therefore replaced by a symmetric 2 percent inflation target.[6] Such a symmetric target is simple, clear, and easy to communicate and should therefore help to better anchor long-term inflation expectations. The ECB Governing Council sees the level of 2 percent as representing a good balance between providing a safety margin against the risks of deflation and

[5] ECB (2003), p. 81.

[6] ECB (2021a).

the welfare costs posed by excessive inflation. With this new symmetric 2 percent inflation target, the ECB has joined many central banks in advanced economies that flexibly target a 2 percent inflation rate.

Why did central banks not move to literal price stability? For example, the Bank of Canada investigated the option of price-level targeting regularly in its periodic review of Canada's inflation-control target, but so far it has always continued with a 2 percent inflation target.[7]

To understand why, our essay highlights four factors not considered in the GK case for literal price stability. Section 2 analyzes the impact of the *effective lower bound* (ELB) on nominal interest rates, which was central to the revised formulation of the price stability objectives both in the United States and the euro area. Section 3 reconsiders aspects of the GK model, which focused on price rigidities and assumed a perfectly competitive labor market. GK argued this is a reasonable approximation when wages, at any point in time, are nonallocative. We review some recent evidence on wage rigidity and analyses of its implications for the optimal inflation target. Section 4 considers the role of fiscal policy. The main message is that when the ELB limits the ability of monetary policy — acting on its own — to deliver price stability in a timely way, fiscal policy can help to overcome the constraint. Hence, interactions of fiscal and monetary policy become central for the conduct of monetary policy at the ELB. Finally, GK's analysis suggested that literal price stability would also be optimal for a monetary union, arguing that an integrated financial market would provide the necessary insurance against country-specific shocks. Section 5 makes a few observations on the evolution of financial risk sharing in EMU against that background.

Overall, we conclude that these factors significantly undermine the case for literal price stability and support the current practice in most advanced economies of targeting a small positive inflation rate.

[7] E.g., Bank of Canada (2011).

The relevance of the effective lower bound on nominal interest rates[8]

Marvin Goodfriend was an early advocate of the importance of interest rates for central bank policy practice and analysis, but the GK analysis was mainly concerned with the behavior of inflation and real activity.[9] In his comments on GK at the conference, Gali (2001) observed that a zero inflation policy would lead to a very low steady-state level of the nominal interest rate and that GK had not considered the fact that a central bank could not push down nominal interest rates below zero (the ZLB). The assumption in GK was in line with the policy wisdom at the time. For example, at the conference, Jose Vinals (2001) wrote: "In sum, zero bound problems are very rare events and most of their negative consequences can and should be avoided by preventive measures." In the same spirit, when reviewing and revisiting the ECB's monetary policy strategy in 2003, the consensus from a number of studies was that the ZLB was unlikely to bind if the inflation norm was set at 1 percent or higher.[10] Such conclusions were predicated on a 2 to 3 percent range for the equilibrium or natural real interest rate.

Today the perspective is very different as a consequence of policy experience and empirical evidence. Although Japanese short-term interest rates had come close to zero during the mid-1990s, it was only in 1999 that a zero interest rate policy was adopted by the Bank of Japan. At the time, Japan was seen as an interesting but isolated case. Later, the perspective changed as more and more central banks confronted limits on the use of interest rates in monetary policymaking. For example, the ECB encountered the ELB during the sovereign debt crisis in 2010-2011 and has yet to exit it, echoing the Japanese experience. Many other central banks have faced similar circumstances, including the Federal Reserve beginning in late 2008. COVID-19 once again

[8] See ECB (2021b, p. 35) for a more elaborate discussion and analysis of the impact of the ELB in the euro area.

[9] Goodfriend's 1991 "Interest Rates and Conduct of Monetary Policy" is a notable contribution that is reviewed by John Taylor elsewhere in this volume.

[10] Issing (2003), p. 17.

made the ELB relevant for most advanced economies. Today, the ELB has become a fact that policymakers have to take into account in the normal conduct of policy.

The most important reason for why nominal interest rates have been close to the ELB is the gradual fall in the natural real interest rate, frequently called *r**. This has been a global phenomenon driven by a combination of factors such as lower population and productivity growth, rising inequality, and higher demand for safe assets following the GFC. Brand et al (2018) survey a range of estimates of *r** for the euro area from 1999 to 2019. While the estimated level of *r** differs across methodologies, all estimates point to a significant decline over this period from a range of 2 to 3 percent to one of 0 to -2%.

A lower natural rate implies that the ELB is more likely to keep a central bank from lowering real rates to offset disinflationary forces. On the basis of stochastic simulations using a variety of macroeconomic models for the euro area, ECB (2021b, p. 36) shows that — for an inflation target of 2 percent — the time spent at the effective lower bound increases from 10 percent to more than 30 percent as the equilibrium real interest rate falls from 2 to 0 percent. The likelihood of a binding ELB has also increased due to changes in estimated macro volatility. In 2003, the variance of the demand and supply shocks affecting the economy was assumed to be relatively low, consistent with the experience in the Great Moderation period. Following the GFC, the volatility of the economy has increased. This higher volatility may be related to the fall in the equilibrium real interest rate. Adam (2020) finds that with a low *r**, the sensitivity of the business cycle to asset price bubbles increases, which in turn increases the volatility of the economy, the time spent at the ELB, and the optimal inflation target. A higher inflation target reduces the relevance of this constraint as, for example, also shown in Andrade et al (2019), who find that the optimal inflation target increases by 0.9 percentage point for each 1 percentage point fall in *r**. An additional factor that may have contributed to an increase in the optimal inflation target is increased inequality. It not only may have contributed to the fall in the equilibrium real rate,[11] but can also

[11] Mian et al (2021).

make the economy more sensitive to the real interest rate increases that occur at the ELB as low-income households typically are more affected and have a larger propensity to consume than richer ones.[12]

Without the use of nonstandard monetary policy measures such as forward guidance or asset purchases, a 2 percent inflation target is likely not enough to avoid a disinflationary bias when the equilibrium rate is zero. Depending on the model used, this disinflation bias can be sizeable, even with a 2 percent inflation target.[13] Forward guidance and other nonstandard policy measures such as asset purchases and targeted long-term lending operations can however help to overcome this bias as, for example, shown in Coenen et al (2020, 2021), Gerke, Kienzler, and Scheer (2021), and Mazelis, Motto, and Ristiniemi (2021).

The ECB's new monetary policy strategy consequently takes into account the implications of the ELB for its reaction function.[14] In particular, when the economy is close to the lower bound, the commitment to the symmetry of its 2 percent inflation target requires especially forceful and persistent monetary policy measures. These preclude negative deviations of inflation from the target becoming entrenched. Such forceful action may include the use of large-scale asset purchases or targeted long-term refinancing operations, which are now part of the central bank's instrument set and were implemented in response to the pandemic crisis. In addition, closer to the ELB, a more persistent use of such instruments may be necessary, which could lead to a transitory period in which inflation is moderately above target. The Fed has implemented the more persistent use of its instruments through an asymmetric average inflation targeting framework. By contrast, the ECB has implemented the need for persistence and patience through a strengthened threshold-based interest rate forward guidance.

[12] Fernández-Villaverde et al (2020).

[13] ECB (2021b), p. 37.

[14] ECB (2021a).

Downward nominal wage rigidities and the inflation buffer [15]

GK assumed a perfectly competitive labor market. While they acknowledge that there may be labor market frictions that lead to equilibrium unemployment, they argue that wages — at any given point in time — do not play an allocative role. In such an environment, nominal rigidity in wage formation does not matter. At the conference, though, Wyplosz (2001) argued that the importance of downward nominal wage rigidity (DNWR) may justify a positive inflation target, following the work of Akerlof, Dickens, and Perry (1997). DNWR leads to a nonvertical long-run Phillips curve and introduces an exploitable monetary policy trade-off at low levels of inflation. Based on estimates of the slope of a long-run Phillips curve for the euro area, Wyplosz suggested an optimal inflation target of 4 percent.

Since 2001, a lot of empirical evidence has been collected on the relevance of price and wage rigidities in the euro area and beyond. Consolo et al (2021) review the accumulated evidence on price and wage rigidities in the euro area since the early 2000s: they find evidence of both price and wage rigidities in the euro area. However, price flexibility may have increased during the EMU period, in particular in the more traded nonenergy industrial goods category, and there is little evidence of pervasive downward price rigidity. By itself, this would suggest that a zero inflation target is optimal to avoid misallocations due to inefficient relative price changes when inflation is positive.[16]

In contrast, evidence from the ECB's Wage Dynamics Network (WDN) surveys suggest that the length of wage contracts may have increased and, more importantly, that nominal base wages are very sticky downward. According to the WDN surveys, nominal base wage cuts are very

[15] This section is based on Consolo et al (2021).

[16] Note, however, that studies combining the frequency of price changes with the fact that goods prices tend to decrease over their life cycle suggest that a substantial positive inflation target would still be needed to minimize misallocations over time. Adam et al. (2021) estimate that the positive inflation buffer needed to account for these effects might well be above 1 percent in the euro area.

rare among euro area firms. Remarkably, this was the case even during the period 2010-2013 despite the length and severity of the sovereign debt crisis.[17] Downward nominal rigidity during the crisis is further suggested by the fact that the percentage of firms freezing base wages increased dramatically, reaching its peak during 2008-09, before declining over the period 2010-13. The WDN surveys also find that the wages of new hires are closely related to those of incumbents suggesting that wages do play an allocative role.[18]

For the US economy, using high-quality administrative data, Grisgby et al. (2021) finds that downward wage rigidity is more pervasive than previously measured with the nominal base wage declining only for 2 percent of job stayers. These researchers also find that the flexibility of base wages of new hires is similar to that of incumbent workers.

This euro area and US evidence suggests that higher real wages due to a binding downward nominal wage constraint may lead to persistent effects of aggregate demand on unemployment, with relatively high real wages depressing hiring and increasing unemployment duration. For instance, according to Daly and Hobijn (2014), DNWR provides a rationale for persistent US output losses during the GFC.

Turning to the implications for monetary policy, we stress that DNWR provides a rationale for a positive inflation buffer as it "greases the wheels" of the labor market.[19] New Keynesian DSGE models with exogenous growth that embed DNWR find that the optimal inflation rate is positive, although it is usually below 2 percent. Specifically, the calibrated DSGE model developed in Consolo et al (2021) provides a point estimate for the optimal inflation rate of about 1.2 percent with a confidence band ranging from 0.2 to 1.6 percent.

[17] See Consolo et al. (2021), section 2.2.

[18] See, e.g., Galuscak et al. (2012).

[19] E.g., Akerlof, Dickens, and Perry (1997).

A surprising conclusion of some recent research is that the introduction of DNWR in a model with the ZLB reduces the optimal inflation rate.[20] The mechanism is that wage rigidities limit the frequency and the persistence of the ZLB by keeping marginal costs relatively higher. In the quantitative analysis of Consolo et al (2021), discussed earlier, the introduction of the ZLB leads to a lower optimal inflation rate from 1.2 to 0.3 percent. These results are, however, overturned in DSGE models that feature equilibrium unemployment and endogenous growth as in Abritti and Consolo (2021). Such models support a symmetric inflation buffer around 2 percent.[21] From a welfare perspective, the optimal rate of inflation balances welfare costs of price inflation distortions and hysteresis effects on output and unemployment. Overall, recent empirical studies and investigations with quantitative models lead to a robust conclusion that DNWR leads to a positive average optimal inflation rate, even in the presence of the ELB — reinforcing the logic that has led the ECB to choose a 2 percent rather than 0 percent target over the years.

Fiscal-monetary policy interaction and the ELB

The GK framework identifies a clear division of labor between fiscal and monetary policy. Optimal fiscal policy compensates for the permanent distortions in the economy. For example, a wage subsidy can compensate for the average markup. Optimal monetary policy, in contrast, focuses on stabilizing the markup over the course of the business cycle. Such a perspective leads to fiscal policy as structural policy. Fiscal policy is crucial to provide incentives to work and save, accumulate knowledge, and innovate. Fiscal policy is, therefore, aimed at growth, employment, resource allocation, and the distribution of income and wealth. In contrast, monetary policy focuses on keeping the economy close to potential at business cycle frequencies.[22]

[20] Billi and Galí (2020) and Amano and Gnocchi (2021).

[21] See also ECB (2021b), p. 34.

[22] See Tabellini (2001).

Recent reviews of monetary policy strategy by the Federal Reserve and by the ECB explicitly recognize the relevance of the ELB for monetary-fiscal interactions.[23] Specifically, when the optimal policy interest rate is substantially lower than allowed by the ELB, the monetary authority typically uses forward guidance and communicates that interest rates will be kept low for an extended period. Fiscal multipliers are larger under these conditions than when monetary policy adjusts the policy rate according to a typical reaction function. Fiscal policy thus can assist monetary policy in avoiding recessions and restoring price stability. The power of fiscal policy is greatest when it is needed the most.

Ramey and Zubairy (2018) provide empirical evidence of a government spending multiplier of 1.5, for the United States, at the ZLB. Similarly, Klein and Winkler (2021), using an historical panel, also find a multiplier of 1.5 at the ZLB. There is a vast model-based literature arguing that multipliers can be very large at the ZLB. It includes Christiano, Eichenbaum, and Rebelo (2011), Eggertsson (2011), Woodford (2011), and Woodford and Xie (2020). Although Boneva, Braun, and Waki (2016) show that the effect of fiscal policy may be smaller than multipliers reported in the literature, they still come out with a multiplier above 1, at 1.05.

ECB (2021c, p. 72 and ff) presents simulations using the ECB-BASE model that shed light on monetary-fiscal policy interactions at the ELB. Looking at negative scenarios, the simulations show that fiscal stabilization policy stays effective at the ELB. In contrast, monetary policy rates are constrained so that the contribution from monetary policy is limited to nonstandard measures. In the concluding section, ECB (2021c) argues that there are substantial benefits from monetary-fiscal policy coordination that would result from well-calibrated changes to the euro area macroeconomic policy architecture.

[23] See, especially, ECB (2021c).

The bottom line is that the ELB limits the ability of monetary policy — acting on its own — to deliver price stability in a timely way. But fiscal policy can help to overcome the constraint. Hence, fiscal-monetary policy interactions are becoming central for the conduct of monetary policy at the ELB.

Financial frictions, monetary operations, and credit market imperfections

GK use principles of public finance to determine whether price stability can be expected to be a good approximation of optimal monetary policy under more general circumstances than afforded by the basic closed economy model. One very interesting extension discussed by GK is the case of a small open economy, taken to mean that private agents and the government can trade in complete world financial markets at given prices. In such a setting, financial variables and wealth are stabilized by access to world finance. The small open economy gets full insurance, at fair prices, against idiosyncratic shocks. The setup is not without problems. Tirole (2002) argues that a country's moral hazard limits its access to financing. In the presence of asymmetric/incomplete information and government incentive problems, the complete market assumption may not be a particularly useful benchmark. In general, the financial structure will have to reflect government information and incentives.

But, in 2001, monetary unification was seen as a major force leading to financial market integration. Financial union — a single European market — might not yet be realized but, with time, deeper financial integration would amplify the benefits from the euro. Fast progress since the late 1990s toward the integration of bond markets and interbank money markets seemed in line with such an optimistic view. At the global level, too, there was the Great Moderation. It was a period of relative stability from the late 1980s to the GFC. After the first 10 years of the euro, the prospects looked bright.

Unfortunately, the process of gradual financial integration in Europe was put into reverse as the GFC morphed into sovereign debt crises. As feared by the founding fathers of the euro, financial markets abruptly

fragmented under stress.[24] A strong correlation emerged between sovereign risk and bank risk. The phenomenon became so salient that it got a special name: the doom loop.[25] One version of the mechanism is as follows. First, the sovereign comes under stress, so that bank balance sheets deteriorate given their exposure to the sovereign. Second, financing conditions tighten as credit spreads widen. Third, investment and economic activity declines, leading loan defaults to increase. In turn, the balance sheets of banks deteriorate further. Finally, public debt and deficits widen, closing the loop. This loop is one explanation of the well-known high correlation between private and public credit default swaps.

Now, it is impossible for us to see the abstract complete markets model as a relevant benchmark. During the decade beginning in 2008, the fragilities of the European pattern of financial integration came into sharp focus. For central banking, these fragilities affected the monetary transmission mechanism and, through it, the single monetary policy.

One particular challenge may come from self-fulfilling debt crises. When the sovereign is vulnerable and there is the possibility of a rollover crisis, there may be multiple equilibria. In such a crisis, there is a new role for a central bank: it can tilt the balance toward the good equilibrium.[26] In some cases, action through intervention in markets may not even be required. The euro area provided the perfect example in 2012. In the early summer, bond yields on Spanish and Italian bonds were heading to levels that in previous experience had triggered bond

[24] Delors Report, p. 20.

[25] There is a voluminous literature on the sovereign-bank nexus. See Schnabel (2021) for a recent survey from an influential policymaker. References include Acharya, Drechsler, and Schnabl (2014), L. Bocola, (2016), Brunnermeier et al (2016), and Farhi and Tirole (2014).

[26] See Corsetti and Dedola (2016), Bocola and Dovis (2019), and Lorenzoni and Werning (2019).

market crises. It was in this context that Mario Draghi famously stated: "Within our mandate, the ECB is ready to do whatever it takes to preserve the euro." The statement was enough to calm markets. "Whatever it takes" became the three most famous words in the history of European monetary and financial integration.[27]

An important implication for central bankers is that, given multiple financial market frictions and the fragmentation of the single financial market, the operational framework for monetary policy implementation becomes very relevant. The simplicity of monetary policy implementation through a money market interest rate is lost. The management of the central bank's balance sheet becomes a matter of concern. The details of monetary policy implementation matter. This is particularly the case in crises. The last decade provides a rich illustration.

Summing up

As presented at the first ECB central banking conference in 2001, the GK analytical policy framework based on imperfect competition and price rigidity provided an intuitive and elegant rationale for central banks pursuing literal price stability. In this essay, we argue that additional frictions — including the ELB on nominal interest rates and DNWR — can explain why central banks in the advanced economies have instead targeted a small positive inflation rate of 2 percent.

We also argue that monetary policy may not be enough to achieve the 2 percent target. With a zero or negative natural real interest rate, fiscal policy may also have to take on a macroeconomic stabilization role to avoid inflation becoming trapped too close to zero. Moreover, incomplete banking union and capital markets union makes departures from the complete contingent markets' paradigm employed by GK painfully visible. The magnitude of financial instability and its consequences for economic activity and employment were salient during the sovereign debt crises in the euro area from 2010-13.

[27] A useful reference is Saka, Fuertes, and Kalotychou (2015).

Yet, our bottom line is that the case for price stability, understood as low and stable inflation, at say 2 percent, remains strong. The gradual fall of the real natural interest rate, in the euro area, to the range of 0 to -2 percent, makes it more likely that policy interest rates will be constrained by the ELB. In such circumstances, it is important that the conduct of policies be patient and persistent, with particular attention paid to the interaction of monetary and fiscal policy.

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The 2007 Monetary Policy Consensus in Retrospect[1]

Mark Gertler

Keynes famously ends the General Theory with a description of the "academic scribbler" whose ideas from "a few years back" eventually find their way into policymaking. When Marvin Goodfriend wrote "How the World Achieved Consensus on Monetary Policy" in 2007, that time lag had largely disappeared, at least in central banking. For example, in the Federal Reserve System it had become the norm for a substantial fraction of those in important decision-making positions to hold PhDs in economics. Not only did these officials have advanced degrees, they often earned the stature that led them to be chosen for their position by doing cutting edge research. The most prominent example was the Federal Reserve chairman at the time, Ben Bernanke. It is also now the case that the research done by staff at the Fed and other central banks is as sophisticated as any that occurs in academia. As a result, ideas flow freely and instantly between the halls of academia and central banks. The time lag is gone.

An important theme of Marvin's 2007 paper is how the development of this symbiotic relationship between academic research and central bank policymaking led to a consensus on a new framework for monetary policymaking, a framework that has proved highly useful and remains with us today. What Marvin leaves out is the significant role that he played in this development. To my knowledge, Marvin was the first economist to simultaneously contribute to the modern literature on monetary policy and hold a nontrivial policymaking job in the Federal Reserve System. A happy coincidence is that at Brown he was classmates with his future coauthor Bob King. The two would play an important role in developing the New Keynesian framework and

[1] Thanks to Bob King and Alex Wolman for helpful comments.

making it operational for analyzing monetary policy. Being able to work with Bob kept Marvin in close proximity to academia. At the same time, Marvin's experience with the policymaking process provided him with important insights into how to make their work, as well as his other research, most useful in practice.

The early years: disarray and revolution in macroeconomics

When Marvin joined the Richmond Fed in 1978, communication between central banking and academia may have been at an all-time low. The failure of the large econometric models developed more than a decade earlier to anticipate the stagflation of the late 1960s and '70s left central banks without a framework to provide guidance for monetary policy, at least one in which they could have confidence. In academia, the rational expectations revolution was heating up. Popular at the time was the Phelps/Friedman natural rate theory, which related output to unanticipated movement in inflation. It was standard to assume that expectations were formed adaptively, so that a monetary expansion in the short run would increase real output temporarily but then produce a subsequent increase in inflation. Rational expectations turned things upside down: Within the context of the Phelps/Friedman framework, predictable movements in the money supply (which produced predictable movements in inflation) had no effect on real output, as Robert Lucas (1972) famously showed. To put it mildly, central bankers were not particularly hospitable to the idea that only unpredictable movements in the money supply could affect real activity.

A more extreme development from the vantage of central bankers was the advent of real business cycle (RBC) theory, which involved the use of the stochastic competitive equilibrium growth model to explain business cycles. The virtue of the approach is the explicit use of microfoundations to build a macroeconomic framework. A striking implication, however, is the total irrelevance of monetary and financial factors. Another dramatic implication was that business cycles, while unfortunate, represented efficient responses of the economy to exogenous disturbances. Needless to say, this development did not exactly enhance academic interaction with monetary policymakers.

The Volcker disinflation: consequences for research and policymaking

As Marvin emphasizes, a critical turning point was the shift to tight monetary policy in late 1979, engineered by Paul Volcker. The aim was to bring the era of high inflation to an end. As Marvin describes, the sudden and unexpected tightening can be thought of as a kind of natural experiment to study the impact of monetary policy on output and inflation. The tightening succeeded in reducing inflation, though with a lag. But in the process it induced the largest recession of the postwar period up to that point. As Marvin notes, the episode sent a clear message to central bankers: they did have the ability to control inflation. At the same time, disinflations were not costless, even if the factors that determined these costs were not clearly understood.

I would add that the Volcker disinflation also had a profound effect on the course of academic research. It was clear that neither the Phelps/Friedman model with rational expectations nor RBC theory could easily account for the effect of the Volcker tightening on output and inflation dynamics. The need for a new framework was obvious. But it was also clear that the field could not retreat from the methodological advances ushered in by the rational expectations/RBC revolution. These considerations led to an effort to rebuild Keynesian economics using microfoundations. Out of this effort would emerge a framework that could be used — and eventually would be used — in the policymaking process. No, the framework has not come anywhere close to the point where it can be used to put monetary policy on automatic pilot. But it has reached the point where it does play a significant role in helping organize thinking about policy implementation. As a result, the relationship between academic research and central bank policymaking has become highly symbiotic. Economic events influence the development of the model. The model in turn informs policymaking.

Marvin's work with Bob King (Goodfriend and King, 1997) played a significant role in the development of what is now widely known as the New Keynesian (NK) model.[2] Marvin and Bob perhaps more aptly refer to this paradigm as the New Neoclassical Synthesis, as it begins with an RBC model and then adds three crucial ingredients. First, money is introduced so that the model can account for nominal variables. Second, monopolistic competition is incorporated so that it is possible to characterize price setting by firms. Third, nominal rigidities are added, which gives rise to the nonneutraliy of money and inefficient fluctuations in output.[3] Absent nominal price rigidity, the framework behaves essentially as an RBC model. With nominal price rigidity, the Keynesian features emerge.

The interest rate as the policy instrument

Another important component of the consensus that Marvin emphasizes is the use of the short-term interest rate as the instrument of monetary policy, in keeping with actual practice at central banks. As late as the 1980s, it was still commonplace in academic work to model the money supply as the policy instrument. However, central banks have learned through practical experience that trying to directly regulate monetary aggregates was problematic. Broad monetary aggregates were difficult to control due to the endogeneity of inside money. Controlling narrow aggregates like reserves generated wild gyrations in interest rates due to fluctuations in reserve demand. These wild fluctuations in interest rates, in turn, wreaked havoc on the economy.

Given his proximity to policymaking, Marvin quickly saw that to get the attention of central bankers, academic work needed to treat the interest rate as the policy instrument. Indeed, Marvin was among the

[2] Related work includes Rotemberg and Woodford (1997), Clarida, Gali, and Gertler (1999), Woodford (2003), Christiano, Eichenbaum, and Evans (2005), and Gali (2015). For a collection of the early contributions to the New Keynesian framework, see Mankiw and Romer (1991). For a critique, see Chari, Kehoe, and McGrattan (2009).

[3] The most common way to incorporate nominal rigidities is via the staggered contracting approach of Calvo (1983), which is a more tractable version of Taylor's (1980) overlapping contracts framework.

earliest researchers to interpret monetary policy actions through the lens of interest rate decisions, not only about current rates settings, but also about communication of the paths of future rates.[4]

A monetary policy framework

Overall, Marvin Goodfriend played a key role in developing a framework for monetary policy that facilitated interaction between academic researchers and policymakers at central banks. I now employ a version of this approach that, while simple, is sufficiently rich to help organize thinking about some of the key issues facing central bankers. Let y_t^* denote log real output, y_t^* the natural (flexible price) level of output, and x_t the output gap, where each variable is a log deviation from the state. Next, let i_t be the nominal interest rate, π_t inflation, $\bar{\pi}_t$ the central bank's target inflation rate, r_t^* the natural real rate of interest, and u_t a cost push shock.[5] Then we can express the model as follows:

$$y_t = x_t + y_t^* \quad (1)$$

$$x_t = -\sigma(i_t - E_t\pi_{t+1} - r_t^*) + E_t x_{t+1} \quad (2)$$

$$\pi_t = \lambda x_t + \beta E_t \pi_{t+1} + u_t \quad (3)$$

$$i_t = r_t^* + \bar{\pi}_t + \emptyset_\pi(\pi_t - \bar{\pi}_t) + \emptyset_x x_t \quad (4)$$

$$i_t \geq 0 \quad (5)$$

Equation (1) decomposes output into the sum of the output gap and the natural level of output. Simply put, the New Keynesian features determine x_t while the RBC framework characterizes the variation in y_t^*. A key theme of Goodfriend-King was that there is no reason to think y_t^* should evolve as a smooth linear trend, as was the traditional approach in policy circles. Rather, y_t^* should fluctuate in a manner that RBC theory suggests. A classic application of this thinking occurred in the mid-1990s when a productivity boom ushered in a period of

[4] See Marvin's paper "Interest Rates and the Conduct of Monetary Policy" (1991), which is also discussed in this volume, in an essay by John Taylor.

[5] The cost push shock can be interpreted as a transitory fluctuation in the desired markup. See Gali (2015).

strong growth. Pressure mounted on the Greenspan Federal Reserve to raise rates to slow down growth for fear of subsequent inflationary pressures. However, Greenspan correctly perceived that supply side factors were generating the boom and wisely chose to accommodate it.[6]

Equation (2) is the familiar New Keynesian IS curve that relates the output gap inversely to the gap between the real interest rate and the natural rate plus the expected future output gap.[7] From a policy perspective, there are two key features of this formulation. First, as is recognized in both theory and practice, an important benchmark for rate setting is the natural interest rate r_t^*. The notion of a natural or "equilibrium" real rate is not new: it dates back to Wicksell. What is new is the use of r_t^* to judge the stance of policy. Of course, like y_t^*, r_t^* is not directly observable. As the model implies, however, one can use the behavior of inflation to infer the direction of the error in the estimate. For example, if r_t^* is lower than forecast, then the central bank may be setting interest rates higher than desired, resulting in a lower than desired output gap. The net effect, as can be seen from the aggregate supply curve (3) is that inflation will be lower than expected. Hence, the surprise in inflation can be used to update the estimate of r_t^*. The use of r_t^* as benchmark in the policy process is now standard, as the theory would predict.

A second key insight from the New Keynesian IS curve, one that Marvin strongly emphasizes, is that credible communication about the future path of policy is critical. To illustrate, let's consider the case where the central bank's target inflation rate $\bar{\pi}_t^*$ is zero. As any first-year graduate student knows, one can iterate equation (3) forward to obtain an expression that links the output gap inversely to the expected path of the interest rate gap. The expression makes clear that

[6] To be fair, the issue becomes murkier later on in the boom as inflationary pressures mounted. According to Alex Wolman, Marvin argued at the time that the high productivity growth had pushed up r_t^*, suggesting it was time to raise rates, as the Fed did shortly after.

[7] As is well known, the relation comes from the consumption Euler equation, given an economy with consumption goods only. Gali and Gertler (2007) show how to generalize to the case where investment is present as well.

monetary policy management is not simply about current rate setting, but also about managing market expectations of the path of future rates. To close the output gap, for example, it is not only necessary to set the nominal rate equal to the natural rate, the central bank must also credibly promise to set the future path of i_t equal to r_{t+1}^*. Communication about future policy, the importance of which comes naturally out of this simple model, indeed plays a central role in the monetary policymaking process. The framework also makes clear why communication — or "forward guidance" as it is known today — should not take the form of promising a path of rates: the natural rate is likely to vary in unexpected ways, which will affect the appropriate rate setting. Hence, as it has evolved in practice, communication must always stress the "data dependence" of rate setting.

The movement of the economy to the zero lower bound in 2008 pushed forward guidance to center stage. As the simple framework makes clear, when the natural rate becomes negative, the zero lower bound constraint, equation (5), becomes binding. Aside from unconventional policies — which we briefly mention later — the central bank's only option for stimulating the economy at the ZLB is to use forward guidance. In particular, the central bank must promise to keep rates low after the economy has emerged from the ZLB. The tension is that since keeping rates low after the storm has passed could be inflationary, the central bank may be tempted to renege on its promise. As made clear by Eggertsson and Woodford (2003) and Werning (2012), a central bank confronting a liquidity trap must commit to keep rates "lower for longer," which will involve some overshooting of the inflation target, once the economy leaves the liquidity trap. Again, we have another example of how theory meets policymaking in practice. Throughout the recent history of operating at the ZLB, central banks in the industrializesd world have opted for forward guidance with an emphasis on a lower for longer strategy for interest rates, along with a temporary overshooting of the inflation target.

