Language after Liftoff: Fed Communication Away from the Zero Lower Bound*

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Abstract

This paper examines the Federal Reserve’s communication strategy to see how well it has worked and how it can be improved. It argues that Federal Reserve communication when short-term interest rates are no longer constrained by the zero lower bound should be focused on relaying a data-based reaction function which informs market participants how interest rates will adjust as new information arrives. Instead, the Federal Reserve in recent years has relied more heavily than desired on “time-based” forward guidance, focusing on when interest rates are likely to rise rather than under what circumstances. We argue that, except under unusual circumstances, this is an imprudent strategy, as it mutes the effect of macroeconomic news on interest rates and unnecessarily places restrictions on future Federal Reserve action when new information arrives. We argue that the Federal Reserve can improve communication in the current environment by moving away from time-based forward guidance, clarifying how interest rates are likely to change given new information, and providing more information in the Summary of Economic Projections.
“A couple of [meeting] participants questioned whether some financial market participants fully appreciated that monetary policy is data dependent, and a number of participants emphasized the importance of continuing to communicate this aspect of monetary policy.”

Federal Open Market Committee Minutes, January 2016

Section 1: Introduction

Central bank communication about monetary policy has come a long way in the last two decades. However, as highlighted by the quote above, the transition still seems to be a work in progress. Before the 1990s central banks pursued communication strategies with very limited transparency. This was particularly true for the Federal Reserve. Prior to 1995, the FOMC did not even publicly announce its target for the federal funds rate, its primary monetary policy instrument, forcing market participants to infer the target from the Fed’s actions.

Starting in the 1990s, this all began to change, with communication becoming a central focus. Central banks began to provide more information about the objectives of monetary policy and how they expect to achieve them. The recognition that monetary policy works not just through the current setting of policy instruments, but also through expectations about the future path of these instruments, led central banks to provide information about future paths of the policy interest rate, which has become known as “forward guidance”. Forward guidance became even more important when the policy rate declined to zero in the aftermath of the recent global financial crisis, leading to a zero lower bound on the policy rate. With the central bank’s inability to drive the policy rate much below zero, the management of expectations of future policy rates through forward guidance has become a key tool of monetary policy.¹

¹ With the introduction of negative interest and the ability of some central banks to move policy rates effectively the better part of a full percentage point below zero, there has been some slippage in the term “zero lower bound.” We use this term to identify the unusual situation in which policy rates have been moved to zero or below.
Short term interest rates are now moving away from the zero lower bound. As they do, the Federal Reserve will face a number of communication challenges as policy normalizes. In particular, some of the forward guidance techniques used when rates were pinned against zero will be less useful in more normal circumstances. In fact, the same techniques that were advisable at the zero lower bound may hinder effective communication away from the zero lower bound. There is evidence that in recent years market participants perceive a lower quality of communication coming from the Federal Reserve. For example, the average primary dealer score of communication quality by the Federal Reserve has been significantly lower since June 2013.\(^2\)

In this paper, we examine the Federal Reserve’s communication strategy to see how well it has worked and whether there are modifications that might improve it. We start by examining what economic theory on optimal monetary policy, which ambitiously has been referred to as the “science of monetary policy” by Clarida, Gali and Gertler (1999), tells us about central bank communication strategy. We discuss how Federal Reserve monetary policy communication has evolved over the last twenty years. Then we conduct empirical analysis to evaluate the Federal Reserve’s monetary policy communication. Finally, we apply the theory and evidence to see what changes in Federal Reserve monetary policy communication can make it more effective.

Our central argument is that Federal Reserve communication in recent years has relied too heavily on what we refer to as “time-based” forward guidance. This is direction provided by the Federal Reserve to market participants that is based on calendar time, such as the Congressional testimony by Chair Janet Yellen in July 2015 in which she noted: “If the economy evolves as we expect, economic conditions likely would make it appropriate at some point this

\(^2\)Some of this perceived deterioration may simply reflect the increased challenges of effective communication at key turning points in policy, but we argue that weaning the market from date-based guidance has been a contributing factor. See Section 4.2 for more details on the Primary Dealers Survey and the scores since 2011.
year to raise the federal-funds rate target, thereby beginning to normalize the stance of monetary policy” (our emphasis). Another example of time-based forward guidance was the statement released after the August 2011 FOMC meeting which noted that “economic conditions … are likely to warrant exceptionally low levels for the federal funds rate at least through mid-2013.” The key characteristic of time-based forward guidance is that guidelines are a function of calendar time as opposed to new economic information that arrives.

The paper begins with an examination of the theory of central bank communication in Section 2.1. We argue that time-based forward guidance is an imprudent communication strategy from a theoretical perspective when a central bank is no longer up against the zero lower bound on nominal interest rates. Foundational theories on monetary policy communication call for forward guidance that is data-dependent, not time-dependent. In other words, communication of monetary policy should inform market participants about how the central bank will react to future macroeconomic news. The emphasis away from the zero lower bound should be on communicating to market participants the central bank’s reaction function—how the central bank will adjust rates given new information—and not on time-based forward guidance. If done effectively, a successful central bank communication strategy guides the market to do the heavy lifting for monetary policy by incorporating new information immediately into interest rates.

Time-dependent forward guidance causes two problems. First, time-dependent forward guidance implies a commitment to ignore future macroeconomic news, which in most circumstances is not what the central bank intends. Time-dependent forward guidance actually makes the central bank reaction function less clear in many circumstances. As a result, markets may react by failing to incorporate news into interest rate determination. Second, time-dependent forward guidance constrains future actions of the central bank. This leads to a predicament if
macroeconomic news changes in an unexpected manner: either the central bank sticks with the original action which may be sub-optimal given new information, or the central bank changes course which hurts its credibility.

We begin our empirical analysis by providing in Section 2.2 a descriptive analysis of Federal Reserve communication since 1999. We classify each statement from FOMC meetings since 1999 as including data-dependent forward guidance, time-dependent forward guidance, or no forward guidance. There have been two periods in which the FOMC has provided strong time-dependent forward guidance: the 2003 to 2006 period, and the 2011 to 2015 period. In both periods, the FOMC statements contained strong language about future monetary policy decisions that were based on a measure of calendar time. Next we turn to an analysis of the summary of economic projections (SEP), a potentially important element in the FOMC’s forward guidance since 2011. In particular, we assess the extent to which the SEP provides useful information about the FOMC’s policy reaction function.

We then consider empirical evidence on the market impact of time-based forward guidance in Section 3. Consistent with theory, we find that interest rates become less sensitive to macroeconomic news when the FOMC statements utilize strong time-dependent forward guidance. Using the method introduced by Swanson and Williams (2014), we show that the sensitivity of interest rates to macroeconomic news announcements is only half as large when the FOMC statement contains strong time-based forward guidance. This is true at the 3-month, 6-month, 1-year, and 2-year maturities of U.S. Treasuries. We also show that market volatility declines to abnormally low levels when the FOMC uses time-based forward guidance.

In Section 4 we consider evidence from the Federal Reserve Bank of New York’s survey of primary dealers’ assessment of the effectiveness of Fed communications. We find that
abnormally low scores recorded in recent years have been associated with both increased volatility of interest rates following FOMC announcements and in some notable instances, confusion that was evidently associated with time-based guidance.

To be clear, we appreciate the difficult position monetary policy-makers are in when it comes to forward guidance. Almost all time-based forward guidance given by the Federal Reserve comes with data-based qualifications. As an example, the July 2015 congressional testimony by Janet Yellen discussed above explicitly noted that the time-based forward guidance was only relevant if “the economy evolves as we expect.” But unfortunately, as we document with examples below, the financial press (and market participants, from our experience) focus disproportionately on the time-based forward guidance given in these statements and downplay the data-based qualification. One message from our study is that the financial press and market participants should stop focusing so much on dates when FOMC members speak, and instead focus more on new information related to the central bank reaction function.

In Section 5, we provide recommendations for potential improvements for the Federal Reserve communication strategy. We argue that time-based forward guidance should be used only in exceptional circumstances, such as when rate setting ability is constrained by the zero lower bound. However, we also acknowledge that data-based forward guidance where policy-makers provide information on the future path of policy rates is quite difficult, especially given institutional features of the FOMC. Given these difficulties, one alternative we consider is potentially dropping forward guidance with a projected policy path and instead return to implicit guidance that was contained in balance of risk or policy bias statements, with some amplification. Another alternative would be to try to improve the way forward guidance with a
projected policy path is communicated. We make a number of suggestions as to how this communication might be improved.

Setting the stage

Before delving more deeply into the theory and data, we believe two simple examples can help guide the time-based and data-based forward guidance discussion. They also highlight the communication difficulties faced by central bankers. On July 10th, 2015, Chair Janet Yellen gave a speech at the City Club of Cleveland. The most covered part of her speech was the following two sentences:

“Based on my outlook, I expect that it will be appropriate at some point later this year to take the first step to raise the federal funds rate and thus begin normalizing monetary policy. But I want to emphasize that the course of the economy and inflation remain highly uncertain, and unanticipated developments could delay or accelerate this first step.”

This statement involves both time-based forward guidance (a prediction that rates will raise in the calendar year of 2015) qualified by a data-dependency (unanticipated developments could derail this plan). This statement exemplifies the broader pattern of Federal Reserve officials linking time-based forward guidance with a qualification that incoming information could change the time-based prediction.

How did the financial press cover the speech? The headlines of articles from the Financial Times, New York Times, and Wall Street Journal articles were “Yellen Reiterates Case for 2015 Rate Rise,” “Yellen Expects Fed to Raise Rates this Year,” and “Janet Yellen: Fed on Track for 2015 Rate Hike,” respectively. We conducted a more systematic analysis by doing a
Google search of the phrase, “Janet Yellen July 10 2015” and examined the first 50 web pages listed. We found 14 articles covering the speech by different news organizations. Every single one of them had a headline mentioning a rate hike on 2015.

The speech was almost 4,000 words and covered myriad topics. But the financial media focused primarily on the time-dependent forward guidance part of the speech for their headlines. The newspapers did not completely ignore the data-dependency associated with the statement. For example, both the Financial Times and the Wall Street Journal included both sentences of the above quote from the speech. The New York Times did not include the data-dependency qualification, only the time-based forward guidance sentence. Regardless, we believe that a fair reading of all three articles leaves the impression that the Federal Reserve was quite certain that rates would be raised in 2015 independent of economic circumstances, and our opinion is that financial market participants also gleaned the same conclusion.

We also see a similar focus on calendar time in media interviews with Federal Reserve officials. For example, in a January 6, in an interview with Stanley Fischer, Steve Liesman of CNBC asked the following question, “The Summary of Economic Projections says there will be four rate hikes this year, or at least that’s the median forecast of a FOMC member. Is that your view?” and then continued to ask similar questions about the timing of Fed rate hikes. This fixation on calendar time is not only a feature of media interviews, but, in the experience of some of the authors, exact timing is the question most asked by market participants about Federal Reserve policy actions.

In this paper, we focus on the following question: Is it advisable for Federal Reserve officials to provide such time-based forward guidance when the financial press and market

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participants are likely to ignore any data-dependency that comes with it? Does the answer to this question depend on whether short term rates are against the zero lower bound?

Section 2: The Theory and Facts of Central Bank Communication

In this section, we discuss the theory of effective communication by the central bank regarding monetary policy, and we also provide a review of the recent history of communication policies of the Federal Reserve in the United States. We discuss the time-inconsistency problem facing central bankers and the difference between data-based forward guidance and time-based forward guidance. We also describe Federal Reserve communication through statements released after the Federal Open Market Committee (FOMC) meetings, and the statement of economic projections that the FOMC has released since 2011.

2.1 What should central bank communication accomplish?

The modern era for the science of monetary policy began with the rational expectations revolution in macroeconomics. In a remarkable series of papers, Robert Lucas (1972, 1973, and 1976), demonstrated that expectations are central in macroeconomic models, and therefore managing expectations is a crucial element of monetary policy. A key discovery in the science of monetary policy that emanated from the rational expectations revolutions was the time-inconsistency problem (Kydland and Prescott (1977), Calvo (1978), and Barro and Gordon (1983)).

