



MICHAEL H. MOSKOW HONORARY PAPER SERIES

Federal Reserve Communications and the Road to Transparency

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Over the past 25 years, the Federal Reserve has radically transformed its communications strategies with the dual aims of increasing the public's understanding of the institution's work and informing expectations for the path of monetary policy. The transformation has involved an increase in the volume and changes in the type of communication with the public about the goals of monetary policy and the actions that the Federal Open Market Committee (FOMC) takes to achieve those goals.

In part, these changes reflect lessons from economic theory, which stress the importance of expectations of future policy for influencing the spending and saving decisions of households and businesses and the complications that uncertainty over the policy environment can present for the public's decision making. These lessons highlight the importance of the Fed describing as clearly as possible the factors that will determine the future path of monetary policy.

In this paper, we provide a brief history of the changes in Fed communications and transparency — a process to which Michael Moskow made significant contributions, both at the system level and locally in the Seventh District, as president of the Federal Reserve Bank of Chicago. As president of the Chicago Fed, Michael served on a number of subcommittees of the FOMC that were charged with improving the Fed's public communications about monetary policy and was an advocate of explaining the Fed's policy rationale to the public.

Why Do We Want to Communicate Clearly About Monetary Policy?

One reason to communicate better about policy is to inform the public's expectations about future policy rates, as private-sector spending and saving

decisions often depend on long-term interest rates, which in turn depend on expectations of future policy rates. This becomes particularly important when a central bank faces the zero lower bound on interest rates. As we discuss later in this essay, by influencing expectations, forward guidance about monetary policy can provide accommodation even if the Fed has no room to lower the current level of its main policy tool, the fed funds rate.

Another reason the Federal Reserve wishes to communicate clearly about monetary policy is to reduce uncertainty about future policy and financial conditions. When the public has a clear understanding of the Federal Reserve's goals and the methods used to achieve them, individuals and businesses can plan better for their future consumption, saving, and investment needs. Furthermore, since policy uncertainty can affect the risk premiums built into interest rates, clearer communication about policy can lower this risk add-on to borrowing costs.

Finally, transparency is an appropriate goal for a central bank in a democracy. We value our ability to conduct monetary policy independently, but we are always accountable to the public we serve. Accordingly, we have a responsibility to explain to people what we do and why and how we do it.

Central Banks Have Not Always Favored Transparency

Central banks have not always done a good job communicating policy. Indeed, for a long time, many central bankers thought the way for policy to be most effective was for it to operate out of public view. Surprises in policy could be more powerful in moving financial conditions and influencing the economy than expected changes, policymakers argued. And communicating too much about policy might contribute to instability in financial markets. This led to a strategy of little communication with the public.

Throughout much of the twentieth century, central banks seemed to follow what was said to have been the motto of the Bank of England under Montagu Norman in the 1930s, "Never explain, never apologize."ⁱⁱⁱ In his book *Lords of Finance*,^{iv} Liaquat Ahamed cites an exchange between economist John Maynard Keynes and the deputy governor of the Bank of England, Ernest Harvey, in which Harvey says, "I think it has been our practice to leave our actions to explain our policy. It is a dangerous thing to start to give reasons."

This illustrates how monetary policy was purposely woven in a web of mystery.

Even in more modern times, the Federal Reserve has at times been guilty of using this strategy. As Chairman Alan Greenspan famously said during a 1987 Senate testimony, "Since becoming a central banker, I have learned to mumble with great incoherence. If I seem unduly clear to you, you must have misunderstood what I said."^v

But this is not to say that Chairman Greenspan was in the same communications camp as Norman. Greenspan acknowledged the importance of explaining Federal Reserve actions to the public, and he spoke a good deal about them in many public

forums. And as we shall see, many important communications innovations occurred under his leadership.

The (Long and Winding) Road to Transparency

Enhancing the Policy Statement

An important milestone in Fed communications occurred in February 1994, about six months before Michael became president of the Federal Reserve Bank of Chicago, when for the first time, the Fed put out a public announcement describing the FOMC's policy decision. It said:

“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.”^{vi}

Historically, the only public announcement the Federal Reserve would make after an FOMC meeting was to say the meeting had ended, and markets were left to infer Fed actions from what they saw in open market operations. The actual policy decision and rationale behind it were not made public until the minutes of the FOMC meeting were released on the Friday after the *subsequent* meeting — that is, more than a month after the meeting featured in the minutes. So, announcing what the FOMC had decided to do immediately after the meeting was a very significant departure from the past. Admittedly, the terminology “increase slightly the degree of pressure on reserve positions” might not be the clearest way of describing a rate increase. Still, the February 1994 policy statement marked a significant change in the Fed's communications strategy.

The February 1994 statement was also notable for describing the rationale behind the policy change, as seen in its last sentence. The Fed had lowered the fed funds rate more than 500 basis points during the 1990–91 recession and slow-growth period that followed it, and the federal funds rate had been at 3 percent since August 1992. But now the Committee wanted to communicate to the public its view that the economy had reached the point where a rate increase would be appropriate. Later, we'll look at how this worked out. Even after this important change, however, the Fed still managed to mumble pretty well. Here is an example of an FOMC directive to the New York Fed's Open Market Trading Desk^{vii} on how it should conduct open market operations over the period between the July and August 1997 FOMC meetings:

“In the implementation of policy for the immediate future, the Committee seeks to maintain the existing degree of pressure on reserve positions. In the context of the Committee's long-run objectives for price stability and sustainable economic growth, and giving careful consideration to economic, financial, and monetary developments,

somewhat greater reserve restraint would or slightly lesser reserve restraint might be acceptable in the intermeeting period.”