Inflation targeting and trend inflation

As Marvin emphasizes, a critical reason for reaching consensus on monetary policy was the success in moving from high and volatile

inflation to a prolonged period of low and stable inflation. Here also the academic work provided useful insight to guide policy. Though I add the caveat that what it had to offer was not completely satisfactory, particularly with regard to how the central bank can manage private sector beliefs about trend inflation, as I discuss shortly.

At a most basic level, the challenge for a central bank in maintaining inflation is finding an appropriate nominal anchor. For this purpose, from 1944 until 1973, a number of the major central banks agreed to maintain a fixed exchange rate against the dollar while the Federal Reserve tied the dollar to the price of gold. The loss of monetary independence eventually made the system unworkable, especially as inflation pressures had been building in the US in the late 1960s/early 1970s. There was a brief flirtation with using money growth as the nominal anchor. But as noted earlier, broad monetary aggregates proved difficult to control while targeting narrow aggregates like reserves typically introduces disruptive gyrations in interest rates. The failure of these traditional nominal anchors led both central bankers and academics to view an inflation target as the most effective nominal anchor.[8] Indeed, in the early 1990s a number of central banks adopted an explicit inflation target. The Federal Reserve began communicating as if it had a 2 percent inflation target in the early 1990s before eventually formalizing this policy under Chair Bernanke in 2012. Now virtually all the major central banks in the industrialized world have adopted a formal inflation target.

The challenge that inflation targeting poses for both central banks and academics is twofold: First, if trend inflation differs from the desired target, what is the best way to engineer a convergence to target? Second, if indeed trend inflation is in close range of the target, how should the central bank manage policy to achieve the dual mandate of price and output stability. Both these issues have received enormous attention in the academic literature.

[8] See, for example, Bernanke, Laubach, Mishkin, and Posen (1998).

To sharpen the focus, it is useful to express the Phillips curve (3) in a way that allows for variable trend inflation. Let $\bar{\pi}_t = lim_{i\to\infty} E_t\{\pi_{t+i}\}$ be market expectations of trend inflation, $\bar{x}_t = \lim_{i\to\infty} E_t\{x_{t+i}\}$ market expectations of the trend output gap, and $x_t^\tau = x_t - \bar{x}_t$ the cyclical component of the output gap. Assume that both x_t^τ and u_t obey stationary first order processes with serial correlation parameters, p_x and p_u respectively. Finally, suppose the inflation target is zero. Then following Hazell, Herreno, Nakamura, and Steinsson (2021), we can express inflation as

$$\pi_t = kx_t^\tau + \bar{\pi}_t + wu_t \quad (6)$$

where $\bar{\pi}_t$ is given by

$$\bar{\pi}_t = \frac{\lambda}{1-\beta}\bar{x}_t$$

and with $k = \frac{\lambda}{1-\beta\rho_x}$, $\omega = \frac{1}{1-\beta\rho_u}$. As equation (6) makes clear, inflation depends not only on excess demand captured by x_t and cost push shocks captured by u_t, but also on market expectations of trend inflation. Indeed, as Hazell, Herreno, Nakamura, and Steinsson and others have shown, most of the variation in inflation over the postwar has been due to the trend term.

As Marvin argues, central bank credibility is key to understanding why $\bar{\pi}_t$ may differ persistently from target. It is also key to understanding the costs of engineering it to target (in terms of undesired output fluctuations). Here the academic literature took the lead. The classic paper by Kydland and Prescott (1977) motivates how positive trend inflation could emerge when the central bank is operating under discretion and is tempted to push output above its flexible price equilibrium.[9] With a credible commitment toward not generating a surprise inflation, the problem disappears. Central banks quickly adopted the idea that credibility was critical for controlling inflation. Indeed, one could argue further that this literature provided the foundation for the move toward inflation targeting.[10]

[9] In the New Keynesian framework, due to imperfect competition, the flexible price equilibrium level of output is below the efficient level, creating an incentive for the central bank to want to push output above y_t^*.

[10] See, for example, Bernanke, Laubach, Mishkin, and Posen (1999).

Establishing credibility

Where the literature has been somewhat silent, however, is on exactly how a central bank establishes credibility. History suggests that central banks cannot simply announce that they are going to make a credible commitment.

Rather, they must earn the private sector's trust through experience.[11] Here Marvin's description of the Volcker disinflation is instructive. What the theory suggests is that if Volcker had been perfectly credible at the outset, the announcement of the monetary tightening would have induced a drop in inflation to target with minimal cost in terms of output loss. But there was little reason for the private sector to take Volcker's promises at face value. Using Marvin's terminology, the late 1960s-1970s was an era of "stop-go" policy: the central bank would periodically tighten but then let up as the economy weakened even though inflation remained high. Compounding matters for Volcker was his initial policy reversal: after the aggressive move toward tightening in October 1979, there was an equally dramatic drop in rates in 1980. This move was likely costly in terms of central bank credibility, having the practical effect of slowing the convergence of beliefs about trend inflation to target. The implication, as equation (6) makes clear, is that the disinflation would entail a costly recession before inflation reached target. Marvin's broader point, I think, is that central banks cannot simply be bestowed with credibility; they need to earn it by showing through experience that they can deliver on their promises.

Another way that the central bank can enhance its credibility is by setting the policy instrument in a way that is clearly consistent with its objectives. As Taylor (1993) notes, a policy rule that achieves this objective is the simple interest rate feedback given by equation (4) but with two key restrictions. First, the trend term $\bar{\pi}_t$ is set equal to the inflation target (in our example zero). Second, the feedback coefficient on inflation, $\emptyset_\pi$ exceeds unity. As a result, whenever inflation exceeds target, the central bank increases the nominal rate sufficiently to raise

[11] Erceg and Levin (2001) make some progress in analyzing how a central bank might establish credibility: they assume the private sector updates its beliefs about the central bank's time varying trend inflation rate by using the variation in the policy

the real rate. This action reduces demand, pushing inflation back to target. Taylor showed that the Greenspan Federal Reserve — a central bank determined to establish and maintain credibility — set rates in a manner consistent with this rule. From Marvin's perspective, the Taylor rule offered a practical guideline for implementing inflation targeting. To be clear, it is nowhere near the point of being a mechanical rule that central banks can use to put monetary policy on automatic pilot, especially given that two key ingredients, r_t^* and y_t^*, are not directly observable. Nonetheless, the rule does offer a guideline for framing the policy discussion in a way that connects to the general inflation targeting framework. It is not an exaggeration to suggest that at least from the early 1990s to the eve of the Great Recession in 2007, the great majority of central banks in the industrialized countries adopted the inflation targeting/Taylor rule (guideline) approach. The prolonged period of low inflation and stable output growth only served to reinforce the consensus.

After the consensus: developments from 2007-2021

Marvin wrote "How the World Achieved Consensus..." in 2007, just before the global financial crisis of 2008-2009. Of course, the New Keynesian model could not directly capture the crisis, given the absence of financial market frictions. Nor was it useful for understanding the myriad of unconventional credit market interventions aimed at containing the crisis.

Nonetheless, in certain dimensions it provided important insights. Central bank interest rate strategy came directly out of the New Keynesian analysis of the ZLB, which featured forward guidance and "lower for longer." The establishment of a credible inflation target, as the theory prescribes should be done, helped keep inflation stable in the face of a sharp contraction in real activity. As a result, a destructive deflation was avoided.

Indeed, the inflation targeting/Taylor rule framework appears to remain intact today at many central banks, with some adjustments that

rate. Exactly why the central bank's preferred trend inflation is exogenous and time varying remains an open question, though.

take into account the experience of financial crisis: the policy toolkit now includes some of the unconventional tools employed in the financial crisis, and macroprudential policy occupies a significant role.

Monetary policy analysis: never a dull moment

But as Marvin cautions, the monetary policy framework remains a work in progress. Perhaps the most important issue outstanding is that we still have at best only a rough idea of how central banks can effectively anchor inflation expectations.[12] In this regard, Japan's inability to escape low inflation/deflation after decades poses a challenge, especially since the Bank of Japan introduced a Western-style inflation targeting framework in 2013. Part of the answer surely is that since the late 1990s, the Bank of Japan had done nothing to convince the public that it could indeed engineer an escape from a deflation trap, given the persistently low inflation since the 1990s.[13] This could lead to hardening of long-term inflation expectations at or below zero. Nonetheless, it remains a puzzle as to why Japan appears stuck. At the core of the problem is an incomplete understanding of what determines expectations of trend inflation.

A related, though less dramatic, example involves the inability of the central banks of the industrialized economies in the West to reach the 2 percent inflation target during the recovery period following the Great Recession. In the decade-long recovery, both core PCE inflation and the five-year breakeven inflation rate hovered between a 1 and 2 percent annual rate, without ever consistently reaching the 2 percent target. The target miss was larger for Europe. The inability to consistently reach the target over such a long period is something we still don't understand. Complicating matters is that inflationary pressures have picked up considerably over the current year. Associated with this pickup has been an increase in both the five- and 10-year breakeven inflation rate from 1.5 percent annually on the eve of the pandemic to currently 2.5 percent. It appears that the increase in inflation is feeding

[12] See Candia, Coibin, and Gorodnichenko (2021) for evidence that the inflation expectations of US firms remain far from anchored.

[13] See Gertler (2017) for an analysis of this issue.

into beliefs about trend inflation. Exactly how the Federal Reserve should manage this situation is no doubt an issue Marvin would have been all over.

Summing up

Marvin's role as a policymaker sharpened his thinking as a researcher. His active engagement in research sharpened his thinking as a policymaker. As can be seen from his example, academic scribblers are no longer so remote from the policy process. Marvin is among the central figures responsible for this development.

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From the Great Inflation to the Great Moderation

Robert L. Hetzel

During Marvin Goodfriend's more than 25 years at the Richmond Fed, US monetary policy changed from the activist go-stop policy of the 1970s to the Volcker-Greenspan policy of creating an expectation of price stability. Marvin both documented this radical transformation and played a key role — through policy analysis and analytical work — in its becoming the consensus view of academics and policymakers. In this essay, I review the Volcker and Greenspan policy accomplishments and Marvin's contributions, referring to 10 of his papers in the process.

Marvin's genius and gift for making substantive contributions lay in his ability to draw from diverse methodological traditions. Milton Friedman identified two broad classes of approaches to identifying causation in economics. The Walrasian approach requires from the beginning explicit specification of a general equilibrium model, in contemporary terms, an optimizing, dynamic, stochastic, general equilibrium model. The Marshallian approach, favored by Friedman, requires from the beginning a search for empirical regularities and then uses an historical narrative organized around events that have the element of semi-controlled experiments.[1] Marvin's ability to meld these two approaches is illustrated by the way in which he integrated theory and historical narrative, respectively, in Goodfriend and King (1997) and Goodfriend (2005).

While Marvin's research used both theory and history, his approach to both was grounded in monetarist principles, Bill Poole having been an important influence in the Brown PhD program.

> The consensus among monetary economists that central banks are responsible for inflation is built on both theory and evidence. Above all, there is the substantial body of evidence from the inflationary experiences of a great many nations, including the widespread

[1] Friedman and Schwartz (1963).

> inflation in the industrialized world during the 1960s and 1970s, showing that sustained inflation is always associated with excessive money growth. The evidence also clearly indicates that inflation is stopped by slowing the growth of the money supply.[2]

Money remains in the background for much of this essay, but I will argue that these monetarist principles are consistent even with Marvin's work on the New Keynesian models in which money was ostensibly absent.

The transformation of monetary policy from pre- to post-Volcker

Marvin used the term "go-stop" to describe FOMC policy in the pre-Volcker period.[3] He describes it as follows:

> Inflation would rise slowly as monetary policy stimulated employment in the go phase of the policy cycle. By the time the public and Fed became sufficiently concerned about rising inflation for monetary policy to act against it, pricing decisions had already begun to embody higher inflation expectations. At that point, a given degree of restraint on inflation required a more aggressive increase in short-term interest rates, with greater risk of recession.[4]

The go-stop character of monetary policy was based on achieving a socially desirable low rate of unemployment and on the consensus that cost-push pressures drove inflation. The latter assumption meant that achievement of price stability would incur a high cost in terms of unemployment. With go-stop policy, inflation drifted up in the 1970s, causing the loss of a stable nominal anchor.

[2] Goodfriend (1997), 8.

[3] Through innumerable conversations, Marvin helped the author work out his own ideas. See Hetzel (2008, 2012, and forthcoming 2022).

[4] Goodfriend (2005), 244.

> The absence of an anchor for inflation caused inflation expectations and long bond rates to fluctuate widely.… [It] became increasingly difficult to track the public's inflation expectations to tell how nominal federal funds rate policy actions translated into real rate actions.[5]

Paul Volcker became FOMC chairman in August 1979. On October 6, 1979, the FOMC announced nonborrowed reserves procedures designed to ensure a deceleration in money growth. As Marvin wrote,

> In October 1979 it was not at all clear how quickly the Volcker Fed could acquire credibility for low inflation, how costly a disinflation might be, or even whether it could succeed at all, given the pressure that would be brought to bear on the Fed as a result of the accompanying recession.[6]

Proponents of rational expectations argued that credibility for disinflation would greatly reduce the cost of disinflation. Goodfriend and King (2005) pointed out that the disinflation was not a good test of the proposition. Volcker could not commit to price stability because of uncertainty over the support of the political system.

The Volcker disinflation was ultimately successful. The Volcker-Greenspan monetary policy that followed ended the instability of the 1970s and created the Great Moderation. Marvin documented that transition, for example, in Goodfriend (2005). In Marvin's telling, monetarism was central to the Volcker disinflation:

> Monetarist theory and evidence on money supply and demand, and on the relationship between money and inflation, encouraged the Volcker Fed to act against inflation. The successful stabilization and eventual elimination of inflation at reasonable cost in light of subsequent benefits, without wage and price controls, and without supportive fiscal policy actions, vindicated the main monetarist message…. By assembling a convincing body of theory and evidence that controlling money was necessary and sufficient for controlling

[5] Goodfriend (2005), 245 and 247.

[6] Goodfriend (2005), 247.

> inflation, and that a central bank could control money, monetarists laid the groundwork for the Volcker Fed to take responsibility for inflation after October 1979 and bring it down.[7]

Pre-Volcker, the activist policy of discretionarily balancing off independent targets for low unemployment and low inflation foundered as the inflationary expectations of the public rose and offset the stimulative effects of monetary expansion, leaving only higher inflation with no benefit in terms of lower unemployment. Marvin wrote,

> Over time, deliberately expansionary monetary policy in the 'go' phase of the policy cycle came to be anticipated by workers and firms. Workers learned to take advantage of tight labor markets to make higher wage demands, and firms took advantage of tight product markets to pass along higher costs in higher prices. Increasingly aggressive wage- and price-setting behavior tended to neutralize the favorable employment effects of expansionary policy.[8]

This process led to expected and actual inflation becoming unanchored.

Reanchoring inflationary expectations required abandoning the prior activist policy with its characteristic of expansionary monetary policy in recoveries and contractionary monetary policy in response to the resulting inflation. As made evident in the preemptive increases in the funds rate in economic recoveries intended to prevent the emergence of inflation and to forestall an increase in expected inflation, policy maintained a neutral character. Marvin summarized:

> For the Volcker Fed … its room to maneuver between fighting inflation and fighting recession disappeared. In effect, the Fed lost the leeway to choose between stimulating employment in the go phase of the policy cycle and fighting inflation in the stop phase.[9]

[7] Goodfriend (2005), 243 and 246.

[8] Goodfriend (2005), 6-7.

[9] Goodfriend (2005), 247.

The discipline imposed on monetary policy in the Volcker-Greenspan era came from the desire to short circuit the process whereby expected inflation would rise with monetary stimulus and rising inflation. Stabilizing expected inflation in a way consistent with a return to price stability required preemptive increases in the funds rate. Once a policy of price stability became fully credible starting in 1995, this meant raising interest rates vigorously in economic recovery when signs of tightness emerged in labor and product markets. "The Fed has learned to adjust interest rates more preemptively since October 1979 … and inflationary go-stop policy cycles are no more."[10]

The Great Moderation through the lens of the NK model

The shift in the monetary regime to focusing on price stability from discretionarily trading off between unemployment and inflation changed the intellectual consensus. The profession became receptive to the development of the New Keynesian (NK) dynamic stochastic general equilibrium (DSGE) model. Goodfriend and King (1997) used the term "New Neoclassical Synthesis" to characterize the model and to emphasize the sharp break with the prior class of Keynesian models.[11]

Optimal policy in the NK model

A central property of the basic NK model, as exposited by Goodfriend and King (1997), is that optimal monetary policy is neutral (see also King and Wolman, 1999). That is, it is nonactivist in that the optimal policy does not move between expansionary and contractionary monetary policy. Instead, policy remains focused on price stability and turns over the behavior of the real economy to the real business cycle core of the economy. In the basic NK model, a credible policy that stabilizes the price level keeps output at potential, even for shocks to aggregate supply.

[10] Goodfriend (2005), 256.

[11] Marvin's 1997 paper with Bob King was a key landmark in the development of this class of models; that paper is the subject of Michael Woodford's essay in this volume.

Blanchard and Gali (2007) refer to the simultaneous occurrence of price stability and a zero output gap in the basic NK model as "divine coincidence." They treat markup shocks as classic supply shocks requiring a trade-off between inflation and employment. Price stability is nonoptimal in that it requires increases in unemployment in the event of supply shocks. In the spirit of the Goodfriend-King (1997) version of the NK model, however, the central bank can let the shocks pass through to the price level and over time they average out as noise. "If one argues that some costs flow directly to prices in a perfectly competitive sector, then theory suggests that the central bank should consider stabilizing only a 'core' index of monopolistically competitive sticky prices."[12] In Goodfriend (2005, p. 254) Marvin lists modifications to the basic model that can produce a short-run trade-off between inflation and unemployment and explains why they are unlikely to be important in practice.

Because the NK Phillips curve makes current inflation depend upon expected future inflation and the markup (the excess of price over marginal cost), a policy of price stability entails stabilization of firms' markup.[13] The markup is a latent (nonobservable) variable. However, a rule that maintains the output gap equal to zero through price stability is equivalent to a rule that maintains actual and expected real rates of interest equal to their natural counterparts. Practical implementation of a rule that provides for price stability then requires a reaction function that provides for a stable nominal anchor and that causes the real funds rate to track the natural rate of interest.

How policy worked in practice

In the Great Moderation of the Volcker-Greenspan era, the FOMC did not literally implement a rule that directly targeted the price level. Since the chairmanship of William McChesney Martin, the FOMC's reaction function has always worked on the lean-against-the-wind (LAW) principle.[14] Specifically, when the economy was growing above

[12] Goodfriend (2005), 255. See also Aoki (2003).

[13] See Goodfriend (2002), 36.

[14] Hetzel (2022).

potential as evidenced by a sustained increase in the rate of resource utilization (a declining unemployment rate), the FOMC raised the funds rate in measured increments. It then watched bond markets to ascertain that markets believed the FOMC would raise rates over time sufficiently to maintain price stability.[15] A converse statement holds for weakness.

The NK model provides the economic intuition for LAW procedures in that above-trend output growth is associated with optimism about the future and below-trend growth with pessimism about the future. Optimism is associated with a relatively high natural rate of interest while pessimism is associated with a relatively low natural rate of interest, as Marvin discusses, for example, in Goodfriend (2004).[16] LAW procedures are then the foundation for tracking the natural rate of interest. The central modification to LAW that differentiated go-stop monetary policy from the successor policy directed at the reestablishment of price stability was preemptive increases in the funds rate intended to prevent the revival of inflation. In terms of the NK model, such preemptive tightening allows the FOMC to track the natural rate of interest.[17]

Preemption began with the FOMC's response to inflation scares.[18] Marvin wrote:

> The successful containment of the 1983-84 inflation scare was the most remarkable feature of the Volcker disinflation. The Fed had succeeded in reducing inflation temporarily in many preceding go-stop policy cycles. Preemptive interest rate policy actions in 1983-84 finally put an end to inflationary go-stop policy. This success was particularly important for the future because it showed that well-timed, aggressive interest rate policy actions could defuse an inflation scare and preempt rising inflation without creating a recession.[19]

[15] Goodfriend (1991).

[16] Goodfriend (2002), 33-34, 37-38

[17] A simple feedback rule with which the Fed changes its policy instrument in response to misses of the price level from target would run afoul of the Friedman (1960, 87-88) critique of long and variable lags, which he specifically applied to a price level target.

[18] Goodfriend (1993).

[19] Goodfriend (2005), 249.

Preemptive increases in the funds rate do not limit sustainable growth in employment. Marvin also highlighted the preemptive tightening in 1994.

> The economic expansion gathered strength in late 1993. The zero real federal funds rate was no longer needed and would become inflationary if left in place. The Fed began to raise the federal funds rate in February 1994, taking it in seven steps from 3 percent to 6 percent by February 1995. Inflation showed little tendency to accelerate and remained between 2.5 percent and 3 percent. Thus, the Fed's policy actions took the real federal funds rate from zero to a little more than 3 percent. The move raised real short-term interest rates to a range that could be considered neutral to mildly restrictive. In spite of the policy tightening, real GDP grew by 4 percent in 1994, up from 2.6 percent in 1993, and the unemployment rate fell from 6.6 percent to 5.6 percent from January to December 1994. ...
>
> The 1994 tightening demonstrated that a well-timed preemptive increase in real short-term interest rates is nothing to be feared. In this case, it was needed to slow the growth of aggregate demand relative to aggregate supply to avert a buildup of inflationary pressures. By holding the line on inflation in 1994, preemptive policy actions laid the foundation for the boom that followed.[20]

This discipline imposed on underlying LAW procedures contrasted with the discretion that characterized the go-stop policy of the 1970s. "[D]iscretion leads inexorably to go-stop policy that brings rising and unstable inflation and inflation expectations, with adverse consequences for interest rates and employment." [21]

However, there is an issue of political economy. Preemptive increases in the funds rate inevitably arouse populist criticism charging that the FOMC is increasing unemployment to fight a nonexistent inflation.

[20] Goodfriend (2002), 5.

[21] Goodfriend (1997), 17.

> By successfully keeping inflation in check, preemptive policy actions *necessarily* appear to be busting ghosts. So the appearance of ghost busting is a consequence of good monetary policy.[22]

What about money?

One notable aspect of NK models is that they do not contain money. Is there then a contradiction between Marvin's willingness to use NK models for policy analysis and his view that monetarism was central to the Volcker disinflation? No: under optimal policy in the basic NK model of Goodfriend and King (1997), money is a veil. It need not appear in the model.[23] The reason is that the optimal monetary rule ensures monetary control. "Under a neutral policy, the monetary authority accommodates variations in money demand to insure that excesses or shortages of money do not create aggregate demand disturbance."[24] With the output gap equal to zero, there is no excess demand or supply in the goods market to spill over and create a corresponding excess supply or demand in the bond market. With no excess supply or demand in the bond market, there are no excesses or deficiencies for the Fed to monetize or demonetize as a consequence of defending its interest rate target, thereby creating destabilizing changes in money.

Contrary to the expectations of monetarists, the required monetary control in the Volcker-Greenspan era did not occur through adoption by the Fed of a reserves aggregate as a target for achieving substantive money targets. The control occurred indirectly through a rule that provided for a stable nominal anchor through commitment to maintenance of an expectation of nominal stability, ultimately price stability. With that nominal expectational stability, the Fed could implement operating procedures that caused the real funds rate to track the natural rate of interest, thereby turning over the determination of real variables such as output and employment to the unfettered operation of the price system. In the 1970s, the monetary regime entailed

[22] Goodfriend (1997), 17, italics in original.

[23] Marvin does say, "[T]he Fed should have a contingency plan for returning to monetary targeting in the event that high and volatile inflation and inflation expectations cause trouble again." (Goodfriend, 2005, 257).

[24] Goodfriend and King (1997), 267.

discretionarily trading off between objectives of low unemployment and low inflation presumed driven by cost-push forces. This activist policy created destabilizing fluctuations in money. The neutral policy pursued in the Volcker-Greenspan era disciplined money creation so that it did not become a source of instability.

Conclusion

I close with a passage from Goodfriend (1997), which seems especially relevant today, in light of the FOMC's movement away from preemptive funds rate increases. Marvin wrote,

> The Fed has acquired credibility since the early 1980s by consistently taking policy actions to hold inflation in check. Experience shows that the guiding principle for monetary policy is to preempt rising inflation. The go-stop policy experience teaches that waiting until the public acknowledges rising inflation to be a problem is to wait too long. At that point, the higher inflation becomes entrenched and must be counteracted by corrective policy actions more likely to depress economic activity.[25]

It is indeed a tragedy that Marvin is no longer here to help us learn from the "Odyssey" of monetary policy not only in the 20th century, but also the 21st century. But we do have the gift of his body of work, whose continued relevance for thinking about monetary policy I have tried to convey in this essay.

[25] Goodfriend (1997), 14.

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Taming Inflation Scares

Athanasios Orphanides and John C. Williams

The beginning of the 1990s marked a singular moment when academic researchers and policymakers critically examined the most basic questions of monetary policy for the post-Bretton Woods world. Researchers analyzed and debated the choices of policy instrument and goals, central bank independence and transparency, and the relative merits of rules vs. discretion. John Taylor's seminal 1993 paper "Discretion versus Policy Rules in Practice" exemplified this era.

At the Federal Reserve, Chair Greenspan acknowledged the unfinished work of anchoring sustained low inflation, saying "It is an open question whether we have learned enough to skirt the dangers of budgetary and monetary excess that have triggered past episodes of debilitating inflation."[1] Likewise, central banks around the world were redesigning institutional frameworks with the aim of reestablishing a nominal anchor. These included the European Monetary System, which was under severe stress at the time, and the adoption of inflation targeting, starting with the Reserve Bank of New Zealand.

It was in this context that Marvin Goodfriend's essay "Interest Rate Policy and the Inflation Scare Problem: 1979-1992" entered the discussion, synthesizing strands of theory and practice with the goal "to distill observations to guide future analysis of monetary policy with the ultimate objective of improving macroeconomic performance."[2] Our essay connects Goodfriend's important and timely paper to the academic and policy debates of the period. It then traces its influence on subsequent monetary policy research and the evolution of the Federal Reserve's monetary policy strategy and communication.

Goodfriend focused on the interplay of interest rate policy and "inflation scares," which he defined to be adverse movements in long-term

[1] Greenspan (1993), p. 5.

[2] Goodfriend (1993), p. 2.

inflation expectations inconsistent with the Federal Reserve's inflation goal. He highlighted a critical dilemma that arises when the public and, in particular, financial markets doubt the central bank's commitment to achieve price stability. He argued that resisting inflation scares is costly because it requires a tightening of monetary policy that would not otherwise be warranted by economic fundamentals. On the other hand, failing to effectively address an inflation scare engendered the risk of persistent, undesirably high inflation. He illustrated this dilemma with specific examples from the US disinflationary period of 1979-1992.

Goodfriend drew a number of profound conceptual and policy implications from his analysis of inflation scares. At the time, these were novel and not entirely uncontroversial. But they have stood the test of time, becoming part of the canon of central banks' approaches to monetary policy. First and foremost, he stressed the importance of formulating a strategy that clearly communicates the commitment to price stability and anchors inflation expectations at the desired level.[3] He argued that such a strategy affords the central bank greater flexibility to respond forcefully to recessionary shocks, thereby improving economic stability, without risking an adverse shift in longer-term inflation expectations. Second, he identified the central role inflation expectations play in the conduct of monetary policy and highlighted, by example, the value of measuring, monitoring, and analyzing inflation expectations. Third, building on his earlier work in Goodfriend (1991), he emphasized the primacy of the short-term interest rate as the instrument of monetary policy, at a time when many economic models assumed a measure of money supply was the policy instrument. Finally, he used the example of inflation scares to illustrate the need to recognize the role of imperfections in information and credibility for the formulation of a successful monetary policy strategy. His arguments highlighted that establishing and maintaining an enduring nominal anchor is at the heart of such an effort.

[3] These themes were developed further by Goodfriend in collaboration with Robert King (Goodfriend and King 1997), and in his work advocating for central bank transparency regarding its inflation goal and strategy (Goodfriend 2004).

The policy context

Monetary policy strategy in the United States has undergone a sea change over the past four decades.[4] By the late 1970s, Federal Reserve policy had inadvertently contributed to macroeconomic instability and the central bank's credibility was in question. Starting with Fed Chairman Paul Volcker's monetary reform in 1979, the subsequent long journey was marked by a series of dramatic changes and subtle refinements. The immediate challenge that Volcker faced was to reestablish the Federal Reserve's credibility and restore low and stable inflation. By the mid-1980s, with the credibility of Federal Reserve's commitment to price stability improved, the policy debate could once again return to the overarching monetary policy challenge: What institutional framework and monetary policy strategy can best enhance economic stability, promote high growth and employment, and deliver a stable nominal anchor and price stability?

A related question was whether a clearer formal mandate for price stability would be necessary to assure improvement and defend against the risk of policy backsliding to the unfortunate experience of the 1970s. By the end of the 1980s, the evidence and practical experience worldwide supported the benefits of an independent central bank with a clear mandate to preserve price stability. However, there was then no clear consensus on the relative merits and costs of changing central bank mandates in that direction, or of the necessity of such changes in legislation for improving policy practice.

In the United States, the zero-inflation resolution, proposed in 1989, represented one specific legislative effort toward that end. Although Chair Greenspan supported the legislation, it was not enacted.[5] Opponents of the legislation argued that greater emphasis on price stability would come at the cost of employment and growth. By contrast,

[4] Meltzer (2009), Williams (2015), and Orphanides (2020).

[5] In his testimony, Chairman Greenspan (1989) welcomed the clarity of the legislation in supporting the Federal Reserve's disinflation effort and noted that the mere adoption of the legislation would be helpful in reducing inflation expectations and achieving price stability, but he also cautioned that eliminating inflation too quickly would entail a cost in the form of suppressed growth.

Goodfriend argued that a more explicit mandate for price stability would *enhance* economic stability:

> The preceding observation suggests an attractive argument in favor of a congressional mandate for price stability. By reducing the risk of inflation scares, such a mandate would free the funds rate to react more aggressively to unemployment in the short run. Thus, a mandate for price stability would not only help eliminate inefficiencies associated with long-run inflation, it would add flexibility to the funds rate that might improve countercyclical stabilization policy as well.[6]

At the center of the policy debate was an increasing appreciation of the key role of the interplay between monetary policy and inflation expectations in shaping the effectiveness of monetary policy to counteract economic shocks and secure desirable economic outcomes.