The time-inconsistency problem can arise when monetary policy conducted on a discretionary, day-by-day basis leads to worse long-run outcomes than could be achieved by committing to a policy rule. In particular, policymakers may find it tempting to exploit a short-
run Phillips curve tradeoff between inflation and employment; but private agents, cognizant of this temptation, will adjust expectations to anticipate the expansionary policy, so that it will result only in higher inflation than is desirable with no short-run increase in employment. In other words, without a commitment mechanism, monetary policy makers may find themselves unable to *consistently* follow an optimal plan over *time*; the optimal plan can be *time-inconsistent* and so will soon be abandoned.

Several solutions to the time-inconsistency problem have been proposed, all of which involve a particular form of central bank communication. One solution to the time-inconsistency problem is the adoption of an instrument monetary policy rule. Examples include a monetarist constant-money-growth-rate rule advocated by Milton Friedman, or the Taylor (1993) rule in which the federal funds rate is set to be a weighted average of an output gap (actual output minus potential output) and an inflation gap (actual inflation minus the target inflation rate.) Adoption of such rules makes central bank communication very straightforward: the central bank only has to announce that it will be following such a rule and then actually does so.

There are, however, four main arguments against pursuing such a communication strategy. First, for an instrument rule to produce good economic outcomes, policymakers must have a reliable model of the macroeconomy so that they can have confidence that the instrument rule they choose is close to the optimal policy rule. For example, deriving an optimal Taylor rule requires that the central bank has confidence in its estimate of the natural rate of unemployment and that a Phillips-curve relationship is stable. Unfortunately, research indicates that estimates of the natural rate of unemployment are highly uncertain (Staiger, Stock and Watson (1997) and Federal Reserve officials have cast doubts on whether the Phillips curve is sufficiently stable to provide a reliable guide to monetary policy (e.g., recent remarks by
Brainard (2015) and Tarullo (CNBC, 2015). Indeed, Orphanides (2002) has argued that the very high inflation outcomes in the United States in the 1970s were due to an underestimate of the natural rate of unemployment on the part of Federal Reserve policymakers.

Second, following an instrument rule requires that the structure of the economy does not undergo substantial changes so the instrument rule remains valid. The failure of monetary targeting in many countries in the 1980s indicates the dangers of adopting instrument rules. A particularly striking example occurred in Switzerland in the late 1980s, as documented in Bernanke, Laubach, Mishkin and Posen (1999). In 1980, the Swiss National Bank adopted a growth rate target for the monetary base. In 1988, the Swiss introduced a new interbank payment system, the Swiss Interbank Clearing (SIC), and a wide ranging revision of commercial banks liquidity requirements. These structural changes caused a severe drop in banks’ desired holdings of deposits at the Swiss National Bank, and so a smaller amount of the monetary base was now needed relative to aggregate spending. The resulting upward shift in velocity meant that adherence to the monetary base target led to very high inflation, with Swiss inflation rising to above 5%, well above that of the rest of Europe, which of course horrified the anti-inflation Swiss. The problem with monetary targeting instrument rules is exemplified by the colorful quote from Gerald Bouey, the governor of the Bank of Canada in the 1980s, who said, “We didn’t abandon monetary aggregates, they abandoned us.”

Third, an instrument rule can be too rigid because it cannot foresee every contingency. For example almost no one could have predicted that problems in one small part of the financial system, subprime mortgage lending, would lead to the worst financial crisis since the Great Depression. The unprecedented steps that the Federal Reserve took during the crisis to prevent it
from escalating into an even deeper crisis that could have led to a depression (Mishkin and White, forthcoming) could not have been written into a policy rule ahead of time.

Fourth, an instrument rule does not easily incorporate the use of judgement. Monetary policy is as much an art as a science. Monetary policymakers need to look at a wide range of information in order to decide on the best course for monetary policy, and some of this information is not easily quantifiable. Judgement is thus an essential element of good monetary policy, and it is very hard to write it into a rule.

All of these arguments argue against implementation of an instrument rule for monetary policy and this is why recent proposed Congressional legislation to encourage the Federal Reserve to adopt a Taylor-rule framework for the conduct of monetary policy would likely produce much worse economic outcomes. But does this mean that monetary policy should be discretionary?

The distinction between rules and discretion has strongly influenced academic debates about monetary policy for many decades. But as Bernanke and Mishkin (1997) have argued, this distinction is too stark. Both rules and discretion are subject to problems, and so the dichotomy between rules and discretion may be too simple to capture the realities that monetary policymakers face. Discretion can be a relatively undisciplined approach that leads to the time-inconsistency problem. Alternatively, it might operate within a clearly articulated framework, in which the central bank commits to and communicates in advance its objectives and tactics of monetary policymaking—although not their specific actions on policy instruments. Bernanke and Mishkin (1997) referred to this type of framework as “constrained discretion”.

Inflation targeting, which began to be adopted by central banks in the 1990s, in which a central bank commits to an explicit numerical inflation objective (commonly around 2%), is one
such communication strategy to constrain discretion. First, inflation-targeting central banks publicly announce an explicit numerical inflation objective (commonly around 2%). Second, inflation-targeting central banks communicate their commitment to achieving the inflation target over the medium term and their accountability for achieving the inflation target. Third, inflation-targeting central banks provide information about their policy actions and their policy reaction functions so that market participants and politicians can evaluate whether central banks have taken and will take the appropriate policy measures to achieve the inflation target.

As discussed in Mishkin (1999) and Bernanke, Laubach, Mishkin and Posen (1999) central banks that have adopted inflation targeting have put tremendous stress on increasing the transparency of central bank communication. Central bank officials communicate regularly with government officials and take every opportunity to make public speeches on their monetary policy strategy. In addition, they produce documents, generically referred to as “Inflation Reports” which discuss: 1) the goals and limitations of monetary policy, including the rationale for inflation targets; 2) the numerical values of the inflation targets and how they were determined, 3) how the inflation targets are to be achieved with policy actions, given current economic conditions; and 4) reasons for any deviations from targets.

All of these communication efforts are intended to improve private-sector planning by reducing uncertainty about monetary policy, interest rates and inflation. In addition, they have made central banks more accountable and have elements of a behavior rule. An inflation target can help overcome the time-inconsistency problem by providing an expected constraint on discretionary policy. For example, if monetary policymakers commit to an inflation objective, say of 2%, then they know that they will be subject to public scrutiny and criticism if they miss this objective or pursue policies that are inconsistent with this objective. To avoid embarrassment
and possible punishment, they will be less tempted to pursue overly expansionary, discretionary policies in the short run that will be inconsistent with their commitment to the inflation target.

Inflation targeting also has the advantage of anchoring inflation expectations relative to countries that have not adopted it (see the evidence in Blinder, Ehrmann, Fratzsher, De Haan and Jansen, 2008). Since inflation expectations are a central element in inflation dynamics, it is not surprising that inflation targeting generally has been found to stabilize inflation particularly in emerging market economies, where institutions are weaker than in advanced economies. Inflation targeting has been found to produce not only more-stable inflation but lower volatility of output fluctuations (Fatás, Mihov, and Rose, 2007; Mishkin and Schmidt-Hebbel, 2002, 2007).

The benefits of the communication strategy developed in the 1990s as part of the implementation of inflation targeting is now generally accepted by central banks throughout the world. Indeed, even central banks in countries that did not adopt an explicit numerical objective for inflation and so were not classified as inflation targeters in the 1990s and 2000s, the Federal Reserve being a notable example, increased these channels of communication along with inflation-targeting central banks.

Although the communication strategy developed as part of inflation targeting has gone a long way to reduce the time-inconsistency problem, further advances in the science of monetary policy, notably the seminal work of Michael Woodford (2003), argue that there are important benefits from central bank communication going a step further by providing information about the future policy path of the policy interest rate, known as “forward guidance”.

As discussed in Woodford (2003), optimal monetary policy involves a central bank’s commitment to a target criterion, which involves trading off deviations of inflation from its
target level with the output gap, the deviation of output from potential. Optimizing this target
criterion then results in the setting of the policy instrument, such as the federal funds rate, which
reacts to the current and expected future states of the economy. Central bank communication so
the public understands how the central bank sets the policy instrument reaction function can
improve monetary policy performance because it leads to the right expectations dynamics.

To see why consider a negative shock to aggregate demand when both the inflation gap
and output gap are at zero. The result would be that both the inflation and output gaps would turn
negative in the future and an optimal monetary policy reaction function would indicate that the
federal funds rate path would be lowered. If the Federal Reserve’s reaction function is well
understood by the public, then without the Fed taking any actions, expectations of the future
federal funds rate would decline, which would result in lower longer-term interest rates and
stimulate the economy. The result would then be an immediate offset to the negative aggregate
demand shock which would help stabilize the economy.

Another way of stating this result is that successful central bank communication about the
monetary policy reaction function would enable the markets to do a lot of the work for the
central bank. If the monetary policy reaction to shocks is predictable, expectation dynamics work
to tighten or loosen financial conditions appropriately when there are shocks to the economy.

One way to provide information about the monetary policy reaction function is for the
central bank to conduct \textit{data-based} forward guidance, that is, provide information on the future
path of the policy rate \textit{conditional} on the data that is expected over the policy horizon. This
means not only providing information on the policy path given the central bank’s forecast, but
also to indicate how that path changes if and when the central bank’s forecast changes. This type
of forward guidance differs from \textit{time-based} forward guidance in which a central bank commits
to set the policy rate at specific levels at specific calendar dates. An extreme version of time-based forward guidance would be a central bank committing not to raise interest rates from their current level for one year. Such a commitment would ignore incoming information, which is why the forward guidance is *time-based*. Sections 3 and 4 provide evidence on whether time-based or data-based forward guidance is optimal. But before we begin the normative analysis, we first describe current communication by the Federal Reserve.

### 2.2 FOMC communication over the past twenty years

How closely has communication from the Federal Reserve followed the science of monetary policy discussed in the previous section? In this subsection we evaluate FOMC communication focusing primarily on post-meeting statements, and in the next subsection we turn to the summary of economic projections.

FOMC communication via post-meeting statements commenced in February 1994 with the onset of the 1994-95 tightening cycle. For the next five years, the statements served as announcements of changes in policy; they did not accompany meetings when policy was left unchanged. Prior to this period, the public was left to infer policy action from developments in the market. Regular post-meeting statements began in May 1999. The initial intent of these regular statements was threefold: (1) to announce and explain policy changes, if any, (2) to provide information about how the Committee views key current and prospective economic developments, and (3) to provide some guidance about possible future policy action.

Over the ensuing 16-plus years, the initial intent of the post-meeting statements has remained intact, but their length and complexity has increased significantly. The length of the statements has quadrupled over time, and for a while spiked even higher during the post-crisis
period of quantitative easing (Chart 2.1). This lengthening was associated in part with the greater attention given to forward guidance, especially as it grew in importance and specificity during the crisis and post-crisis period. It also reflected the challenges of communicating major innovations in policy as large-scale asset purchase programs were introduced. The first regular statement in May 1999 had 150 words, of which less than one-third were devoted to what we will term a “weak form” of forward guidance. The December 2015 statement contained about 600 words, with more than one-third devoted to forward guidance.

**Chart 2.1: Total number of words in FOMC statements***

*Chart indicates that length of FOMC statements has grown substantially over time, and that it surged during and after the financial crisis, especially as the Fed’s balance sheet programs were being implemented.

Source: Authors’ calculations.
In recent years, post-meeting communications have been augmented by substantially more than additional words per statement. Beginning in April 2011 post-meeting press conferences and the Summary of Economic Projections (SEP) were introduced. And in January 2012 FOMC participant interest rate projections (shown initially in the so-called “dots chart”) were released, along with a statement of longer-run goals and policy strategy that formalized the Committee’s inflation objective. These additions were generally intended to amplify the basic message about monetary policy contained in the post-meeting statements. However, as we will note further below, the median dots have not always coincided exactly with the central view of the Committee. The SEPs and the Committee’s interest rate forecasts in particular are an important form of forward guidance that we consider in more depth in the next section.