Believe it or not, attaching the words “somewhat” and “would” to the case of greater reserve restraint versus the weaker words “slightly” and “might” to the case of lesser reserve restraint was meant to convey the idea that a change to higher rates (greater reserve restraint) was more likely than a change to lower rates (lesser reserve restraint), either over the intermeeting period or at the next meeting.

As president of the Federal Reserve Bank of Chicago at this time, Michael served on an FOMC communications subcommittee that took on the task of making the directive language more clear and meaningful. Here is the substitute they came up with:

“In the implementation of policy for the immediate future, the Committee seeks conditions in reserve markets consistent with maintaining the federal funds rate at an average of around 5-1/2 percent. In the context of the Committee’s long-run objectives for price stability and sustainable economic growth, and giving careful consideration to economic, financial, and monetary developments, a somewhat higher federal funds rate would or a slightly lower federal funds rate might be acceptable in the intermeeting period.”

So, the improved version retained some of the obtuse language of the original, but at least the directive now explicitly stated the fed funds rate target.

The Fed’s policy statements continued to evolve. In July 1995, the statement began to provide the actual target for the federal funds rate. And in May 1999, the Fed began making post-meeting statements even if the funds rate target did not change.

In 1999, the Fed started providing the public with information about the direction policy likely would be leaning in the immediate future. It did so by including a comment in the policy statement about whether Committee views were “tilted” toward looser or tighter policy for the next FOMC meeting. Previously, the tilt, or the “bias” as Fed watchers referred to it, could only be found in the minutes. And because the minutes weren’t released until after the following meeting, the tilt was not an effective signal to the public of where policy was heading.

Then in February 2000, the Fed changed the language from “tilting” to describing a “balance of risks” to its policy goals; this was essentially the same information, but it was now being expressed in a way that would make the connections clearer between the Fed’s policy and its mandated goals.

Forward Guidance about the Policy Path: The 2003–04 Experience

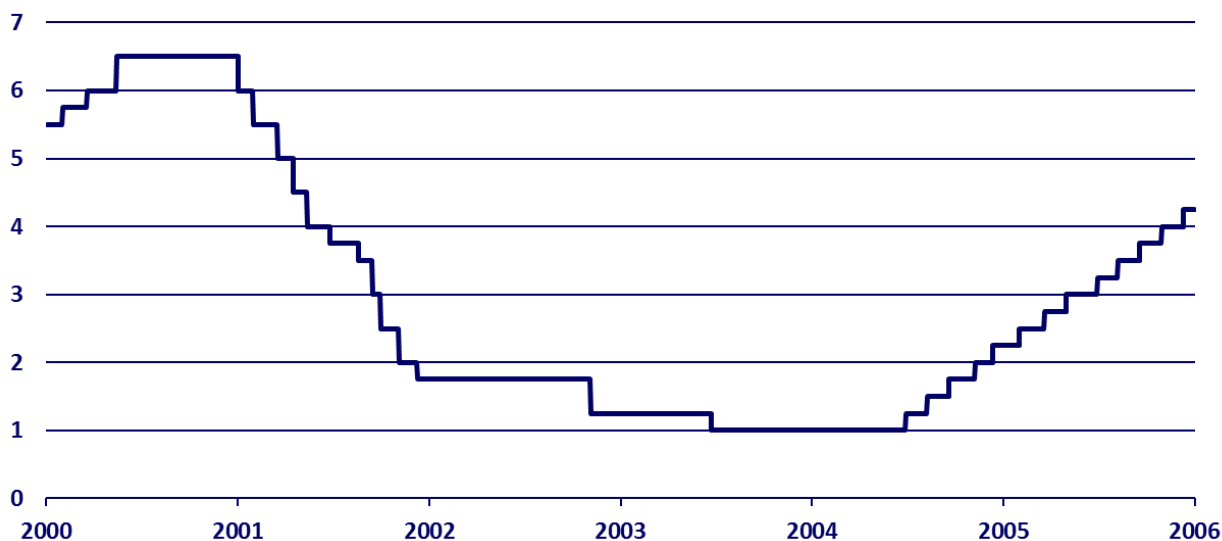
Another important period in communications came in 2003 and 2004, when the Fed started giving some more explicit and longer-range guidance about where policy rates were likely going, given the current economic outlook.

During the 2001 recession and subsequent weak recovery (with associated disinflationary pressures), the Fed had cut the funds rate 550 basis points to 1 percent and had left it there since June 2003. It wasn't until June 2004 that the economy had gained enough traction and deflationary pressures had abated enough that the Fed was ready to raise rates. (See Figure 1)

Figure 1: Forward Guidance About Policy Path^{viii}

Federal Funds Target Rate

(percent)