While the zero-inflation legislative initiative failed in the United States, legislation stipulating monetary policy mandates was enacted in other countries that had experienced high inflation in the 1970s and 1980s and where disinflation efforts were less successful than in the United States. The most prominent example proved to be the case of New Zealand, which originated the inflation targeting framework. The Reserve Bank of New Zealand Act 1989, which became law in 1990, instructed the central bank to focus on a single objective, an inflation goal, and enhanced the central bank's operational independence to achieve this goal.

The adoption and clear communication of an explicit numerical inflation target, the distinguishing characteristics of the inflation targeting approach, were subsequently widely adopted, including by the Federal Reserve. At the time Goodfriend wrote the inflation scares article, however, the inflation targeting framework was in still in its

[6] Goodfriend (1993), p. 17.

infancy.[7] Opacity in goals and, in the case of the Federal Reserve, even in policy instruments was common.[8] Inflation targeting gradually came to be seen as the preferred way to communicate the quantitative definition of price stability that Goodfriend's analysis called for.

Over time, the Federal Reserve came to recognize that a policy strategy that anchored inflation expectations in line with a clearly communicated definition of price stability enhanced the overall effectiveness of monetary policy, and furthermore, that this could be achieved with appropriate interpretation of the Federal Reserve's mandate within the existing institutional framework.

On January 25, 2012, the Federal Open Market Committee (FOMC) formally adopted a 2 percent inflation goal as its definition of price stability:

> Communicating this inflation goal clearly to the public helps keep longer-term inflation expectations firmly anchored, thereby fostering price stability and moderate long-term interest rates and enhancing the Committee's ability to promote maximum employment in the face of significant economic disturbances.[9]

[7] The article was published in early 1993, first in the *Annual Report* of the Federal Reserve Bank of Richmond for 1992 and then in the Bank's *Economic Quarterly*. Goodfriend had completed a draft by the summer of 1992. In between, he had the opportunity to present the work at the Bank of England and the Riksbank, two central banks that adopted inflation targeting in response to the ERM crisis that erupted in the fall of 1992. Goodfriend's arguments in support of a "mandate for price stability" and of the short-term interest rate as the instrument of monetary policy were pertinent to the inflation targeting debate.

[8] As discussed in the essay by Lars E.O. Svensson elsewhere in this volume, in his influential article on "Monetary Mystique," Goodfriend (1986) argued that the Fed's preference for secrecy, as practiced in the mid-1980s, was difficult to justify. The Fed subsequently became more transparent, but this was a gradual process. While the Federal Reserve calibrated policy with a target federal funds rate, the timing of policy changes was not immediately disclosed until February 1994, and the actual setting of the policy instrument — the target federal funds rate — was only communicated starting in July 1995. Lindsey (2003) presents a history of the evolution of FOMC communication that spans this period.

[9] Federal Reserve (2012).

In 2020, the FOMC stated, "The Committee judges that longer-term inflation expectations that are well anchored at 2 percent foster price stability and moderate long-term interest rates and enhance the Committee's ability to promote maximum employment in the face of significant economic disturbances" (Federal Reserve, 2020). The language in these statements echoes the arguments of Goodfriend's article.

Advances in models for monetary policy analysis

Today, the merits of a monetary policy strategy based on the communication of a clear goal for inflation as the central bank's definition of price stability and aiming to solidly anchor inflation expectations in line with this goal are uncontroversial.[10] At the time of the writing of Goodfriend's article, however, economic theory had not yet provided clear support for moving policy in this direction. During the 1980s, the field of macroeconomics was disjointed regarding monetary policy. On the one hand, it was recognized that available models employed for policy analysis by central banks did not adequately capture the endogeneity of inflation expectations to monetary policy strategy and its communication. On the other hand, while the rational expectations revolution had highlighted the critical importance of policy regimes for shaping expectations, the prevalent assumption of full information and perfect knowledge made available models too simplistic to overcome reasonable policymaker doubts about the resulting policy advice.

Assuming rational expectations with full information and perfect knowledge, as was common in monetary policy models at the time of Goodfriend's article, created an apparent disconnect between theory and practice. Such models typically assumed that inflation expectations were well-anchored, effectively ruling out the inflation scares documented by Goodfriend. On the other hand, policy practitioners

[10] With the recent adoption of a 2 percent goal by the European Central Bank, all major advanced economy central banks now share this element in their policy strategy. In its policy strategy statement, the ECB highlighted the role of a clear goal for anchoring inflation expectations: "The two per cent inflation target provides a clear anchor for inflation expectations, which is essential for maintaining price stability" (ECB 2021).

learned to pay close attention to private inflation expectations, as these could be inferred, albeit imperfectly, from surveys and financial market data. Indeed, the increasing appreciation of the central role of credibility for the effectiveness of monetary policy in recent decades has resulted in more resources allocated by central banks to improving the measurement of inflation expectations[11] as well as support for the development of related financial markets.[12] It also prompted the development of models that would close the apparent gap between theory and practice.

One strand of this literature introduced imperfect credibility by positing that the central bank's implicit inflation goal shifted over time and tracing the evolution of beliefs about this goal. Along these lines, Kozicki and Tinsley (2001) demonstrated that "shifting endpoints" modeled in this fashion improved our understanding of expectations embedded in the term structure of interest rates. Explicit introduction of learning about policy and other aspects of the economy improved the ability of canonical models to explain inflation persistence and business cycle dynamics.[13] Another strand focused on the policy implications of departures from rational expectations with the introduction of a process of perpetual learning by private agents as a mechanism governing the formation of expectations.[14] These models show that modest deviations from the assumption of rational expectations with perfect knowledge introduce a layer of complexity in inflation dynamics that can give rise to the type of inflation scares envisaged by Goodfriend.[15] As a result, policies that would appear to be efficient under

[11] Such efforts include the development of new surveys as well as models that combine information from surveys and financial markets, such as indexed debt, to arrive at estimates of inflation expectations. (See, e.g., Armantier et al 2017, D'Amico, Kim and Wei 2018, and Ahn and Fulton 2020.)

[12] The Federal Reserve supported the Treasury's development of "inflation-indexed" debt in the mid-1990s. In his article, Goodfriend cited a proposal by Hetzel (1992) about how the improved measures of long-term inflation expectations that could be derived once indexed debt became available would assist the Fed in setting monetary policy.

[13] Erceg and Levin (2003), Milani (2007), Orphanides and Wei (2012), and Slobodyan and Wouters (2012).

[14] Orphanides and Williams (2004), and Gaspar, Smets, and Vestin (2010).

[15] Orphanides and Williams (2005).

rational expectations can instead yield poor results when knowledge is imperfect. In these models, consistent with Goodfriend's policy recommendations, better outcomes can be achieved with policies that reflect a greater commitment to price stability.

The continuing importance of taming inflation scares

We conclude with one key message from Goodfriend's analysis of inflation scares relevant for monetary policy strategy: systematic anchoring of inflation expectations can improve the achievement of both price stability and economic activity goals. In contrast, the Fed's imperfect credibility during the disinflationary period of 1979-1992 led to bouts of inflation scares that increased the economic costs of restoring price stability. Goodfriend argued that when its commitment to price stability is credible, the Fed enjoys "remarkable latitude" (p. 17) for easing monetary policy in response to a recessionary shock without triggering an inflation scare. A policy strategy that keeps inflation expectations solidly anchored in line with a clearly communicated definition of price stability supports both growth and employment. Providing an enduring nominal anchor succeeds in taming inflation scares. The Federal Reserve's monetary policy strategy and communication has evolved since Goodfriend highlighted the inflation scare problem, heeding these important lessons.

Marvin Goodriend's article on inflation scares was characteristic of his approach to policy research "with the ultimate objective of improving macroeconomic performance." His eagerness to explore new ideas, debate, listen, and debate some more, and his openness to questioning central bank orthodoxy, were inspiring for younger economists like us who had the good fortune to interact with him. His passion for principled, research-based policy in the quest for improving the contribution of an independent central bank to society is part of his lasting legacy.

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Federal Reserve Independence: Is it Time for a New Treasury-Fed Accord?

*Charles Plosser**

In March 1951, after a long, and at times acrimonious, debate, the US Treasury and the Federal Reserve reached an agreement that allowed the central bank to end nearly a decade of pegging the interest rate on government debt.[1] The country was facing uncomfortably high inflation following World War II and the Fed was frustrated by the fiscal demands of the Treasury that, in its view, rendered it unable to ensure price stability. The Treasury-Fed Accord of 1951 was an institutional arrangement, not a legal agreement, that established an understanding of how both parties would conduct policy, and it was an important milestone in the transformation of the Fed into an independent central bank. As described by Allan Meltzer (2003, p. 738), it "prevented an administration from deciding unilaterally to use monetary expansion to gain temporary political advantage or to finance too much of the budget at the central bank." Its goal was to permit the Fed to control its own balance sheet rather than have it be controlled by the Treasury for the purposes of debt management.[2] Following the agreement, the Fed reduced the growth of bank reserves, allowing interest rates to rise to slow inflation.

* The comments and suggestions of Michael Bordo, Robert Hetzel, Jeffrey Lacker, Mickey Levy, Bill Nelson, and especially Robert King and Alex Wolman are greatly appreciated.

[1] See Hetzel and Leach (2001) and Meltzer (2003, pp. 699-724) for further insights surrounding the creation and details of the 1951 Accord.

[2] Allan Sproul, then president of the Federal Reserve Bank of New York, was asked if the Fed's efforts to break the link to Treasury funding demands might usurp the debt-management responsibilities of the Treasury. He responded: "Certainly not. The essence of debt-management is to tailor your offerings to the market in terms of current economic conditions, not to have the market tailored to your offerings by the central bank." See Board of Governors (1951).

The Accord reached its 50th anniversary in March 2001. At the time, it seemed that central bank independence with respect to monetary policy was increasingly secure and price stability was widely accepted as the primary objective of the Fed and many other central banks. Concerns about entanglements of monetary and fiscal policy were of more historical interest than pressing issues, at least in the US. But by the 70th anniversary in March 2021, following massive central bank interventions in the recession of 2008-09 and again beginning in March 2020, the traditional boundaries between monetary and fiscal policy had blurred.

In this essay, I discuss some of the important changes in the use of the Fed's balance sheet and ask if the 1951 Accord remains a sufficient framework to ensure the Fed's independence. I conclude that it does not. Through its expansion of credit policies, the Fed has effectively engaged in fiscal policy actions that more appropriately belong to Congress. Congress, as well as the Fed, have taken actions that violate at least the spirit of the 1951 Accord. Taken together, these actions undermine the independence of monetary policy decision-making by the Fed and open the door to political and fiscal abuse of the central bank's balance sheet. Thus, it is important to strengthen Fed independence through the appropriate assignment of decision-rights and accountability required of the institution in a democratic society. Later in this essay I will lay out a concrete proposal aimed at fostering these goals.

Some background

I began publicly speaking and writing on these matters during my time at the Federal Reserve (2006-15), as the Fed began its first round of quantitative easing (QE).[3] But like any other research, the ideas I express here have antecedents in the work of others and, in particular, that of Marvin Goodfriend. Marvin spent most of his career as a monetary economist working at the Federal Reserve Bank of Richmond.[4] He served as the Bank's research director and chief policy advisor during the tenure of President Al Broaddus. Marvin had deep knowledge and experience in policymaking as well as economic theory. His forward-looking research often identified important issues before they rose to the forefront of policy debates.

Goodfriend and King (1988) and Goodfriend (1994), for example, stress the importance of distinguishing two elements of central bank policy. The first is monetary policy, which is reflected in changes in the overall size of the Fed's balance sheet. Such actions are frequently framed in terms of interest rate policies intended to bring about desired changes in the balance sheet. The second is credit policy, which is captured by changes in the composition of assets held.[5] This decomposition is consistent with a long tradition in monetary economics that views central banks as unique because they alone can directly alter the amount of government-created money. Credit policy by the Fed is more correctly viewed as debt-financed fiscal policy as it inevitably (and presumably intentionally) favors one party over another and places taxpayer funds at risk. It amounts to off-budget spending since it does not go through the usual congressional appropriation process.

The notion of placing taxpayer funds at risk is important for understanding the consequences and dangers of central bank credit policy. In the case of the Fed, credit policies almost always involve substituting more risky assets for less risky assets on the balance sheet, thus shifting credit risks from individual entities (usually in the private sector) to the taxpayer. Credit policy decisions place taxpayer funds at risk and often involve complex and highly political choices. As such, they

[3] For early examples, see Plosser (2009a, 2009b, 2009c).

[4] In 2005, he joined Carnegie-Mellon University, adding to the proud tradition in monetary economics established by Allan Meltzer and Ben McCallum. He subsequently assumed a leadership role in the Carnegie-Rochester Conference on Public Policy Series and joined the Shadow Open Market Committee (SOMC), two organizations in which I was deeply involved until my departure for the Federal Reserve in 2006.

[5] Douglas Diamond (2022), in this volume, discusses Goodfriend and King (1988) using their terminology of "banking policy" rather than the more modern "credit policy" label that I adopt. Banking policy also includes regulations, but that will not be discussed here.

are more appropriately thought of as the responsibility of Congress and the Treasury, not the central bank. So it is important to clearly address the decision-rights and accountability of credit policies. Some examples help illustrate these points.

The government, and Congress more specifically, frequently engages in an array of credit policy actions that put taxpayer funds at risk. Some take place through the tax code, but many occur through loans and loan guarantees to private entities. This is the most common form of credit allocation by the government. One high-profile example was a Department of Energy loan guarantee of $535 million made in 2009 to the Solyndra Corp, a developer of solar panels using a new technology. It was touted as a great investment in "green" technology. The company filed for bankruptcy in 2011, and the government (taxpayer) took a loss of $528 million.[6]

Goodfriend and King (1988), however, discuss central bank credit policies. One common example is lending to individual banks through the discount window. Federal Reserve Banks make such loans based on collateral posted by individual banks. The interest rate is called the primary credit rate and must be approved by the Board of Governors. The rate is typically set somewhat above the fed funds target rate determined by the Federal Open Market Committee (FOMC). Such loans are traditionally very short term, fully collateralized, and can only be made to solvent depository institutions. A discount window loan provides the individual bank with reserves so that both the assets and liabilities of the Fed increase. But such lending need not increase the balance sheet since the Fed could simultaneously sell Treasuries from its portfolio to offset or "sterilize" the transaction, leaving monetary policy unchanged. Thus, such sterilized lending would be

[6] See Geman (2015) for an interesting account of this episode.

characterized as pure credit policy.[7] [8] The resulting composition of Fed assets would likely be riskier than the Treasuries it held before. So selling Treasuries to purchase riskier assets, credit policy by the Fed is essentially debt-financed fiscal policy.

Another example discussed by Goodfriend (1994) and Broaddus and Goodfriend (1996) is Fed participation in foreign exchange intervention. Such interventions can be sterilized (through an offsetting purchase or sale of Treasury securities) or unsterilized, which allows the balance sheet size to respond. The empirical evidence suggests that sterilized foreign exchange interventions have small and temporary effects at most. Requiring or expecting the Fed to engage in credit policy in the form of sterilized foreign exchange interventions that expose the Fed to credit risk and place taxpayer funds at risk would seem to be of questionable value without explicit congressional approval.

In a remarkable stroke of foresight, Goodfriend (1994) suggested that the Fed and Treasury consider a "new Accord" to address Fed credit policies. He worried that "large federal budget deficits, a deposit insurance crisis, or a significant foreign exchange market intervention" might give rise to increased fiscal pressures on the Fed and specifically on its credit policies.[9]

Goodfriend (1994) recommended that such a "new Accord" be based on the following principles: "(1) liquidity assistance should not fund insolvent institutions; (2) credit policy should not fund expenditures that ought to get explicit Congressional authorization; (3) Congress should

[7] On August 16, 2007, the FOMC had just such a conversation. In discussing a proposed reduction in the discount rate from 100bp above the fed funds target to 50bp, Jeffrey Lacker, then president of the Federal Reserve Bank of Richmond and longtime colleague of Goodfriend, asked if any additional loans would be sterilized or allowed to increase the balance sheet. Bill Dudley, then manager of the System Open Market Desk, responded that there would be "offsetting adjustments." See Board of Governors (2007, p. 4).

[8] As will be discussed further below, many of the lending programs pursued between 2007 and September 2008 can be thought of as pure credit policies as they were largely sterilized, thus having little direct consequence for the stance of monetary policy.

[9] See also Broaddus and Goodfriend (1996).

not direct the Fed to transfer assets to the Treasury in order to reduce the Federal debt." Such an agreement, of course, has not come to pass.

Events since 2008 have strengthened the case for greater clarity of the boundaries between the Fed and both the Treasury and Congress regarding the decision-rights and accountability of credit policies.

In the remainder of this essay, I offer some general, mostly well-known, observations about the importance of an independent central bank and the critical role of institutional constraints in preserving independence. Then I highlight how changes in the use of the Fed's balance sheet by both the Fed and the fiscal authorities (the Treasury and Congress) have potentially undermined the fragile balance established by the 1951 Accord. This discussion is followed by some suggestions — largely compatible with those in Goodfriend (1994, 2009) and Plosser (2009a, 2009b, 2017b) — for reclaiming both independence and accountability of the Fed by strengthening the boundaries around credit policy.

Fed independence and the role of institutions

The case for central bank independence largely stems from monetary policy's unique role in providing price stability. Since a central bank can also play a role in financing government expenditures, the potential for conflicting interests between the monetary and fiscal authorities is clear, as was evident in the events leading up to the 1951 Accord. Governments can finance spending in three ways: taxation, debt (future taxes), or printing money. In this sense, monetary and fiscal policy are intertwined through the government's budget constraint. The historical record offers a strong case for the independence of monetary policy. It teaches us that without institutional or constitutional constraints of some form, governments often resort to the printing press to avoid difficult fiscal decisions, potentially undermining monetary policy's responsibility for ensuring price stability.[10]

[10] See Plosser (2016a) for a brief discussion of recent events in Argentina as one example.

Thus, there are good reasons to maintain a healthy separation between monetary and fiscal policy. The 1951 Accord is a form of institutional constraint that acknowledges that the Fed has the decision-rights to control the size of its own balance sheet to protect monetary policy from dominance by the fiscal or political authorities. But it also suggests that the Fed should refrain from active engagement in issues that fundamentally are under the purview of Congress and the fiscal authorities.

Plosser (2010, 2012, 2014) discusses some dimensions of these institutional arrangements but stresses that independence does not mean that the Fed should have unrestricted powers, nor does it mean the institution is unaccountable. In a democracy, independence requires that there be constraints on the breadth of the central bank's responsibilities and its powers.

Limits to central bank authorities can take different forms. One important element involves the breadth and scope of the bank's mandate. Narrow mandates focus the central bank on a limited set of objectives that make it easier to hold the institution accountable for success or failure. Narrow mandates also limit the range of the central bank's responsibilities that it can use to justify its actions. This argues for a mandate that focuses more narrowly on price stability.[11]

It is also common to see restrictions on the types of assets that the central bank can buy and sell to limit its interference with market allocations of scarce capital and generally to avoid actions more appropriately left to the fiscal authorities or the market. For example, the Federal Reserve Act (FRA) limits asset purchases by the Fed to specific classes of securities.[12] The Fed does not have the general authority to buy private sector securities, such as equities or corporate bonds, nor can it buy securities issued by state or local governments

[11] Unfortunately, the trend is an expanding mandate for central banks and the Fed, in particular. They are being pressured to consider all sorts of distributional issues in the real economy from wealth inequality, inclusive employment, as well as broader issues such as climate change. Levy and Plosser (2020), for example, discuss how this arises in the Fed's new monetary strategy adopted in August 2020.

[12] See Section 14(2(b)) of the FRA.

unless they are revenue bonds or tax anticipation bonds with maturities of six months or less.[13]

Between 1950 and 2007, the Fed followed a policy of buying and selling almost exclusively Treasury securities. In fact, between 1951 and 2000, outright holdings of Treasury securities accounted for over 85 percent of the growth in the balance sheet and in 2000, 83 percent of total assets.[14] By August 2007, Treasury securities held outright accounted for 90 percent of the Fed's balance sheet and 92 percent of the asset growth since 1950. Thus, the Fed operated a de facto "Treasuries-only" approach to its balance sheet. The Fed's rationale for this approach has been an explicit desire to make its buying and selling as neutral as possible on the allocation of capital by the private sector and to ensure its portfolio is liquid, avoiding large amounts of interest rate risk inherent in longer-term bonds.[15]

Legal constraints on the central bank can sometimes provide protection from fiscal interference because these give the Fed grounds for denying requests from the fiscal authorities. Of course, Congress can change the law, but such constraints raise the bar for getting the Fed to do something that might undermine its independence. An example, which will be discussed further below, occurred in December 2008 when Senator Chris Dodd wrote a letter to Fed Chair Ben Bernanke requesting that the Fed lend money to the failing automobile companies. Bernanke said no, on the grounds that certain provisions of the FRA made it inappropriate for the Fed to intervene in the case or to engage in industrial policy. His case was weakened by the Fed's own actions to rescue Bear Stearns and AIG earlier in the year and its

[13] There are exceptions such as loans at the discount window and, under extraordinary circumstances, lending under Section13(3) of the FRA, which is considered further below.

[14] Outright holdings of Treasuries exclude repurchase agreements collateralized by Treasuries, which were largely temporary in nature. Including them would raise these percentages slightly.

[15] The Fed has frequently debated whether its holdings of Treasuries should be predominately in the form of short-term bills or a more balanced range of maturities that mimic the actual distribution of the outstanding public debt. In the 1950s the portfolio was more heavily weighted toward longer maturity Treasuries as a consequence of the accumulation of wartime bonds and the interest rate peg prior to the 1951 Accord. Gradually, the portfolio tilted toward shorter maturities, in part to improve its liquidity. There was also a desire to make the portfolio "neutral," that is similar to the maturity structure of the outstanding public debt. There were occasions when the Treasury would try to get the Fed to extend its maturity structure to accommodate Treasury's funding desires. As of 2002, the Fed's Treasury portfolio was pretty close to neutral and thus was heavily weighted toward the short end of maturity spectrum. About 65 percent of the Treasury securities had maturities of two years or less (compared to about 55 percent of the public debt) and a little over 10 percent had maturities of 10 years or more (compared to about 17 percent of the public debt). See Huther, Ihrig, and Klee (2017) for an interesting discussion of the evolution of the Fed's Treasuries portfolio.

financial support for the GSE's through the purchases of agency debt.[16]

Of course, constraints and restrictions can also be placed on the fiscal authorities that limit interference in monetary policy. The 1951 Accord was just such an example, as it declared that the Treasury would not use the Fed's balance sheet to directly fund fiscal deficits. The prominent role credit policy has played since the financial crisis makes it important to reconsider the limits to the Fed's scope for such policies and do so in a way that respects and protects its independence.

The fraying boundaries

The boundaries established in the FRA and strengthened by the 1951 Accord enhanced the credibility of the Fed as an independent central bank and its ability to achieve its mandates. Of course, performance has not been perfect, as the high inflation of the late 1960s and 1970s clearly illustrates. The fiscal authorities, including the executive branch and members of Congress, frequently express their views on the appropriateness of Fed policy, but often with little or no effect on policy. Yet in the years leading up to the Great Inflation, President Lyndon Johnson exerted increasing pressure on Federal Reserve Chair William McChesney Martin to keep rates low to help support his spending agenda that included the Great Society programs and the Vietnam War. Martin became concerned about inflationary pressures, and many on the FOMC were even more concerned. The pressure from the White House was intense: Martin succumbed by delaying FOMC action, in

[16] As will be discussed later, Congress ended up using fiscal policy tools to deal with the challenges facing the auto industry.

part, by telling his colleagues that the Fed should keep the Treasury market on an "even keel."[17] The Fed finally raised the discount rate on December 3, 1965. The president was not pleased. The political pressure from the executive branch was clearly at odds with the spirit of the 1951 Accord and was largely responsible for beginnings of the Great Inflation. In October 1969, with inflation running at nearly 6 percent, President Richard Nixon replaced Martin, who by then was committed to restraining inflation, with Arthur Burns, whom he thought would be more compliant with his political wishes. And indeed, he was. The Accord was strained, and political pressure dominated Fed decision-making. These periods under presidents Johnson and Nixon were consequential breakdowns in the traditional boundaries that had developed to support independence and avoid monetary and fiscal policy entanglements. They bear significant responsibility for the subsequent inflation.[18]

Following the Great Inflation, the wisdom and spirit of the Accord was mostly restored with the strong support of Fed Chair Paul Volcker and President Ronald Reagan. As mentioned at the outset, by 2001, the 50th anniversary of the 1951 Accord, central bank independence seemed well established as a principle of sound central banking and price stability was increasingly accepted as the primary objective.

Yet, beginning with the financial crisis and the accompanying recession, and continuing into the pandemic and economic turmoil it engendered, we again witnessed substantial deterioration in the traditional institutional barriers between fiscal and monetary policy, especially the willingness of the Fed to use its balance sheet to conduct credit policy. In the remainder of this section I trace how the Fed's credit policies shaped its balance sheet during the 2007 to 2021 period.

[17] "Even keel" policy during the 1950s and 1960s was Fed speak for avoiding policy actions that might disrupt financing operations of the Treasury.

[18] See Levin and Taylor (2013) and Meltzer (2009) for a more in-depth discussion of this historic period.

Balance sheet responses to the financial crisis

The Early Crisis and Sterilized Lending. Early in the financial crisis, August 2007 to August 2008, the Fed aggressively used its balance sheet to conduct sterilized credit policy. As a consequence, these early credit policies had little impact on the size of the balance sheet but did significantly change its composition. As pointed out previously, in August 2007, outright holdings of Treasury securities accounted for about 90 percent of the Fed's balance sheet. One year later, in August 2008, Fed holdings of Treasuries had declined by $305 billion, largely to fund its credit extensions. Treasuries fell to just 53 percent of assets held by the Fed. On net, the balance sheet increased by less than 4 percent, about $37 billion over the year.

Much of the lending went to depository institutions through discount window loans and through a new program created in December 2007 called the Term Auction Facility (TAF) that supplemented traditional discount window lending but permitted longer terms. By August 2008, such lending increased by almost $170 billion.[19] [20]

The most significant event during this period was the Fed's steps to rescue the creditors of the investment bank Bear Stearns. Like its other actions during this period, this lending arrangement (about $30 billion) was credit policy as it was primarily the purchase of non-Treasury securities (mostly high-yield/subprime mortgages) financed by the sale of Treasury securities. In other words, it was debt-financed fiscal policy, yet the spending did not show up as funds appropriated by

[19] Other assets that increased during this period included dollar swap lines with foreign central banks and repurchase agreements.

[20] Some ask why the Fed was concerned about sterilization and increasing the size of the balance sheet at that time. It is useful to remember that in December 2007 the CPI year-over-year rate of inflation was 4.1 percent and by August 2008 it was 5.4 percent. The Fed did reduce the funds rate from 4.25 percent, where it started the year, down to 2 percent by the end of April 2008. So, it is not entirely a surprise that the Fed was weighing the prospects for inflation as well as the risks financial instability.

Congress. The rescue was undertaken by the Board of Governors (not the FOMC) under the authority granted in Section 13(3) of the FRA.[21] By the end of August 2008, sterilized lending by the Fed led its holdings of short-dated Treasuries to fall to $22 billion. This decline made it much more difficult for the Fed to engage in further sterilization without selling long-term Treasuries.

The powers under Section 13(3) of the FRA allowed for the expanding role of the Fed into credit allocation. The provisions permitted the Board of Governors, "under unusual and exigent circumstances" to lend to private firms, individuals, and partnerships. It was originally put in place in the 1930s as a complement to the Fed's role as lender of last resort. Yet it was almost never used.[22] Even in periods of severe financial strain, such as the savings and loan crisis, the failures of Enron and WorldCom, the stock market crisis in 1987, the collapse of the NASDAQ accompanying the bursting of the so-called tech bubble, and the financial stress of the terrorist attacks on 9/11, the Fed did not resort to the discretionary powers of Section 13(3) to purchase private sector risky securities.[23] The Fed earned a reputation, developed over nearly three-quarters of a century, that it would not use this provision to conduct credit policy. The Fed's conduct starting in March 2008 undermined this reputation and the long-standing boundaries recognized by the Fed and the Treasury.

[21] The lending to support the Bear Stearns rescue was consolidated into the Maiden Lane, LLC facility and presented as a separate item on the Fed's balance sheet. At the time of the Bear Stearns rescue the Fed created two other Section 13(3) facilities in support of primary dealers, the Term Securities Lending Facility (TSLF) and the Primary Dealer Credit Facility (PCDF).

[22] Prior to 1980 the Fed did use Section 13(3) on a few occasions to permit nonmember banks to borrow at the discount window. The Monetary Control Act of 1980 eliminated the prohibition of nonmember borrowing from the Fed so any depository bank could have access to the discount window.

[23] During this period the Fed also declined to use its Section 13(3) authority to lend to Penn Central, New York City, Lockheed, or Chrysler, despite political pressure and claims of potential financial contagion. See Fettig (2002) and Schwartz (1992) for some additional history and discussion.

In many ways, the rescue of Bear Stearns was the watershed moment in the crisis. The Board used its powers under Section 13(3) for the first time since the Great Depression to engage in lending to rescue a failing private entity outside the traditional banking system. This created uncertainty about future policy actions and moral hazard that did not exist before the intervention. That is, firms could be rescued with public funds by the Federal Reserve. It set the stage for the turmoil that followed in September of 2008 surrounding the rescue of AIG and the failure of Lehman Bros.[24]

Thus, early in the financial crisis the stage was set for a much more active role for the Fed in credit allocation and thus, a more active involvement in fiscal policy.

The Financial Crisis Stage Two: More Credit Policy and Balance Sheet Expansion. In September to December 2008, following the failure of Lehman Bros. on September 15, the Fed invested $85 billion in the rescue of AIG using the Board's powers under Section 13(3). Over the course of the fall of 2008, the Board also created, again using Section13(3), an alphabet soup of lending programs in an effort to support the broader real economy by investing in private sector securities.[25] It included programs to make loans to private investors to purchase asset-backed securities, commercial paper, and to support money market funds, for example. These programs would not be sterilized and thus would involve balance sheet expansion, an action impacting monetary policy.