Other Fed policy communications, including minutes to the FOMC meetings, press conferences, and FOMC speeches and testimonies are of course important as well. But to limit the scope of our analysis to something manageable, we assume these other forms of communication have generally played two roles: first to further amplify the FOMC’s central policy message and second to indicate the full range of sometimes conflicting views about current policy and policy prospects among Committee participants. In general, the thrust of monetary policy (as viewed/intended by the center of the Committee) has been captured first and foremost in the statements that the Committee has drafted for release following each meeting. The Committee leadership has rarely deviated in alternative communications from the line given in the current FOMC statement.4

From the outset of these regular statements, forward guidance imbedded in the language of the statements has been both implicit and explicit. Market participants could infer how the Fed

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4 In his recent memoir, Bernanke (2015) did note that in several instances during 2008 to 2010, he was dissatisfied with the policy setting and used speeches by the Fed leadership (himself, President Dudley or Vice Chairman Kohn) to recalibrate market expectations.
was leaning with respect to possible future policy action from the “tone” the overall statement, including in particular its description of recent and prospective economic developments. In the inaugural May 1999 statement, for example, the Committee said that it saw “tight domestic labor markets” and the “potential for a buildup in inflationary imbalances.” This would have been taken as an indication that policymakers could be leaning toward a tightening. The statement also went a step further and said more specifically that the Committee was adopting a bias toward tightening in its policy directive, thereby indicating more directly that policy rates could be rising in the months ahead. The statement thus contained a weak form of data-based forward guidance: it indicated the possibility of action ahead and the direction of that action. This form of forward guidance would become the baseline or norm for the Committee except during several major swings into time-based policy guidance. A stronger form of data-based guidance would have been more specific about the potential path of rates and what economic conditions would generate it.

In what follows, we will focus primarily on the evolution of the more specific forms of forward guidance in FOMC communications. For completeness, however, we also touch at least briefly on the implicit form—that is, what markets may have been able to glean from the tone of the FOMC’s statement (or its overall “hawkishness” or “dovishness”) about the prospects for policy going forward. Fortunately, advances in computational linguistics or textual analysis allow us to do so fairly efficiently. Following a procedure similar to that used by Lucca and Trebbi (2009), Luzzetti et. al. (2016) have constructed an objective measure of the relative hawkishness or dovishness of FOMC statements since 1999. Their “Hawk-Dove Score” or

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5 Luzzetti, Hooper, and Slok’s procedure can be summarized as follows. First, they use an off-the-shelf computational linguistics program to break the raw text from the FOMC statements into searchable groups that capture the essential meaning of the text. Second, they conduct Google searches to determine the relative frequency with which each phrase is found jointly with “hawkish” and “dovish” in the universe of websites covered by the
HDS shown in Chart 2.2 is found to have interesting leading-indicator properties. They find that shifts in the perceived relative hawkishness or dovishness of the FOMC’s language correctly anticipates changes in policy in the same direction within four to six months about two-thirds of the time.⁶ For example, the statements became increasingly hawkish prior to and during the hiking cycles of the late-1990s/early-2000s and mid-2000s. They also shifted in a more dovish direction prior to the completion of these hiking cycles in both cases, thereby foreshadowing the Fed’s pivot to a more neutral and eventually easing policy stance. The statements have had a dovish bias throughout the post-crisis recovery with relatively muted fluctuations compared to before the crisis. Most recently (including through the January 2016 statement), as the Fed had begun to raise rates, the HDS score turned more dovish, pointing to a very cautious pace of rate advances ahead. Finally, more often than not, perceived movements in statement language as gauged by the HDS correctly anticipated key changes in balance sheet policy. In brief, the overall tone of the statement language, including importantly the description of economic developments and prospects, while not intended as forward guidance per se, does appear to have useful forward guidance properties.

**Chart 2.2: “Tone” of statement tends to anticipate movements in policy***

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⁶ This finding is in the same spirit as a growing body of literature that has found that textual analysis of the FOMC minutes can anticipate movements in both Fed policy and Fed staff forecasts. See Stekler and Symington (2014), and Ericsson (2015).
2.3 *Data-based versus time-based forward guidance in FOMC statements*

As we discussed in subsection 2.1, from a conceptual perspective, forward guidance can be viewed as either time-based or data-based. In practice, the FOMC has used both, often within the same statement. In this sub-section we trace through the recent history of FOMC communications with a particular focus on the structure of forward guidance contained in these communications. Our intent is to analyze this structure through our lens of time-based vs data-based guidance. We do so by striving to categorize the net forward guidance content of each statement as either time-based or data-based (or neither).
This categorization does not readily lend itself to computational linguistics, so our approach is unabashedly judgmental: Based on a careful reading of the FOMC statements and using a scale that runs in principle from -5 to +5, we assign a negative score to statements judged to be weighted more heavily toward time-based guidance, with stronger such guidance receiving a more negative score. We count as time-based guidance any indication to the market to expect policy action or inaction for some period of time in the future that is not necessarily based on particular economic outcomes.

This definition does suffer from some ambiguity. The FOMC has generally been careful in its time-based guidance to include conditional statements regarding actual or projected economic outcomes. When such data-based conditionality is perceived to be relatively strong or clear, the time-based guidance is judged to be relatively weak. When the market would have viewed the guidance as time-based even in the face of clear conditionality, the guidance was judged to be stronger. Examples of strongly time-based guidance include (1) the periods in the mid-2000s when rates were expected to be held low for a “considerable period” and subsequently when they were to be raised at a “measured pace,” as well as (2) the episode in 2012 when specific future dates were given for liftoff horizons.

A positive score is assigned to statements judged to be weighted more heavily toward data-based guidance, with stronger such guidance getting a more positive score. We count as data-based guidance any indication that policy is likely to change given recent and prospective economic developments. An example of data-dependent guidance was the period in the early 2000s when the statement often noted a bias toward action conditional on particular economic outcomes.
Our final time vs. data based index is shown in Chart 2.3. It indicates several fairly clear swings in guidance from weakly data-based to more strongly time-based. It also shows a predominance of time-based guidance during the crisis and post-crisis (zero lower bound) period, and fluctuations from one type of guidance to the other during more normal periods. In what follows we trace these swings through the several major phases of US monetary policy during the past sixteen years.

**Chart 2.3: Forward guidance: Timeline of time-dependence vs data-dependence**

*Chart shows a judgmentally computed index of the relative strength of net time-based or data-based content of FOMC forward guidance at any given point in time. Numbers closer to zero denote weaker guidance. Labels indicate key terms used in guidance.*

*Source: Authors’ calculations*

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7 Chart 2.3 appears to exhibit a preponderance of time-based forward guidance. This results in part from the relative strength of that guidance during unusual economic circumstances. During more normal periods, the Fed’s adherence to data-based guidance could have been scored higher in a positive direction if we had given more weight to the extent to which policy was being guided (albeit implicitly) by Taylor rule types of considerations.
1999-2003: Weak data-based guidance. During the policy firming cycle of 1999-2001 and the easing cycle of 2002-03, forward guidance was generally, but not exclusively, data-dependent, earning a score of around +1. Early on, the statements expressed concern about the risks of gathering inflationary imbalances and noted first an explicit bias toward policy firming, and later an implicit policy bias in the form of a balance of risks tilted toward excessive inflation.8 Beginning in 2001, risks shifted toward economic weakness and a negative balance of risks or an implicit easing bias. For much of this entire period, there was a weak indication that if economic trends continued as expected or feared, policy action would be forthcoming. On some occasions, notably in the second half of 1999 and much of 2002, forward guidance was very weak. In some cases, an explicitly balanced directive or neutral balance of risks was noted (e.g., August, November 1999 and March, June, November, December 2002). We gave these periods a score of -0.5, indicating very weak time-dependent guidance, as they provided a signal that no policy action was anticipated in the very near term. In other cases an explicitly balanced directive was modified by language expressing concerns about, e.g., inflation imbalances, as in June and December 1999. These instances got a value of +0.5, indicating very weak data-dependent guidance.

2003-06: Strong time-based guidance. In June 2003, the fed funds target rate was reduced to what was then an all-time low of 1.0%, a level that many observers felt the Fed would

8 The May 1999 statement revealed that Committee had voted to adopt a policy directive that was tilted toward a possible firming of policy in the period ahead. The “directive” (including policy tilt or bias) had been included in instructions the Committee had conveyed to the New York Fed trading desk after its meetings since 1983. Prior to the May 1999 meeting, however, the directive had not been revealed to the public until the meeting minutes were released after the next FOMC meeting. By that time, the information was generally fairly stale. We gave the May and October 1999 meetings scores of +1.5—in both instances the policy directive was tilted toward policy firming. Beginning in February 2000, the Committee shifted to a less specific “balance of risks” formulation, which we give a slightly lower score of +1.0 because it was not directly tied to a possible policy firming, although market participants may have grown to interpret it in that vein.
see as a lower limit. Evidently feeling constrained by that limit and feeling the need to give the market a stronger message about the extent of its concern about growing risks of deflation, the Committee resorted for the first time to some fairly strong time-based guidance. At the next meeting in August, the statement, with inflation risks still balanced to the downside, the Committee added to its post-meeting statement, the phrase “…the Committee believes that policy accommodation can be maintained for a considerable period.” This clear indication that policy would not be changing for some time to come was given a time-based score of -3.0. It lasted for four meetings (six months) while the downside risks to inflation gradually receded. In January 2004, the considerable period language was replaced by a statement that the Committee could “be patient in removing its policy accommodation,”—a weakening of the time-dependent guidance (to a score of -2.0). This formulation lasted a couple meetings.

In May 2004, with policy rates still at the 1% level, the guidance was changed to: “At this juncture, with inflation low and resource use slack, the Committee believes that policy accommodation can be removed at a pace that is likely to be measured.” This would soon be interpreted as strong calendar-based guidance, indeed, it would only take a couple meetings of experience with 25bp rate hikes attached to this language to make it so (strengthening from -2 to -3). The measured pace language lasted through November 2005—i.e., for most of the 17 consecutive meetings of 25bp hikes that ensued over the next two-plus years. It was accompanied throughout this period by the data-dependent qualification that, “Nonetheless, the Committee will respond to changes in economic prospects as needed to fulfill its obligation to maintain price stability.” But it soon became clear to the market that it would take a significant shock to move the Fed away from 25bps per meeting pace so long as the “measured pace”

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9 Rudebusch and Williams (2006, p.255) observe that when this new variant of forward guidance was introduced, it “trumped” the balance of risks statement.
language remained intact. So the time-dependent content of the statement predominated. In December 2005, “measured pace” was softened to “some further measured policy firming,” signaling the coming end to the uptrend, and a weakening of the calendar-based guidance (to -2). In January “measured” was dropped altogether from this phrase, and the time-dependence of the guidance weakened significantly (to -0.5) and remained there until rates reached 5.25% in June.

For several years this episode of time based guidance had taken on a life of its own, with the FOMC holding to its language of a steady predictable pace of tightening to come even after the unemployment gap was eliminated by mid-2005 and year/year core PCE inflation had moved above 2%. Over the next several years, the unemployment rate would move below NAIRU and inflation would fluctuate somewhat above what was perceived to be the Fed’s generally preferred level of 2%--evidence that policy had been overly easy. In retrospect though, the bigger danger associated with the measured pace mantra may have been the extent to which its predictability encouraged excessive risk taking, especially in the housing market. Some observers have argued that monetary policy that was too easy and predictable during this period led to the housing bubble and the resulting financial instability that was followed by the worst financial crisis in the United States since the Great Depression. This would be the first of several episodes of time-based FOMC guidance that essentially placed monetary policy in a box that was difficult to escape. Deviating from the previously announced path would have caused the market may take the view that the Federal Reserve has flip flopped and broken its word, thereby weakening the Fed’s credibility.

2006-08 Weak data-based guidance as crisis approaches. For the first year after rates peaked at 5.25%, the FOMC kept policy unchanged and issued statements indicating that risks

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10 See for example, Taylor (2007), Meltzer (2009), and White (2009). For a rebuttal to this argument, see Bernanke (2010), who attributes the housing bubble more to regulatory shortcomings than monetary policy.
were balanced toward inflation being too high. They also continued to indicate that further policy action would depend on the evolution of the outlook for growth and inflation, keeping guidance in the statement weakly data-dependent (scored at +1.0). In the early stages of the financial crisis beginning in August 2007, inflation remained a concern, but downside risks to growth were increasing, and the deterioration of financial market conditions was adding considerable uncertainty to the picture. Forward guidance, weak to begin with, became minimal. The FOMC cut rates aggressively from 5.25% to 2% over the next six meetings, and issued statements that noted both continuing upside risks to inflation and downside risks to growth stemming from turbulence in financial markets. Amid considerable uncertainty, risks were either balanced evenly (generally following rate cuts) or tilted slightly toward further easing. Overall, we scored what guidance there was during this period up until September 2008 as weakly data-based (assigning a value of +0.5, except on the few occasions when risks were explicitly seen as balanced, which got a score of 0 given the uncertainty at the time).