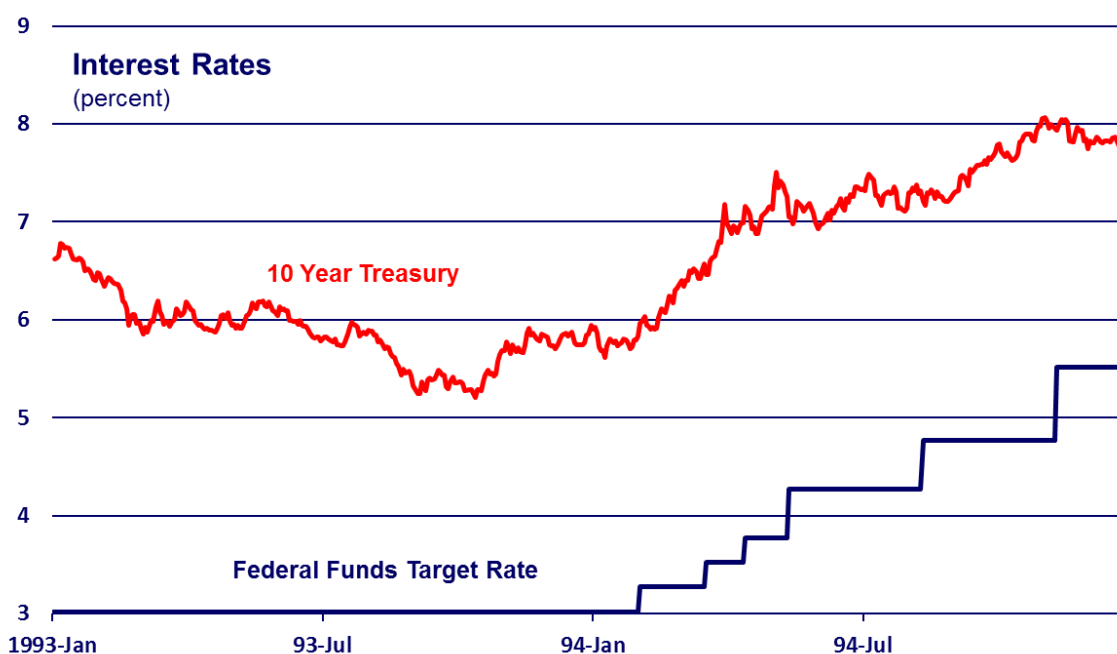


In addition to these choices, the Fed provided some forward guidance over the future path for the funds rate. As conditions remained soft in the summer of 2003, the Fed let the public know that rates likely would be on hold for a “considerable period.”^{ix} As improvements finally occurred in early 2004, the Fed communicated that it was in no hurry to raise rates — specifically, that some “patience” in the removal of accommodation was appropriate.^x And when the Fed finally started to move rates in June 2004, it signaled that the pace of rate hikes was going to be slow — the so-called “measured pace” language.^{xi}

Why did we do this? During the summer of 2003 and early 2004, policymakers thought the current and prospective state of the economy dictated a good deal of policy accommodation. Indeed, in the spring of 2003, inflation had fallen so low that for the first time, the Fed actually acknowledged that inflation could fall uncomfortably low — certainly something striking for all of us who had lived through the inflations of the 1970s and 1980s and the later disinflations. So why not lower the funds rate further? Well, some were worried at that time that the effective lower bound for the fed funds rate was not zero, but somewhat higher. This was based on a concern that rates closer to zero would disrupt money market functioning. Still, the Fed could potentially enhance accommodation by informing the public that rates would stay low for a while. Lower expected policy rates would feed into lower longer-run interest rates and support spending. And less uncertainty about future rates would permit for better private-sector planning and allow for fewer resources be devoted to precautionary actions.

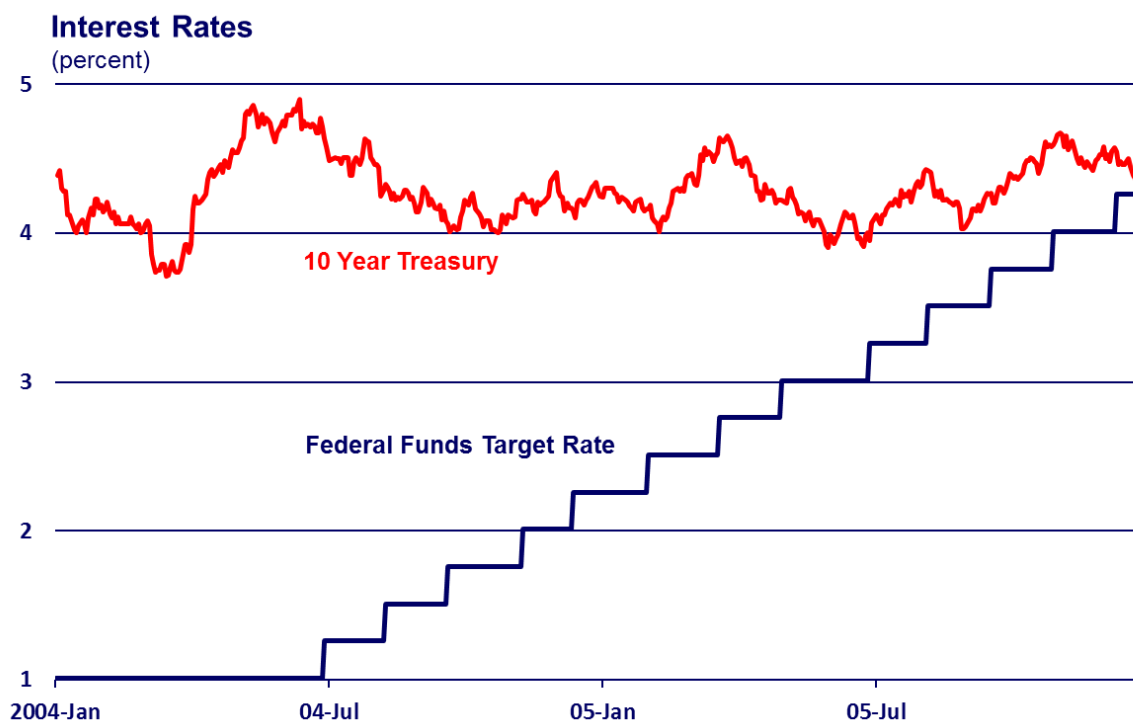
As we moved through early 2004, the recovery gained traction and the time to raise rates was near. One thing weighing on policymakers was the reaction to the Fed funds rate hike in 1994. That policy action also followed a protracted period of low rates, as shown in Figure 2. The blue line in the figure shows the funds rate path, and the red line the interest rate on 10-year Treasury securities. Even though Chairman Greenspan had signaled that the funds rate was going to lift off soon, bond markets reacted sharply when the funds rate actually was increased, with the 10-year Treasury rate spiking up 150 basis points after the initial set of rate increases. Part of the goal of policy tightening is to generate tighter conditions in financial markets, so some increase in longer-term rates is desirable. But ideally, the increase would not be unduly disruptive to financial markets. This was not the case in 1994, when the resulting bond sell-off created quite a stir.