[24] The question is would Lehman Bros. (and other financial actors) have behaved differently had Bear Stearns not been rescued by the Fed? We do not know. We do know that following the failure of Lehman, other major investment banks became banks with access to the discount window, yet they were subject to more regulation and oversight (Goldman Sachs and Morgan Stanley), and another (Merrill Lynch) sold itself to a bank (Bank of America). Might Lehman, along with the others, have done the same thing earlier in the year had Bear Stearns been allowed to fail, perhaps reducing some of the ensuing turmoil?

[25] In addition to the previously announced TSLF and PDCF, these new programs included the Term Asset Backed Loan Facility (TALF)), Commercial Paper Funding Facility (CPFF), Asset-Backed Commercial Paper Money Market Mutual Fund Lending Facility (AMLF), and the Money Market Investor Funding Facility (MMIF).

It is important to recognize that these programs took time to establish and could have been implemented directly by the Treasury. Fundamentally, the new programs shifted credit risks from private entities to the taxpayer without explicit congressional approval. As such, they represented off-budget spending by the Fed. Even in fast-moving crises, where it may be desirable to have the Fed act with alacrity, the programs (including the lending to rescue Bear Stearns and AIG) could have been shifted over to the Treasury after a few months in exchange for government securities. This would have required legislation, but it would have meant Congress was responsible for the oversight and accountability of these taxpayer financed investments. I suggested just such an action in the FOMC meeting in December 2008 and publicly in Plosser (2009a).[26] I will discuss this strategy more below as it is a key part of my "New Accord" recommendations to clarify and constrain the use of Fed credit policies in an emergency.

Another significant step was taken in November 2008 when the Board announced it would purchase $500 billion in agency MBS and $100 billion of agency debt beginning in January 2009.[27] This was an entirely new and significant step into credit allocation. As discussed previously, the Fed had essentially operated with a "Treasuries-only" portfolio since the 1951 Accord. Because the agency MBS purchases also expanded the balance sheet, it was also an important monetary

[26] In the FOMC meeting on December 15-16, 2008, I said: "As I have articulated before, I believe we need to remain cognizant of the line between monetary policy and fiscal policy. I would prefer to see us purchasing Treasuries rather than riskier assets, as I would favor the purchases of long-term Treasuries over new 13(3) facilities. ... To the extent that some of our lending programs are targeted at aiding specific markets, my preference would be to shift those assets from the Fed's balance sheet to the Treasury and substitute Treasury securities. This would help distinguish monetary policy from credit policy and preserve our ability to conduct independent monetary policy." Board of Governors (2008b, p. 41).

[27] See Board of Governors (2008a). The term agency debt refers to the direct obligations of housing-related government-sponsored enterprises (GSEs), including Fannie Mae, Freddie Mac, and the Federal Home Loan Banks. Agency MBS are the mortgage-backed securities backed by Fannie Mae, Freddie Mac, and Ginnie Mae. The credit policy dimensions of the program were made all the more apparent by the purchase of GSE debt. But this aspect of the program had multiple implications. For example, at this point the GSEs had already been placed in conservatorship, so by purchasing agency debt the Fed was supporting the fiscal policy dimensions of the government takeover of the institutions.

policy action, although this was not emphasized by the Board of Governors at the time.[28] In the announcement, for example, the Fed said, "This action is being taken to reduce the cost and increase the availability of credit for the purchase of houses, which in turn should support housing markets and foster improved conditions in financial markets more generally."[29] Chair Bernanke (2009) spoke specifically on this issue, saying that the Fed was using its powers to engage in "credit easing." As he explained, the tools "…. make use of the asset side of the Federal Reserve's balance sheet. That is, each involves the Fed's authorities to extend credit or purchase securities." The actions were clearly stated in terms of the Fed's intention to allocate credit to the housing sector relative to other sectors of the economy. The alternative, of course, would be to buy Treasuries.

In March 2009, the FOMC announced it would increase the intended agency MBS purchases by $750 billion and agency debt by $100 billion. The announcement also indicated the intention to purchase $300 billion in longer-term Treasury securities. Purchases of agency MBS continued until the spring of 2010. At that point, the financial markets' functioning had mostly normalized, and the economy was beginning to slowly recover. The Fed, however, continued to purchase long-term Treasuries and lengthen the maturity of its portfolio.

[28] There is an important underlying issue that has not received much public attention. The announcement of MBS purchases in November was made by the Board of Governors (BOG) not the FOMC. In fact, there seems to be no FOMC document or record of prior approval by the FOMC. Consequently, the BOG appears to have made an announcement of a major expansion of the Fed's balance sheet without the explicit approval of the FOMC, which is the body responsible for monetary policy. While the expansion was approved by the FOMC at its December 2008 meeting, it was accompanied by significant discussion scattered throughout the meeting (see Board of Governors (2008b, pp. 16-103, 166-167)). The commentary on pages 30-35 by Jeffrey Lacker (president of the Richmond Fed) concerning governance and the roles and responsibilities of the BOG and the FOMC regarding monetary policy and the size of the balance sheet is particularly relevant. Outside of commitments by the chair to work cooperatively with the FOMC in the future on such matters, I was unable to find subsequent documentation that these governance issues have been discussed or further clarified.

[29] From 2015 through 2017, the Fed did purchase some agency MBS as a means of stabilizing the size of its MBS portfolio.

By the summer of 2012, the Fed was dissatisfied with the pace of the recovery and wanted to apply more monetary stimulus, so the rationale for MBS purchases was modified "to support a stronger economic recovery and help ensure inflation, over time, is most consistent with its dual mandate."[30] Purchases continued through the end of 2014.[31] By December 2014, the Fed's portfolio of agency MBS had grown to $1.74 trillion, accounting for almost 40 percent of Fed assets.[32]

The Treasury and Fed Joint Statement of March 2009. After concerns expressed by FOMC members and others, the Fed and Treasury issued a joint press release on March 23, 2009, seeking to clarify the role of the Fed.[33] The statement made four points. First, the Fed and Treasury should cooperate in "improving the functioning of credit markets and fostering financial stability." Second, the Fed "should seek to avoid credit risk and credit allocation," noting that "(g)overnment decisions to influence the allocation of credit are the province of the fiscal authorities." Third, it acknowledged the need for the Fed to preserve monetary stability and that lending under emergency circumstances (that is, Section 13(3)) that increased the balance sheet, "must not constrain the exercise of monetary policy." It added that the Fed and Treasury were seeking to provide "additional tools the Federal Reserve can use to sterilize the effects of its lending or securities purchases on the supply of bank reserves." The fourth and final point was to recognize the need for a "resolution regime for systemically critical financial institutions." The concluding paragraph offered a tantalizing hint at Treasury's financial responsibilities: "In the longer run and as its authorities permit, the Treasury will seek to remove from the Federal Reserve's balance sheet, or to liquidate, the so-called Maiden Lane facilities."

[30] Board of Governors (2012).

[31] From 2015 through 2017, the Fed did purchase some agency MBS as a means of stabilizing the size of its MBS portfolio.

[32] The total size of the balance sheet in December 2014 had grown to $4.5 trillion, more than a fivefold increase from its pre-crisis size of $850 billion.

[33] See Board of Governors (2009) for the joint press release. See Lacker (2009) and Plosser (2009a) for public expressions of concerns in early 2009 and footnotes 26 and 39 regarding comments by Plosser in the transcript of the December 15-16, 2008, FOMC meeting (Board of Governors (2008b)).

This joint statement made some good points but did not change or constrain Fed or Treasury actions in any meaningful way. The Fed continued its Section 13(3) credit policies, including its agency MBS purchases, and non-Treasury assets were never transferred to the Treasury. Moreover, as will be discussed further below, the Fed's response to the pandemic in 2020 followed the same playbook, constructing credit programs and purchasing agency MBS in a manner similar to what it had done in the post-2007 period, except on a larger scale.

Section 13(3) and the Dodd-Frank Act of 2010. The Dodd-Frank Act of 2010 made some changes to provisions in Section 13(3) to address concerns about credit allocation and the use of emergency lending. Three provisions are relevant. First, the Fed must get prior approval from the secretary of the Treasury for any program proposed under Section 13(3).[34] Second, any program or facility established must be designed to provide liquidity to the financial system, have broad-based eligibility, and not be constructed in such a way as to target a single firm or entity. Third, all transactions conducted under Section 13(3) of the FRA must be with "solvent" institutions or entities only. These changes place some restrictions on emergency lending but, as we will see, they are not very limiting.

Other Forms of Risk Taking on the Balance Sheet. As previously noted, by the late 1990s and up until 2007, the Fed managed its Treasury portfolio in a "neutral" fashion. That is, it had a maturity structure that looked similar to the maturity structure of the overall public debt.[35] Beginning in 2007, the duration of the Fed's portfolio began to lengthen as its credit programs expanded and it sold short-term Treasuries to sterilize the impact on the balance sheet. So not only was the Fed taking on more credit risk, but it was also acquiring more interest rate risk. A deliberate effort to lengthen the duration of its Treasury portfolio began in March 2009 when the Fed announced that it intended to purchase $300 billion in long-term Treasury securities. The rationale

[34] Prior to this change, the Board of Governors could determine if "circumstances" could be categorized as an "unusual and exigent."

[35] See Huther, Ihrig, and Klee (2017) for some supporting evidence.

was an attempt to reduce long-term interest rates and "improve conditions in the private credit markets." [36]

The Maturity Extension Program and Reinvestment Policy was initiated in September 2011 and sought to lower the longer-term interest rate by selling Treasuries from the Fed's portfolio with maturities of less than three years and purchasing Treasuries with maturities of greater than six years. This changed the composition or maturity structure of Treasury securities on the Fed's balance sheet with the goal of flattening the yield curve of government debt. The Fed tried this once before in the 1960s in what was known as Operation Twist. At the time it was widely viewed as unsuccessful, although some suggest it may have been more effective than previously thought.[37] But regardless of its efficacy, the operation is an exercise in maturity management of the public debt, traditionally executed by the Treasury and not the Fed. Moreover, the Treasury could effectively offset the Fed's effort by issuing more long-term debt relative to short-term debt, resulting in the same distribution of maturities in the hands of the public as existed before the Fed's program. Of course, the effect on the Fed, in either case, is to increase the interest rate risk of its own portfolio by creating a greater maturity mismatch between the Fed's liabilities (bank reserves and currency) and its assets.[38]

Congressional Responses to Credit Policies and Balance Sheet Expansion by the Fed. In addition to the revision to Section 13(3) already discussed, the Fed's plunge into credit allocation generated policy responses by Congress. For example, as discussed previously, Congress asked the Fed to consider financial aid to the automobile companies. The companies had been under financial stress prior to the crisis, but it turned more acute in 2008. Chair Bernanke turned down the request.

[36] Of course, the purchase of agency MBS was also lengthening the duration of the Fed's portfolio.

[37] See Swanson (2011).

[38] The System Open Market Account (SOMA), comprised of securities held by the Fed, had an average duration of 2.8 years in August 2007. By December 2014 it had grown to almost six years, and by December 2020 it stood at about five years.

In the end, Congress addressed the matter directly using its fiscal powers.[39] However, it is not difficult to understand the request from Congress. The Fed had already rescued Bear Stearns and AIG, although Lehman was allowed to fail; it had committed to providing support to the housing sector, including purchases of agency debt of the GSEs; and it was purchasing (through the CPFF) commercial paper directly from issuers. So why not provide support to the automobile industry?

This illustrates the confusion created in the eyes of the public, and Congress, over the limits or boundaries surrounding Fed credit policies.[40]

[39] The big three auto companies received about $80 billion in assistance through the Troubled Asset Relief Program (TARP). However, restructuring attempts failed, and in June 2009 GM and Chrysler went through a forced bankruptcy and restructuring. See Klier and Rubenstein (2012) for a review of the crisis in the auto industry.

[40] This issue of acceptable lending and its impact on intermediation was discussed more broadly in the December FOMC meeting and is illustrated by the following exchange. Board of Governors (2008b, pp. 235):

> MR. PLOSSER. But in some sense, just to follow up on this point, the limits are what is really important here because, as long as we don't define some limits and we just say limited by TARP capital, well, that doesn't really answer the question. As long as the markets act as if we or someone else is going to step in and rescue them from any more lending arrangements they happen to be facing, the incentives for the intermediary system to repair itself or to gradually adjust are going to be limited. I'm worried about the lack of definition about what constitutes a legitimate market or instrument or firm that we wouldn't save.
>
> CHAIRMAN BERNANKE. That's a good point, and I think one thing that is a problem now is the transition between Administrations. We'll soon have a new Treasury Secretary and a new Administration. I think it's very important—I've discussed this with Tim Geithner and others—that as soon as possible we lay out a broad strategy. What are the components of our strategy? What are we going to do going forward?
>
> MR. PLOSSER. And what are the limits to it?

Unfortunately, efforts to exploit the Fed's balance sheet for fiscal purposes continued. In the Dodd-Frank Act of 2010, Congress relied on the Fed for direct fiscal support. As part of the legislation, the Consumer Financial Protection Bureau (CFPB) was created. It was a vigorously debated provision. In the end, Congress created the agency and decided the Fed should fund it but gave the Fed no control or oversight authority. The result is that the CFPB is exempt from the annual appropriation process.[41] Of course, this mandated expenditure reduces Fed payments to the Treasury each year. Thus, the taxpayers still pay, but the agency becomes an off-budget expenditure. Without a change in the enabling legislation, the CFPB budget is determined by Fed operating expenditures and rises with them.

In the Fixing America's Surface Transportation Act (FAST) of 2015, Congress also used the Fed's balance sheet as a means of funding. Specifically, the act required that the Federal Reserve Bank surplus account not exceed $10 billion. This resulted in almost $20 billion being transferred directly to the Treasury to help fund the act.[42] In the Bipartisan Budget Act of 2018, Congress further decreased the Fed's surplus account to $7.5 billion, resulting in another $2.5 billion transfer to the Treasury.[43]

[41] The Fed is required to pay all expenses of the CFPB up to the equivalent of 12 percent of the Fed's own operating budget.

[42] The 2015 act also required the Fed to reduce the dividend it was paying to member banks. These changes (the permanent cap on the surplus account and reduction in the dividends) constituted a permanent increase in flow of funds from the Fed to the Treasury.

[43] Congress has exploited the Fed's balance sheet in this manner before. One example was in 2000 when Congress passed a budget that transferred $3.75 billion from the Fed's surplus account to the Treasury. Goodfriend (1994) considers an even earlier example in 1993. This motivated him to include as his third principle for a new Accord quoted earlier, "Congress should not direct the Fed to transfer assets to the Treasury in order to reduce the Federal deficit." These actions to exploit the Fed's balance sheet clearly violate the spirit of the 1951 Accord.

Managing a Large Balance Sheet and the Potential for Abuse. Unsterilized credit policy initiatives, including the large volume of agency MBS purchases, contributed to unprecedented growth in bank reserves and hence the Fed's balance sheet. The Fed has never seriously considered reducing the balance sheet sufficiently to enable a return to its precrisis operating regime, commonly referred to as a "corridor system." In this prior regime, the Fed adjusted the volume of bank reserves up and down to ensure that the fed funds rate (the rate that banks trade reserves among themselves) remained close to its target set by the FOMC. Most major central banks used this regime prior to the financial crisis.

Once bank reserves became large, this framework could not be used, as modest changes in bank reserves would have no impact on the effective fed funds rate.[44] As long as the fed funds target is effectively zero, this is not a major issue. It becomes a significant issue when the Fed wishes to raise the fed funds target above zero. How can it do that when the banking system is flooded with reserves? Goodfriend (2002) suggested that paying interest on reserves (IOR) would be a way to raise rates even if a large volume of reserves existed in the banking system.[45] [46] The IOR acts as a floor on short-term rates under which banks have no incentive to lend. Thus, raising the IOR would encourage other rates to increase without shrinking reserves. In central bank parlance this is called a "floor system." The essential policy instrument in this regime is the interest rate paid on reserves.[47]

In theory, this allows the Fed to manage the interest rate and bank reserves separately. The danger of this approach is that it increases the temptation to use the Fed's balance sheet for other purposes. The

[44] In December 2006, bank reserves were about $55 billion, and by December 2015, they had reached over $2.5 trillion. They declined to $1.5 trillion in September 2018 when they began to rise again, reaching over $4.4 trillion in October 2021.

[45] The Fed was granted the ability pay interest on reserves in October 2008.

[46] Ennis and Weinberg, in this volume, discuss in detail the recent Fed experience with paying interest on reserves, in the context of Goodfriend's seminal 2002 paper.

[47] This creates another governance challenge because IOR is set by the Board of Governors. So technically this leaves the BOG, not the FOMC, with the ultimate authority to determine monetary policy. It seems that the FOMC can suggest the stance of monetary policy, but the BOG does not have to concur. See Plosser (2020) for further discussion.

Fed was forced into this arrangement by its QE policies, but the Fed has now explicitly adopted the floor system as an operating regime, although they had to give it another name. So it became the "ample reserve" regime.[48] The Fed has been vague as to how it will decide on the size of the balance sheet and what factors might motivate changes in the volume of purchases up or down.

A series of official statements by the FOMC on policy normalization began in 2014.[49] None anticipated outright sales of securities. Most who opposed sales argued that simply allowing runoffs of maturing securities would be sufficient to gradually shrink the balance sheet.[50] Others were concerned that the balance sheet may need to fall faster and sales may be necessary. The fact that runoffs are likely to be slower for the MBS portfolio (especially as interest rates rise) means that the role of credit policy as measured by the share of MBS would likely rise over time.

All versions of the normalization statement have similar versions of "the Committee intends to maintain securities holdings in amounts needed to implement monetary policy efficiently and effectively." The statement also declares that "in the longer run, the Committee intends to hold primarily Treasury securities in the SOMA." These statements do not contain much information or constraints on credit policy. In this new operating regime, the Fed seems to have even more latitude to fluctuate the size and composition of its balance sheet, but it is not entirely clear to what end. Based on the arguments in this essay, the adoption of the new "ample reserve" operating regime reinforces the importance of a new credit Accord that more tightly constrains the composition of the Fed's balance sheet. Put differently, the ample reserve regime offers no limiting principle on the size or composition balance sheet. The corridor regime constrains the balance sheet to be a size that delivers an effective funds rate close to the target set by the

[48] See Board of Governors (2019a and 2019b).

[49] See Board of Governors (2022a) and Board of Governors (2022b) for the most recent incarnation.

[50] The Fed has frequently cited concerns that outright sales of MBS risk disruptions in the financial market and the housing sector.

FOMC to implement a monetary policy that achieves the Fed's macroeconomic mandates.

A large unconstrained balance sheet is ripe for abuse. The fiscal authorities will be tempted to look to that balance sheet for their own purposes, including credit policy and off-budget fiscal policy. This would undoubtedly lead to the Fed being drawn into political debates on how to best "allocate" or "diversify" the Fed's balance sheet. This further politicization of the Fed would lead to a loss of independence that could interfere with accomplishing its congressionally mandated goals.[51]

Balance Sheet Responses to the Pandemic and Shutdowns

Despite the concerns over the Fed's engagement in credit policy and the entanglements with fiscal policy, during the pandemic the Fed mostly relied on the same strategy it had adopted during the financial crisis. It rapidly expanded the balance sheet and aggressively employed unsterilized credit programs authorized by the Board of Governors under Section 13(3) and approved by the Treasury secretary.

Uncertainty over the risks surrounding the pandemic emerged in the financial markets in March 2020. On March 3, 2020, the Fed announced a 50 basis point reduction in its target range for the fed funds rate. This was followed on March 15, 2020, by an additional 100 basis point reduction to a range of 0 to 0.25 percent. At the same meeting, the Fed announced its intention to increase its holdings of Treasury securities by $500 billion and its holdings of agency MBS by $200 billion. The stated purpose was to support the "smooth functioning of markets" for these securities.[52]

In June 2020, the Fed extended, indefinitely, the asset purchases of Treasuries and agency MBS at a pace of $80 billion and $40 billion

[51] See Plosser (2020) for more discussion of the floor system and the risks it poses to independence.

[52] From the end of March to the end of June the Fed purchased almost $560 billion in of agency MBS and about $240 billion of Treasuries.

per month, respectively. By June 2020, financial markets were largely functioning normally so, like the shift in 2012, the Fed indicated the rationale for continued purchases was "fostering effective transmission of monetary policy to broader financial conditions."[53] The Fed's balance sheet grew by $4.4 trillion in just 21 months (January 2020 to September 2021). Treasuries accounted for about $3.1 trillion of the increase and agency MBS purchases were about $1.1 trillion. These purchases were huge: following the financial crisis, it took the Fed about six years to purchase $1.0 trillion in agency MBS while expanding the balance sheet by a total of about $3.8 trillion.

The virus rapidly spread across the US and the world, and, by mid-March, shutdowns began across the country that resulted in economic disruption. The Fed rapidly increased and expanded the reach of its credit policies. The range of coverage was quite remarkable and extended far beyond the banking system. Various lending programs developed during the financial crisis to aid the availability of credit were revived, including those supporting the commercial paper market, the asset-backed paper market, money market mutual funds, and securities lending for the primary dealers.[54]

But there were a number of additional programs created to target specific sectors of the economy. Several targeted the business sector by lending directly to corporations through the purchase of newly issued debt securities, including short-term commercial paper, from investment grade issuers.[55] Another new funding facility enabled the purchase of existing corporate bonds as well as exchange-traded-funds (ETF) in the secondary market, including those that primarily invested in risky US high-yield securities.[56] Support for midsized companies, including profit and not-for-profit entities, was expanded

[53] Board of Governors (2020). The housing market was at the center of the financial crisis in 2007-10. In the recession of 2020, housing was not central to the crisis in any fundamental way.

[54] These revived programs included the TALF, CPFF, AMLF, which was renamed Money Market Liquidity Facility (MMLF), and PDCF.

[55] These programs included the CPFF and the Primary Market Corporate Credit Facility (PMCCF).

[56] This program was the Secondary Market Corporate Credit Facility (SMCCF).

through additional Section 13(3) programs.[57] The Fed also created a program to lend directly to state and municipal governments.[58] According to Section 13(3), as updated by the Dodd-Frank legislation, the programs had to be approved by the Treasury. Many of them were structured so that the Treasury committed first-loss backing of about 10 percent.[59] Nonetheless, these programs all constituted fiscal policy actions by the Fed to allocate credit across the economy.

As with many of the funding facilities created during the financial crisis, all of these facilities could have been set up and administered by the Treasury without Fed involvement. They were basically debt-financed fiscal policy that transferred risk from private-sector debtholders to the government. Some argue that only the Fed can play the role in emergencies, but the Paycheck Protection Program (PPP) demonstrates that it can be done. PPP loans made to small businesses were administered and guaranteed by the Small Business Administration (SBA).[60] This could be an emergency model that does not use the Fed balance sheet to conduct fiscal policy.

There is an interesting twist to these most recent programs. The programs were ended in December 2020. Treasury Secretary Steven Mnuchin recommended that the programs not be renewed. He viewed the programs as having served their purpose and as no longer being the best use of funds.[61] Fed Chair Jerome Powell preferred to continue the programs. Congress was split on the issue. One interpretation of this episode is that, at the end of the day, the fiscal authorities ended the credit policies of the Fed over the objections of Chair Powell. The

[57] This was the focus of the Main Street Lending Program (MSLP).

[58] This refers to the Municipal Liquidity Facility (MLF).

[59] This backing by the Treasury does not really change anything, as the government would likely have to absorb any losses (or gains) the Fed incurs in any event. Its major effect is to acknowledge publicly that the Treasury and Congress bear some responsibility.

[60] The Fed's involvement was a little different in that the Fed would lend to financial institutions and take PPP loans guaranteed by the SBA as collateral. As of October 2021, approximately 76 percent of all PPP loans have been forgiven by the SBA ($602 billion) and reimbursements paid to the lenders.

[61] The funds in this case were those Congress had dedicated as a limited first-loss backstop for certain 13(3) facilities.

macroeconomic consequences of this action seemed undetectable. But the debate was clouded by who had the decision rights to do what. While this episode sheds some light on how Congress can exercise ultimate control over certain credit policy actions by the Fed, it does not address the potential for abuse of the Fed's balance sheet for fiscal purposes. The operation of the PPP would be the better model for emergency credit policy.

A new Treasury-Fed Accord

The use of the Fed's balance sheet as a tool of credit policy has taken on new dimensions since the financial crisis, entangling the Fed deeper into the realm of fiscal policy. The traditional boundaries between monetary policy and fiscal policy have been breached in ways not envisioned in the 1951 Accord. Once a central bank ventures into credit allocation and off-budget financing of fiscal initiatives, it is likely to find itself under increasing pressure from the private sector, financial markets, or the government to use its balance sheet to substitute for other fiscal decisions. In essence, groups will seek to capture the Fed's balance sheet to further their own economic and political interests. Allocating credit through its lending practices or asset purchases means the Fed can create its own form of moral hazard, as markets and governments come to see the central bank as a source of financial support or a tool of fiscal policy, thus undermining private and public fiscal discipline. This pressure will undermine central bank trust, invite politicization, and severely threaten monetary policy's effectiveness and independence.

To restore the boundaries between monetary and fiscal policy and to safeguard Fed independence, there needs to be a new Accord that clarifies and circumscribes the role of credit policy actions by the Fed. As noted at the outset of this essay, Goodfriend (1994) recognized that credit policy undertaken by the Fed poses risks to the institution. The importance of this issue has grown since the financial crisis, and it is apparent that there needs to be a clear statement of the roles and responsibilities of the Fed and Treasury to reinforce the integrity of both fiscal and monetary policy, and reduce uncertainty and moral hazard.

The original principles laid out in Goodfriend (1994) are useful, but the challenges that have materialized since the financial crisis go beyond anything Goodfriend likely envisioned in 1994. In my view, a new Accord must raise the bar on the fiscal authorities, as well as the monetary authority, to reverse the growing abuse of the Fed's balance sheet and to support and maintain Fed independence.

Goodfriend (2009), updated Goodfriend (1994) in light of the events in 2007-08. His three principles became six. Briefly, they were as follows: (1) the Fed should "adhere to a Treasuries-only acquisition policy except for occasional and limited discount window lending;" (2) the Fed and Treasury should "co-operate" to "shrink the central bank's lending reach" through program runoff or by moving the associated assets to "be managed elsewhere in the government;" (3) the Fed and Treasury should "co-operate" so that the credit policy actions do not "undermine price stability;" (4) the Fed and the Treasury should "agree on a low long run inflation objective to anchor inflation expectations;" (5) "the Treasury should help the Fed to secure the power of 'interest on reserves;'" (6) the Fed and Treasury should co-operate quickly on these matters to "secure the commitment to price stability."[62]

These ideas are principled but short on specificity, and the institutional mechanisms that would help ensure the boundaries on credit policies are transparent and effective. The call to "co-operate" does not change incentives or clarify the boundaries of credit policies but is most likely to result in maintaining the status quo. The Treasury-Fed joint press release in 2009, which was a response to internal and external criticism, acknowledged many important concepts but did not change the incentives or behavior of the Fed or the Treasury. Without institutional mechanisms or constraints that limit or define the scope for actions, the incentives to abuse the Fed's balance sheet through credit policy will remain a threat to the Fed and monetary policy independence.

[62] It is worth noting that in January 2012 the Fed established, for the first time, an explicit inflation target (see Lacker [2020] for a discussion of how that came about). Also, the Fed received the authority to pay interest on reserves in October 2008.

Early in the rush to transform the Fed's balance sheet into a tool of credit policy, I stressed two themes that would help clarify the boundaries of Fed credit policy and the resolution of conflicts.[63] The two themes are similar in spirit to Goodfriend's first and second principles given above. The first is to require the Fed to follow a Treasuries-only policy when conducting monetary policy. This is not a new idea but a return to the practice followed by the Fed for most of the postwar period. The agency MBS purchases were a dramatic departure from that practice but were legal under the FRA. My intention is to require a Treasuries-only portfolio with the exception of collateralized lending to solvent financial institutions through the discount window. The second theme is to address the role of the Fed as a "lender of last resort," a traditional function of a central bank, and particularly the powers embedded in Section 13(3) in emergencies.

The framework has three key features:[64]

1. The Federal Reserve should be required to maintain a Treasuries-only policy as it pertains to the conduct of monetary policy.

2. The Federal Reserve should be prohibited from purchasing non-Treasury securities or lending against private collateral except through traditional discount window operations with solvent depository institutions.

3. Emergency lending under Section 13(3) should be eliminated and replaced with a new arrangement where the Treasury is the responsible agency. The Treasury, however, may request assistance from the Fed in an emergency. The new provisions would *require* the Treasury to exchange (at book value) Treasury securities for any private or non-Treasury securities temporarily acquired by the Fed in the process.

[63] See footnote 26 (Board of Governors (2008b, p. 41) and Plosser (2009a, 2009b, and 2009c).

[64] This material follows Plosser (2017b).

The Fed Should Maintain a Treasuries-Only Policy in the conduct of Monetary Policy. From 1951 until 2007, as discussed earlier, the Fed conducted monetary policy through what can be described as a Treasuries-only policy, that is through the purchase and sale of Treasury securities. In August 2007, the balance sheet was $873 billion, and Treasuries accounted for about 90 percent ($785 billion) of Fed assets. As of October 2021, Treasuries only accounted for 64 percent of the balance sheet and agency MBS represented about 30 percent of Fed assets. These holdings comprised about 30 percent ($2.5 trillion) of all outstanding agency MBS, indicating how large the credit allocation program of the Fed had become. The purpose of a Treasuries-only policy is to prevent the Fed from subsidizing the housing sector (or any other sector) through its conduct of monetary policy. Yet, as noted earlier, the Fed explicitly stated that the purchases of agency MBS and agency debt were intended as a policy to give special credit preference to the housing sector over other sectors through monetary policy. Such credit allocation should be a fiscal policy decision and not left to the discretion of the monetary authorities.

One counterargument is that the Fed should not be limited to Treasuries, in fact, should not purchase Treasuries at all, as it ties monetary policy directly to the funding of fiscal deficits.[65] Allowing the Fed to purchase private sector securities (private equities, corporate bonds, etc.), so the argument goes, would help protect Fed independence by breaking the close link with government finance. Yet, this strategy seems worse than the alternative. Central banks with significant holdings of private sector securities would likely come under even more pressure from those who seek to use the balance sheet and the powers of the central bank for credit allocation in support of political or economic advantage.