**2008-12 Crisis management and the strengthening of time-based guidance.** In the wake of the financial turmoil brought on by the collapse of Lehman in September 2008, the FOMC cut rates quickly to essentially zero by the end of the year. With the final rate cut to zero in December, the Committee added to the statement their expectation that “weak economic conditions are likely to warrant exceptionally low levels of the federal funds rate for some time,” which in itself was moderately strong calendar-based guidance (scored at -2.0). Two meetings later, this guidance was strengthened when “for some time” was upgraded to “for an extended period.” This formulation remained in the statement for nearly two and a half years, through June 2011 (scored at -3.0).
In August 2011, “extended period” was replaced by a more forceful and explicit variant of calendar guidance by naming a specific date: the statement now said that rates were expected to remain exceptionally low “at least through mid-2013” (i.e. for about the next two years). About six months later, the guidance was extended to “at least late 2014” to maintain the two-year horizon. And in September 2012 it was extended out even further, to “at least mid-2015,” but this formulation was to remain for only two meetings. This entire period was scored at -4, the strongest episode of time-dependent guidance. This episode of unusually explicit time-based guidance was important because illustrates the possible potency of this tool. The FOMC, whose monetary ammunition was running low, was looking for additional weapons to being to bear. Improvement in the labor market had stalled with the unemployment rate having leveled off far above NAIRU at 9% for nearly a year, with inflation still well below 2%. Two QE programs (discussed further below) had been implemented but had failed to move market rates as low as desired, sustainably. In late July-early August, a debt ceiling crises and downgrading of US Treasury debt precipitated a sharp rally in the bond market. During this period, the 10-year Treasury yield plunged from above 3% to less than 2%. With the rally well under way and the 10-year yield at 2.3% the Fed implemented its “at least through mid-2013” guidance on August 9, 2011. The move appeared to have the desired effect as the 10-year yield plunged further immediately following the announcement. The 10-year yield would move below 2% and remain there for most of the next year and a half. In the wake of previous and subsequent debt crises (in 1995-96 and 2013) rates had bounced back fairly quickly. But it would not do so this time, even as the unemployment rate resumed its downtrend and inflation returned to near 2% during 2012. The strong date-based forward guidance evidently had a powerful impact, though its impact was no doubt augmented significantly by additional QE programs.
Chart 2.4: Bond yields depressed by strong time-based guidance during 2011-2013*

Chart shows that 10-year Treasury yield dropped and remained at unusually depressed level for well over a year after the FOMC moved to especially strong date-based guidance in August 2011.
Source: Federal Reserve H.15

**Balance sheet policy.** While time-based forward guidance on rates became increasingly explicit during this period, the influence of this guidance on market expectations about rates was no-doubt reinforced to some extent by the introduction of balance sheet policies. A succession of balance sheet programs were preannounced and implemented during this period. These measures were aimed at (1) providing liquidity to the markets, (2) easing financial and credit conditions, and eventually (3) driving longer-term interest rates lower. In December 2008 the FOMC statement said the Committee would implement a number of special liquidity facilities and stood ready to increase its purchases of mortgage backed securities, and possibly even to engage in purchases of longer-term Treasuries. These programs, including QE1 were implemented by early
2009 and phased out (with preannounced termination dates) about a year later in early 2010. Later in 2010, the Committee warned that it could engage in further QE purchases, and followed through with a second program (QE2) that fall, which was completed in mid-2011.

On September 21 2011 a maturity extension (operation twist) program was announced that was to run through mid-2012 and later extended to end-2012. The 10-year yield was already below 2% when this program was implemented, but it no doubt helped suppress yields for its duration. To this point, the QE programs had been time-based (the magnitude of purchases was pre-set on a time schedule, not driven by economic performance outcomes), and closed-ended (their termination dates were announced in advance). In September 2012, a third round of asset purchases was announced (QE3), at a rate of $40 billion per month, and this one was left open-ended (it would continue until the outlook for the labor market “improved substantially.”) Many market participants seemed to lose sight of the conditions for ending QE3, and the program was soon nicknamed “Q-infinity” given its open-ended nature. When the program was expanded to purchases of $85 billion per month in December 2012 (as the maturity extension program ended), expectations that the Fed would be acting to hold rates low for a long time to come were further bolstered. This expectation would set things up for some fireworks in the months ahead as the Fed began to hint at a tapering of this program.

Because the QE programs were time-based rather than data-based (i.e., their magnitudes and endpoints were announced in advance), we assume they tended to support our time-based scoring of overall forward guidance during this period.

**SEP and press conferences.** During the crisis and immediate post-crisis period the FOMC introduced a number of innovations to its post-meeting communication. FOMC participants’ economic projections (including the ranges and central tendencies for real GDP
growth, unemployment, and headline and core PCE inflation) were included in the minutes to FOMC meetings four times a year beginning with the minutes to the October 2007 meeting released on November 20, 2007. Prior to that time the forecasts had been published semi-annually in the Monetary Policy Report for nearly thirty. Increasing the frequency of the forecast releases was done in the spirit of enhancing transparency: in principle, to give the public more information about the FOMC’s plan for policy and the rationale for that plan in terms of expected macroeconomic performance.\textsuperscript{11} In April 2011, the release of this summary of economic projections (SEP) was advanced to right after the FOMC meeting, along with the introduction of the post-meeting press conferences. The SEP had only limited guidance content until January 2012, when the Committee participants’ interest rate forecasts (the “dots chart”) were introduced and included with the other SEP materials. The January 2012 meeting also produced the Committee’s statement of “Longer-run goals and policy strategy,” which would be reconfirmed annually thereafter. The central goal and achievement of this statement was to establish the Committee’s formal 2% objective for PCE inflation. In January this year, the statement was amended to emphasize that the inflation goal is symmetric—that is, the Committee would be concerned if inflation were running persistently above or below its objective.

The forward-guidance content of these innovations had both data-based and time-based content. The release of FOMC participant interest rate forecasts and the formalization of the inflation target were a nod in the direction of data-dependence. But the usefulness of the dots was limited in this regard because the “median dot” did not represent a “Committee” forecast,\textsuperscript{11} Chairman Bernanke made these points in a speech that accompanied the Fed’s announcement on November 14, 2007 that the forecasts would be released with higher frequency. His speech also anticipated that it would be difficult to come up with a true consensus forecast given the diversity of views on the Committee. See, Ben Bernanke, “Federal Reserve Communications,” Speech at Cato Institute November 14, 2007.
and in any case was not necessarily based on an internally consistent forecast. Various reports in the minutes to FOMC meetings during the second half of 2012 indicated that the Committee spent a fair amount of time considering and experimenting with constructing a consensus forecast for the Committee. It was generally concluded that because of the diversity of views among participants about the economy’s structure and dynamics, the cost of doing so would exceed the benefit. The dots were (and still are) presented anonymously and represented what each participant believed to be the appropriate policy setting. Moreover, there was no way to line the dots up with their associated macro forecasts (potentially useful information that was available internally and is now being released with the Transcripts with a five-year lag). In any event, the content of the most important element, the dots chart, was for quite a while taken by the market as time-dependent guidance. This is because the initial dots chart and those that followed for some time to come showed that the Committee did not expect to be raising rates for at least the next two years. (In the next section we will consider the extent to which information about the FOMC’s reaction function can be gleaned from the dots.) The press conferences basically served in this domain to explain, clarify, and amplify the forward-guidance put forth in the FOMC statement. On occasion forward guidance provided during the press conference would go beyond that included in the statement, as we will see below.

2013-15: Some softening of time-based guidance: Unemployment threshold. In December 2012, the Committee changed the orientation of its forward guidance. It dropped its

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12 For a time, Chair Yellen went to some pains to distance the dots from view of the Committee as put forth in the FOMC statement. During the post-FOMC meeting press conference on March 19, 2014 for example, she observed that, “…one should not look to the dot plot, so to speak, as the primary way in which the Committee wants to or is speaking about policy to the public at large.” More recently (beginning in September 2015), the Committee has drawn more attention to the median dot by publishing the median values of the economic forecasts including the interest rate projections.

13 The minutes to the October 23-24 FOMC meeting noted, for example, that “most participants judged that, given the diversity of their views about the economy’s structure and dynamics, it would be difficult for the Committee to agree on a fully specified longer-term path for monetary policy to incorporate into a quantitative consensus forecast in a timely manner.”
explicit time-based forward guidance, and replaced it with what appeared, on the surface at least, to be data-based guidance. The strongly time-based phrase “at least mid-2015” was dropped and replaced by wording that sounded more data-dependent. In particular, the statement now said that exceptionally low rates would be appropriate “at least as long as the unemployment rate remains above 6-1/2 percent, inflation between one and two years ahead is projected to be no more than a half percentage point above the Committee’s 2 percent longer-run goal, and longer-term inflation expectations continue to be well anchored.” This formulation would remain in place for at least another year. This change had the superficial appearance of a significant shift toward data-based guidance. However, we elected to downplay the shift in that direction in our scoring for several reasons. First, the intent of the new wording was the same as the old, namely to bolster the message that the Committee expected policy rates to be “low for long” and that it would be doing essentially whatever it took to achieve its economic objectives. Indeed, the December statement said specifically that the Committee “views these thresholds as consistent with its earlier time-based guidance.” The thresholds given would not be relevant for the setting of policy rates in the near to medium term—it was clear that the Committee did not expect them to be reached for quite some time. Moreover, the asset purchase program was essentially still on auto pilot—i.e., the magnitude of purchases would not be sensitive to incoming data for some time to come. The wording changes appear to have been made primarily to avoid both the inconvenience of having continually to update the date thresholds and the possible negative effects on confidence in Fed policy that such updating entailed. As a result, we downgraded the time-based score during this period (December 2012-December 2013) from -4.0 to -2.0, not all the way to a positive (data-based) value.
**Taper tantrum.** On May 1, 2013, the Committee hinted that the asset purchase program could be coming to an end (i.e., would not be lasting for a long time to come as many in the market had come to expect). This hint took the form of the addition of the sentence, “The Committee is prepared to increase or reduce the pace of its purchases to maintain appropriate policy accommodation as the outlook for the labor market or inflation changes.” On the surface, this was a move in the direction of data-dependence. However, the taper message also had important time-based effects. The message had considerably more impact on the market after Chairman Bernanke drew attention to it in his JEC Testimony on May 22 and after the June FOMC statement and press conference bolstered it. Fed talk of tapering gave rise to a tantrum in the markets as investors revised their strongly held “Q-infinity” expectations. It also set up reasonably strong expectations that the Fed would indeed begin to wind down its asset purchase program by that September. In the event, the tantrum in global financial markets caused the FOMC to hold off actually beginning to taper asset purchases until the end of the year. The absence of a taper announcement in September was generally unexpected and caused some confusion in the markets as we discuss further below. When the taper announcement did eventually come in December, and it had minimal effect on the market, partly because fair warning was given in the October statement that tapering was close at hand. The taper would occur gradually over eight meetings, with net asset purchases ending in October 2014. The December 2013 statement emphasized that the pace of tapering was not on a preset course, and would depend on the degree of progress made in meeting the Committee’s economic objectives.

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14 Bernanke’s testimony text mirrored the May FOMC statement; what triggered the strongest market reaction was his memorable comment about “next few meetings” in response to a question and request for interpretation during the testimony.

15 The October 2013 FOMC statement said in essence that conditions for tapering had essentially been met, and that the Committee wanted to see just a little more evidence before doing so.
But within a few meetings, the pace of tapering became seen in the market as a very steady process—a nod in the direction of time-based guidance.