Figure 2: 1994: “Blood in the Bond Market”^{xii}



Fortunately, in 2004, the Fed’s communication seemed to have the desired effect, and the 2004 rate increase was accompanied by no such crash in bond prices (Figure 3).^{xiii} Admittedly, a lot of other factors were in play holding down long-term interest rates then. And rates had already gone up a lot as the economy improved in early 2003. Still, improved communication about the prospective path for policy facilitated a smoother transition during the policy normalization process.

Figure 3: 2004: No Crash in Bond Prices^{xiv}



Another important communications enhancement that occurred during this period was in December 2004. This is when the Fed changed the meeting minutes release timetable so that minutes of the latest FOMC meeting would now be published three weeks after each meeting, instead of days after the subsequent meeting. This dramatically increased the level of attention paid by the press and public to the minutes as they now contained much more timely information about the FOMC's decision-making process.

Increasing Transparency

Many other enhancements to Fed communications soon followed. These included moving from semi-annual to quarterly economic projections (2007), extending the projection time period to include one additional year (2008), adding long-run forecasts (2009), and having the chair hold a press conference after the meetings in which those projections come out (2011).

January 2012 brought two major innovations in Fed communications. First was the publication of a long-run policy strategy statement, which formally stated the Fed's balanced approach to achieving the dual mandate objectives of maximum employment and price stability. Importantly, the strategy statement explicitly stated the price stability objective as 2 percent annual inflation in the price index for total consumption expenditures.^{xv} It also highlighted participants' longer-run projections for the unemployment rate as a way of communicating their current views on the meaning of maximum employment.

The second communications innovation that occurred in January 2012 was that for the first time, the Fed published Committee participants' views about the appropriate policy underlying their economic projections — the so-called “dot plot,” which depicts participants' views about future values for the federal funds rate (Figure 4). The dot plot garnered substantial attention as Fed watchers analyzed the details. For a humorous take on what we might see if we stare at the dots for too long, see Figure 5, reprinted from economist Jared Bernstein's June 18, 2014, blog post.^{xvi}

Figure 4: The Dot Plot: Fed Interest Rate Forecasts^{xvii}

June 18, 2014 Dotplot: Target Federal Funds Rate at Year End
(percent)

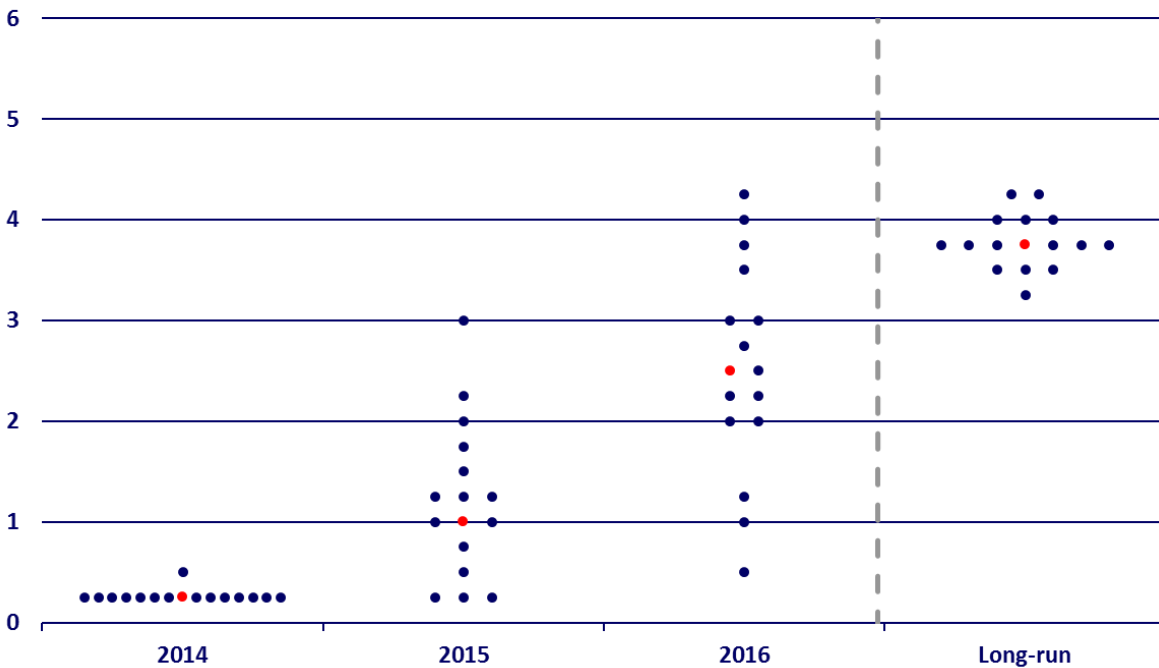
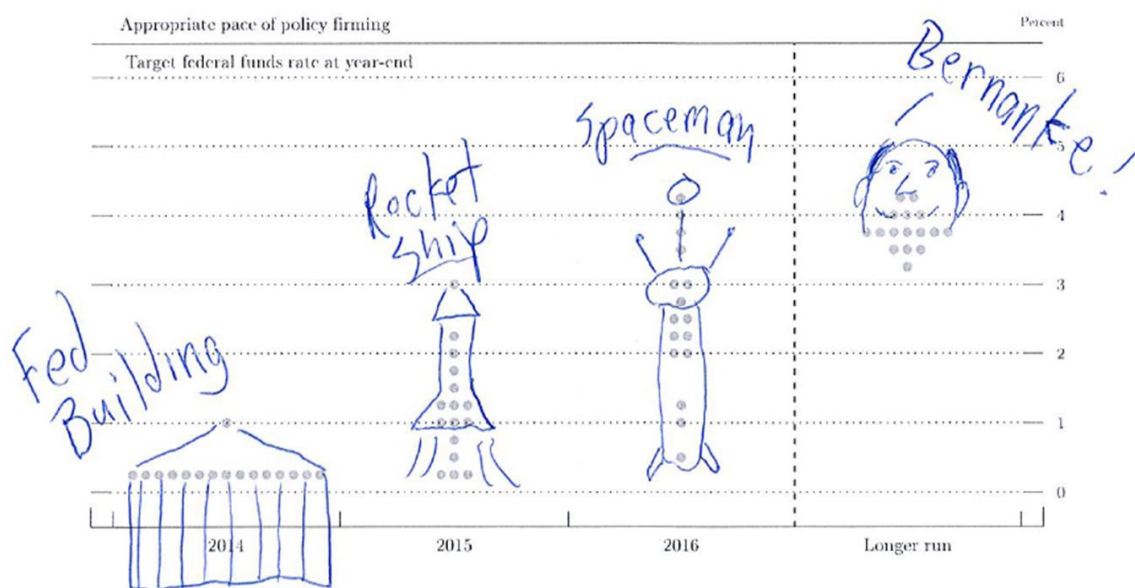