The risk is real and already in play in other countries. For example, the Swiss National Bank (SNB) has come under pressure in the last decade from various groups, including the government, to manage their portfolio of investments (mostly comprised of foreign exchange

[65] See Selgin (2018) for example.

reserves) to satisfy other objectives. There have been calls for the SNB to invest more in Swiss firms to support the Swiss economy, to use its portfolio to support "green" investments or sell assets in fossil fuel industries to promote a climate change agenda, and the list of requests seems to grow over time. If the Fed were free to invest in private sector assets, there would be no end to the requests from Congress and elsewhere for the Fed to tailor its asset holdings to suit a variety of interest groups, both private and public. The Fed is already under pressure by the financial sector to respond to stock prices and other asset prices during volatile times. The Fed would likely come under enormous pressure to stabilize or boost the market if it were actively buying and selling large amounts of equities, even ETFs. Imagine future confirmation hearings for the Board of Governors that focused on how a nominee would manage the asset allocation of the Fed's multitrillion-dollar balance sheet rather than on the conduct of monetary policy.[66] Recently, the Fed has already accepted the premise that climate change should be a priority. There seems to be little doubt that it will come under intense political pressure to use its balance sheet to reflect this priority.[67]

The Fed's new "ample reserves" regime and its intention to maintain a large balance sheet increases the temptation for abuse.[68] For all these reasons, restricting the Fed to a Treasuries-only portfolio would be an

[66] This is another reason the Fed's ample reserves approach to an operating regime is potentially dangerous as it gives the Fed more latitude to expand the balance sheet for purposes other than monetary policy. See Plosser (2017a and 2020). On this point, Plosser (2020) and Selgin (2018) seem to agree in preferring the Fed return to a corridor or channel regime for achieving its interest rate target.

[67] This pressure is evident in the early 2022 confirmation hearings of nominees to the Board.

[68] An alternative would be for the Fed to shrink its balance sheet so it can return to its precrisis corridor regime, but this seems increasingly unlikely.

important step in restricting its role in credit allocation, reducing moral hazard, and helping protect its independence from political encroachment.[69]

It would be best to implement this requirement by amending Section 14(2) of the FRA that pertains to open-market operations. The change would limit the scope of securities eligible for sale and purchase by the Federal Reserve Banks. In particular, it would remove the provisions that allow the Fed to purchase MBS and certain short-term obligations of state or local municipalities.

This change does not replace the need for the continuation of the 1951 Accord, which deals with the size of the balance sheet. The interest rate peg implemented through the 1940s, for example, was implemented with a Treasuries-only strategy. With the freedom to expand the balance sheet enabled by the ample reserve regime, there will be even more pressure to use the Fed for off-budget public spending. To protect the independence of monetary policy and allow it to best address its mandated goals, the fiscal authorities (Treasury and Congress) must refrain from actions that move funds directly from the Fed's balance sheet to the Treasury. There also should be a reaffirmation of the 1951 Accord that pressuring the Fed to add government debt to its balance sheet through the required purchases of Treasuries to address fiscal demands is inappropriate. Such actions violate the spirit of the 1951 Accord.

Limited Lending to Financial Institutions. One role of central banks is to serve as a lender of last resort (LOLR). This notion dates back, at least, to the early 19th century and the work of Henry Thornton (1802) and later Walter Bagehot (1873). The basic idea is that central banks are

[69] Broaddus and Goodfriend (2001) argued for a Treasuries-only policy, not because the Fed was violating the idea in practice, but in reaction to the unlikely event that the federal government would pay off the public debt. The impetus for such a discussion was projections by the Congressional Budget Office (CBO) in 2000 suggesting that government surpluses might be sufficient to retire all of the public debt within a decade. They argued from the work of Goodfriend and King (1988) and Goodfriend (1994), much as is argued here, that the Treasuries-only policy is a good one and that the Fed and Treasury should cooperate to ensure that there remained a sufficient stock of Treasuries to allow the Fed to conduct monetary policy using Treasuries rather than purchasing private assets.

well suited to ensure the elasticity of the currency to address banking crises, which occur when banks, because of the maturity mismatch between their assets and liabilities, find themselves short of liquidity. In so doing, central banks can help ensure the integrity of the payment system through their provision of cash. Bagehot (1873) is credited with the recommendation that in the face of a banking crisis, the central bank should lend to solvent institutions at a penalty rate against good collateral to make sure solvent banks can easily accommodate depositors' demands for cash.

I will refer to the LOLR as the central bank lending to banking institutions. This essentially describes the functions of the long-standing discount window where the Fed lends to banks against a wide range of eligible collateral. The guidelines for borrowing from the discount window are that the firm must be solvent and the interest rate must be set above the traditional interbank lending rate, or federal funds rate. There is some logic to this as the central bank has a responsibility to support the continued functioning of the payments system in an emergency. Banks are regulated, the Fed has more ability to assess the solvency of the institution, and banks remain integral to the payment system. There are debatable questions as to the breadth of firms that should have access to the discount window. I believe the criteria should hinge on the role the institution plays in the payment system, not simply that it is part of the financial sector in general. But this is not a question that will be addressed in this essay.

Limitations on Emergency Lending to Nonfinancial Borrowers. Many people have come to accept the notion that the central bank's LOLR function implies that it should be a backstop lender to all manner of private institutions that are in stress. Section 13(3) is considered an emergency provision that allows the Fed to lend to the private sector under "unusual and exigent circumstances." Apart from agency MBS and agency debt purchases, almost all the facilities discussed in this essay were established under Section 13(3).

These programs were forms of credit policy that should be the responsibility of and accountable to the Treasury or Congress. There is little reason they could not have been undertaken by the Treasury.

We saw this was possible with the PPP. Even with the modified language of Section 13(3) enacted under Dodd-Frank, the Fed retains wide discretion as illustrated by the scope of programs developed in 2020. A new Accord must confront the possibility of emergencies but carefully recognize the appropriate placement of decision-rights and accountability. In Plosser (2009a), as the Fed was rapidly expanding its credit policies, I suggested that to safeguard Fed independence and ensure the integrity of fiscal policy, the Fed and the Treasury should agree to "an arrangement whereby the Treasury takes the non-Treasury assets and non-discount window loans from the Fed's balance sheet in exchange for Treasury securities." This would transfer funding for the credit programs to the Treasury, ensuring that credit policies that put taxpayer funds at risk are under the control of the fiscal authorities. It would also return the control of the Fed's balance sheet to the Fed so that it can continue to conduct independent monetary policy.

This strategy suggests replacing Section 13(3) with a new arrangement to address emergency lending that would clarify the boundaries for the Fed and the Treasury.[70]

- In an emergency, a request could be made by the Treasury for Fed assistance in facilitating government policies to support lending to individuals, partnerships, and corporations.
- If Congress has not previously granted contingency funds for such use, the Treasury would be required to immediately seek congressional approval and funding for the projected expenditures within 30 days of the action.
- Upon congressional approval, the Treasury would, within 14 days, arrange to exchange (at book value) Treasury securities for any non-Treasury securities or assets that may have been temporarily acquired by the Fed. Any gains or losses would thus accrue to the Treasury.
- Should Congress not approve the necessary funds within the 30-

[70] Such a rewrite should have occurred in the Dodd-Frank legislation.

day window, the Fed would be required to liquidate such securities within 60 days of their acquisition and the Treasury would be required to terminate the program.

By exchanging the private sector assets on the Fed's balance sheet for Treasuries, the Treasury-only requirement is restored, and the Fed can control the size of its balance sheet through normal operations. The exchange does not alter the program in any way; the credit policy or distributional aspects remain in place. The Treasury was responsible for the program and it remains responsible. If the Fed funded the acquisition of the non-Treasury assets by the sale of Treasuries (that is sterilized), the exchange would leave the balance sheet back where it stood prior to the initiation of the program. If the assets purchased were funded by an expansion of the balance sheet (that is unsterilized), the exchange would permit the Fed to shrink its balance sheet, through the sale of Treasuries, back to its previous level or not depending on what it thought was the appropriate size. These provisions incorporated into a new Section 13(3) ensure that credit policies remain the responsibility of the Treasury and Congress, reducing the threats that the Fed will be pressured to undertake further action on its own discretionary authority or that the composition of the balance sheet could impinge on monetary policy decisions.

This arrangement would clarify the boundaries of Fed credit policies in terms of decision-rights and accountability. The Fed could be a facilitator on behalf of the Treasury but would not make discretionary decisions on credit actions. Congress would have to recognize its responsibilities by agreeing in advance to the process and recognizing that the Fed would be required to sell assets if the decisions on the funds are not forthcoming.

Closing thoughts

The Treasury-Fed Accord of 1951 was a significant turning point in establishing the Federal Reserve as an independent central bank. By abandoning the Treasury's requirement that the Fed maintain the peg on government bond yields, it allowed the Fed to control its own balance sheet and freed it to tighten monetary policy to control inflation.

Over the years, but especially after 2008, the Fed and the Treasury have significantly changed their approach to the central bank's balance sheet.

Some might argue that the new Fed-Treasury approach was all driven by the confrontation with effective lower bound and the financial crisis that required unusual steps and unconventional policies. This certainly has an element of truth. This essay, however, is not intended as an evaluation of the efficacy of the programs themselves. Rather, my concern is that the deep involvement and reliance on the Federal Reserve to initiate and administer fiscal policy — in the form of the allocation of credit — puts at risk the political independence of the central bank and the integrity of fiscal policy.

In early 2020, more than a decade after the financial crisis, the Fed was a long way from what most would call a normal policy framework, most notably in its vast holdings of agency MBS. Its new ample reserve regime does not offer much guidance on how the balance sheet will be managed in terms of its size or its composition. Will balance sheet expansion occur at times other than when constrained by the zero bound? Will MBS purchases become a staple of future expansions? Without sales, they will remain on the balance sheet for many years. Will credit policies become a more standard feature of the operating regime? The Fed's behavior since 2007 has surely affected the public's expectations along these lines and the Fed may find it difficult to say no.[71] When the pandemic came and the government shut the economy down, the Fed pulled out the same playbook (zero rates, massive asset purchases combined with credit allocation policies, including purchases of MBS, and emergency lending facilities) even though the shock was quite different from the financial crisis. While to some this may appear to be a natural and even desirable step, it is both troubling and risky from the standpoint of Fed independence and the conduct of monetary policy.

[71] This confusion surrounding the ample reserve regime and how it will be implemented adds uncertainty to the conduct of monetary policy, and it suggests that the Fed should consider returning to a corridor system. This would help strengthen the Fed's position against those that might seek to take advantage of the Fed's balance sheet for other purposes.

To ensure and strengthen the independence of the Fed, clearer boundaries between monetary and fiscal policies should be established. Without such boundaries, the Fed will come under increasing pressure to use its balance sheet, and especially credit policy, to further the special interests of politicians or those in the private sector. Given this "new" world and the expanded role the Fed and the Treasury have taken for the balance sheet, we must consider amending the 1951 Accord to address the new challenges to independence.

Credit policy poses a threat to Fed independence just as did the practice of pressuring the Fed to pursue an interest rate peg in the post-WWII era. This essay seeks to address the shortcomings of the 1951 Accord by restricting the Fed to holding only Treasury securities. It also recommends that Section 13(3) be replace with a rule that credit programs should be initiated and managed by the Treasury, not the Fed. The Treasury could seek the Fed's assistance in facilitating such programs. But consequences must be clear in the statute. In particular, if such facilitation results in the Fed acquiring non-Treasury assets on behalf of the Treasury, then the Treasury must replace those assets with government securities within a relatively short, predetermined time period, or they would be sold in the market, returning the Fed's balance sheet to its Treasuries-only status. These steps would strengthen the institutional framework supporting Fed independence and the integrity of both monetary and fiscal policy.

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Industrial Development and Convergence

Sergio T. Rebelo and Pierre-Daniel G. Sarte

Marvin Goodfriend was an economist with broad interests. He is well known for his contributions to macroeconomics and monetary economics. But he was also an avid reader of economic history and a student of the forces that drive economic growth.

Goodfriend wrote two papers on growth with his Brown University classmate John McDermott: "Early Development" and "Industrial Development and the Convergence Question," published in the *American Economic Review* in 1995 and 1998, respectively.

Early Development (Goodfriend and McDermott, 1995) examines the transition from a traditional, stagnant economy to a modern, growing economy. This work is part of an extensive literature on poverty traps and industrialization that includes Murphy and Shleifer (1989), Becker, Murphy, and Tamura (1990), Galor and Weil (2000), and Lucas (2002).

Industrial Development (Goodfriend and McDermott, 1998) highlights the importance of familiarity with the technologies of other countries in the returns to human capital accumulation and the growth process. This work is part of a large literature on the connections between trade and growth.[1]

In this essay, we describe the Industrial Development model and ponder its lessons for contemporary policy discussions.

Model structure

Goodfriend and McDermott (1998) develop a model in which human capital accumulation is the engine of growth, as in Lucas (1988).

[1] Grossman and Helpman (1991, 2015) and Eaton and Kortum (2001).

The novel dimension is an interaction between the size of the population and the technology for human capital accumulation.

Final output is produced by combining efficiency units of labor with a continuum of differentiated goods produced by monopolists. There is free entry into the production of differentiated goods, so profits are zero in equilibrium. But, unlike Romer (1990), Goodfriend and McDermott assume in both of their papers that firms do not have to incur research and development costs to produce a new differentiated good.

The key mechanism is that a larger population results in higher demand for differentiated goods. The prospects of higher sales and profits induce entry so that a rise in population increases the number of differentiated-good producers. In turn, the number of differentiated goods produced has a positive impact on the ability of workers to accumulate human capital. Goodfriend and McDermott (1998) assume that this driver of human capital accumulation depends on how many goods are produced at home and how many of the goods produced abroad are familiar to domestic agents.

Ultimately, the setup is one in which countries that are open to the rest of the world, and familiar with technologies used or developed elsewhere, find it easier to accumulate know-how. As a result, these countries develop at a rate that allows them to catch up and even overtake the per capita output levels of more advanced trading partners. By contrast, countries that are less inclined to promote openness, and are less familiar with technologies used elsewhere, fall persistently behind the leading countries and potentially never catch up.

Context and contributions

In thinking about the broader arch of economic history, from the eve of the Industrial Revolution to recent times, Goodfriend and McDermott (1998) sought to identify key mechanisms underlying economic development that would not necessarily be evident over a shorter time period or in an individual country. They also recognized that these mechanisms needed to be consistent with periods of both divergence and convergence across countries during the process of world growth.

Goodfriend and McDermott (1998) isolates one of the potential ingredients responsible for the Japanese, South Korean, and Chinese growth miracles. In the context of their model, the familiarity of firms and workers in these economies with goods produced in the US increased the returns to human capital accumulation, fostering a period of fast growth. The concept of familiarity with foreign economies, in particular, which plays a central role in Goodfriend and McDermott (1998), now seems prescient given the explosion of information-sharing that the information technology revolution was about to make possible.

The Goodfriend and McDermott (1998) model can be used to think about some grand experiments implemented in the 20th century: Japan, South Korea, and other Asian countries chose export promotion as their development strategy in the 1970s and, starting in 1979, China also went this route. By contrast, India, Latin America, and Africa chose import substitution as their development policy.

Import substitution had the appeal of combining economic growth with political independence from the US and other large economies. In particular, Latin American countries hoped that import substitution would be a solution to the problem of being, in the words of the Mexican president Porfirio Dias, "too far from God, too close to the United States." After becoming independent in 1947, India hoped that import substitution would allow it to achieve "swadeshi," i.e., a genuine self-reliance that would make India independent of both communist and capitalist countries.

Import substitution produced some early wins. In 1954, Hindustan Motors, a state-owned Indian company, started producing automobiles. Imposing high tariffs on foreign goods and fostering the development of a domestic industry helped create a fast-growth decade in Brazil during the 1970s.

But these successes proved ephemeral. The Ambassador, the car first produced in India in 1954, remained almost unchanged for 50 years. Import substitution turned Brazil into one of the world's most closed economies. By protecting its computer industry, Brazil made

the domestic price of computers much higher than the international price,[2] reducing the productivity benefits from adopting information technologies in a wide range of industries. The success of Brazil in the 1970s was followed by decades of stagnation that lent credence to the famous quip by the writer Stefan Zweig: "Brazil is the land of the future and always will be."

There are many aspects of import substitution regimes that might have contributed to their poor performance. The extensive government involvement in the economy gave entrepreneurs an incentive to invest in political connections rather than learning new technologies or adopting from abroad. At the same time, the protection from competition reduced incentives to be efficient and invest in new technologies.

Goodfriend and McDermott (1998) add two important factors to this standard list of the perils of import substitution. The first factor is scale. In many countries, the internal market is too small. According to Scitovsky (1969), the 1960s saw 90 Latin American companies in eight countries producing cars and trucks with a combined volume of about 600,000 vehicles. Yet, he documents that during this period, the efficient scale for an automobile plant was estimated to require a minimal annual production of 250,000 vehicles. In the Goodfriend and McDermott (1998) model, scale matters indirectly: it affects the returns to human capital accumulation and the associated growth prospects. In earlier work, Goodfriend and McDermott (1995) argued that a large enough scale, achieved through population growth, was key to increased specialization, which eventually raised learning productivity enough to kick start a period of self-sustaining technological progress.

The second factor highlighted by Goodfriend and McDermott is familiarity with foreign goods and technologies. Countries that close their doors to trade also shut their doors to foreign technologies. In the Goodfriend and McDermott (1998) model, low familiarity with foreign goods depresses the returns to human capital accumulation and

[2] Luzio and Greenstein (1995).

dims growth prospects. Here, familiarity is envisioned as stemming in part from active commercial relations, but also from a more pervasive knowledge of foreign cultures and commodities.

Reading this paper brings to mind themes that are very relevant today. Just as the information technology revolution was about to hit its stride, Goodfriend and McDermott (1998) wrote that "... it is easy to see that familiarity would grow over time with the economy. Nations become more familiar with each other as technological progress lowers transports costs and communication costs." After achieving remarkable success with export promotion, China is now turning to import substitution with its campaign "Made in China 2025." Goodfriend and McDermott's (1998) model predicts that this choice will penalize China's growth prospects. But will progress in information technology allow China to stay inside its great walls and maintain familiarity with the technological world outside?

As it turns out, forces that contributed to familiarity with the outside world also brought to the fore new vulnerabilities such as cybercrime and intellectual property theft. Intellectual property products, in particular, are now a key component of investment goods in the US National Income Accounts following, in part, a reclassification of industries in 1999 and again in 2013. Therefore, will the ease with which information can be obtained increase the incentive to accumulate human capital in countries that are still relatively closed to foreign trade? In Goodfriend and McDermott (1998), world growth is maximized when all countries are perfectly familiar with each other. Would they still see the world in this way 25 years later?

These are fascinating topics that can be discussed in the context of the Goodfriend and McDermott (1998) model. We only wish that Marvin could be here to debate them with us, as he would have undoubtedly done enthusiastically.

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Rational Expectations and Volcker's Disinflation

Thomas J. Sargent

I am grateful to the authors of Goodfriend and King (2005) for letting me watch two masters of modern macroeconomics at work as they marshal both quantitative and narrative evidence and then carefully choose simple, but not too simple, theoretical tools to interpret the evidence. I lived through the turbulent times they describe, and their account rings true, as I tell at the end of this essay. I write this with mixed feelings because the theory that they use with so much success abandons the rational expectations equilibrium concept that I love so.[1]

People inside a rational expectations model share a unique statistical model. For given parameters that describe technologies, preferences, and information flows, there is typically a manifold of rational expectations equilibria that are indexed by distinct budget-feasible government policies. Credible government plans are special rational expectations equilibria in which government policies are chosen by a sequence of policymakers who always choose to continue a possibly history-dependent plan.[2] A government strategy is a sequence of history-dependent functions that map a history at time *t* into government actions at time *t*. A government strategy is effectively a sequence of conditional distributions for future actions that government decision-makers choose to confirm. In models of credible government policies, government decision rules thus play two roles, one as decision rules for policymakers and another as the public's *forecasting functions*. The "communism of statistical models" that prevails within a rational expectations equilibrium and the subgame perfection that prevails

[1] Baxter (1985) and Ball (1994, 1995) also either refined or abandoned rational expectations equilibria in order to understand episodes in which the credibility of fiscal-monetary policies was the focus of public discussions.

[2] Chang (1998) provides sharp definitions of a manifold of rational expectations equilibria and of credible government policies within an elementary monetary model.

within a model of credible government policy have the consequence that it is subtle, if not impossible, to tell who chooses a government policy — government decision-makers or private forecasters. In a rational expectations model of credible public policy, the conditional probability distributions that the public uses to forecast are the very same ones that government policymakers want to confirm.[3] In such an equilibrium, a Federal Open Markets Committee (FOMC) would never want statistically to disappoint or surprise the market. Such an FOMC feels no urge to "acquire credibility."[4]

The authors of Goodfriend and King (2005) were accomplished architects of rational expectations models. But for good reasons, they chose not to interpret the Volcker disinflation by constructing a rational expectations model. Their thorough readings of FOMC transcripts and other sources left Goodfriend and King (2005) without a coherent description of an FOMC decision rule or evidence that the Fed thought systematically about designing one. It described disagreements and confusions about macroeconomic structures among FOMC members. It documented FOMC concerns that the market's expectations about inflation and other outcomes differed systematically and persistently from FOMC targets. Goodfriend and King spotted "inflation scares" in high long-term interest rates that had disappointed the FOMC's intention that by pushing short-term nominal interest rates *up* it could

[3] See Chari and Kehoe (1990) and Stokey (1991).

[4] This statement is an accurate description of a large class of plain vanilla rational expectations models in the Ramsey plan tradition and its extension to models of credible policies by Chari and Kehoe (1990) and Stokey (1991) as refined by Bassetto (2005). For example, see Chang (1998). These models have a single type of policymaker who, together with private agents inside the model, all trust the same single statistical model. It is a less accurate description of rational expectations models that like Backus and Driffill (1985a,b) and Lu et al. (2008, 2016) posit multiple types of policymakers who have different objective functions. In these models, a policymaker has an incentive to pretend to be another type. The claim in the text is also dubious in rational expectations models in which policymakers have multiple statistical models about which they are uncertain, so that what constitutes "the unique model" for a rational expectations equilibrium concept is possibly what a Bayesian statistician would dub a "hierarchical model" that involves Bayesian model averaging over the distinct statistical models.

lower long-term nominal interest rates by permanently lowering inflation rates.[5] Disconnecting the market's forecasts from those of policymakers is impossible in a rational expectations equilibrium. These considerations led Goodfriend and King to abandon a rational expectations equilibrium concept in creating their model of a central banker striving to "acquire credibility." Thus, Goodfriend and King (2005, p. 34) summarized their paper in this way:

> In contrast [to what goes on in a rational expectations model], during the Volcker disinflation the Fed needed to acquire credibility for low and stable inflation. We studied this episode without having a firm understanding of Fed behavior, so instead we adopted an analytical strategy that focused on the interplay between inflation, expected inflation, credibility and real activity without specifying the monetary policy rule. We sought to document how the Volcker FOMC tried to acquire credibility: with an initial appeal to monetary targets as a nominal anchor, with new operating procedures designed to allow greater scope for short-term interest rates to be determined by market forces, and ultimately by employing an interest rate and reserve aggregate policy mix to work the actual inflation rate down. Our methodology for studying the disinflation without a firm understanding of the Fed's behavioral rule places us in a position similar to the public and the FOMC itself. To improve our understanding of the Volcker disinflation, it will be necessary to specify Fed behavior explicitly and to model the interaction of Fed policy with the dynamics of private sector beliefs about inflation. Requiring these beliefs to be consistent with the financial market data will allow a clearer understanding of the role of imperfect credibility in the Volcker disinflation.

Goodfriend and King's model combines an artfully parameterized inflation "forecast credibility gap" with an expectational Phillips curve and a Fisher equation. By intentionally taking its "forecast credibility

[5] See Goodfriend (1993) for a definition of an inflation scare and a technique for diagnosing one.

gap" equation as a primitive and intentionally not providing "micro-foundations" for it, it got a convenient tool for precisely defining and quantifying a credibility gap. The paper calibrated its model to do a good job of approximating inflation, unemployment, and long- and short-term interest rate paths under the Volcker-led FOMC and inferred private sector beliefs about prospects for inflation. Its concluding section, part of which I just quoted, called for more work to learn about the imperfect credibility that challenged Volcker's FOMC and our assessment of how well the FOMC had coped with it.

I admire Goodfriend and King's thoughtful marshalling of the evidence that led to their sparsely parameterized non-rational expectations model as well as the road map it provides for further work. In the spirit of its concluding section, I mention just two routes opened up by its abandoning of rational expectations, each of which involves belief heterogeneities and model uncertainties. The first, exemplified by the Bayesian model-averaging setup of Cogley and Sargent (2005), acknowledges that in the 1970s and 1980s neither the academic macroeconomic community nor the Federal Reserve staff nor FOMC members had settled on a macroeconomic model. Competing views about dynamic trade-offs between inflation and unemployment were embedded in alternative conceptions of a Phillips curve. Cogley and Sargent describe a setting in which part of the FOMC's information is a Bayesian posterior over three distinct Phillips curves, each of whose coefficients are themselves updated as data accrue. The FOMC's initial 1960 prior puts almost all probability on a Samuelson-Solow Phillips curve and very little on a Lucas rational expectations version of an expectational Phillips curve.[6] An intertemporal objective function tells the FOMC to pay attention not only to posterior probabilities attached to each model, but also to the continuation values implied by each of them. Then a peculiar thing happens. Even though observations gathered during the 1970s tell the policymaker to put most weight on the Lucas model, the updated Samuelson-Solow model tells the policymaker that very bad continuation values would be associated with the rapid inflation stabilization policy that the Lucas model recommends.

[6] Goodfriend and King's model includes such a Phillips curve.

It is only after enough data caused updated coefficients of the Samuelson-Solow model to imply that less adverse outcomes would occur under the recommended actions from the Lucas model that the FOMC ultimately decided to sharply reduce inflation toward zero. Thus, posterior probabilities attached to the three models are not all that matters. When they predict sufficiently adverse consequences of following advice delivered by higher posterior probability models, models with low posterior probabilities can derail recommendations that come from higher posterior models. Consequently, the FOMC will decide to stabilize inflation only after estimated coefficients of the Samuelson-Solow model have adapted to imply low enough inflation-unemployment "sacrifice ratios." Note how this special type of "model averaging" recommendation system gives special weight to models that set off Cassandra warnings like those proclaimed by Arthur Okun (see Goodfriend and King [2005, pp. 982-83]) and many others.

"Expectations management" is a second research agenda opened by Goodfriend and King's decision not to use a rational expectations model. To make progress on this topic requires a setting in which, first, private agents and the government have different beliefs; second, the government has a model of how its actions affect private agents' beliefs; and third, discrepancies of beliefs between government and private agents can be rationalized. Filling all three of these requirements simultaneously is a tall order. Karantounias (2013, 2018) offers a promising approach based on a multi-agent application of robust control theory. In his setting, a representative agent and a Ramsey planner share a common approximating statistical model, just as they do in a rational expectations model. But now one or both of them distrusts the approximating model. In Karantounias (2013), the Ramsey planner completely trusts the approximating model, but private agents don't; the Ramsey planner knows this. Because private agents choose policies that are best responses not to the shared approximating model, but to their worst-case model, an object that is affected by the Ramsey planner's policy, the Ramsey planner is thrust into manipulating private agents' beliefs. In a similar vein, Presno and Orlik (2016) study expectations management as components of credible government policies in a Chang (1998) monetary environment that they alter

by having private agents manage their distrust of an approximating model by using techniques from robust control theory.[7]

Goodfriend and King's story rings true to me as an eyewitness to events they describe so well. In June 1976, I attended a meeting of a group of "academic consultants" at the Federal Reserve Board in Washington, DC. I had been invited by George Leland Bach, the organizer of the meeting, at the urging of fellow attendee Milton Friedman. I think I was invited because Milton Friedman had told Lee Bach that I was one of "those crazy economists up in Minnesota" who talked about macro models in which the FOMC is just a decision rule that maps its information into its actions, a rule that everyone inside and outside a macroeconomic model knows.[8] Arthur Burns chaired the meeting.

Academics were supposed to discuss a report the Fed staff had prepared. Lead speakers for the academics were Milton Friedman and Arthur Okun, representing contending "monetarist" and "Keynesian" perspectives. Friedman spoke first and offered a scholarly discussion of the Fed staff report, drilling down especially on two or three footnotes. Then Arthur Okun brought out fireworks based on his passionate belief in sacrifice ratios like those summarized by Goodfriend and King (2005, pp. 982-83). Okun did not mention the Fed staff report. Instead, he lambasted the FOMC for the crusade that he said it was now pursuing to stamp out inflation quickly, while foolishly ignoring what he said were big social costs in terms of GDP and unemployment. He said that the Fed had decided to do that on its own authority against what Okun understood to be the preferences of the public and Congress. Okun concluded by warning Burns and the other governors that if they chose to persist in so abusing their independence, they would have nobody to blame but themselves if Congress were soon to take away their independence. After moments of silence as he puffed his pipe while looking straight at Okun, Chairman Burns said, "Would the next-speaker please confine himself to economics?" Burns then sequentially

[7] Robert King and others have rolled up their sleeves and worked on this problem using a quite different approach than I describe here, and one that I think is very fruitful. See King et al. (2008) and Lu et al. (2016).

[8] According to Silber (2012, p. 176), the quotes indicate what Paul Volcker thought of those of us then working in Minnesota.

asked the other academics present to comment on the Fed staff report.

Before my turn, Governor Henry Wallich said, "Mr. Sargent, your tribe always talks about monetary policy rules and rational expectations. OK. Please tell me what you think our rule is." I answered, "I can't tell." Goodfriend and King's careful sifting of more documentary evidence than I certainly had at that time indicates that, like me at the time, they could not fathom a coherently thought-out FOMC decision rule. The gap between actions at the FOMC and how we "crazy Minnesota economists"[9] thought choices should be framed did not reflect well on the FOMC.[10]

[9] And of course also at Chicago and Carnegie-Mellon and Rochester.

[10] For an extended account of Volcker's struggle permanently to lower US inflation that mostly agrees with Goodfriend and King's, see Silber (2012, Part III). Silber recently offered an ominous comparison of discrepancies between current bond traders' market-revealed inflation forecasts and those of monetary policy analysts like himself and the opposite sign of such discrepancies that Volcker confronted. Silber fears that a "credibility gap" of opposite sign now threatens us. See Silber, William L., "Why Last Week's Higher Inflation Left Bond Yields Unchanged." LinkedIn post, July 18, 2021, available at https://www.linkedin.com/in/william-silber-0a854b158/detail/recent-activity/shares/.