**Removing the thresholds.** The unemployment threshold began to outlive its usefulness and had to be modified a year after it was introduced. Unemployment was dropping faster than expected without sufficient progress on the inflation front, thanks to a stronger than expected downtrend in labor force participation. In December 2013, the Committee changed “at least as long as unemployment remains above 6-1/2%” to “well past the time that the unemployment rate declines below 6-1/2 percent.” Two meetings later, in March 2014, reference to the 6.5% unemployment threshold for liftoff was dropped altogether. The FOMC had to acknowledge that its threshold-based guidance was now out of date because the unemployment rate had already moved below its threshold: in January unemployment fell to 6.6% (real time) and in April it would be at 6.2%. Inflation was still too low to signal that liftoff was around the corner. The threshold was replaced with wording that was somewhat more calendar based: the Committee would hold rates low “for a considerable time after the asset purchase program ends, especially if projected inflation continues to run below the Committee’s 2 percent longer-run goal…” This wording would remain until the asset purchase program ended in October 2014. The March statement also added a sentence that strengthened the low-for-long message and had both data-based and time-based elements: “The Committee currently anticipates that, even after employment and inflation are near mandate-consistent levels, economic conditions may, for some time, warrant keeping the target federal funds rate below levels the Committee views as normal in the longer run.” This sentence would remain intact through October 2015. For the period March-December 2014 we strengthened the time-based guidance score to -3.0.
2015: Boxed into liftoff. In December 2014, time-based guidance was changed when “considerable time after the asset purchase program ends” was replaced by: “The Committee judges that it can be patient in beginning to normalize the stance of monetary policy.” This new wording was described as consistent with the previous wording, so we left the score at -3.0. Moreover, at the December press conference, Chair Yellen set up what would become some fairly strong time-based expectations of an initial rate hike or “liftoff” in 2015. This is a message that would be repeated in Fed communications on a number of occasions as 2015 wore on.16 “Patient” was dropped two meetings later in March 2015. It was replaced by two new additions, the net effect of which was a wash on our scoring: (1) the data-based indication that liftoff would occur when the Committee had seen more improvement in the labor market and was reasonably confident its inflation objective would be met, and (2) the strongly time-based indication that

16 Examples of indications to this effect from Fed leadership include: Chair Yellen: Dec 17, 2014 press conference: “Assuming that the economy evolves broadly in line with participants’ expectations, almost all participants believe that it will be appropriate to begin raising the target range for the federal funds rate in 2015.” March 27, 2015: “With continued improvement in economic conditions, an increase in the target range for that rate may well be warranted later this year.” June 17, 2015 press conference: “clearly, most participants are anticipating that a rate increase this year will be appropriate.” July 10, 2015: “I expect that it will be appropriate at some point later this year to take the first step to raise the federal funds rate and thus begin normalizing monetary policy.” September 17, 2015 press conference: “an argument can be made for a rise in interest rates at this time.” “October remains a possibility.” September 24, 2015: “Most FOMC participants, including myself, currently anticipate that achieving these conditions will likely entail an initial increase in the federal funds rate later this year, followed by a gradual pace of tightening thereafter.”

Vice Chair Fischer: February 27, 2015: “The FOMC and market participants anticipate that the federal funds rate will be raised sometime this year.” March 23, 2015: “However it is widely expected that the rate will lift off before the end of this year, as the normalization of monetary policy gets underway.” October 11, 2015: “Most participants, myself included, anticipated that achieving these conditions would entail an initial increase in the federal funds rate later this year”.

President Dudley: December 01, 2014: “In fact, if my own forecast is realized, I would expect to favor raising the FOMC’s federal funds rate target sometime in 2015.” “Market expectations that lift-off will occur around mid-2015 seem reasonable to me.” June 05, 2015: “I still think it is likely that conditions will be appropriate to begin monetary policy normalization later this year.”

In all cases such statements were clearly conditional, a fact the market/press did not always fully appreciate. Often they simply reflected what was evident in the SEPs.
liftoff would not occur at the next meeting in April (“the Committee judges that an increase in the target range for the federal funds rate remains unlikely at the April FOMC meeting”). Moreover, at the March press conference, time-based guidance was strengthened when the Chair said that the possibility of a June rate hike could not be ruled out. In June, it was noted that most participants anticipated a rate hike this year (citing the SEPs) but it was also noted that the outcome would be data-determined (meeting by meeting) so we scored guidance as having shifted back weakly to being net data-based (score of +1).

A possible September liftoff was signaled in July, when the data-based guidance was modified to read “some more improvement in the labor market,” suggesting to many observers that liftoff was a “live” option for September. By this time, it appeared that the Committee had become pretty well boxed into a rate increase before year-end: fulfilling those expectations had become a matter of importance to Fed credibility. In the event, liftoff in September was delayed until December following a surge in global financial turbulence in August. In the absence of significant guidance ahead of the meeting, and in the presence of some possibly conflicting signals from FOMC participants the September result led to some confusion in the markets, and appeared to hit Fed credibility as discussed further below. Market expectations of liftoff before year-end, which had been in the vicinity of 60% shortly before the September meeting, dropped to 45% after the meeting (Chart 2.5). These expectations continued to trend downward, reaching a low near 30% ahead of the October FOMC meeting, even as various FOMC member speeches strove to signal a possible/likely rate hike in December. When market expectations failed to respond to these signals, the October FOMC statement resorted to an unusually strong dose of time-based guidance by stating that liftoff could be a likely outcome at the “next” meeting—a
stronger version of the guidance the October 2013 statement had provided for the December 2013 taper announcement.

Chart 2.5: Market expectations of end-2015 liftoff recede until October FOMC statement*

*Chart shows that market expectations of a December 2015 liftoff in policy rates continued to fall after the September FOMC meeting even as Fed-speak signaled a likely rate hike by year end. These expectations then jumped after the Fed resorted to strong time-based guidance at the end-October meeting.
Source: Authors’ calculations based on fed funds futures quotes from Bloomberg

**Liftoff achieved:** The December meeting did announce liftoff and included the following guidance concerning future rate moves:

“In determining the timing and size of future adjustments to the target range for the federal funds rate, the Committee will assess realized and expected economic conditions relative to its objectives of maximum employment and 2 percent inflation. This assessment will take into account a wide range of information, including measures of
labor market conditions, indicators of inflation pressures and inflation expectations, and readings on financial and international developments. In light of the current shortfall of inflation from 2 percent, the Committee will carefully monitor actual and expected progress toward its inflation goal. 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. However, the actual path of the federal funds rate will depend on the economic outlook as informed by incoming data.”

This guidance contains both data-based and time-based elements, with neither being either strong or specific. Relative to what had been present previously since March 2014 in the sentence on the Committee’s expectations, the qualifier “even after employment and inflation are near mandate-consistent levels” was dropped. This may have tilted things toward time-based guidance a bit. But with the ice broken and departure from the zero bound under way, further moves, although “gradual,” will be driven increasingly by incoming data. We therefore score forward guidance in the December statement as, on balance, a modest but important shift back to being data-based. In particular, we scored October at -4 (“next”) and December at +1.

This guidance was left intact in the January 2016 FOMC statement. What changed in the January statement, besides a softening of the economic activity and inflation picture, was an interesting change in the wording around the balance of risks. The risks around activity and employment had been seen as balanced in December. In the wake of some increased turmoil in financial markets, this wording was dropped in January and replace by a statement that, “The Committee is closely monitoring global economic and financial developments and is assessing their implications for the labor market and inflation, and for the balance of risks to the outlook.”
Reading between the lines, it was evident that economic and financial conditions would have to improve before the FOMC made its next rate hike; we judged this to be a slight strengthening of the previous meeting’s data-based guidance: score +1.5.

2.4. Analysis of the Summary of Economic Projections (SEP)

In this subsection we turn to an analysis of the potential usefulness of the FOMC participants’ economic forecasts—including in particular their interest rate projections—as they have been reported in the SEP as guidance to the markets about the possible future course of monetary policy. In particular, we review both the accuracy of these forecasts and the extent to which they may be able to inform market participants about the properties of the FOMC’s policy reaction function.

Over the last couple of years, the accuracy of the FOMC’s dot projections has been quite low (see Chart 2.6 below). Past FOMC median forecasts showed liftoff occurring as early as 2014 and at one point saw a 1% rate by the end of that year. Similarly, the forecast for 2015 was consistently higher than the realized rate of 0.35%. At present, market expectations for the funds rate path over the 2016-18 interval are well below the FOMC projections. But, has the inaccuracy of past FOMC projections been attributable to deviations in expected outcomes for the economy or to some other factor? And, what can we say about the relationship between their economic forecast and fed funds expectations for coming years? Since the FOMC provides their forecasts for GDP growth, unemployment and inflation, we can try to test the extent to which economic surprises have led to a different policy outcome than the FOMC anticipated and gauge the degree to which changes in the economic outlook might impact the future course of policy. In particular, we can use the Taylor Rule as a lens through which to explore the FOMC’s reaction to
incoming data and changes to their economic forecasts. Ideally, this reaction function will be relatively stable, allowing markets to infer the policy impact of changes in the economic landscape as they occur.

**Chart 2.6: FOMC Median Estimates for Federal Funds Rate**

*Source: FOMC Summary of Economic Projections (SEP). Data begin with January 2012 meeting but omit those meetings for which the projected rate remained at the zero lower bound throughout the forecast horizon.

We start by assuming that all FOMC participants use a Taylor Rule type of framework to make their policy projections (Taylor 1993 and 1999). This means that the fed funds rate they project one year, two years and three years out is determined by the current funds rate, the long run equilibrium funds rate, the projected output gap (% difference between and actual and
potential GDP) and the projected inflation gap (difference between the actual and desired inflation rate) as shown here:

\[(R_t - R_t^*) = c + B_{YGAP}(GDPGAP_t) + B_{PGAP}(P_t - P_t^*)\]

where,

\[R_t = \text{the federal funds rate},\]

\[R_t^* = \text{long run equilibrium federal funds rate},\]

\[GDPGAP_t = GDPGAP_{t-1} + (GDP_t - GDP_t^*)\]

\[GDPGAP_{t-1} \text{ is set equal to the FRB/US estimate of the level of the output gap (\%) at the end of each calendar year,}\]

\[GDP_t = \text{real GDP growth},\]

\[GDP_t^* = \text{real longer run GDP growth (i.e., potential)},\]

\[P_t = \text{core PCE inflation rate},\]

\[P_t^* = \text{the long run inflation target},\]

\[B_{YGAP} \text{ and } B_{PGAP} \text{ are the regression coefficients on the output gap and inflation gap terms.}\]

All data are from the FOMC’s SEP which includes a fed funds forecast beginning Jan 2012. The inputs take the form of panel data since they include a separate time series for each FOMC meeting. So, for instance, we use the set of forecasts for 2012 that were produced at the Jan 2012 meeting as the first observation, the set of forecasts for 2013 that were produced at that same meeting as the second observation, and the set of forecasts for 2014 as the third and final observation for that particular meeting. The fourth observation will be the set of forecasts for 2012 that were produced at the March 2012 meeting and so on. Since there were five SEP’s
published in 2012 and four in subsequent years and since the forecast horizon at each FOMC meeting is three or four years, we wind up with 58 observations.

Specifying an FOMC reaction function using this type of framework may be problematic in the presence of a zero-lower-bound constraint. In a number of cases – especially during the early years of the sample period – there is so much economic slack that the projected policy rate is stuck near zero even when there is some expected narrowing in the output and inflation gaps. In other words, a Taylor Rule specification will show that there is no need for policymakers to “react” until certain economic thresholds are achieved and the optimal nominal policy rate starts to move up from zero. Therefore, we eliminate the 24 observations showing a projected policy rate that is stuck at the ZLB. The results based on the remaining 35 observations are shown in the first column of Table 2.1 and the residuals are plotted in Chart 2.7 (note that all equations in this section use the Newey-West estimator to correct for autocorrelation of the residuals).
Table 2.1: SEP Taylor Rule Regressions

<table>
<thead>
<tr>
<th></th>
<th>Output Gap</th>
<th>Unemployment Gap</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1) Level</td>
<td>(2) First Difference</td>
</tr>
<tr>
<td>C</td>
<td>-1.87</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>(4.38)</td>
<td>(0.66)</td>
</tr>
<tr>
<td>B_YGAP</td>
<td>0.72</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td>(2.38)</td>
<td>(2.45)</td>
</tr>
<tr>
<td>B_URGAP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B_PGAP</td>
<td>1.71</td>
<td>1.84</td>
</tr>
<tr>
<td></td>
<td>(2.09)</td>
<td>(4.27)</td>
</tr>
<tr>
<td>R²</td>
<td>0.34</td>
<td>0.33</td>
</tr>
<tr>
<td>S.E.</td>
<td>0.94</td>
<td>0.25</td>
</tr>
<tr>
<td>F-stat</td>
<td>8.16</td>
<td>6.70</td>
</tr>
<tr>
<td>N</td>
<td>35</td>
<td>30</td>
</tr>
</tbody>
</table>

**Note:** All equations use the Newey-West estimator. T-statistics of coefficients are in parentheses.
The results suggest that a simple Taylor rule framework may represent a reasonable starting point in trying to identify the FOMC’s reaction function. Indeed, the coefficients on the inflation and output gap terms are quite similar to the original Taylor (1993) specification of 1.5 for the inflation gap and 0.5 for the output gap. However, in the specification used here, 100 bp seems like a relatively large standard error and one might expect the constant term to be closer to zero – that is, the projected policy rate should be close to the long run equilibrium rate in the absence of an inflation or output gap. A constant term of nearly -2.0 may reflect a view that the perceived short run equilibrium policy rate has been much lower than the longer run equilibrium rate, as highlighted in recent remarks by a number of Fed officials. Moreover, the plot of the
residuals associated with Equation 1 seems to indicate that the divergence between the short term equilibrium policy rate and its long run equilibrium is consistently expected to dissipate over time (see Chart 2.7). This is seen by noting that while the residuals shift around from meeting-to-meeting, they tend to get more positive as you move through the forecast horizon at any particular meeting. For example, starting with the March 2014 meeting, the largest positive residual at every meeting has been the last year of the forecast horizon. This implies that the FOMC reaction function may incorporate a divergence between the short run and long run equilibrium policy rate and that this divergence is expected to dissipate over time.