Figure 5: Analyzing the Dots^{xviii}

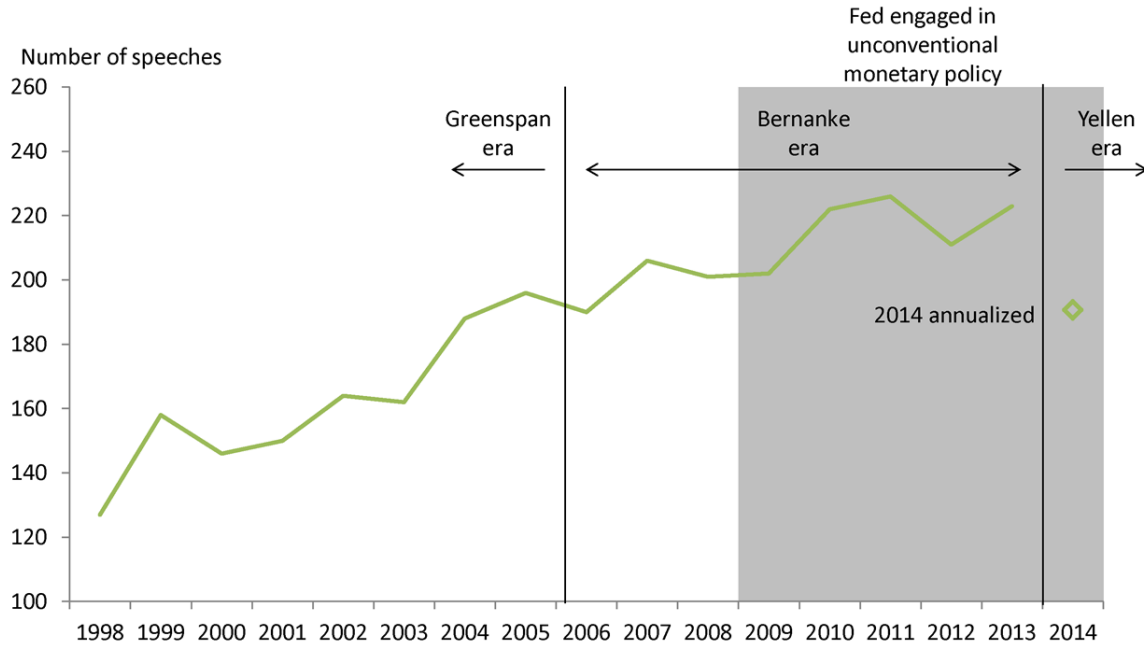


Not everyone is a fan of the dot-plot — some argue there is so much dispersion in the dots that the picture just causes confusion. However, uncertainty over forecasts is fundamental: Given that people have different views about the forces driving the economy, it is not surprising that they have different views about the appropriate policy needed to achieve the dual mandate goals. In addition, portraying an impression of precision that does not really exist might also have a cost. For example, it might reduce private-sector uncertainty below fundamentals and result in a shortfall of hedging and other precautionary behavior.

Further enhancements to the forecasts have occurred since 2012 — such as including a median forecast and confidence ranges about the projections. Other changes have been discussed from time to time but have not been implemented so far, such as developing a Committee consensus forecast or linking individual projections across time and variables.

Our focus in this paper is on changes in the formal communications of the FOMC as a whole, but of course, the Fed also communicates in other ways, for example, through speeches, media interviews, conference presentations, and other outreach activities. These activities have also increased in volume and broadened in scope in recent years. The increase in the number of FOMC participants' speeches can be seen in Figure 6, which is taken from an October 2014 conference presentation entitled "How the FOMC Talks" by Mark Wynne from the Federal Reserve Bank of Dallas. Not surprisingly, the Fed's outreach efforts ramped up quite a bit during the Great Recession, when the need for public understanding and reassurance about Fed policy was arguably greater than it had ever been. And as with the dot-plot backlash, some now would argue that the Fed talks too much and creates uncertainty about policy by permitting different channels and voices to compete for the public's attention.