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Monetary Mystique and the Fed's Path Toward Increased Transparency[1]

Lars E.O. Svensson

Marvin Goodfriend's paper "Monetary Mystique: Secrecy and Central Banking"[2] is a masterpiece: It is an extremely well-written, meticulous, and fair analysis and critique of the Federal Reserve's defense of its practice of secrecy in monetary policy and central banking. His critique was devastating, and he completely demolished the Federal Open Market Committee's (FOMC) arguments in the most precise and convincing way. Nevertheless, it took the Fed many years to reach the current standards of transparency and accountability in monetary policy.

The paper and its background

When Marvin wrote and published his paper, central banking was generally cloaked in mystery. In a much-quoted paragraph, Karl Brunner had written in 1981:

> Central Banking [has been] traditionally surrounded by a peculiar and protective political mystique. . . The mystique thrives on a pervasive impression that Central Banking is an esoteric art. Access to this art and its proper execution is confined to the initiated elite. The esoteric nature of the art is moreover revealed by an inherent impossibility to articulate its insights in explicit and intelligible words and sentences.[3]

[1] I thank Alan Blinder for help with the chronology of the Fed's path toward increasing transparency and Robert King and Alexander Wolman for helpful comments. Support from the Jan Wallander and Tom Hedelius research foundation and the Tore Browaldh research foundation is gratefully acknowledged. Views expressed and any errors are my own.

[2] Goodfriend (1986).

[3] Brunner (1981), p. 5; Goodfriend (1986) provides a longer quote.

A specific background to Marvin's paper was that in March 1975, the FOMC of the Federal Reserve System was sued under the Freedom of Information Act to make public, immediately following each FOMC meeting, the policy directive and minutes for that meeting. At the time, the policy directives were available to the public 90 days after their decision. In response to the suit, the FOMC did shorten the publication lag to 45 days, which was a few days after the next regularly scheduled meeting. But the Committee stated that it was not prepared to disclose policy actions and minutes immediately after an FOMC meeting.[4] The suit went to court. After six years of court proceedings, including a hearing before the US Supreme Court, the case was decided in 1981 in favor of the FOMC.

Nevertheless, even though the FOMC won the legal case, it lost the intellectual case. The suit forced the Federal Reserve, for the first time, to provide a detailed written defense of its secrecy. The court records were made public. This allowed Marvin to summarize and evaluate the FOMC's arguments for continued secrecy. He collected the arguments found in the FOMC's affidavits into five categories:

1. *Unfair speculation:* Only the large speculator is in a position to benefit from disclosure of the current policy directive.
2. *Inappropriate market reaction:* Current disclosure would cause the market to overreact or to react contrary to the intention of the FOMC; in general, market reaction would be more difficult to predict with current disclosure.
3. *Harm to the government's commercial interest:* Current disclosure would cause market reactions that would raise the cost of marketing US Treasury debt and make open market operations more costly.
4. *Undesirable precommitment:* The FOMC does not wish to precommit its future policy actions, and current disclosure of the policy directive would tend to precommit the FOMC.

[4] The FOMC also discontinued its Memoranda of Discussion, the detailed written minutes, removing them as an issue in the case (Goodfriend 1986, footnote 13).

5. *More difficult interest rate smoothing:* Current disclosure would make it more difficult for the FOMC to smooth interest rates.

The FOMC's arguments are laughable by today's standards. They were probably laughable to Marvin at the time, but he took them very seriously. He meticulously and fairly evaluated each category of arguments in the light of existing economic theory and "recent theoretical work related to the secrecy issue." And he ended up completely demolishing the arguments in the most precise and effective way.

In the abstract of the paper, Marvin wrote (my emphasis): "The discussion highlights a number of potential benefits and costs of central bank secrecy, and identifies *some conditions under which secrecy could be socially beneficial*." In the summary at the end of the article, Marvin furthermore wrote (my emphasis):

> [My critique of the FOMC's defense], based heavily on rational expectations reasoning, *supported some FOMC contentions* and pointed out some theoretical weaknesses in others. In order to investigate the secrecy issue further, theoretical papers related to the secrecy issue were reviewed. The discussion highlighted a number of potential benefits and costs of central bank secrecy, and *identified some conditions under which secrecy could be socially desirable*. At best, however, given the inconclusiveness of the theoretical arguments and the presumption that government secrecy is inconsistent with the healthy functioning of a democracy, further work is required to demonstrate that central bank secrecy is socially beneficial. (p. 90.)

However, as far as I can see in Marvin's main text, he did not find *any reasonable conditions* under which secrecy would be socially beneficial and some FOMC contentions would be supported. The abstract and summary seems to have been written in order to somewhat hide the true force of the critique in the main text. If so, this is understandable. That Marvin wrote and published this paper must be seen as an act of considerable courage. Marvin was a vice president at the Richmond Fed at the time. That an insider of the Fed, a vice president of a Federal Reserve Bank, publicly criticized — even implicitly ridiculed — a major FOMC position was not a trivial thing.

As far as I know, Marvin had the full support of his boss, J. Alfred Broaddus, who had been appointed director of Research and senior vice president at the Richmond Fed in 1985. Broaddus presumably also had the support of his boss, President Robert P. Black. But the paper must have been very unpopular with the FOMC and the chairman of the Federal Reserve Board in 1986. It seems that one could easily have anticipated then that the paper could have negative consequences for Marvin's career in the Federal Reserve System.

Paul Volcker, who was chair until August 1987, was hardly a friend of transparency. He "liked to blow smoke — both literally and figuratively — in his congressional testimonies."[5] Neither was the new chair, Alan Greenspan. He boasted that he had learned to "mumble with great incoherence," and famously told an audience that "if you think what I said was clear and unmistakable, I can assure you you've probably misunderstood me."[6] More specifically, in 1989 — three years after the publication of Marvin's paper — an apparently unconvinced Greenspan vigorously argued in Congress against immediate announcements of changes in the federal funds target:

> The immediate disclosure of any changes in our operating targets would make this information available more quickly to all who were interested, but it would have costs. Simply put, this provision would take a valuable policy instrument away from us. It would reduce our flexibility to implement decisions quietly at times to achieve a desired effect while minimizing possible financial market disruptions. Currently, we can choose to make changes either quite publicly or more subtly, as conditions warrant. With an obligation to announce all changes as they occurred, this distinction would evaporate; all moves would be accompanied by announcement effects akin to those currently associated with discount rate changes.[7]

[5] Blinder (2020).

[6] Blinder et al. (2001).

[7] Greenspan (1989), pp. 14–15.

The Federal Reserve's path to increased transparency

It took quite a few years for the Fed to become more transparent and less secret, in what Yellen (2012) called a "recent revolution and continuous evolution" and Blinder (2020) called a "slow-motion revolution." In February 1994, immediately after the FOMC meeting, the committee surprised Fed watchers and media by issuing a statement under Greenspan's name:[8]

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

After this, there were announcements immediately after the FOMC meetings at which the federal funds rate was changed.

Thus, eight years after the publication of Marvin's paper, the Fed gave up its strong resistance toward disclosing its policy decisions immediately after each meeting. The Fed thereby implicitly acknowledged that Marvin had been right. Marvin had completely won the case.[9]

However, this was not the end of the Fed's steps toward increased transparency. As noted by Blinder (2020, p. 43), in August 1994, the Fed offered its first bit of forward guidance — although that term

[8] FOMC (1994).

[9] Broaddus would be appointed president of the Richmond Fed in 1993, and Marvin was the same year promoted to senior vice president and director of Research. Ex post, neither Marvin's nor Broaddus's career seems to have suffered.

would not appear until years later: In announcing that it was raising both the discount rate and the federal funds rate by 50 basis points, rather than the expected 25, the committee added that "these actions are expected to be sufficient, at least for a time, to meet the objective of sustained, noninflationary growth," where "at least for some time" was a new phrase.

More importantly, in 1999, the FOMC started to issue a short explanatory statement also when the interest rate was *not* changed. The FOMC also started to reveal whether there was a "bias" toward future tightening, easing, or neither in its thinking about the near-term future of interest rates, that is, effectively a near-term forward guidance.[10] During Greenspan's time, a more specific much-noted forward guidance appeared in the August 2003 statement and subsequently:

> The Committee judges that, on balance, the risk of inflation becoming undesirably low is likely to be the predominant concern for the foreseeable future. In these circumstances, the Committee believes that policy accommodation can be maintained *for a considerable period*.[11] [12]

There were several further steps toward more information and transparency with Ben Bernanke as chairman (see Blinder, 2020, and Yellen, 2012, for details). In November 2007, the first "Summary of Economic Projections" (SEP) — a summary of FOMC participants' individual projections of GDP, unemployment, and inflation produced four times a year — was included in the minutes published three weeks after the October 2007 FOMC meeting. Any individual projections of the federal funds rate were not included at this time. After the federal funds rate hit its perceived effective lower bound (0–25 basis points) in December 2008, the statement was amended in 2009 to include decisions on asset purchases and more explicit forward guidance for the interest rate,

[10] Blinder (2020).

[11] FOMC (2003a), my emphasis.

[12] The expression "for a considerable period" had first appeared in Greenspan's July 2003 testimony before Congress (Greenspan 2003). There is some interesting, lively, and perhaps even tense discussion in the August 2003 FOMC meeting about whether or not to include that sentence in the FOMC statement (FOMC 2003b, pp. 86–95). (I am grateful to Alexander Wolman for alerting me to this.)

first in the form of initial qualitative language similar to the 2003 language: "for some time," then "for an extended period," which remained until August 2011, when a specific date was first mentioned. This "calendar-based" forward guidance was later changed to be "data-based." In April 2011, the first press conference after a meeting was held. Then an advance version of the SEP table on the ranges and central tendencies of the participants' projections was released.

In January 2012, there were two major steps. First, the "Statement on Longer-Run Goals and Monetary Policy Strategy" was issued. It was an extremely well-written and concise summary of the Federal Reserve's goals and strategy. It has since been reaffirmed by the FOMC every year in January.[13] The statement was the result of a subcommittee chaired by then Vice Chair Janet Yellen (see Yellen, 2012, for details and the case for transparency). Second, the SEP was amended to also include the individual FOMC participants' projections of the federal funds rate, the "dot plot" of individual participants' assessment of the appropriate policy-rate settings over the next three years and the long run.[14]

With these two steps, the Federal Reserve had arguably become a full-fledged flexible inflation targeter, including doing "forecast-targeting" (see Svensson, 2020b, for details). The Fed's loss function was well understood, and the "balanced approach" indicated equal weight on stabilizing inflation around the inflation target and employment around its estimate of full employment.[15] It was publishing projections of its target variables, inflation and employment (unemployment), and of its main instrument, the federal funds rate.

To be precise, the SEP includes the FOMC participants' *individual* projections *before* the meeting; it is not the result of a joint decision about a *joint* projection *at* the meeting. In particular, the projections are not linked together: the SEP shows the distributions for each variable but

[13] FOMC (2012b).

[14] FOMC (2012a).

[15] Yellen (2020).

not the joint distribution (no table with numbered rows for participants and columns for variables, even unnamed). For that, one has to wait five years until the minutes and SEPs amended with such unnamed tables are released. Nevertheless, the SEPs are quite informative: they provide forward guidance about the participants' appropriate policy paths, reveal the participants' long-run forecasts (including the neutral unemployment and policy rates), and help to hold the FOMC accountable for achieving its goals.[16] Perhaps the median projections are not so different from what a vote on the projections would result in?[17]

The new monetary policy strategy

In August 2020, the Federal Reserve announced a revision of its monetary policy strategy and released a new "Statement on Longer-Run Goals and Monetary Policy Strategy,"[18] a result of the strategy review that it had initiated in 2019.[19] With regard to the *maximum employment mandate*, the FOMC now seeks over time to mitigate "shortfalls" of employment from its maximum level, not "deviations." This means that a low unemployment rate by itself, unless accompanied by signs of unwanted increases in inflation, will not justify a policy tightening. Focusing on shortfalls of employment instead of deviations introduces an asymmetry in the maximum employment mandate, and the statement drops previous language about "a balanced approach."

[16] Svensson (2020a,b).

[17] A decision-making process whereby the FOMC arrives at an explicitly joint policy-rate path and corresponding inflation and unemployment forecasts would be more consistent with forecast targeting. As discussed in Svensson (2020b, pp. 81–82), the FOMC has undertaken some experiments in constructing a consensus policy-rate path and forecasts of inflation and unemployment. They are discussed in some detail under the heading "Experimental Consensus Forecast" in the October 2012 transcripts, FOMC (2012c, pp. 201–79). There were several difficulties noted about constructing consensus forecasts, including that the policymaking environment was unusually complex with both unconventional portfolio actions and forward guidance being important policy tools. In view of these difficulties, the FOMC abandoned the consensus forecast exercise at the time — perhaps not permanently — and instead focused on improvements to the SEP. This resulted in the first dot plot, in FOMC (2012a).

[18] FOMC (2020).

[19] Powell (2020).

With regard to the price *stability mandate*, the FOMC now "seeks to achieve inflation that averages 2 percent over time." This implies that if inflation has been running persistently below 2 percent, the FOMC would likely aim to achieve inflation "moderately above 2 percent for some time." The Federal Reserve has thus adopted an explicit "makeup" strategy. As explained by Powell (2020), Clarida (2020), and Brainard (2020), this introduces a strategy of "flexible average inflation targeting."[20] It is also made clear that it would not be appropriate to implement this strategy by using a mechanical Taylor-type instrument rule.[21]

Although the Fed has announced that it seeks to achieve inflation that "averages 2 percent over time," it has left itself with some flexibility by not announcing an explicit period over which average inflation is calculated. Dropping the language about a balanced approach leaves some ambiguity about the relative weights on the maximum-employment and price-stability mandates. It is understandable if the Fed prefers some flexibility in adapting the new framework, but eventually a high level of transparency and accountability will most likely require the Fed to become more explicit on these points.

[20] Svensson (2020a) discussed the strategies of flexible price-level targeting, temporary price-level targeting when the effective lower bound for the policy rate binds, flexible average-inflation targeting, and nominal-GDP targeting for the Fed and, in conclusion, recommended flexible average-inflation targeting.

[21] Clarida (2020); Brainard (2020). Such reservations were also expressed by FOMC participants in the discussion of average-inflation targeting at the September 2019 FOMC meeting (FOMC 2019).

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Interest Rate Policy

John B. Taylor

Marvin Goodfriend's classic 1991 paper, "Interest Rates and the Conduct of Monetary Policy" was first published in the *Carnegie-Rochester Conference Series on Public Policy* more than three decades ago. It is a wide-ranging paper with an original analysis of interest rate policy that was relevant in 1991 but is even more relevant today. His analysis was informed by his experience in the Federal Reserve System as a policy adviser at the Federal Reserve Bank of Richmond. He took this unique, first-hand experience and translated it into practical monetary policy proposals in a highly thoughtful and original way.

The Goodfriend paper begins with a history of the Fed's interest rate targeting procedures that is useful for monetary economists even today. He then reviews the instrument choice problem — money versus interest rate — that had been studied in a classic article by William Poole in 1970, describing how its results carried over to a modern dynamic-rational-expectations model. He discusses the mechanics of interest rate smoothing, showing how the persistence of the federal funds rate results from the Fed's macroeconomic stabilization policy.[1] Finally, he provides evidence that the Fed implicitly had rules-based monetary policy for the interest rate during most of the 1970s and 1980s.[2]

In this paper, I build on the analysis of Marvin Goodfriend and examine how the Fed can better engage in a rules-based monetary policy going forward.

[1] Dotsey, Hornstein and Wolman discuss Goodfriend's (1987) modeling of interest rate smoothing in another essay in this volume.

[2] Athanasios Orphanides and Volker Wieland later provided a detailed confirmation of this view, stimulated by their work at the Fed to provide "Taylor Rule" memos to the FOMC starting in the mid 1990s.

Prior to the global financial crisis, policymakers within the Federal Reserve System had adopted elements of the rules-based approach to interest rate policy that I advocated in my 1993 *Carnegie-Rochester* paper. For example, during his time as president of the Federal Reserve Bank of St. Louis, William Poole used "the Taylor rule" as a guide to his thinking about policy actions to be taken in upcoming meetings *and* as a vehicle for explaining the Fed's decisions to the public.[3] But then there was a move away from such an explicit use as the Fed and the government more generally used a wide range of policies to deal with the Great Recession, not all of which I view as desirable.[4]

More recently, starting around 2017, the Federal Reserve returned to a more rules-based monetary policy that had worked well in the United States in the 1980s and 1990s, as Goodfriend observed. Many papers were written at the Fed and elsewhere reflecting this revival and showing the benefits of rules-based policies. In 2017, the Fed began to report on rules-based policy in its *Monetary Policy Report*, and favorable comments about rules-based policy were made by many policymakers.

One explanation for the revival was simply a revealed preference for such an approach on the part of monetary policy officials and others interested in monetary policymaking. Another explanation for the revival was the desire to figure out how to deal with the effective or zero lower bound on the interest rate that Goodfriend (2000) had highlighted earlier: there was genuine concern at the Fed about the lower bound in the case of a need for substantial easing. Another possible explanation was the disappointment with monetary policy leading to the Great Recession and especially the deviation from rules in the 2003-05 "too low for too long" period. Yet another explanation was the recognition that rules are needed to evaluate quantitative easing proposals.

[3] See Poole (2007).

[4] Taylor (2009).

The Fed began a helpful reporting approach in the July 2017 *Monetary Policy Report* when Janet Yellen was Fed chair. Each report contained the policy rate implications of five well-known rules embedding reactions to inflation and unemployment.

An interruption

However, that move toward rules-based policies was interrupted when COVID-19 hit the American economy. The Fed took a number of actions to deal with the economic effects of the severe health crisis.[5] By most accounts, these actions were special and were not consistent with rules-based policies.

The Fed also stopped reporting on rules-based policy in its *Monetary Policy Report*. The pandemic that started in the first quarter of 2020 was a jolt to the American economy and to many other economies. It interrupted the revival of rules-based policies at the Fed and most other central banks. The actions at the Fed included a rapid reduction in the target for the federal funds rate from 1.75 percent to .25 percent during the weeks of March 2020. Both M1 and M2 measures of the money supply grew rapidly. It also included large-scale purchases of Treasury and mortgage-backed securities, causing a large expansion of the Fed's balance sheet with assets rising rapidly from about $4 trillion to about $7 trillion during the second quarter of 2020 and then continuing to grow to about $9 trillion at the end of 2021.

The Federal Reserve's *Monetary Policy Report* after the first year of the pandemic, released on February 19, 2021, however, contained a whole section on monetary policy rules. That policy rules reentered the *Report* was a welcome development, restoring the helpful reporting approach from the July 2017 *Monetary Policy Report*. The approach continued in 2018, 2019, and early 2020, but it was dropped in July 2020.

[5] See Taylor (2021).

Five rules were discussed in the February 2021 *Monetary Policy Report* on pages 45 through 48. To quote the *Report*, these include "the well-known Taylor (1993) rule, the 'balanced approach' rule, the 'adjusted Taylor (1993)' rule, and the 'first difference' rule." In addition to these rules, there was a new "'balanced approach (shortfalls) rule,' which represents one simple way to illustrate the Committee's focus on shortfalls from maximum employment." Table 1 shows the five rules from the February 2021 *Report*. There were also five rules in the earlier *Reports*, but the February *Report* left one out and added the new balanced approach (shortfalls) rule in its place. As stated in the Fed document, this simple new rule

> would not call for increasing the policy rate as employment moves higher and unemployment drops below its estimated longer-run level. This modified rule aims to illustrate, in a simple way, the Committee's focus on shortfalls of employment from assessments of its maximum level.

Table 1. Five Policy Rules in the February 2021 Monetary Policy Report, p. 47

A. Monetary policy rules

Taylor (1993) rule	$R_t^{T93} = r_t^{LR} + \pi_t + 0.5(\pi_t - \pi^{LR}) + (u_t^{LR} - u_t)$
Balanced-approach rule	$R_t^{BA} = r_t^{LR} + \pi_t + 0.5(\pi_t - \pi^{LR}) + 2(u_t^{LR} - u_t)$
Balanced-approach (shortfalls) rule	$R_t^{SBA} = r_t^{LR} + \pi_t + 0.5(\pi_t - \pi^{LR}) + 2min\{(u_t^{LR} - u_t), 0\}$
Adjusted Taylor (1993) rule	$R_t^{T93\,adj} = max\{R_t^{T93} - Z_t, \text{ELB}\}$
First-difference rule	$R_t^{FD} = R_{t-1} + 0.5(\pi_t - \pi^{LR}) + (u_t^{LR} - u_t) - (u_{t-4}^{LR} - u_{t-4})$

Reporting rules is only a step toward systematic policy

It is good that rules were put back in the Fed's *Monetary Policy Report*, but it would be more helpful if the Fed incorporated some of these rules or strategy ideas into its actual decisions. Apparently, this has not yet happened.

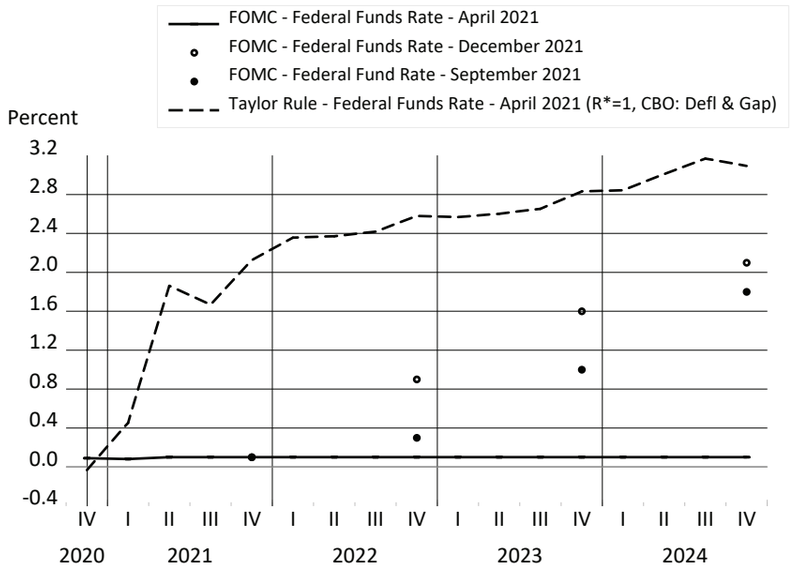
Even more troubling, as I write in March 2022, the Federal Reserve has again eliminated the table and the discussion of rules: the Fed's *Monetary Policy Report* sent to Congress on February 25, 2022, did not include the usual section on monetary policy rules. The Fed had included the section on policy rules in its *Reports* since July 2017, except for July 2020 during its initial response to Covid — a total of eight times going back to Janet Yellen's term as Fed chair.

This omission was significant. It occurred at the same time that the Fed fell well "behind the curve," and inflation has risen as a result.[6] In fact, the removal happened as the discrepancy between standard policy rules, including the Taylor rule listed in the *Monetary Policy Report*, and actual Fed policy is as large as it has ever been. The removal thus diverted attention from this big discrepancy. Several members of Congress brought attention to this omission when Chair Powell testified on March 2 and March 3, 2022, and Powell's answers were very important. While he did not provide reasons for the omission, in the House he answered Rep. Bill Huizenga by pledging "We'll have it in the next one." He then followed up accordingly with Rep. French Hill. In the Senate, Powell answered Sen. Bill Hagerty by pledging "We'll bring them back for the July thing."

The recent *Monetary Policy Report's* omission masks very large differences between the rules and the Fed's current and forecasted policies. Figure 1 shows the discrepancy. It gives the FOMC's projection of the federal funds rate and the rules-based paths for the federal funds rate through 2024. This FOMC projection is the "value of the midpoint of the projected appropriate target range for the federal funds rate or the projected appropriate target level for the federal funds rate at the end of the specified calendar year," as stated in the Fed's *Summary of Economic Projections*.

[6] In 2013, Andrew Levin and I argued that "getting behind the curve" was central to the Great Inflation of the 1960s and 1970s.

Figure 1. FOMC Projections of Federal Funds Rate and a Policy Rule



The dashed line in Figure 1 shows the federal funds rate using the same parameters as those in the Taylor rule which is discussed in the February 2021 *Monetary Policy Report*. Note that in the *Monetary Policy Report* the Fed uses the difference between the unemployment rate (u_t) and the long-term natural unemployment rate (u_t^{LR}) rather than the output gap, and it thus modifies the coefficient on the difference to reflect the regular and related movements of the rate difference and the gap. The so-called equilibrium interest rate has been reduced from 2 percent to 1 percent. Such a reduction has been suggested at the Fed but may be larger or smaller than assumed here. The line uses the same percentage deviation of real GDP from potential GDP as in the Congressional Budget Office (CBO) report, as well as the CBO inflation forecast for the PCE. Many other economic forecasters have inflation and real GDP forecasts close to those of CBO.

Even with this smaller equilibrium real interest rate (1 percent rather than 2 percent in the original Taylor rule), the FOMC's path for the federal funds rate is well below any of these policy rules. There is a

difference in the first quarter of 2021, and the difference does not diminish over time.

There has been little mention of why the discrepancy exists between the Fed's projections and the rules. Does this mean the Fed will actually keep the rate so low under these circumstances regarding real GDP and inflation? Will it then raise the rate sharply in 2023 or 2024?

An optimal reentry

The policy rule parameters, even with the full percentage point lower real equilibrium real interest rate, may not adequately reflect the results of the Fed's position and the new flexible average inflation rate concept. To consider these alternatives and thereby come closer to the new "flexible form of average inflation targeting" policy of the Fed, we also consider the formulation of policy rules by David Papell and Ruxandra Prodan (2021) in a recent paper.

Papell and Prodan (2021) consider a Taylor rule with shortfalls and a balanced approach rule with shortfalls as introduced in the *Monetary Policy Report*. In both cases, they consider the unemployment rate relative to the long-run level rather than the GDP gap. For the Taylor (shortfalls) rule and the balanced approach (shortfalls) rule, they replace the difference between the unemployment rate in the long run and the actual unemployment rate with the minimum of that difference and 0. In other words, the focus is on the shortfall of unemployment from the long-run value rather than the deviation. Thus, if the unemployment rate is 3.5 percent and the long-run level is 4.0 percent, the interest rate is not raised as it would be in the rules without shortfalls. That is, zero is the minimum of .5 percent (=4.0-3.5) and zero. This is as in the balanced approach (shortfalls) rule in the *Monetary Policy Report*.

Papell and Prodan (2021) observe, however, that this adjustment does not fully reflect the changes in policy strategy made by the FOMC. They therefore also consider another adjustment that results in the Taylor (consistent) rule and the balanced approach (consistent) rule. This second adjustment defines the unemployment rate consistent with maximum employment to be 3.5 percent rather than

4.0 percent and also assumes an inflation rate that is moderately above the target inflation rate. For example, if the target inflation rate is 2 percent, then they use a moderate inflation rate of 2.2 percent, using a numerical example of Clarida (2021). This means the Fed would not adjust the interest rate simply because the inflation rate was 2.0 or 2.1 percent; rather, it would watch for inflation going above 2.2 percent.

Papell and Prodan (2021) consider the behavior of the shortfalls and the consistent rules over recent history using the actual historical values of the unemployment rate, the inflation rate, and the federal funds rate. It is helpful to look at the behavior of the rules going into the future using forecasts of unemployment and inflation and comparing that with the FOMC's stated path for the interest rate. They look at the period from the fourth quarter of 2020 through the fourth quarter of 2023. It is also assumed that the equilibrium real interest rate is .5 percent rather than 1 percent, which reduces the interest rate.

Papell and Prodan also consider the Taylor rule, including the regular, shortfalls, and consistent rules, along with the FOMC path for the federal funds rate, using a lower equilibrium real interest rate of .5 percent in these rules. The interest rate from the rules rises as the inflation rate is forecast to rise and the unemployment rate is forecast to fall. The balanced approach and the balanced approach (shortfalls) rule are the same through the third quarter of 2022.

Looking out into the period in 2022 and 2023, a sizable gap emerges. That gap rises to 2.4 percent in the fourth quarter of 2022 and 2.8 percent in the fourth quarter of 2023. Also consider the balanced approach (regular, consistent, and shortfalls) rule. There is little difference in the later years with the average difference between the rule and federal funds rate being 3 percent in 2023Q4, compared with 2.8 percent and 2.7 percent with the Taylor rules. But the balanced approach rules rise faster. Thus, it indicates that the policy rate could be held low through the fourth quarter of 2021. But even in this case, an adjustment is warranted; perhaps for this reason, in the first quarter of 2022 the Fed began to signal higher rates by the end of 2022. In its March 16, 2022, *Summary of Economic Projections*, the Federal Open Market Committee reported that the "the value of the midpoint of the

projected appropriate target range for the federal funds rate or the projected appropriate target level" would be 1.9 percent by the end of 2022. But this is still low, and even lower if one adjusts the rule-based path upward for the federal funds rate to take account of higher inflation rates observed in 2022.

To summarize, the analysis of optimal reentry takes into account the shortfalls of unemployment rather than deviations and focuses on the average inflation rate by looking at moderate inflation rates slightly higher than the long-run target inflation rate. Nevertheless, the results are similar to what was found by looking at the regular Taylor rule. The results can be usefully summarized by looking at the average gap in percentage points between the FOMC interest rate and the settings of the three rules with modifications.

Conclusion

This paper has examined a return to a rules-based monetary policy in the United States and has outlined methods to do so. By reviewing the years leading up to the present monetary situation, it provides the background for analyzing current and future monetary policy decisions.

The results indicate that the Fed should now engage in a strategy or rule in which people and markets understand how it will adjust its policy interest rate if economic growth increases and inflation stays high as it is now forecast to do. It would of course be a contingency plan as all rules and strategies should be. By having clearly stated a shortfalls policy rule in its February 2021 *Monetary Policy Report*, the Fed has prepared for such a strategy in practice. Explaining how its policy rule or strategy would be consistent with its flexible average inflation targeting would further clarify the Fed's monetary policy and facilitate the market adjustment when it takes place. It would remove uncertainty and remaining inconsistencies. The changes in the Reports have not yet affected actual monetary policy decisions, and there is evidence of a big difference between the rules-based policy and the actions of the Fed.

By any measure it is time for reentry.

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The Implications of Optimal Prediction Formulae

Mark W. Watson

Marvin Goodfriend was not an econometrician, but he was a quantitative economist. He based his policy advice on the logic and quantitative implications of economic models. Like many economists who came of age in the late 1970s and early 1980s, Marvin learned how models were affected by the assumption of rational expectations. He also realized that the optimal prediction formulae used to compute rational expectations had implications for econometric practice, and he used these implications in his empirical research. Three of Marvin's papers include particularly novel applications of these insights. I'll discuss these and then conclude with some brief comments about Marvin and the research environment at the Federal Reserve Bank of Richmond.