For good reason, markets often appear to place more weight on how the FOMC dots change from meeting-to-meeting as opposed to their latest level. Therefore, an alternative specification for the FOMC reaction function is to look at how the evolution of the projected policy path from meeting to meeting stacks up against changes in the economic forecast. So, we estimate the same Taylor Rule specification seen in equation 1 in first difference terms. The results are shown in the second column in Table 2.1 and the residuals are plotted in Chart 2.8.

We lose five observations in the first difference specification since, every September, the forecast horizon is extended by a year. The coefficients on the inflation and output gap terms in Equation 2 appear reasonable, the constant term is close to zero, the standard error drops to 25 bp, and the residuals do not show the same sort of directional bias at each meeting that we saw in Equation 1.

---

17 Note that the plot of residuals shows projected R-R* less the fitted value for each SEP meeting with the meeting dates on the horizontal axis. Also, the SEP forecast horizon is three or four years at every meeting but the zero lower bound problem discussed earlier means that some meetings only show one or two observations.
Another alternative specification of the Taylor Rule reaction function involves the substitution of an unemployment rate gap for an output gap. So,

\[(R_t - R_t^*) = c + B_{URGAP}(U_t - U_t^*) + B_{PGAP}(P_t - P_t^*)\]

where,

- \(U_t\) = unemployment rate,
- \(U_t^*\) = long run equilibrium unemployment rate (i.e., NAIRU),
- \(B_{URGAP}\) and \(B_{PGAP}\) are the regression coefficients on the unemployment gap and inflation gap terms.
The results are shown in the third column of Table 2.1 and the residuals are plotted in Chart 2.9. The fit for Equation 3 appears to be noticeably better than Equation 1 (note that, as one would expect, the sign on the unemployment gap variable is negative because a positive value is indicative of economic slack in contrast to the output gap variable in which a negative value indicates that there is slack in the economy). The better fit could reflect greater emphasis by the FOMC on the unemployment rate as a measure of slack during the sample period or it might reflect difficulty in measuring the output gap on a real time basis (i.e., trying to estimate the projected level of the output gap based mainly on estimates of the projected growth rates of actual and potential GDP). In any case, compared with Equation 1, the specification seen in Equation 3 appears to represent an improvement in identifying the FOMC’s reaction function.

**Chart 2.9: Residuals from Regression (3)**

*Source: Authors’ calculations*
We next estimate Equation 3 in first difference terms. The results are shown as Equation 4 in Table 2.1 and the plot of residuals is in Chart 2.10. Interestingly, while using the level of the unemployment gap seems to yield a much better representation of the FOMC’s reaction function than using the level of the output gap, the Equation 4 results suggest that a first difference specification using the unemployment gap does marginally worse than a comparable first difference specification using the output gap.

Chart 2.10: Residuals from Regression (4)

In sum, an examination of alternative FOMC reaction function specifications, based on a simple and well-established policy rule, suggests that financial markets should be able to come reasonably close to identifying the likely monetary policy impact arising from a change in the
outlook for growth, unemployment and/or inflation. Of course, many other economic and noneconomic factors can come into play in the formulation of monetary policy but a consistent and well-understood reaction function should help to limit policy surprises and improve Fed guidance.

Finally, there may be a way to improve the communication of the FOMC reaction function. Researchers at the Cleveland Fed have estimated Taylor rule parameters for private-sector forecasters (see Charlstrom and Jacobson, 2015). The period studied is 1995 to 2008. They find that the coefficients for the inflation and output gap differ widely among the forecasters, who are all participants in the Philadelphia Fed’s Survey of Professional Forecasters (SPF). Indeed, the estimated coefficient on the inflation gap ranges from -1.0 to +2.5 while the coefficient on the output gap ranges from -0.8 to 7.1. In other words, the reaction functions of these forecasters are all over the map. They also estimate Taylor Rule coefficients based on the median forecasts of these individuals. These coefficients (1.8 for the inflation gap and 1.7 for the unemployment gap) seem quite reasonable. However, they are not all that close to the coefficients of any individual forecaster (see Figure 2 in the Charlstrom and Jacobson note). So, it might be reasonable to assume that while the median forecasts of FOMC members may be used to formulate a reaction function that represents the collective view, there is no reason to believe that reaction functions are similar across different members – or even that the collective behavior is close to that of any individual member. Thus, it may be beneficial for the SEP to link the dot forecasts to economic forecasts of individual members. That is, publish the economic forecast of each participant alongside the individual dot forecasts that are already made available (of course, without revealing the identity of the individual associated with any particular forecast). The Fed already compiles such information and publishes it as part of a detailed SEP compilation that accompanies the FOMC meeting transcripts that are made available with a lengthy delay of 5 or so years. For example, see Table 2 in this document: http://www.federalreserve.gov/monetarypolicy/files/FOMC20091104SEPcompilation.pdf. Releasing this type of detailed information to the public at the same time as the SEP could help provide additional clarity in identifying the reaction function of the FOMC as a whole.
Section 3: Time-Based Forward Guidance Can Lead to Bad Expectations Dynamics

This section begins our normative assessment of Federal Reserve communication quality. As shown above, both the FOMC statements and the summary of economic projections contain elements of time-based forward guidance. We believe that there are two main disadvantages to time-based forward guidance. The first is that time-based forward guidance can lead to bad expectations dynamics by market participants, which can in turn reduce the sensitivity of interest rates to macroeconomic news. In many circumstances, this is the opposite of what the central bank is trying to accomplish. Second, time-based forward guidance can constrain central bankers in a sub-optimal fashion, which can then lead to market confusion and a reduction in the credibility of the central bank. This section discusses the first disadvantage, and the section 4 discusses the second one.

3.1 Expectations dynamics and time-based forward guidance: The theory

The benefits of forward guidance in setting the correct expectations dynamics occur only if the forward guidance is data-dependent, and not if it is time-dependent. Forward guidance that is data-dependent is conditional on the state of the economy. As the state of the economy changes, the projected path of the policy rate should change as well. For example, if there is a strong employment report in which there is higher job growth and stronger growth of wages so that the Fed and the market’s forecast of real GDP growth and inflation rises, then the projected policy path and longer-term interest rates should shift upwards in order to stabilize output and inflation.

If instead, the forward guidance is time-dependent--the Fed says that the federal funds rate will be set to particular values at particular date-- then when the inflation and output
forecasts rises, there is no change in the policy path. Now the inflation shock does not lead to an automatic effective tightening of monetary policy.

Indeed, time-dependent forward guidance can lead to expectation dynamics that make things even worse. Again consider the situation in which the positive employment report leads to expectations that inflation will be higher than previously expected. With time-dependent forward guidance, the projected policy path does not change, but expected inflation rises. This means that the expected path of future real interest rates, policy interest rates minus expected inflation, now declines. The effect of the positive employment report shock is then an effective easing of monetary policy, the opposite to what would be an optimal effective monetary policy response.

This undesirable feature of time-dependent forward guidance is exactly the same problem created by the zero lower bound for the policy rate, as discussed in Eggertson and Woodford (2003). They point out that when there is a negative aggregate demand shock and the policy rate is at the zero lower bound, then a negative aggregate demand shock leads to a decline in expected inflation and therefore a rise in real interest rates, which further weakens aggregate demand. Negative aggregate demand shocks when the zero lower bound is binding therefore can lead to prolonged economic downturns. Time-dependent forward guidance creates a similar problem because, just as occurs when the policy rate is at the zero lower bound, a negative aggregate demand shock leaves the projected future path of the policy rate unchanged, so that real interest rates rise, thereby propagating the negative aggregate demand shock further.

Another way of stating the above argument is that data-dependent forward guidance leads to beneficial expectation dynamics, while time-dependent forward guidance leads to perverse expectation dynamics.
Another subtle issue for forward guidance relates to the predictability of monetary policy. Policy predictability is generally viewed as desirable (see Baker, Bloom, and Davis (2015)). This would seem to be an argument for time-based forward guidance which can eliminate all uncertainty as to monetary policy actions by specify exactly what they will be at particular dates. However, the analysis of optimal policy indicates that while data-based predictability of central bank actions is desirable, this is not necessarily true for time-based predictability.

Consider a situation like that which occurred from 2004 to 2006, when the FOMC announced that “policy accommodation can be removed at a pace that is likely to be measured,” and then raised the federal funds rate at seventeen consecutive FOMC meetings by exactly 25 basis points. In this case, the future policy action before every FOMC meeting was highly predictable. Yet because the policy actions at each meeting were not reacting to current data, these actions were almost surely not consistent with an optimal reaction function. Indeed, monetary policy during this period has been subject to severe criticism. In 2007 and 2008 inflation overshot any reasonable estimate of the Fed’s desired inflation objective. Some critics (e.g., Taylor, 2007) have even argued that monetary policy during this period was the primary cause of the housing bubble, whose collapse helped bring on the most severe financial crisis since the Great Depression.

The predictability of time-based forward guidance can have another downside. The knowledge that monetary policy actions are certain at given date may lull the markets into thinking there is less uncertainty in the economy than is actually the case. The result may be an underassessment of risk, leading to excessive risk taking. Indeed, the almost total predictability of FOMC actions from 2004 to 2006 was associated with very low risk premiums in credit
markets. The predictability of monetary policy in this period may therefore have contributed to the excessive risk taking that ultimately helped trigger the global financial crisis.

There is a final subtle issue about the benefits of a central bank communicating a predictable policy reaction function. At first glance, the analysis seems to provide a very strong argument for a central bank adopting an instrument rule like the Taylor rule. After all, a Taylor rule is a very simple way of specifying a predictable monetary policy reaction function. However, the theory of optimal monetary policy suggests that the policy reaction function changes over time, either as monetary policymakers learn more about how the economy works or when the structure of the economy changes. Furthermore, the policy reaction function might need to be modified when there are unforeseen contingencies that were previously not part of the reaction function, but now need to be introduced into the reaction function. Judgement should also certainly be a feature of optimal policy as demonstrated by Svensson (2005) and should also be part of a monetary policy reaction function. A Taylor rule, which does not change over time, can therefore be far from an optimal policy.

Unlike a Taylor rule, data-dependent forward guidance can be consistent with optimal monetary policy, but this requires that it changes if the optimal monetary policy reaction function changes. This requires that projections of the future policy path not only must be altered when forecasts of the economy change, but also when the central bank has reasons to expect that the model of the economy is changing. Data-dependent forward guidance thus requires substantial communication to explain not only the past policy reaction function, but also any reasons for changes in the reaction function. Explaining how and why the policy reaction function might be changing, a requirement of data-dependent forward guidance, is by no means an easy task. As a result, it might be hard to credibly communicate data-based forward guidance.
Consider what optimal, data-dependent forward guidance might have looked like when the global financial crisis started in August of 2007. At the time, inflation was rising and the economy was still growing rapidly in the third quarter. The Federal Reserve dramatically deviated from its previous reaction function, which was not too far off from a Taylor rule, by aggressively cutting the federal funds rate even before the economy and inflation had turned down. If the Fed had been providing forward guidance, it would have needed to explain that the disruption to financial markets required a change in the policy reaction function, with much easier monetary policy in the future in response to financial shocks than had been anticipated earlier. If this communication led to the markets understanding that there had been a shift in the policy reaction function, longer-term interest rates would have fallen more rapidly in response to news that the financial disruption was getting worse. This would have helped effective monetary policy be even more expansionary than it otherwise would have been, helping offset some of the negative shocks to the economy from the ongoing financial crisis.