Figure 6: Total FOMC Member Speeches^{xix}



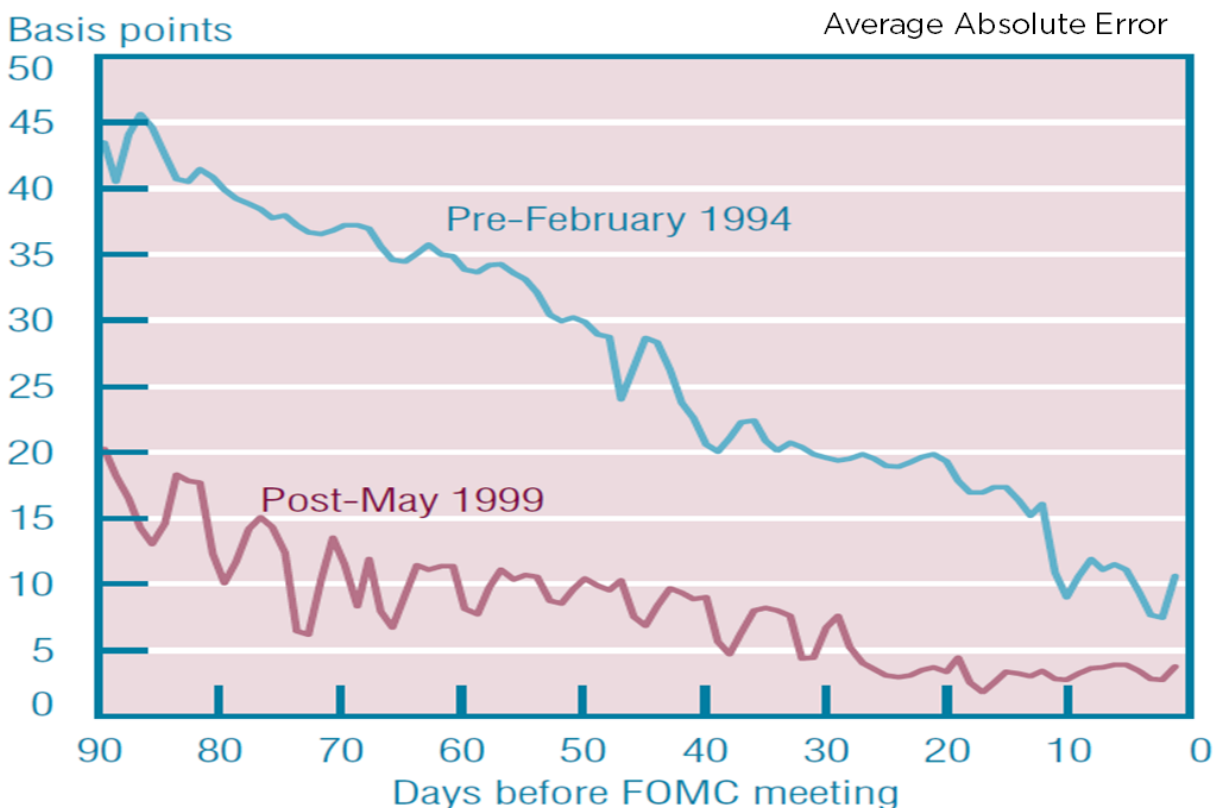
How Do We Measure Success?

There is no perfect measure of communications success, but we can point to evidence of decreased uncertainty and the use of forward guidance as a policy tool.

Reducing Uncertainty

Research on uncertainty conducted by our colleagues at the Federal Reserve Bank of Cleveland suggests the Fed’s efforts have been at least somewhat effective. In Figure 7, the x-axis plots the number of days leading up to an FOMC meeting. The blue line plots the average absolute error in the federal funds futures market’s pricing for what the funds rate would be after the subsequent meeting using data from 1989 to February 1994 (the first time the Fed announced a change in the rate with a post-meeting statement). So, 90 days before the meeting, the average error, regardless of whether it was too high or too low, was about 45 basis points.

Figure 7: Reducing Uncertainty^{xx}



The red line shows what this average error was using data between May 1999, when the Fed first started making announcements after every meeting regardless of whether it changed rates or not — and early 2006 (which were the latest data available when the paper was written). You can see that these errors are quite a bit lower than the pre-1994 ones until just a few days before the meeting.

Of course, many other things may have contributed to this change. Notably, the Fed funds futures market became more liquid during the sample period, and the economic environment and underlying uncertainty also were different across the two time periods. Still, the evidence is suggestive that markets better understand now where policy is going than they did in the past.

Communications as a Policy Tool

Next, we consider communications itself as a policy instrument. How does Fed guidance about future interest rates influence the degree of policy accommodation or tightening the Fed delivers?

Let's start with two equations. The first states that longer-term interest rates equal expected average future short-term rates plus a term premium (tp). (The term premium reflects the riskiness of holding long-term assets relative to short-term assets. They generally are positive, but can be negative depending on certain

configurations of the risks investors face.) As depicted here, the 10-year interest rate will be the average of the expectation of the next 10 years' 1-year rates plus the 10-year term premium.

$$r_t^{10} \approx \frac{1}{10} E_t [r_t^1 + r_{t+1}^1 + r_{t+2}^1 + \dots + r_{t+10}^1] + tp_t^{10}$$

The second equation is the present discounted value formula for the income generated by an asset with annual income flows y_t . For the 10-year-lived asset shown below, the present value of expected future income flows depends on interest rates in the future, not just a particular current one-period rate.

$$DPV_t = E_t \left[\frac{y_1}{1+r_t^1} + \frac{y_2}{(1+r_t^1)(1+r_{t+1}^1)} + \dots + \frac{y_{10}}{(1+r_t^1)\dots(1+r_{t+10}^1)} \right]$$

Most analysts tend to think that longer-term interest rates matter more for household and business spending decisions than do short-term rates. And changes in asset values can have an important influence on saving and investment decisions (though the value of the asset may differ some from the DPV due to investors' attitudes toward risk.) Accordingly, monetary policy influences the economy not just through its setting for the current short-term rate, but also through its influence on expectations for future short-term rates. This means forward guidance about future short rates can affect the real economy today.