Money demand and expected inflation

A key parameter determining the effect of money creation on prices and seigniorage is the semielasticity of demand for real balances, M_t/P_t, with respect to expected inflation, π^e_{t+1}. This is the parameter α in the celebrated Cagan money demand function[1] that is used to study periods of hyperinflation:

$$m_t - p_t = \beta + \alpha\pi^e_{t+1} \quad (1)$$

where $m_t - p_t = \ln(M_t/P_t)$. An important challenge for estimating the semielasticity α is that π^e_{t+1} is unobserved. Marvin's 1982 *Journal of Monetary Economics* paper[2] presents a method for estimating α under the rational expectations assumption:

$$\pi^e_{t+1} = \mathbb{E}(\pi_{t+1} \mid \Omega_t) \quad (2)$$

where Ω_t denotes a time *t* information set. In its general form, (1) represents a canonical linear model involving unobserved future

[1] Cagan (1956).

[2] Goodfriend (1982).

expectations. Estimating such models under rational expectations was an exciting and active area of research as Marvin developed his estimator for α, and Marvin, along with several other researchers, proposed estimators based on essentially the same insight. (Goodfriend references Hall [1978] and Hayashi [1979] and also discusses the important contribution by Sargent [1977].) The basic estimation insight in all of these papers is now widely appreciated: any variable X can be decomposed as $X = \mathbb{E}(X \mid \Omega) + e$, where e is the prediction error with $\mathbb{E}(e \mid \Omega) = 0$. Applied to inflation, (2) implies the decomposition $\pi_{t+1} = \pi^e_{t+1} + e_{t+1}$, where e_{t+1} is uncorrelated with any variable in the information set Ω_t. Solving for π^e_{t+1} using this decomposition and substituting into (1) yields

$$m_t - p_t = \beta + \alpha\pi_{t+1} - \alpha e_{t+1}, \tag{3}$$

so the unobserved expectation of inflation in (1) is replaced with actual inflation and a prediction error is added to the equation. The prediction error e_{t+1} is positively correlated with π_{t+1}, so the OLS estimator of α from (3) is not consistent. What is required is an instrument. Rational expectations imply that any variable $Z_t \in \Omega_t$ is uncorrelated with e_{t+1}, so the challenge is to choose Z_t so it is correlated with π_{t+1}. From (1), $m_t - p_t$satisfies these two requirements, leading to the IV estimator

$$\hat{\alpha}^{IV} = \frac{\text{Var}\,(m_t - p_t)}{\text{Cov}\,(m_t - p_t, \pi_{t+1})}, \tag{4}$$

which is a version of the estimator proposed by Goodfriend. Thus, from a single equation, and without an explicit modeling of expectations, one can estimate the semielasticity that was the objective of Cagan, Sargent, and others. Notice that the structure of the model yields $m_t - p_t \propto \mathbb{E}(\pi_{t+1} \mid \Omega_t)$, so under homoskedastic i.i.d. errors, $m_t - p_t$ is the optimal instrument and $\hat{\alpha}^{IV}$ is the efficient IV estimator.

Marvin's formulation was different from (1)-(4) in three respects. First, and of no consequence, Marvin solved (3) for π_{t+1}, then regressed π_{t+1} on $m_t - p_t$ using OLS to estimate $1/\alpha$, and then inverted to find $\hat{\alpha}$. This is a "long-way-around" version of the IV estimator in (4). Second, and more interesting, Marvin decomposed $m_t - p_t$ into its m and p components, leading to a test of an overidentifying restriction in the model. Third, and most important, Marvin considered a more general version of (1) that included an additional error v, a "velocity" shock to the money demand equation. In this case, and as noted in Marvin's paper, $m_t - p_t$ is no longer a valid instrument and $\hat{\alpha}^{IV}$ is inconsistent. What is required is an instrument $Z_t \in \Omega_t$ that is correlated with π_{t+1} but uncorrelated with the velocity shock. A more complete model (as in Sargent [1977]) would yield such an instrument using, for example, an exogenous shifter in the money supply function.

The estimator proposed by Goodfriend in this paper and the related estimators proposed by several others during the late 1970s and early 1980s were important drivers of the study of GMM estimators.[3] This analysis has largely been carried out for stationary (or $I(0)$) time series. Far less work has been done on the properties of these estimators (and related inference procedures) in models with the explosive and/or nonstationary data generated by hyperinflations — these were the data of interest in Goodfriend (1982). Marvin's use of the rational expectations assumption yielded valid moment conditions and an associated IV estimator, but statistical inference with locally explosive data remains an understudied challenge, even 40 years after Marvin's contribution. There is still work to do.

Invoking the properties of rational forecast errors to develop estimators is a direct implication of optimal prediction formulae. Marvin's other two papers use optimal prediction formulae in more subtle ways.

Money demand and partial adjustment

Marvin continued his study of money demand in Goodfriend (1985) but in a stationary (non-hyperinflation) environment. A standard formulation expresses the demand for real balances as a function of a vector of variables, x_t, that includes real income and the nominal rate of interest:

$$m_t - p_t = \delta + x_t'\beta + \text{ error}. \tag{5}$$

An empirical puzzle emerged when (5) was estimated using data from countries like the United States during the 1950s through the

[3] E.g., Hansen (1982) and Hayashi and Sims (1983).

1970s and early 1980s: the model fit the data rather poorly, but the fit improved substantially after augmenting the model with a lagged value of *m-p*, say

$$m_t - p_t = \delta(1-\lambda) + x_t'\beta(1-\lambda) + \lambda(m_{t-1} - p_{t-1}) + \text{ error} \quad (6)$$

A popular rationale for (6) is that the demand for real balances adjusts slowly toward its target value given by $\delta + x_t'\beta$,[4] with a partial adjustment parameter given by $(1-\lambda)$. A problem with this rationale is that the estimated value of λ turned out to be large, implying an unreasonably long adjustment process. For example, Goldfeld (1973) reports $\hat{\lambda}$ =0.72 from a benchmark specification estimated using quarterly data from the US over 1952:Q2-1972:Q4. This implies an adjustment of only 28 percent ($= 1 - \hat{\lambda}$) within the quarter and only 70 percent within a year. Does money demand really adjust that slowly?

Marvin suggested that money demand might, in fact, adjust quite rapidly, and he suggested that the OLS estimator of λ in (6) suffers from errors-in-variables bias. Specifically, he asked: What if the measured value of x is a noisy version of the relevant measures of income and nominal interest rates, say x^*? Could the resulting errors-in-variables bias lead to large estimated values of λ, even though $\lambda = 0$ when using the true value of x^*? Marvin uses optimal prediction formulae to buttress the case for this clever solution to the puzzle about the apparent sluggish adjustment of money demand.

Classical errors-in-variables lead to well-known attenuation bias, so the OLS estimators of the coefficients in (5) are biased toward zero. But Marvin asked the more interesting question: What are the implications of errors-in-variables for estimating the coefficients in (6)? Answering this question requires specifying a joint stochastic process for $m_t - p_t$, the true value of income and interest rates relevant for money demand, x_t^*, and the measurement error, $x_t - x_t^*$.

In practice, empirical researchers use proxies for the income (or expenditure) and interest rates relevant for money demand. For example, Goldfeld used real GDP for income together with interest rates on

[4] For example, see Goldfeld (1973).

commercial paper and time deposits; these were Goldfeld's x-measurements. These are arguably sensible proxies, but they are not perfect measurements of the expenditure and opportunity cost variables determining money demand. Marvin used a variety of sensible calibrations for the $(m_t - p_t, x_t^*, x_t)$ stochastic process, imposing $\mathbb{E}(m_t - p_t \mid x_t^*, m_{t-1} - p_{t-1}) = \delta + x_t^{*\prime}\beta$ so that there is complete adjustment of money demand within the period. He then replaced the true value of x^* with the noisy measurement x and computed $\mathbb{E}(m_t - p_t \mid x_t, m_{t-1} - p_{t-1})$, yielding the population values of (δ, β, λ) in (6). Interestingly, these calibrations yield values of λ that are large and in line with those estimated in the empirical money demand literature.

Marvin's explanation for this dynamic errors-in-variables finding is enlightening: from (5), $m_{t-1} - p_{t-1}$ is positively correlated with $x_{t-1}^{*\prime}\beta$ (and highly so, if the error in (5) is small), x_t^* is likely to be highly serially correlated, so $m_{t-1} - p_{t-1}$ has important predictive power for $x_t^{*\prime}\beta$, even after controlling for the proxy measurements in x. In Marvin's explanation, money demand adjusts rapidly to the fundamentals x_t^*, and the large value of λ in the estimated regression (6) is not structural but instead captures the predictive power of lags of $m - p$ for the correctly measured fundamental x^*.

Consumption and income

The final contribution that I highlight is Goodfriend (1992). The substantive question Marvin addressed in this paper is an apparent failure of the rational expectations version of the life-cycle model for consumption when applied to economy-wide aggregate measures of consumption and income. Specifically, Marvin considered a version of the Hall (1978) random walk model of consumption that implies (under a set of assumptions) that consumption, c_t, is a martingale, so that consumption changes are unpredictable. Marvin's paper studies the robustness of the martingale property under aggregation: he postulates a model in which each individual's consumption is a martingale, and he asks whether the martingale property carries over to aggregate consumption.

Using generic notation, write the model as

$$Y = X + e \tag{7}$$

where $X = E(Y \mid \Omega)$ so that $\mathbb{E}(e \mid \Omega) = 0$. Marvin's paper considers a version of (7) with $Y = c_t$ and $X = c_{t-1}$. Equation (7) implies that the regression of Y onto X and any variable $Z \in \Omega$ will have a unit coefficient on X and a zero coefficient on Z. This is the insight underlying the well-known Mincer-Zarnowitz test for optimal forecasts and the related tests of efficient markets in finance.

Marvin considers a case in which (7) holds for each of *n* members of a population, so $X_i = E(Y_i \mid \Omega_i)$ for $i = 1, \ldots, n$. He then studies the implications for the aggregates, say $Y^{Agg} = \sum_i^n Y_i$ and $X^{Agg} = \sum_{i=1}^n X_i$. Will a Mincer-Zarnowitz regression of Y^{Agg} onto (X^{Agg}, Z^{Agg}) share the same properties as the regression of Y_i onto (X_i, Z_i)? Marvin shows that the aggregates will obey the optimal forecasting relationship if individuals in the economy share the same information set, that is $\Omega_i = \Omega$ for all i, but as general matter, not otherwise. As he notes, $\mathbb{E}(e_i \mid \Omega_i) = 0$ does not imply that $\mathbb{E}(e_i \mid \Omega_i, \Omega_j) = 0$ because Ω_j may contain useful information about Y_i not contained in Ω_i. Goodfriend (1992) uses this insight to discuss Mincer-Zarnowitz regressions using aggregates and panel data models involving many individuals (large n), but over short time periods (small T). The results are interesting and insightful.

A consultant's view

I became a regular consultant in FRB Richmond's research department in 1995. Marvin was research director at the time, and I came at his invitation. The research department was, and remains, a small, friendly, and very serious place to work. Seminars are great, lunchtime conversation is always focused, and a lot gets done. I learn something, or better yet, get puzzled by something, during every visit. I can't know for sure how much of the department's culture is because of Marvin, or how much of Marvin was because of the department's culture. I suspect there was feedback.

Marvin's research will have a lasting effect on economics, and his collegiality and friendship will have a lasting effect on those of us who were lucky enough to work with him.

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The New Neoclassical Synthesis and the Role of Monetary Policy

Michael Woodford

Marvin Goodfriend is probably best known for his contributions to practical policy analysis during his long and distinguished career as an economist and economic advisor within the Federal Reserve system. But his influence was also great outside the Fed, and indeed outside the community of central bankers. Marvin made fundamental contributions to the modern theory of monetary policy, which have greatly influenced the scholarly literature as well. He was unusual in his ability to bridge the worlds of practical policy debate and scholarly analysis, providing academics like myself insight into the issues that needed to be addressed in order for the academic literature to be of greater relevance for policy discussions, while also playing a crucial role in translating the conclusions from economic models for policymakers. My own work was deeply influenced both by my study of Marvin's writing and by the many conversations that I was privileged to have with him about our shared concerns.

His paper with Bob King, "The New Neoclassical Synthesis and the Role of Monetary Policy," is a landmark in the development of the modern, welfare-based theory of monetary policy. It was one of two papers[1] published in the *NBER Macroeconomics Annual* for 1997 that advocated a new approach to monetary policy analysis, using DSGE models with a basic architecture taken from real business cycle (RBC) theory,[2] but introducing sticky prices in order to allow for real effects of monetary policy.

[1] Along with Rotemberg and Woodford (1997).

[2] Kydland and Prescott (1982); Long and Plosser (1983).

The two papers, while written independently, were largely complementary in the approaches that they proposed. However, the emphases of the two papers were different. The primary aim of Rotemberg and Woodford (1997) was to demonstrate the possibility of the kind of econometric policy evaluation of specific quantitative policy rules promoted (most notably) by John Taylor (1979, 1993a), while deriving both model equations and policy objectives from explicit microeconomic foundations as in RBC models. Goodfriend and King instead focused primarily on the conceptual foundations of the new type of model; on the general principles that should inform a welfare-based approach to monetary policy analysis; and on the desirability of a particular kind of target for monetary policy, without reference to the kind of interest rate reaction function that might be involved in implementing it.[3]

These new papers can usefully be considered in the context of Julio Rotemberg's review of the emerging "New Keynesian Microfoundations" a decade earlier.[4] That paper had highlighted a shift from an emphasis on nominal wage rigidity (in the models of authors such as Ned Phelps, Stan Fischer, and John Taylor in the late 1970s) to models of sticky prices, an emphasis continued in the first wave of monetary DSGE models. Rotemberg also emphasized the emergence of models in which price adjustment results from the explicitly modeled optimizing decisions of firms, rather than being specified by a posited dynamic response of "the market" to imbalances between supply and demand or assuming that prices are predetermined by some shadowy "auctioneer" at a level that is "expected to clear the market" at the time that the prices are set. In this connection he argued for the value of modeling individual suppliers as monopolistic competitors. Consideration of the price-setting decisions of suppliers naturally led to an

[3] In focusing on the quantitative evaluation of alternative interest-rate feedback rules, Rotemberg and Woodford work within a program advocated by Taylor (1993b). The discussion of principles for the conduct of monetary policy by Goodfriend and King is instead more in line with the growing adoption by central banks throughout the 1990s of well-defined inflation targets, without a commitment to specific operating procedures through which the targets should be hit. On the advantages of formulating rules for monetary policy as "targeting rules," see Svensson (2003).

[4] Rotemberg (1987).

emphasis on the relationship between individual prices and firms' (actual or anticipated) marginal costs rather than on a gap between supply and demand; it also made it natural to consider the role of firms' expectations regarding future market conditions as a central determinant of pricing dynamics. The paper briefly reviewed popular dynamic models of staggered wage or price adjustment based on nominal commitments for a fixed period of time, as in the influential models of Taylor (1980) and Blanchard (1983) and early models of state-dependent pricing. For purposes of econometric modeling of aggregate time series, however, Rotemberg advocated two approaches that both allowed flexible variation in the degree of stickiness of prices while preserving tractability of the analysis of dynamics: a model with quadratic costs of price adjustment[5] and one in which individual prices remain fixed for random intervals, with a constant hazard for reconsideration at any point in time.[6] The 1997 *NBER Macroeconomics Annual* papers represent a further stage of development of the program sketched by Rotemberg.

A New Neoclassical Synthesis

Goodfriend and King call the approach they advocate a "New Neoclassical Synthesis."[7] The terminology recalls Paul Samuelson's proposal of a "neoclassical synthesis" in the mid-20th century, intended as a way to reconcile the use of Keynesian models for practical policy analysis with the Walrasian model of competitive equilibrium, the canonical model of a market economy among economic theorists. Samuelson proposed that the Walrasian model correctly described the long-run equilibrium of a market economy, once prices and wages have all adjusted in response to market forces, while the Keynesian model (or more specifically, its IS-LM formulation by John Hicks) described

[5] Rotemberg (1982).

[6] Calvo (1983).

[7] Others working on related models around the same time proposed a variety of names for the new style of modeling. Kimball (1995) called it "neomonetarist," and King and Wolman (1996) also stressed the monetarist influence on their model. I had preferred the term "neo-Wicksellian" (Woodford, 2003), but the term that eventually stuck was "New Keynesian," probably because of its popularity as an epithet among critics of the new approach.

equilibrium in a short run over which wages and/or prices were predetermined. This formulation allowed economists to regard each model as valid in its own (carefully delimited) sphere of application, but it didn't really integrate the two approaches; there was no accepted account of the dynamics of wage and price adjustment that should lead from one situation to the other, and this left considerable ambiguity about exactly when (if ever) either of the two limiting cases should be empirically relevant. The lack of a model of wage and price adjustment meant that the framework had little to say about the causes or consequences of inflation, a weakness that became glaring by the 1970s; and the lack of any explicit modeling of dynamics made it hard to say much about the determinants and effects of expectations, an increasing focus of attention by the 1970s as well. As Goodfriend and King discuss, these weaknesses made the original neoclassical synthesis particularly unsuitable as a guide to the conduct of monetary policy.

RBC theory offered a different answer to the question of how to integrate a model of short-run fluctuations in business activity with a model of long-run growth by developing a Walrasian model of a complete intertemporal equilibrium (rather than using Walrasian competitive equilibrium only as a model of an essentially static "long run"), with fluctuations in response to exogenous random disturbances to productivity. The Kydland-Prescott (1982) model offered a complete description of the dynamics of the economy's response to a shock, with no artificial separation of "short-run" from "long-run" analysis, and at the same time provided complete choice-theoretic foundations for all of the model's equations, so that there was a clear answer (at least in theory) to the question of which equations should be considered "structural" in the face of a change in government policies. However, RBC models of this kind provided no guidance for monetary policy. Indeed, Kydland and Prescott argued against any role for monetary policy as a determinant of economic activity, even in the short run, so that a quarterly model of business fluctuations could safely ignore nominal variables altogether. But the econometric estimation of the real effects of monetary policy became an increasing focus of study in the late 1980s and throughout the 1990s, and most of this literature (reviewed in Christiano et al., 1999) found real effects of identified monetary policy shocks that were nontrivial both in size and persistence. The new generation of models developed in the mid-1990s sought to make DSGE models consistent with these facts.

Goodfriend and King argue that the new kind of models represent an updated (and more articulated) version of Samuelson's neoclassical synthesis. A Walrasian model of market equilibrium (essentially, an RBC model) is still at the heart of the synthesis model and represents a limiting case of it (one in which the parameter that determines the delay in price adjustment is set to zero). Moreover, even more than in the original neoclassical synthesis, all model structural relations are derived from explicit analysis of the optimization problems of households and firms (including an analysis of optimal price setting, on those occasions when monopolistically competitive suppliers reconsider their prices), just as in Walrasian general equilibrium models (and RBC models). Yet the fact that prices are not continually reoptimized means that the short-run effects of shocks reflect the consequences of optimizing behavior when some prices or wages are predetermined. This means, as in the original neoclassical synthesis, that aggregate demand — and, crucially for Goodfriend and King, monetary policy — becomes an important determinant of economic activity in the short run, even though the economy's long-run growth path is determined by factors such as productivity growth, growth of the labor force, and incentives for capital accumulation, which are essentially independent of monetary policy. The model also retains important features of an RBC model in that "supply-side" factors (such as random variations in productivity growth) continue to play an important role in the economy's short-run dynamics.

Goodfriend and King introduce nominal rigidities into a DSGE model using a variant of the model of staggered price adjustment originally proposed by Calvo (1983) and adapted to a discrete-time DSGE framework by Yun (1994, 1996). In the Calvo-Yun model, firms are monopolistically competitive suppliers of differentiated goods and set the prices of their own product so as to maximize the value to the owners of the firm of the flow of profits generated by its pricing policy. Thus, the model is one in which prices are determined on the basis of an optimizing decision, as advocated by Rotemberg (1987), rather than

being arbitrarily specified or adjusting "in response to market pressures" through some arbitrarily specified process that is unclear about who actually arranges for prices to change. This makes clear the role of factors such as firms' degree of market power (as well as their information when decisions about prices are made) in price determination. The real effects of monetary disturbances result from an assumption that prices are not continuously reconsidered, and, as in the more ad hoc models of Taylor (1980) and Blanchard (1983), the persistence of these real effects is amplified by staggering of the times at which different firms reconsider their prices. Yun (1994, chap. 1) further showed that the empirical realism of the adjustment dynamics implied by such a specification (when combined with an RBC core model) was improved by assuming random intervals between price adjustments rather than fixed-length price commitments as in the models of Taylor or Blanchard. This made the Calvo-Yun specification convenient for use in parsimoniously parameterized monetary DSGE models that were intended to be compared with aggregate time series, such as King and Watson (1996), Yun (1996), and Rotemberg and Woodford (1997).[8] The Calvo-Yun model also had the advantage of allowing a flexible specification of the time required for prices to adjust, while requiring only a small number of state variables, so that analytical solutions remained possible in the case of sufficiently simple policy rules (as illustrated, for example, in Woodford, 1996 and 1999).

Goodfriend and King discuss how the Calvo-Yun framework can be further generalized, to endogenize the timing of firms' price adjustments rather than treating these as exogenously specified. The approach they suggest (citing an early version of Dotsey et al. [1999], in

[8] Rotemberg and Woodford modify the basic Calvo-Yun model of price setting to assume that when prices are reconsidered, the new price that takes effect in quarter *t* must be set on the basis of the economy's state in quarter *t-1*. This assumption makes their theoretical model consistent with an identifying assumption in their structural VAR estimation of the effects of monetary policy shocks, which interprets contemporaneous correlation between inflation and interest rate innovations as necessarily reflecting an effect of current inflation on the Fed's interest rate target rather than any possible effect of a policy surprise on price setting in that quarter. A similar time lag is assumed in Christiano et al. (2005), for the same reason.

which the analysis is more fully developed) incorporates elements of "state-dependent" pricing models while retaining much of the tractability of the Calvo-Yun framework. In addition to providing more complete microfoundations for the specification of price adjustment dynamics, the richer framework of Goodfriend also nests models such as those of Taylor and Blanchard as special cases, thus allowing a more unified treatment of the literature on this topic.

This kind of microfounded model of price adjustment had consequences beyond those relating to the tractability of calculations, the interpretability of macroeconomic structural relations in terms of measurable microeconomic variables, and the possibility of parameterizing the model to allow for substantial persistence. One that was to prove important for subsequent policy discussions followed from the fact that firms are assumed to set prices in a forward-looking way, recognizing that they are unlikely to reconsider their prices again immediately, though it may already be predictable that market conditions are changing. This makes expectations, and more specifically expectations about other firms' likely price increases over the near term, a crucial factor in price setting, as Goodfriend and King emphasize. To the extent that one accepts the realism of the assumptions of this kind of model, it provides a powerful case for the potential value for stabilization policy of credible, public, and easily interpretable advance commitments about future policy, such as official inflation targets;[9] it also suggests that more ad hoc announcements about future policy, as in the case of "forward guidance" in response to a crisis, can be effective.[10]

Another general implication of NNS models, highlighted by Goodfriend and King, is that they imply that an increase in relative price dispersion has adverse effects similar to a negative productivity shock and that instability of the general price level should increase such dispersion. (To establish this result, they leverage the explicit demand aggregation provided by Dixit-Stiglitz aggregators and the specific

[9] On the role of models of this kind in the theoretical case for inflation targeting, see in particular Svensson (2011).

[10] See for example Eggertsson and Woodford (2003).

production aggregation result developed by Yun [1994, 1996].[11]) This provides a rigorously microfounded basis for concern about the stability of the general price level. While this is probably not the only reason that a variable price level complicates economic decision-making and hence creates distortions, the Goodfriend-King model provides strong support for the importance of price stability, even without taking into account these other potential reasons.

Inflation and welfare

The greatest strength of a model of business fluctuations, and of the short-run effects of monetary policy, with explicit microeconomic foundations is that it becomes possible to evaluate alternative approaches to the conduct of monetary policy not simply in terms of positive predictions (i.e., the extent to which various variables should be stabilized to a greater or lesser extent), but in terms of economic welfare (i.e., the extent to which people more successfully achieve their private objectives, the ones revealed by their behavioral choices). Thus the theory of monetary policy can be treated as a branch of welfare economics, using methods similar to, and fully consistent with, the ones that had already been used for decades in theoretical public finance (including the dynamic extensions of the theory that figured extensively in the more recent literature).

It is in their discussion of the implications of the New Neoclassical Synthesis (NNS) framework for a normative theory of monetary policy that Goodfriend and King break the greatest amount of new ground. Sections 7 and 8 of the paper take up a broad range of central issues in the theory of monetary policy and provide novel insights about most of them. Here I will mention only a few of the most striking of these insights.

Many economic theorists have noted that, in principle, the money prices charged for real goods and services should be of no significance for decisions about quantities (only relative prices should matter), and

[11] These are also the basis for the penalty for inflation variability in the microfounded loss function derived by Rotemberg and Woodford (1997), as discussed further in Woodford (2003, chap. 6).

they have asked why, if that is so, the inflation rate (the rate of change of prices in general) should be a matter of concern at all. Goodfriend and King point out that the NNS model provides an answer by showing how the inflation rate is inevitably connected with changes in relative prices that distort the allocation of resources (even on the assumption that households and firms are all perfectly rational and thus not subject to "money illusion"). First of all, as already mentioned, their model of staggered price setting implies that under any path of the general level of prices other than perfect price stability, the fact that different firms revise their prices at different times will result in relative price differences (that do not reflect any differences in production costs or utility from consumption of the different goods) and hence in deadweight losses of the same kind as those resulting from distorting taxes.

Second, and more subtly, they point out that their model of optimal price setting implies a structural relationship between price changes and the gap between a good's current supply price and the firm's current marginal cost of supplying the good. Hence there is a tight connection between variations in the overall inflation rate and variations in the average markup of prices over marginal cost at each point in time. The markup also has effects on the equilibrium allocation of resources that are closely analogous to the effects of a tax distortion, as standard public finance analyses of the deadweight losses associated with monopoly power have long emphasized.

These insights provide the basis for an analysis of what monetary policy should seek to achieve, that is based on consideration of the consequences of monetary policy for the deadweight losses associated with relative price distortions rather than taking as primitive policymakers' concerns for macroeconomic objectives such as control of inflation or reduction of unemployment. Goodfriend and King draw two important conclusions. The first is that monetary policy should be used to ensure an average inflation rate near zero. This is based on a consideration of the effects of steady inflation or deflation on the average markup on the one hand and on the degree of dispersion of relative prices on the other.

With regard to relative price dispersion, they show that it has an effect like a downward shift of aggregate productivity owing to the fact that the "composite good" that matters for consumers' utility from consumption is produced using a less efficient mix of individual goods (owing to their differing prices). This plainly reduces welfare (for any assumed path of aggregate output, measured in terms of the "composite good"), and it is easy to show that in their model of staggered price setting, relative price dispersion (and hence the productivity reduction) is minimized when the inflation rate is always zero. (In this case, all firms can maintain identical prices even though they reconsider the optimality of their prices at different points in time.) Hence from the standpoint of this consideration, taken in isolation, an inflation rate of exactly zero is clearly optimal.[12]

But it is also necessary to consider the consequences of different constant (average) inflation rates for the average markup of prices over marginal costs of supply. Here Goodfriend and King show that inflation has two offsetting effects. On the one hand, for given expectations regarding future inflation, a higher inflation rate (a greater rate of increase of prices on average between period *t-1* and period *t*) implies a lower average markup in period *t*, because the firms that do not reconsider their prices will fall further below the prices that they would wish to set at that time (which is to say, their prices fall relative to their marginal costs of supply to a greater extent), while those that do increase their prices are simply keeping up with the faster growth of nominal marginal costs (that must grow faster in order to bring about a higher inflation rate). But on the other hand, for a given current rate

[12] The result depends on assuming that prices remain unchanged in nominal terms between the occasions on which they are reconsidered. Yun (1996) proposes a more complex model in which prices are automatically increased to reflect some "normal" rate of inflation between the occasions on which they are reconsidered; in that version of the model, price dispersion is minimized by choosing a steady inflation rate equal to the "normal" rate that firms expect, which need not be zero. The argument that zero inflation results in minimal price dispersion also tacitly assumes that one starts from a situation with zero price dispersion. If one starts from a different distribution of relative prices — for example, because one has had positive inflation up until now — then the policy that minimizes price dispersion will not be one that jumps immediately to a zero inflation rate, though it should converge to zero inflation eventually.

of inflation, a higher expected future rate of inflation (between periods *t* and *t + 1*) will be associated with a *higher* average markup in period *t*, because firms reconsidering their prices (and realizing that most likely they will not reconsider them again as soon as period *t + 1*) will raise them by *more* than the amount by which nominal marginal costs have already risen to take account of the higher costs (and higher competitors' prices) that they expect in period *t + 1*. These two forces roughly balance one another, so that changes in the average rate of inflation around zero don't much change the average markup (assuming that the rate at which firms discount future profits is relatively low).

This much they are able to establish analytically using log-linearized structural equations relating the average markup to the path of inflation, which hold for an inflation rate not too far from zero.[13] Goodfriend and King go further and numerically solve for the deterministic steady state of their model for different assumed constant inflation rates, using the exact nonlinear model equations, and show in their calibrated model that while the steady-state markup is relatively constant for a small range of inflation rates, it becomes significantly higher in the case of inflation rates that are either much below zero *or* much above zero, owing to nonlinearities.[14] Hence consideration of relative price distortions and of average markups lead to roughly similar conclusions: distortions should be larger if the average rate of inflation is very far from zero in either direction. Goodfriend and King accordingly argue that policy should strive to keep the average rate of inflation near zero.

Their discussion of the issue is based on a comparison of alternative possible stationary equilibria with constant inflation, but as subsequent literature was to show, the conclusion is also true if one asks what inflation rate one should commit to maintain in the long run,

[13] The two counterbalancing effects are essentially the same as those that can be observed in the relationship between inflation and the output gap in the familiar "New Keynesian Phillips curve."