3.2 Evidence on the reduced sensitivity to macroeconomic news

Good Federal Reserve communication should lead to interest rates reacting automatically to macroeconomic news as the central bank would desire, leaving the market to do much of the heavy lifting for the central bank. In contrast, as we have argued above, time-based forward guidance may lead to the exact opposite: interest rates may become insensitive to macroeconomic news as market participants place lower weight on novel information given the central bank’s time-based forward guidance.

To empirically test this idea, we adopt an approach pioneered by Swanson and Williams, 2014 (SW henceforth). The goal of their analysis is to examine whether the zero lower bound on
nominal interest rates is a constraint on longer-term interest rates. They argue that an indication of rates being constrained by the zero lower bound is that interest rates become insensitive to macroeconomic news. Their empirical methodology isolates the surprise component of 12 macroeconomic news announcements, including non-farm payrolls, new home sales, and retail sales.

They first estimate the daily sensitivity of nominal interest rates to these surprise announcements from 1990 to 2012. They then use a rolling window estimation procedure to see whether nominal interest rates react in a differential way to the surprise component of macroeconomic news during different periods from 2000 to 2012. This methodology allows them to test whether market interest rates are less sensitive to macroeconomic news surprises in some time period (say, the year 2010) relative to the years from 1990 to 2000.

More specifically, let $\Delta y_t$ be the single day change in the Treasury yield for a given maturity Treasury bill or bond, and let $X_t$ be a vector of the surprise components of macroeconomic releases that took place that day. The SW methodology starts with estimating the following nonlinear least squares specification for the 1990 to 2012 period:

$$
\Delta y_t = \gamma^t + \delta^t \beta X_t + \epsilon_t
$$

The parameters $\gamma^t$ and $\delta^t$ are parameters that are allowed to take on different values in each year. The use of this non-linear specification instead of simply estimating equation (1) separately for each year provides more power given there are not many macroeconomic announcements in a given year. SW normalize the coefficients $\delta^t$ so that they have an average value of unity from 1990 to 2000. The estimation of equation (1) yields a vector of coefficient estimates $\hat{\beta}$, which
represent the average daily response of nominal interest rates to macroeconomic news surprises during from 1990 to 2012.

The SW methodology then uses the estimates of the vector $\hat{\beta}$ to reduce the dimensionality of the macroeconomic news shocks for each day to $\hat{\lambda}_t = \hat{\beta}X_t$. The variable $\hat{\lambda}_t$ is a single number for each day summarizing the surprise component of macroeconomic news that day. The authors then estimate rolling regressions of 250 days around day $\tau$ for each day in the 2001 to 2012 period:

$$\Delta y_t = \gamma \tau + \delta \hat{\lambda}_t + \epsilon_t \tau$$  \hspace{1cm} (2)

The coefficient estimate $\hat{\delta}\tau$ from equation (2) tells us how sensitive interest rates are to macroeconomic news from $\tau - 124$ to $\tau + 125$ trading days around day.

How do we interpret a period in which $\hat{\delta}\tau$ is estimated to be close to zero? Or in other words, how do we interpret a regime in which nominal interest rates become insensitive to macroeconomic news? SW argue that this is evidence that the zero lower bound is binding, and they show evidence that the zero lower bound was not a constraint on 1- and 2-year Treasury yields from 2008 to 2010, but became binding afterward.

We fully agree with the SW interpretation that insensitivity of nominal interest rates to macroeconomic news could reflect constraints on monetary policy imposed by the zero lower bound. However, an alternative reason that nominal interest rates may become insensitive to macroeconomic news is time-based forward guidance. If the Federal Reserve commits to an interest rate policy that is unresponsive to incoming data, then the market will put lower weight on macroeconomic news surprises when setting interest rates. Indeed, as mentioned above, time-
based forward guidance leads to insensitivity in the theory that is similar to the insensitivity
caused by the zero lower bound on nominal interest rates.

We replicate the SW results for the 1990 to 2012 period, and we also extend the results to
include data through November 2015. Chart 3.1 plots \( \hat{\delta R} \) from 2001 to 2008 for the yield on the
3-month Treasury bill along with 95% confidence bands. To interpret magnitudes, an estimate of
one for \( \hat{\delta R} \) corresponds to the yield having the same sensitivity to macroeconomic news surprises
as the average sensitivity from 1990 through 2000. As the graph shows, the 3-month yield
became unresponsive to news from the middle of 2003 to 2006. We know from Section 2.3 that
this corresponds to a period where forward guidance by the FOMC was strongly time-dependent.

Chart 3.1: 3-Month Treasury Yield Sensitivity to News, 2001-2008

*Source: Federal Reserve Board*
Indeed, SW also suggest that the insensitivity during this period was due to time-based forward guidance. As they write:

“What is perhaps more surprising … is that the 3-month Treasury yield was also partially or completely insensitive to news throughout 2003 and 2004, a period during which the federal funds rate target and the 3-month Treasury yield never fell below 1 percent … Rather than try to lower the funds rate below 1 percent, the FOMC opted instead to switch to a policy of managing monetary policy expectations, using phrases such as ‘policy accommodation can be maintained for a considerable period.’ Thus, even though the funds rate was not constrained by a floor of zero in 2003 and 2004, our results show that the 3-month Treasury yield behaved as if it had been constrained by a floor of 1 percent.”

This is exactly the argument we make above: Time-based forward guidance induces market behavior that looks very similar to the behavior one would witness with an explicit constraint on monetary policy. Instead of improving the ability of the market to incorporate news into interest rates, time-based forward guidance severs the link between news and interest rates.

What about the recent period? Figure 3.2 plots the sensitivity of interest rates to macro news surprises (δf) from 2008 to 2015. Starting at the top left and moving clockwise, the chart shows the sensitivity to macro news of the 3-month Treasury, 6-month Treasury, and 2-year Treasury, and 1-year Treasury. The 3-month Treasury yield is almost completely unresponsive to macro news from 2010 onwards, which reflects the zero lower bound constraint on monetary policy. The 6-month Treasury yield shows a similar pattern.

**Chart 3.2: Treasury Yield Sensitivity to News, 2008-2015**
However, the 1-year and 2-year yield continued to respond to news until late 2011. In fact, the sensitivity of the 1-year and 2-year yield to macro surprises becomes statistically indistinguishable from zero at almost the exact time of the FOMC meeting of August 2011. As mentioned above, this was the FOMC meeting that produced the strongest time-based forward guidance up to that point, when the Federal Reserve said that “economic conditions … are likely to warrant exceptionally low levels for the federal funds rate at least through mid-2013.” SW argue that longer term Treasury yields became unresponsive to macro news in 2011 and 2012 because the zero lower bound constraint began to bind even on longer term interest rates. But the pattern is also consistent with the implementation of time-based forward guidance causing the market to discontinue responding to macro news when determining interest rates.

Chart 3.3 combines the analysis in Charts 3.2 and 3.3: it uses the entire sample period (2001 to 2015), and it shows the sensitivity of interest rates to macroeconomic news when the FOMC follows time-based forward guidance, data-based forward guidance, or no forward guidance.
guidance. As it shows, date-based forward guidance is associated with lower sensitivity of interest rates to macroeconomic news at all of the maturities we examine.

Chart 3.3: Sensitivity Coefficient and Forward Guidance, 2001-2015

Further, the result in Chart 3.3 is not driven by the zero-lower bound constraint during the post Great-Recession period. Even excluding the zero lower bound period, the sensitivity of interest rates to macroeconomic news is lower during periods in which FOMC communication on forward guidance is more strongly time-dependent. This pattern is shown in Chart 3.4.

Chart 3.4: Sensitivity Coefficient and Forward Guidance, 2001-2015
3.3 Time-based forward guidance and volatility

Time-based forward guidance can also have important effects on asset prices and market volatility. In principle, central bank communications can affect not only the expectation for the most likely path of the policy rate, but also the degree of certainty with which that expectation is held. And both the first and second moments of the distribution of possible outcomes for the policy rate will matter for asset prices – the first through the risk-neutral expected rate and the second through the risk premium. It can potentially be desirable to use time-based forward guidance to decrease uncertainty in order to lower risk premiums and boost asset prices during periods when the economy is very weak and the zero lower bound constraint is binding. But during normal times it can lead to dangerously low levels of volatility.
Most of the empirical literature that has examined the relation between central bank communications and asset prices has focused on the first moment. However, Swanson (2006) examined the effect of Fed communication on uncertainty about the future path of the policy rate expressed in both market-based and survey-based measures. Looking at Eurodollar option-implied volatility and the dispersion of private sector forecasts for the 3-month bill rate, Swanson demonstrated a decline in uncertainty about future values of the policy rate as Fed transparency increased after 1994.

This decline in uncertainty regarding the path of the funds rate was generally viewed as a desirable outcome in the Swanson study, and with good reason: as the public gains a greater understanding of the Fed’s reaction function, and as the Fed acts in a more rules-based manner, there is less of a need for a large risk premium in interest rates to compensate for a poorly-understood or capricious path for the risk-free rate. If ever-smaller risk premia were the sole aim of policy, then this outcome could likely best be achieved through time-based forward guidance.

However, reduced risk premia in financial markets can lead to problems. For example, certainty over the future path of interest rates may influence the amount of leverage in the financial system. The notion that perceptions of low uncertainty can lead to a risky leveraging-up of the financial system dates back at least to Minsky (1975). A similar insight was presented in a more modern and neoclassical framework in Adrian and Shin (2014). Those authors demonstrate that in the presence of standard debt contracts financial firms will increase leverage when implied volatility and value-at-risk go down. While Adrian and Shin limit their analysis to the leverage of financial institutions, it is not hard to see a similar logic applied to financial structures more broadly. For example, periods of low implied volatility are ideal for carry trades, which usually employ a substantial layering-on of debt finance to enhance profitability. Indeed, a
standard measure of the ex-ante attractiveness of the carry trade is the carry-to-risk measure, which adjusts the interest rate differential carry for the option-implied risk of a rise in capital loss in the duration leg of the trade. When central bank communication provides greater reassurance about the path of rates, risk goes down and the carry-to-risk measure will increase.

To explore these linkages further, we first estimate the sensitivity of yields on 10-year Treasuries to macroeconomic news following the SW (2014) approach highlighted above. We use the sensitivity parameter of 10-year rates to macroeconomic surprises as a proxy for the degree to which Fed communications fostered a sense of data-dependence in the path of future short rates. We then looked at how this series related to the market’s perception of uncertainty regarding future values of 10-year rates. In particular, Chart 3.5 plots the sensitivity parameter estimate \( \hat{\delta}^{\tau} \) for the 10-year Treasury rate against the implied volatility of 10-year rates expected to prevail over the next three months, inferred from the swaptions market.

**Chart 3.5: Volatility and sensitivity to news**

*Source: Authors’ calculations using swaption market quotes from Bloomberg*
Over the entirety of the sample there is no clear relationship. This is primarily due to the relationship varying depending whether a financial crisis is prevailing at the time. During the crisis period there is actually a negative relationship between implied volatility and the sensitivity of rates to macro developments, which perhaps shouldn’t be too surprising as large swings in interest rates during the height of the crisis were driven by things like bank financial reports, financial institution insolvency events, and government intervention announcements.

In more “normal” times, however, there is a clear positive relationship that holds between the sensitivity of rates to macro news and the expected volatility of those rates. When we look at the relation between our sensitivity measure and implied volatility, we include the high-yield CDX as a control for crisis-like flight to quality. For each tenor of the sensitivity measure, we look at swaption tails of the same tenor (in all cases using three-month expiries), so for example, we compare the sensitivity of two-year rates to the market-implied volatility of two-year rates over the next three months, and so on for five- and ten-year rates.