So, what happened during the last recession? Well, by December 2008, the Fed had essentially lowered short-term interest rates to zero. Some central banks — notably the European Central Bank, Bank of Japan, Sveriges Riksbank, and Swiss National Bank — brought rates down to slightly negative during the crisis. The Fed did not. In any event, rates cannot be brought too far below zero, otherwise people will simply hold currency. There is an effective lower bound on policy rates.

Hitting the effective lower bound means a central bank must turn to other tools to provide further accommodation. One thing it can do is issue forward guidance that changes expectations about future rates; by lowering expectations, central banks can reduce long-term interest rates and discount factors and thus provide greater policy accommodation.

(The Fed and other central banks also used other means to try to lower long-term interest rates by reducing the term premium, namely the large-scale asset purchase programs. These programs presented a number of communications challenges, but overall appear to have been a successful complement to forward guidance. However, their analysis is beyond the scope of this essay.)

To provide accommodation through forward guidance on rates in 2008–12, the Fed first used words similar to the guidance in 2004. The Fed stated that policymakers thought economic conditions were likely to warrant very low interest rates for a long time. Then the guidance became more specific, giving actual calendar dates for these expectations. Then, in January 2012, the policy dot plot was added, which gave more details of policymakers' expectations for the economy and interest rates.

In September 2012, the Fed announced its intention to keep rates low even after the recovery strengthened. Though it was never stated officially, some interpreted this behavior as following some of the prescriptions for getting out of the zero lower bound found in theoretical work by Michael Woodford, Ivan Werning, Paul Krugman, Gauti Eggertsson, and others. These authors showed how in many standard theoretical models, promising to keep policy accommodative longer than you otherwise would under future economic circumstances (what economists would call committing to a time-inconsistent policy) could help make up for some of the policy shortfall you find yourself in today by not being able to lower rates as much as you would like.

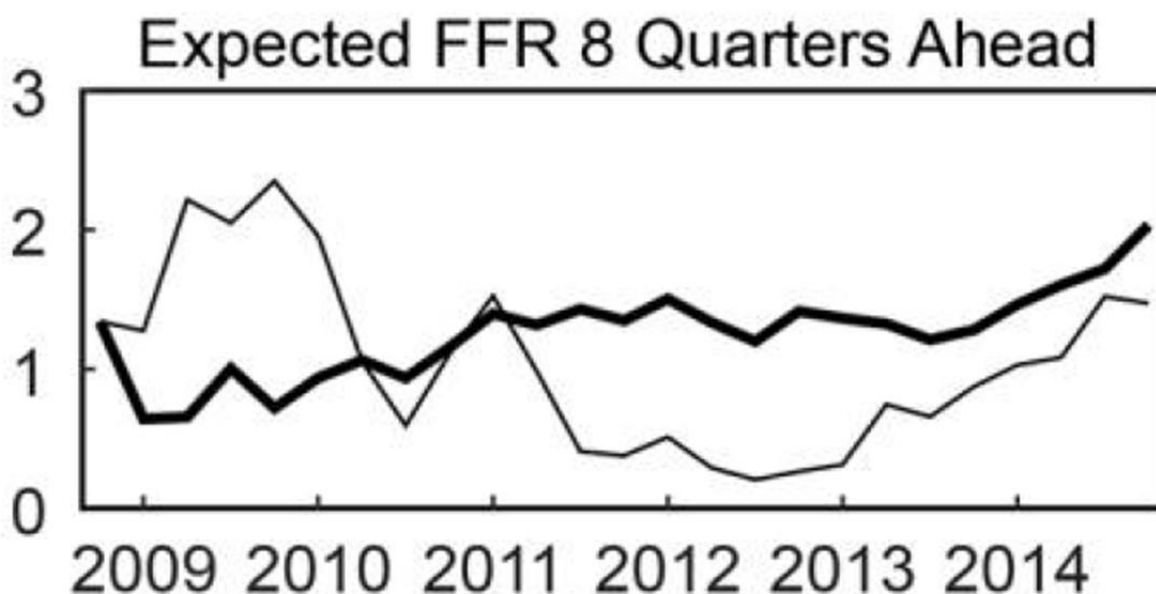
Finally, in December 2012, the Fed made a further modification to the forward guidance by explicitly linking the future lift-off in the funds rate to a substantial improvement in labor market conditions. The Fed tied the policy change to a reduction in the unemployment rate from its then 7.7 percent level to at least 6.5 percent. It included a safeguard saying it would reconsider this policy if inflation rose uncomfortably high in the meantime.

Thus, by the end of 2012, the Fed was providing a lot of specificity on how policy would react, or rather, not react to changes in economic conditions.

How well did this work? Although this is difficult to determine, our colleagues at the Chicago Fed, Jeff Campbell, Jonas Fisher, Alejandro Justiniano, and Leo Melosi, conducted an interesting analysis. They estimated a sophisticated model for the US economy and calculated what policy rate would prevail if the Fed slavishly followed a Taylor Rule, which in their model gives the average response of the Fed to output and inflation conditions estimated between 1993 and 2008:Q3. They then compared these forecasts to the interest rates actually being priced into the federal funds futures market.