[14] For the purposes of their numerical analysis, Goodfriend and King assume Taylor-style staggered price commitments that last for four quarters and calculate the effect of steady-state inflation on relative price distortions, the reset price chosen by adjusting firms, and two measures of the markup.

even when transition dynamics are taken into account. Indeed, under such an optimal policy commitment, one can show that in a model like the one proposed by Goodfriend and King, the inflation rate should converge in the long run to exactly zero rather than to a slightly higher value as suggested by the comparative steady-states analysis given in their paper. This was first shown in a related NNS model (with price commitments that last for exactly two periods) by King and Wolman (1999) and in a model with Calvo-Yun staggered price adjustment by Woodford (2003, chap. 7).[15]

But perhaps more notably, the broad conclusion of Goodfriend and King — that the optimal inflation target cannot be too far from zero — has proven to be remarkably robust to the addition of a variety of further complications to their basic monetary DSGE model, as reviewed by Schmitt-Grohé and Uribe (2011).[16] Nowadays, the general consensus is that an inflation target of a couple of percentage points above zero is preferable to a target of zero. But the modern literature, even when providing arguments for the preferability of a moderately positive inflation rate, continues to use the basic method pioneered by Goodfriend and King: analyzing the implications of different average inflation rates for the microeconomic distortions associated with different degrees of misalignment of relative prices and prices relative to costs by considering how trend inflation interacts with optimal price setting by individual firms.[17]

Stabilization policy and welfare

The arguments just reviewed concern the average rate of inflation but do not yet consider the extent to which it may be desirable to allow inflation to vary around its average (or trend) rate in response to the shocks that give rise to short-run fluctuations in business activity. The second important conclusion of Goodfriend and King addresses

[15] See Benigno and Woodford (2005) for a more complete treatment of this issue.

[16] Goodfriend and King themselves discussed some of these extensions in a follow-up paper for the ECB's First Central Banking Conference on the theme "Why Price Stability?" (Goodfriend and King, 2001). See the discussion of this contribution by Vitor Gaspar and Frank Smets, elsewhere in the current volume.

[17] For a recent example, see Adam and Weber (2019).

this issue. They argue for a conception of "neutral monetary policy" under which monetary policy is used to keep the average markup constant at all times. Under at least some circumstances (which they describe as their "benchmark" case), this corresponds to maintaining a constant price level despite the occurrence of real shocks of various types. Thus their prescription calls not only for an average inflation rate near zero, but also for complete stabilization of the inflation rate.

This conclusion again follows from a consideration of how monetary policy affects the economy through its implications for the path of the average markup. Goodfriend and King argue that monetary policy cannot have much of an effect on the long-run average markup[18] (that is, its average over time, as opposed to the average across firms at a point in time), but that it can determine how the average markup (across firms) varies around this long-run value in response to different kinds of shocks. With regard to the latter issue, they argue that in their model, absolutely any time path for the average markup consistent with the long-run average level can be achieved by a suitably state-contingent monetary policy.

They then ask how one should want the average markup to vary with shocks and argue that since the average markup has effects on the allocation of resources similar to a distorting tax (such as a tax on labor income), the familiar result in theoretical public finance that it is desirable to smooth tax rates over time (and across states associated with different shocks) suggests that it should similarly be optimal to smooth the average markup over time and across states. The structural relationship between the path of inflation and the average markup can then be used to show that the average markup is constant, at the level that occurs in a flexible price equilibrium, if and only if the inflation rate is zero at all times. But an inflation rate of zero at all times means

[18] That is, as discussed above, they show that it is not possible to make the markup be on average much lower than the markup associated with price stability, which would also be the markup in a flexible-price economy (reflecting the market power of monopolistically competitive suppliers). It is possible to use monetary policy to make the average markup significantly higher than this, but that would not be desirable, since even the average markup level associated with price stability distorts the equilibrium allocation of resources away from the social optimum.

that firms' prices do not get out of alignment simply because some firms reconsider their prices and others do not; hence optimal policy creates a situation with no relative price distortions and no differences in the markups of different firms. It is thus not only the *average* markup that must equal the flexible price markup, but each and every firm's markup at each point in time. Hence firms' prices are at all times exactly the ones that they would choose if they were able to continuously update their prices, and the equilibrium allocation of resources under optimal policy will be the same as in an equilibrium with perfectly flexible prices.

Thus the predictions of RBC theory remain relevant in the view of Goodfriend and King. These are not simply the way that output, hours worked, consumption, and so on would vary in response to real shocks if prices were (counterfactually) fully flexible;[19] they are also the way that these variables should evolve, given the way that the economy actually does work, in the case of a "neutral monetary policy" — which Goodfriend and King suggest should be the welfare-maximizing monetary policy.

The proposed argument from an analogy with the theory of tax smoothing is an important one but somewhat incomplete as presented. The fact that inflation variations must correspond to variations in the average markup, and that the average markup has consequences similar to a tax on production or on variable inputs, makes it relevant to ask about the welfare consequences of variability of such a "tax rate." But this distortion is not the *only* one created by variations in inflation; inflation variations also create relative price distortions, and so an analysis of the way in which it is optimal for inflation to vary in response to shocks has to consider the welfare consequences of these effects

[19] Actually, the flexible-price limiting case of the NNS model is not exactly a canonical RBC model, because it would still involve monopolistic competition, and hence a positive markup, while the RBC model of Kydland and Prescott is a perfectly competitive economy. Nonetheless, the logic of equilibrium determination is extremely similar in the two types of flexible-price DSGE models, and even their quantitative predictions are similar if market power is not too extreme.

as well.[20] Nonetheless, in Goodfriend and King's baseline case, consideration of the distortions created by variation in the average markup leads to a conclusion that policy should fully stabilize the price level, regardless of the shocks hitting the economy; this is *also* the policy that minimizes the distortions created by relative price dispersion. Hence even when one takes account of the relative price distortions as well, one can conclude (under certain circumstances) that complete price stability is optimal.[21]

The result that complete price stability is optimal, despite the occurrence of a variety of types of exogenous disturbances to "demand" and "supply" factors, is perhaps less counterintuitive once one realizes that this policy results in an equilibrium allocation of resources that is identical to the one in a flexible price economy that is subject to the same exogenous shocks.[22] At least in the case of a perfectly competitive RBC model, the equilibrium allocation maximizes the expected utility of the representative household, even in the presence of many types of exogenous disturbances. The first welfare theorem does not hold, however, in the case of a flexible price model with monopolistic competition. And the result that perfect price stability is the optimal monetary policy is also no longer quite correct once one adds staggered pricing

[20] In the approach introduced in Rotemberg and Woodford (1997), the expected utility of the representative household is approximated by a quadratic loss function (derived using a perturbation expansion around the zero inflation steady state). The loss function has terms of two sorts each period: one proportional to the squared deviation of aggregate output from its "natural rate," and the other proportional to the squared deviation of the inflation rate from zero (the optimal long-run rate). The deviation of the "average markup" from its steady-state value, emphasized by Goodfriend and King, is (to a log-linear approximation) proportional to the deviation of output from its natural rate, as indeed Goodfriend and King note. Thus their consideration of the welfare losses associated with fluctuations in the average markup corresponds to the terms in the Rotemberg-Woodford loss function that penalize fluctuations in the output gap. But a full consideration of the welfare consequences of optimal policy must take account of the terms proportional to the squared inflation rate as well. These terms represent a quadratic approximation to the impact on productivity of the relative price distortions created by inflation variation, as noted above.

[21] See the discussion of this point in Woodford (2003, chap. 7).

[22] King and Wolman (1996) had earlier described this result when using an NNS model to analyze strict inflation targeting (i.e., price level targeting).

to a model with monopolistic competition.[23] Nonetheless, if the degree of market power is not too great, the welfare-optimal responses of quantities to real disturbances are still fairly close to the flexible price equilibrium responses, and a policy of maintaining price stability is not too bad an approximation of the optimal policy.

Goodfriend and King go on to discuss an important case in which complete stabilization of inflation is *not* optimal — though the exception further demonstrates the fruitfulness of their general approach. This is the case of an oil price shock, which they model as an increase in production costs (negative productivity shock) in the oil-producing sector. They further assume that the oil-producing sector has flexible prices, while prices are sticky (with Calvo-Yun staggered price setting) in the non-oil sector. Their analysis of this case proceeds by first positing that also in the case of this kind of sectoral productivity shock, the flexible price equilibrium (i.e., the RBC equilibrium) should represent a welfare optimum.[24] They then ask if monetary policy can achieve this outcome.

If the oil sector has perfectly flexible prices, the answer is that it can by using monetary policy to ensure a completely stable index of *prices in the non-oil sector* (i.e., the sticky price sector). In this case, all firms in the non-oil sector set the same prices as they would in the flexible price economy, as do all of the oil-producing firms; hence the equilibrium is the same as in the flexible price economy. Of course, stabilizing the price index of the sticky price sector is *not* equivalent to using policy to stabilize a broader price index, which includes the oil price; the broad price index must be allowed to go up. Thus, one can think of the policy as one in which "headline inflation" is allowed to rise in response to a "cost-push shock" in order to avoid having to contract activity

[23] Optimal policy is analyzed taking explicit account of the distortions due to monopolistic competition that remain even in steady state in the subsequent work of King and Wolman (1999), using a model with two-period price commitments, and the analysis of optimal policy in a model with Calvo-Yun price-setting by Benigno and Woodford (2005).

[24] Once again, this would be true if one were talking about a flexible-price model in which both sectors are perfectly competitive. If there is instead monopolistic competition in the non-oil sector, it is not quite true, though the idea remains useful as an approximation.

more in the sticky price sector. Alternatively, one can describe it as a strict inflation-targeting regime, in which however the inflation target is defined in terms of a measure of "core inflation" rather than the headline rate of inflation.[25] Interestingly, not only is the counterfactual flexible-price allocation still useful as a normative benchmark in this case, but the optimal policy can still be described as "neutral monetary policy" in the sense that Goodfriend and King propose — that is, the monetary policy that maintains a constant level for the average markup (corresponding to the markup in a flexible price equilibrium). If we assume a similar degree of market power in both sectors (so that the flexible price markup is the same for both kinds of firms), then the fact that prices are flexible in the oil-producing sector means that markups there are always equal to the flexible price markup, regardless of monetary policy. Achieving an average markup for the economy as a whole equal to the flexible price markup then requires that monetary policy ensure a constant average markup in the non-oil sector that is also equal to the flexible price markup; this is achieved by stabilizing the price index for the sticky price sector.

The analysis provided by Goodfriend and King depends on assuming that prices are perfectly flexible in the oil-producing sector. This is not a bad assumption in the case of the oil sector, but one might also be concerned about the "cost-push" effects of other kinds of asymmetric real disturbances that similarly impact the relative costs of supplying different goods, but none of which are goods with perfectly flexible prices. In this more general case, it will in general not be possible for any monetary policy to bring about the allocation of resources corresponding to a flexible price equilibrium; instead, one will have to consider the trade-off between mitigating or exacerbating distortions of several types, which cannot all be reduced to zero.[26]

[25] The welfare analysis leading to this conclusion is developed more fully in Aoki (2001).

[26] Even in a one-sector model with only aggregate disturbances, such trade-offs exist, of course, if the degree of market power is nonnegligible, as shown by Benigno and Woodford (2005).

Yet even then, "neutral monetary policy" as defined by Goodfriend and King can provide a reasonable approximation to welfare optimal policy. In calibrated numerical examples, Woodford (2003, chap. 6) finds that in a model with two sticky price sectors subject to asymmetric disturbances, a monetary policy that completely stabilizes a particular price index provides a close approximation to the second-best optimal policy; however, as in the discussion of oil shocks by Goodfriend and King, the price index that one should stabilize is not in general the one that weights prices in the two sectors in proportion to their share in the consumption basket of the representative household.[27] Instead, the nearly optimal policy stabilizes a price index that puts greater weight on prices in the sector with stickier prices, but it does not put *sole* weight on prices in only one sector except in the extreme case of perfect price flexibility in one sector.[28] Moreover, the principle of putting more weight on prices in the sector with stickier prices is exactly what would follow from using monetary policy to stabilize the economy-wide average markup, since in the sector with more flexible prices, a given range of variation in the sectoral inflation rate corresponds to smaller variations in markups in that sector.

Obtaining a more precise characterization of optimal policy, and dealing with a larger number of complications (additional types of heterogeneity and additional market frictions), requires one to go beyond the relatively informal discussion of welfare objectives provided in this paper and develop a quantitative analysis in which the trade-offs between distortions of different types can be explicitly represented. However, the distortions identified by Goodfriend and King remain central to analyses of monetary stabilization policy, even when these make use of much more complex models. Even more importantly, the

[27] See in particular Figures 6.2 and 6.3, and the discussion of these figures. The results are based on the analysis of the optimal inflation target for a monetary union subject to region-specific shocks in Benigno (2004).

[28] Woodford (2011) provides further insight into the reason for such a policy to approximate an optimal policy commitment, showing analytically that the optimal policy commitment implies long-run stability of a particular price index. In general, the second-best optimal policy involves transitory fluctuations in this index in response to shocks but no permanent changes in it, even when the shocks result in permanent shifts in the relative price of goods supplied by the two sectors.

spirit of their analysis — insisting not only on explicit microeconomic foundations for the structural relations that define what policy can possibly achieve and explicit microeconomic interpretations of the "shocks" that shift those relationships among aggregate variables, but also on using microeconomic analysis of the distortions created by misaligned prices as the basis for welfare judgments with regard to macroeconomic outcomes — has continued to guide much subsequent work. The paper remains a classic contribution to the theory of monetary policy, and one from which much can be learned even today.

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Credibility and Explicit Inflation Targeting

Robert G. King and Yang K. Lu

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 US 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.[1] 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.[2]

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,

[1] He laid out his views as part of a 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).

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 during recessions but left unaltered in expansions — rather than adopting the explicit, public, and deliberate approach to disinflation advocated by Black, Broaddus, 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[3] 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.[4]

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

[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.

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 the section "Richmond and inflation targeting" by placing Marvin within the Richmond Fed tradition, specifically the expressed 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 "Evolving research at FRBR," we describe how modern monetary economics made its way into Marvin's thinking and the Richmond Fed's FOMC process more generally. In "Goodfriend's inflation targeting manifesto," 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 the "Credibility, inflation, and real activity" section, 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 monetary 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 Broaddus. 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.

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.

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.[5] 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.

[5] For example, at Federal Reserve History, https://www.federalreservehistory.org/people/robert-p-black.

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."[6]

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.[7]

In 1989, Rep. Stephen Neal offered an amendment to the Federal Reserve Act to require the Fed to transition to zero inflation within five

[6] Full text of the speech is available at https://www.richmondfed.org/publications/research/economic_review/1984/er70040.

[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.

years. Black joined four other regional bank presidents and Fed Chairman Alan Greenspan in testifying in support of the proposal.[8] 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.[9] As the Fed's staff economists assessed the real consequences of such a further disinflation, they highlighted the importance of credibility.

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."[10]

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.

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

[8] Full text of the speech is available at https://www.richmondfed.org/publications/research/economic_review/1990/er760101.

[9] See p. 1 of the 12-19-1989 meeting transcript at FRBoard, https://www.federalreserve.gov/monetarypolicy/files/FOMC19891219meeting.pdf.

[10] Meyer's speech is at https://www.federalreserve.gov/boarddocs/speeches/2001/20010717/default.htm. See also Gramlich: https://www.federalreserve.gov/boarddocs/speeches/2000/20000113.html.

percent in January 1994 to 6 percent in January 1995.[11]

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.[12]

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.

[11] This was during an interval of "preemptive policy" for the Greenspan Fed, as discussed in Goodfriend (2004, p. 320) that successfully "brought the economy to virtual price stability." We return to this topic in the section "Goodfriend's inflation targeting manifesto."

[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, https://www.shadowfed.org/wp-content/uploads/2012/04/Goodfriend-SOMC-Apr2012.pdf.

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.[13]

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."[14]

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.[15] 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

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

[14] Transcript of 12-20-1994 FOMC meeting, p. 16, https://www.federalreserve.gov/monetarypolicy/files/fomc19941220meeting.pdf.

[15] Full text of speech is at https://www.richmondfed.org/press_room/speeches/j_alfred_broaddus/1995/broaddus_speech_19950316.

Fed's flexibility in dealing with short-term economic disturbances since appropriate short-term actions could be taken without (or with much less) concern about the potential loss of long-term credibility."

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, Broaddus continued to advocate for an explicit inflation target during 1995 and 1996.[16] 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,

[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, http://www.federalreserve.gov/monetarypolicy/files/FOMC19960131meeting.pdf) and Tom Meltzer (see the July 1996 meeting transcript, https://www.federalreserve.gov/monetarypolicy/files/fomc19960703meeting.pdf).

> 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 than evaluating efforts to contain inflation against an implicit unemployment objective, which I think has been the case in some past years.[17]

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.

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 Laurence Meyer[18] described "opportunistic disinflation" as follows: "Under this strategy, once inflation becomes modest, as today,

[17] See pp. 38-39 in the transcript of the 01-31-1996 meeting, http://www.federalreserve.gov/monetarypolicy/files/FOMC19960131meeting.pdf.

[18] President Clinton announced the renomination of Greenspan, as well as nominations of Alive 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." https://www.washingtonpost.com/archive/politics/1996/02/12/staying-the-course-with-greenspan-at-the-fed/d56fc1ec-c5b6-4e88-976c-0667e1e0a904/.

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: 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."[19]

Some FOMC members and leading Board staff had been moving to this perspective for some time.[20] 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 nonaccelerating 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.

[19] Full text of speech is at https://www.federalreserve.gov/boarddocs/speeches/1996/19960908.htm.

[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.

Second, he challenged the political arguments made by its proponents

> 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: [21]

> 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.[22]

[21] Broaddus 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 pp. 48-49 of the July 1996 transcript at https://www.federalreserve.gov/monetarypolicy/files/fomc19960703meeting.pdf.

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 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.[23] 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."

[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 p. 42 of the July 1996 transcript at https://www.federalreserve.gov/monetarypolicy/files/fomc19960703meeting.pdf.

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 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.[24] 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.

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

[24] See p. 59 of the July 1996 transcript at https://www.federalreserve.gov/monetarypolicy/files/fomc19960703meeting.pdf.

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 scenarios.

Evolving research at FRBR

Al Broaddus has highlighted two elements of Marvin's time in Richmond.[25] 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.

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.[26] Some of Marvin's early Fed working papers were stimulated by those changes.[27] 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.[28] 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 that the price level was indeterminate when the interest rate was taken as exogenous. The Sargent-Wallace finding was

[25] See Broaddus's personal reflections in this volume.
[26] Lindsey, Orphanides, and Rasche (2004).
[27] Goodfriend (1982) and Goodfriend et al. (1986).
[28] Poole (1970).

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.[29]

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 nonstationary price level and nonstationary 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.[30] 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.[31]

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."[32] 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 speech to the Virginia bankers. While not forgetting his monetarist roots, he evolved along with many other

[29] 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.

[30] Broaddus and Goodfriend (1985).

[31] 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).

[32] Elsewhere in this volume, John Taylor discusses this contribution, Goodfriend (1991).

central bankers and economists and held on strongly to other Fisherian principles.[33]

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.[34] 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.[35]

In thinking through Cook's results and related literature, Marvin developed an appreciation of the importance of learning from the term structure about evolving expectations. He viewed the short end as

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

[34] Cook and Hahn (1989).

[35] 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.

dominated by central bank actions and the long end as containing valuable information about long-horizon inflation expectations.[36]

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,[37] 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.[38] 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.

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" approach to macroeconomics. Presented using chapters from a monograph in progress, Grossman's lectures featured household and firm dynamic optimization in consumption, investment, and

[36] Goodfriend (1998).

[37] Goodfriend was associate director of research from 1990-1992, director of research from 1993-1999, and policy advisor from 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 Virgina, and Robert G. King, then of the University of Rochester.

[38] Ching-Sheng Mao, now of National Taiwan University, was at FRBR from 1988-1991.

money demand in settings with gradual price and wage adjustment.[39] 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.[40] 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.

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.[41] 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 and quantitative model that combined monopolistic

[39] 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.

[40] Goodfriend (1997).

[41] Chapter 11 of Bob Woodward's 2000 book *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.

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.[42] 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[43] and Keynesian features.[44] 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).[45] Shifts in money 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.

[42] 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.

[43] A demand for money from a "shopping time" approach.

[44] Monopolistically competitive firms with a pricing friction of the Calvo (1983) form.

[45] 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 p. 391 of Clarida, Gali, and Gertler, 1999).

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 non-inflationary 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.[46] The Richmond analysis called for an increase in

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 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.

[46] Donald Kohn's oral history interview in 2011 highlights two differences. First, Kohn stresses that Broaddus was arguing from a different perspective during the productivity surge (p. 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. Pp. 60-63 of the interview discuss Greenspan, the productivity boom, and thinking through things using FRB-US. https://www.federalreserve.gov/aboutthefed/files/donald-l-kohn-interview-20100527.pdf.

the policy rate to 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.[47]

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.[48] 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 output gap.[49] Many practical monetary economists have stressed that the

[47] See p. 28 in the transcript of the 11-16-1999 meeting, https://www.federalreserve.gov/monetarypolicy/files/FOMC19991116meeting.pdf.

[48] The rule specified symmetric response to inflation below target and output above potential.

[49] 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

central bank needs to adapt it to special circumstances, with financial crises being the most frequently cited events.[50]

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.[51]

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 targeting 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

policy" than does a more standard Taylor rule.

[50] 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.

[51] 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 below in the section "Goodfriend's inflation targeting manifesto."

time and over the coming meetings, to combat inflation within the policy regime that was in place.

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.

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.[52] 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.[53] 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 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.

[52] 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.

[53] 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.

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."[54] It was a challenge that Marvin Goodfriend and his colleagues — growing in quantity and quality — took to heart.

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

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.

[54] Personal recollections of Robert King from an early 1990s pre-FOMC meeting.

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*.'"[55]

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.

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 macroconomic 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.

[55] Goodfriend (2004), p. 311.

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.[56] Another innovation was the concept of *inflation forecast targeting* developed by Svensson (1997) to describe and analyze the practices of the 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.

Goodfriend's revised long-run inflation goal

Starting from his earlier advocacy of a zero long-run inflation rate,[57] Goodfriend had revised up the optimal long-run target in his inflation

[56] 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 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).

[57] Goodfriend and King (1997, 2001).

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.[58]

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."[59] Writing in 2004, Governor Ben 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.[60]

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 Gurkaynak, Sack, and Swanson (2005), as an indication of the uncertainty that the public had about the Fed's long-run objective.

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

[58] 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 2 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. (Goodfriend, 2004, p. 331)

[59] Goodfriend (2004), p. 327. 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" PCE inflation over the prior year (Monetary Policy Report, https://www.federalreserve.gov/pubs/bulletin/2000/0300lead.pdf). 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.

[60] Remarks at the October 2003 FRB St. Louis Inflation Targeting conference published in the 2004 *Review*.

statement that it would place "no unwanted constraint" on the shorter-run conduct of policy.[61]

From the perspective of flexible inflation targeting analyses such as those just discussed and practical central bankers,[62] the idea of a strict inflation 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."[63] He argued that

[61] 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, https://www.federalreserve.gov/boarddocs/speeches/2003/20031017/default.htm.)

[62] See Kohn's (2004) discussion of Goodfriend's proposal.

[63] Goodfriend (2004), p. 323.

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.[64] 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.[65]

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."[66] 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

[64] 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.

[65] Goodfriend (2004), p. 330.

[66] Goodfriend (2004), p. 329.

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.[67] 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.[68] 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.[69] 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.

[67] Goodfriend (2004), p. 330.

[68] Aoki's paper was not discussed at the conference by Goodfriend or others.

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

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 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 the section "Evolving research at FRBR": 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.

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 surprised 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.[70] 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.[71]

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.[72]

[70] 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.

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

[72] 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.

September 1994 once again

We earlier described Al Broaddus's conceptual comments and his recommended policy action in the September 1994 FOMC meeting.[73] The Fed — 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. Broaddus 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 the 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 Broaddus saw these as different in September 1994.

With the FOMC unwilling to move to explicit inflation targeting, Broaddus 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 Broaddus portrayed aggressive preemptive policy as necessary, at least in part, due to the lack of explicit inflation targeting and imperfect Fed credibility.

Practical limitations of flexible inflation targeting theory

Goodfriend understood the power of expectations management in

[73] The earlier section "Advocating inflation targets at the FOMC in 1994" provides the specific quotations.

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.[74]

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

[74] This case, developed in Goodfriend and King (2001), is the subject of an essay in this volume 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.[75]

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 "Credibility, inflation, and real activity" 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

[75] Goodfriend (2004), pp. 328-329.

the extent to which it is flexible as it works to build its credibility.

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?" (p. 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."[76] 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.[77] Like Black and Broaddus 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.[78]

[76] Goodfriend (2004), p. 311.

[77] In his essay for this volume, Lars E.O. Svensson describes the importance of Goodfriend (1986) to the evolution of transparency at the Fed.

[78] 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 Broaddus and Roger Ferguson.

Goodfriend drew lessons from three distinct subperiods of postwar US 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."[79]

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."[80]

[78] 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 Broaddus and Roger Ferguson.

[79] Goodfriend (2004), p. 313.

[80] Goodfriend (2004), p. 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."[81]

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."[82]

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."[83] Goodfriend identified four examples of

[81] Goodfriend (2004), p. 315.

[82] Goodfriend (2004), p. 315.

[83] Goodfriend (2004), p. 318.

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 credibility for low inflation during this period."[84] 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."[85] 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."[86]

[84] Goodfriend (2004), p. 318.

[85] Goodfriend (2004), p. 316.

[86] Goodfriend (2004), pp. 316-317.

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."[87]

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."

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.

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

[87] Goodfriend (2004), p. 320.

included a memo on funds rate settings under the original rule and various modifications.[88] According to Taylor's (1993) presentation, the intercept in his rule was a combination of the implicit long-run inflation target π^* 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 π^*.

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.[89]

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 participants and worried that "in view

[88] 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), 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).

[89] The first five years of the disinflation saw a decline to under 1.2 percent, while the full transition took somewhat longer.

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."[90]

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.

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."[91] 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).

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

[90] January 1997 Blue Book, https://www.federalreserve.gov/monetarypolicy/files/fomc19970205bluebook19970131.pdf.

[91] Goodfriend (2004), p. 313.

us in research, while recognizing that the literature on sustainable plans[92] and loose commitment[93] 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 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.

[92] 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.

[93] 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, 2014). 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.

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.[94] 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.[95] Although these intertemporal models are more complicated, we study them because they are arguably more realistic and certainly more akin to policy models actually in use at many central banks.

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.[96] In our early work on managing expectations with imperfect credibility and evolving reputation, we

[94] 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.

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

[96] The best single example is Cukierman and Liviatan (1991), and his work is collected in Cukierman (1992).

used a KPBG-style model to examine the interplay of announcements, actions, outcomes, reputation and credibility.[97] 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.[98] 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.[99] 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 the policymaker's plans and agent's 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.[100] 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.

[97] King, Lu, and Pasten (2008).

[98] Lu, King, and Pasten (2016), and King and Lu (2021).

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

[100] This latter credibility measure seems closer to Goodfriend's narrative and is consistent with the perspective of 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."

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."[101] 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 models only feature imperfect reputation as the reason for partial credibility. Our theoretical models[102] deliver three implications related to these key ideas in Goodfriend (2004). A first implication is that its announced 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."[103]

[101] Thomas Sargent reviews Goodfriend's work (with King, 2005) on "The Incredible Volcker Disinflation" in an essay for this volume.

[102] King, Lu and Pasten (2008), Lu, King, and Pasten (2016), and King and Lu (2021).

[103] Goodfriend (2004), p. 316.

Is evolving credibility relevant?

As we discussed in the earlier section "Goodfriend's inflation targeting manifesto," 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.[104]

[104] 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.

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.

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 earlier discussion of the Board staff concerns about misinterpretations in the January 1997 Blue Book).

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.

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.[105]

[105] 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 pp. 595-596).

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 bank — but one that cannot accurately communicate its intended inflation — would give rise to the same outcomes as if the central bank cannot commit.[106]

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.

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.

[106] 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, p. 1650) with a relevant game theory reference.

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.[107] In examples when the equilibrium is unique, low 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.[108]

[107] We report them in greater detail in King and Lu (2022a).

[108] Goodfriend (2004), p. 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 central bank planned 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.

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 (2004, p. 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.

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.

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.[109] 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

[109] See Poole (2007), p. 10.

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 statement, or the chair will communicate it."[110] 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.[111] [112]

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.[113] But, combining theory and evidence, Bodenstein, Hebden, and Nunes (2012) found that the benefits were substantially curtailed by credibility difficulties in both the US 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

[110] These quotations are taken from a 2016 Brookings blog post by Bernanke, https://www.brookings.edu/blog/ben-bernanke/2016/11/28/federal-reserve-economic-projections/.

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

[112] Lacker (2020) providers an insider's account of the FOMC adoption of the target.

[113] 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 David Reifschneider and Williams (2000) using the FRB-US model.

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.[114]

In August 2020, the Fed moved to flexible average inflation targeting (FAIT).[115] As it moved toward the new regime, the Fed had a very open 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."[116] 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."[117]

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

[114] https://www.federalreserve.gov/monetarypolicy/timeline-forward-guidance-about-the-federal-funds-rate.htm.

[115] Nessen and Vestin (2005) introduce average inflation targeting, which provides an intermediate policy between basic inflation targeting, with target misses being bygones, and price level (path) targeting, with misses being fully offset subsequently.

[116] FRB statement on revisions, https://www.federalreserve.gov/monetarypolicy/guide-to-changes-in-statement-on-longer-run-goals-monetary-policy-strategy.htm.

[117] See, for example, a September 2020 speech by Lael Brainard, https://www.federalreserve.gov/newsevents/speech/brainard20200901a.htm.

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 2¼% sufficient? 2½%? 3%? For how long? How much of the previous inflation undershoot does the committee intend to offset? In 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."[118] 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.[119] The most recent breakeven inflation rates on standard Treasury

[118] This led the IHS team to refer to the new regime as asymmetric flexible average inflation targeting. See also, speech by Clarida, https://www.federalreserve.gov/newsevents/speech/clarida20201116a.htm.

[119] The December 2021 projections were 2.6, 2.3, 2.1, and 2.0. https://www.federalreserve.gov/monetarypolicy/files/fomcprojtabl20220316.pdf.

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 December 2021 levels,[120] 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, [...] 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."[121]

[120] The December 2021 levels were 2.46, 2.51, and 2.27.

[121] Goodfriend (2004), pp. 327-328.

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