In Figure 8, the thick line shows what the Taylor Rule said eight quarters ahead. So, for example, given the model forecast made in 2009 for inflation and unemployment in 2011, the Taylor Rule would say the funds rate should be about 3/4 percent. The thin line shows what in 2009 futures markets were pricing in for the federal funds rate in 2011, about 1-1/4 percent. According to this analysis, futures markets were expecting policy to be tighter than what the Taylor Rule would say through 2009 and 2010. This is no surprise, as many people were expecting policy to “return to normal.”

Figure 8: 2008-2012 Forward Guidance^{xxi}



Thick line: Model's Taylor Rule federal funds rate prescription
Thin line: Market expectations for the federal funds rate

But these expectations seem to have changed as the Fed transitioned to the date-based forward guidance in late 2011, added the dot plot in early 2012, and enhanced forward guidance in the latter part of 2012. By the end of that year, markets were pricing in about a 25 basis points funds rate, whereas the Taylor Rule had rates roughly 100 basis points higher. So, this analysis provides some evidence that forward guidance did enhance the Fed's policy accommodation.

Conclusion

No one would claim that Fed communications are now perfect. However, it is clear that they are immensely more detailed and likely more effective than they were 25 years ago. In no small part, that reflects the legacy of Michael Moskow at the Chicago Fed, who always advocated for better communications. We are fortunate to have had the chance to work with him on that and other projects during Michael's distinguished career with the Federal Reserve.

ⁱ The views expressed here are our own and do not necessarily reflect the views of the Federal Reserve Bank of Chicago or the Federal Reserve System.

ⁱⁱ Based on remarks given January 23, 2018 at the Chicago Council on Global Affairs in honor of Michael Moskow. Please see the following link for the original presentation slides:
<https://www.chicagofed.org/people/k/krane-spencer>.

ⁱⁱⁱ Norman also had the distinction of hiring Henry Clay, the Bank of England's first professional economist. However much we are in favor of giving work to economists, we make no claim that Clay's arrival contributed

to the British public's understanding of monetary policy. Norman is said to have told Clay that he was "... not here to tell us what to do, but to explain to us why we have done it." (Robert Skidelsky, 2017, " 'Never explain, never apologise': A review of David Kynaston's history of the Bank of England, September 11, available online, <https://robertskidelsky.com/2017/09/11/never-explain-never-apologise-a-review-of-david-kynastons-history-of-the-bank-of-england/>.)

^{iv} Liaquat Ahamed, 2009, *The Lords of Finance*, Penguin Press.

^v Binyamin Appelbaum, 2012, "A Fed Focused on the Value of Clarity," *New York Times*, December 13, available online, <https://www.nytimes.com/2012/12/14/business/economy/a-federal-reserve-that-is-focused-on-the-value-of-clarity.html>.

^{vi} FOMC press release, available online, <https://www.federalreserve.gov/fomc/19940204default.htm>.

^{vii} Available online,

https://fraser.stlouisfed.org/content/?item_id=23113&filepath=/files/docs/historical/FOMC/meetingdocuments/19870707RoPA19870821.pdf.

^{viii} Board of Governors of the Federal Reserve System via Haver Analytics.

^{ix} FOMC press release, August 12, 2003, available online,

<https://www.federalreserve.gov/boarddocs/press/monetary/2003/20030812/default.htm>.

^x FOMC press release, January 28, 2004, available online,

<https://www.federalreserve.gov/boarddocs/press/monetary/2003/20030812/default.htm>.

^{xi} FOMC press release, May 4, 2004, available online,

<https://www.federalreserve.gov/boarddocs/press/monetary/2004/20040504/default.htm>.

^{xii} Board of Governors of the Federal Reserve System via Haver Analytics.

^{xiii} Note, too, that short-term rates appeared to have increased more than markets initially anticipated. For example, in July 2004, Blue Chip forecasted an increase of about 150 basis points in the 3-month T-bill from 2004 through the second half of 2005. In the event, the increase was about 300 basis points.

^{xiv} Board of Governors of the Federal Reserve System via Haver Analytics.

^{xv} In 2016 the Fed specifically stated that this objective was symmetric—meaning that the FOMC would be equally concerned about inflation that ran moderately above or below 2 percent.

^{xvi} Available online, <http://jaredbernsteinblog.com/this-is-what-happens-if-you-stare-at-the-feds-dots-for-too-long/>.

^{xvii} Board of Governors of the Federal Reserve System, 2014, *Summary of Economic Projections*, June 14. Each shaded circle indicates the value (rounded to the nearest 1/8 percentage point) of an individual participant's judgment of the appropriate level of the target federal funds rate at the end of the specified calendar year or over the longer run. Red dots indicate the median projection.

^{xviii} Jared Bernstein, 2014, "This is What Happens if You Stare at the Fed's Dots for Too Long," blog post, Jun 18, available online, <http://jaredbernsteinblog.com/this-is-what-happens-if-you-stare-at-the-feds-dots-for-too-long/>.

^{xix} Mark A. Wynne, 2014, Federal Reserve Bank of Dallas, presentation available online,

<https://www.dallasfed.org/~media/documents/research/events/2014/14bigbendwynne.pdf>.

^{xx} John Carlson, Ben Craig, Patrick Higgins, William Melick, 2016, "FOMC Communications and the Predictability of Near-Term Policy Decisions," Federal Reserve Bank of Cleveland, June.

^{xxi} Jeffrey Campbell, Jonas Fisher, Alejandro Justiniano, and Leonardo Melosi, 2016, "Forward Guidance and Macroeconomic Outcomes Since the Financial Crisis," NBER Macroeconomics Annual.