**Table 3.1: Time-based forward guidance appears to reduce volatility**

<table>
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<tr>
<th></th>
<th>Constant</th>
<th>Sensitivity Param.</th>
<th>CDX High Yield</th>
<th>Model</th>
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<td>Coef.</td>
<td>T-Stat</td>
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<td>10Y Tails</td>
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<td>9.261</td>
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<tr>
<td>5Y Tails</td>
<td>1.564</td>
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<td>1.641</td>
<td>11.396</td>
</tr>
<tr>
<td>2Y Tails</td>
<td>0.234</td>
<td>0.905</td>
<td>2.634</td>
<td>19.518</td>
</tr>
</tbody>
</table>

Sample: January 2002 - November 2015;
Source: Authors’ calculations
As can be seen in Table 3.1, in all cases the sensitivity parameter is a highly statistically and economically significant determinant of implied volatility. Visually we see that relation in Chart 3.6:

**Chart 3.6: Residuals from Table 3.1 Regressions**

*Source: Authors’ calculations*
The sensitivity of rates to data appears to determine the market’s view of uncertainty about the future path of interest rates. If we accept the former variable as reflective of Fed communication we can say that time-dependent communication serves to lower implied volatility (all else equal) and data-dependent communication will raise it. Moreover, implied-volatility does seem to be an important determinant of the amount of leverage market participants desire to bear. Chart 3.7 plots implied volatility in the interest rate market against the leverage of hedge fund clients of a large prime brokerage. Consistent with the Adrian and Shin thesis, leverage and implied volatility are inversely correlated.

**Chart 3.7: Hedge Fund Leverage and Implied Volatility**

*Source: Bloomberg and authors’ calculations*
**August 2011: A case study**

To focus in on the link between Fed communications, uncertainty, and leverage, we look at an event that was the most unambiguous example of a move to time-based communication: the August, 2011 FOMC statement. For the first time in its history the Fed made a conditional commitment to keep rates near zero until “at least through mid-2013.” Expectations for the timing of the first rate hike were promptly pushed out. However, as the emphasis of this section is the second moment of expectations, we look at a few measures of uncertainty around the timing and path of the funds rate.

Before we begin the analysis of the August 2011 FOMC statement, we want to emphasize that we are not arguing that time-based forward guidance in August 2011 was an unwise decision because it lowered asset price volatility. Indeed, this may very well have been the goal of time-based forward guidance. But it is important to evaluate empirically the implications of such time-based forward guidance on volatility.

We begin with survey measures. The Primary Dealer Survey is a survey sent to primary dealers in the Treasury market by the Markets Group of the Federal Reserve Bank of New York every 6 weeks, roughly corresponding to the timing of FOMC meetings.18 The two Primary Dealer Surveys conducted just before and after the August 2011 meeting report a significantly later expected timing for liftoff. Moreover, the interquartile range for the expected quarter of liftoff narrowed from two quarters to one quarter, as respondents became more tightly bunched around 13Q4 in their expectation for the first rate hike. Similarly, the interquartile range for the expected funds rate in the quarter when the median respondent expected liftoff narrowed from 87 basis points to 43 basis points.

18 For more information on the survey, see the website: https://www.newyorkfed.org/markets/primarydealer_survey_questions.html
On the announcement of the calendar guidance interest rates moved down aggressively, but at least initially option-implied expected interest rate volatility did not move down. However, in subsequent months there was a pronounced move lower, and implied volatility reached an all-time low in April, 2013, before correcting upward in the ensuing taper tantrum.

**Chart 3.8: Swaption-Implied Interest Rate Volatility**

Two popular models for decomposing interest rates into risk-neutral yields (or the expected path of the short rate) and term premium – the Kim-Wright model from the Federal Reserve Board and the Adrian, Crump and Moench model from the NY Fed – suggest that vast majority of the decline in interest rates after the August, 2011 FOMC meeting was due to a decline in risk premium. In other words, to the extent one trusts these models they suggest the
easing brought about in financial conditions was not due to a large change in expectations about the path the Fed would follow, but greater reassurance that they would not deviate from that path. In arguing for including financial stability considerations into monetary policy, Stein (2014) cites the Kim-Wright measure as a proxy for financial market vulnerability and one that should be counteracted with higher rates in the event the term premium measures gets unusually low. If one accepts this reasoning, then the stark effect of calendar-based guidance on the term premium measures poses a destabilizing risk to financial market functioning.

Chart 3.9: Estimated Term Premium, Ten-Year Rates

What are some of the other effects of this reassurance on behavior in financial markets? Unfortunately the prime brokerage data presented earlier only begin in late 2011. In considering
other corners of the financial markets for which measures do exist, Stein (2013) suggests high-yield ETFs as a potential area of concern, particularly “if investors in these vehicles seek to withdraw at the first sign of trouble, then this demandable equity will have the same fire-sale generating properties as short-term debt.” After the Fed reassured markets that they would be on hold for at least two years, investor appetite for this asset class soared, with assets under management doubling over the following twelve months.

**Chart 3.10: ETF Assets**

Another area of concern highlighted by Stein, agency mortgage REITs, saw assets under management increase 49% in the year after the August 2011 FOMC, though to be sure, unlike high-yield ETFs, mortgage REIT assets were already strongly trending upward prior to the Fed’s
calendar-based guidance. Nonetheless, 2012 was the strongest year of growth for this highly-levered asset class, a result that should not be too surprising in light of the increase in carry-to-risk that occurred in the wake of the Fed’s 2011 guidance.

**Chart 3.11: Growth in mortgage REIT assets**

The fact that the August, 2011 time-based guidance may have depressed implied volatility and encouraged increased risk-taking should not necessarily be considered a criticism of that decision. The build-up of financial stability risk was a tolerable price to pay for promoting easier financial conditions when the economy was far from the Fed’s mandate. However, it is important nonetheless to obtain a full understanding of the trade-offs involved when the FOMC chooses to employ calendar-based guidance.
Section 4: Time-based Forward Guidance Can Hurt Central Bank Credibility

Another disadvantage of time-based forward guidance is that it effectively boxes in the central bank, constraining future decisions when such constraints are sub-optimal. For example, suppose the central bank communicates the intention of a specific target interest rate in the future. For concreteness, assume that the FOMC meeting statement signals that a rate increase is likely at its next meeting in six weeks. If very negative macroeconomic news emerges during the weeks between the two meetings, then the central bank is faced with a predicament. It can ignore the news and raise rates, which is sub-optimal given new circumstances that call for unchanged or even lower interest rates. Or it can backtrack on its time-dependent forward guidance but suffer damage to its credibility. Neither option is good.

4.1 Anecdotal evidence from three meetings

Has time-based forward guidance hurt the Federal Reserve’s communication effectiveness in recent years? To answer this question, we begin with evidence from the Primary Dealers Survey conducted by the Markets Group at the Federal Reserve Bank of New York described above. In January 2011, the survey began asking a question judging the quality of communication by the Federal Reserve System. The specific question asked in the January 2011 survey was:

*How would you grade the Federal Reserve System’s communication with the markets and with the public since the last policy survey on 12/16/2010? Please provide a rating between 1 and 5, with 1 indicating ineffectiveness and 5 indicating effectiveness.*
From January 2011 to January 2013, this question was asked in every survey, which corresponded to a total of 17 surveys. After January 2013, this question was asked in every other survey, for a total of 13 surveys through January 2016.\footnote{During the period in which the survey asked the communication question in every other survey, it still asked survey respondents to judge the quality of communication since the last survey, not the last survey that asked the same question. So for example, the October 2015 survey asks primary dealers to judge the quality of communication since September 8, 2015, even though the last survey containing the same question was July 20, 2015. As a result, we do not have any information on what survey participants thought of the quality of communication between July 20, 2015 and September 8, 2015.}

The survey is usually conducted a week and a half before an upcoming FOMC meeting and respondents are asked to grade communication since the prior survey. As a result, we link the survey responses to each question to the prior meeting, since we assume that communication associated with that meeting is the primary communication by the Federal Reserve being scored by the dealers. For example, the October 19, 2015 survey is linked to the September 17, 2015 meeting, and we assume that the score in the October 19\textsuperscript{th} survey is reflective of perceptions of communication from the September 17\textsuperscript{th} meeting.\footnote{The next meeting of the FOMC in this example was October 28, 2015.} We take the average score across the dealers, and we rescale the scores to be centered on zero and have a maximum and minimum of $+2$ and $-2$, respectively.

**Chart 4.1: Average PDS Score of Federal Reserve Communication**
Chart 4.1 presents the communication scores for all FOMC meetings for which the survey asked the question. We sort the meetings by their communication score from worse to best. On six occasions, a little over one fifth of the total, communication was judged to be relatively ineffective—scores in negative territory as we have computed them. In commentary provided with the survey results, a common concern expressed in most of these cases was Fed cacophony—the wide range of conflicting views expressed by FOMC participants.

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provided with the survey results, a common concern expressed in most of these cases was Fed cacophony—the wide range of conflicting views expressed by FOMC participants.

However, there are three instances that earned low scores that could arguably be tied to the use of time-based forward guidance and the complications that come with it: June 2013, September 2013, and September 2015. The June 2013 FOMC meeting and press conference associated with the meeting was the culmination of the “taper tantrum” period in which market participants reacted negatively to news that purchases of agency-mortgage backed securities and long term U.S. Treasuries by the Federal Reserve would be tapered. There is a timing complication in tying the negative score to the discussion of the tapering. As noted in Section 2, the original sentence hinting at tapering (obliquely) was released in the May 1, 2013 FOMC meeting statement, while the beginning of the taper tantrum is popularly tied to May 21, 2013 Congressional testimony when Bernanke interpreted the FOMC’s hint more explicitly in response to a question as suggesting taper could start in the next few meetings. In fact, the tantrum response in the bond market occurred over the entire period from early May through the June FOMC meeting, when the taper message was reinforced, and beyond.21 The 10-year Treasury yield had reached a low of 1.6% of the May 1 meeting, it then rose pretty steadily over the next several months, to 2.0% as of the May testimony, 2.4% as of the June FOMC meeting (including a 15-bp jump right after the meeting), and peaked at about 3.0% in early September.

Why did primary dealers assign a low score to the taper tantrum period? One possible reason is that, as we noted earlier, the market participants believed purchases of agency-

21 Chairman Bernanke was fairly clear on this point during the June 2013 press conference: “If the incoming data are broadly consistent with this forecast, the Committee currently anticipates that it would be appropriate to moderate the monthly pace of purchases later this year… And if the subsequent data remain broadly aligned with our current expectations for the economy, we would continue to reduce the pace of purchases in measured steps through the first half of next year, ending purchases around midyear.”
mortgage backed securities and long term U.S. Treasuries would be continued indefinitely (“QE infinity”) when the Federal Reserve announced an open-ended QE3 program. The low-for-long message was also being reinforced by the strong time-based guidance on rates that the Committee was engaged in at the time. The announcement that the Federal Reserve would begin tapering purchases clearly dashed those expectations. Tapering could mean that exit from the low for long policy would not be far behind. Having the rug pulled out from under them was unsettling.

The very negative communications scores for the September 2013 and September 2015 FOMC meetings were also driven by issues related to time-based forward guidance. In both cases, market expectations had been set up earlier in the year for action later in the year (by around September). As we have just noted, Fed communication clearly caused an abrupt shift in market expectations about the termination of QE. The exact statement Bernanke made during the JEC testimony in May was: “If we see continued improvement, and have confidence that this is going to be sustained, in the next few meetings we could take a step down in our pace of purchases” (our emphasis). Notice that the statement contains both data-dependent and time-dependent elements, but we believe market participants and the financial press focused primarily on the time-dependent portion of the statement. Further, the June 2013 press conference and the minutes to the June 2013 and July 2013 FOMC meetings gave rise to an earlier than expected termination of the asset purchase program and the likelihood that the programs would be wound down starting later in the year.

In 2015 there had been indications in press conferences and FOMC minutes from December 2014 onwards that liftoff would be occurring during 2015. We already highlighted in
the introduction the time-based forward guidance statements by Chair Yellen in July of 2015, both in Cleveland and during Congressional testimony.

In both 2013 and 2015, the Chairman Bernanke and Chair Yellen had not spoken publicly for some time ahead of the September meetings (neither spoke at the Jackson Hole meeting), and relatively little guidance was provided prior to that meeting in both years. Given a perceived absence of clear signals either way shortly before the meeting and given the relatively strong time-based guidance that had been provided earlier in the year, many in the market expected action in September in both cases. In both cases financial market turbulence factored into the decisions, and the decisions themselves were relatively close calls. In both cases the outcome of no action came as a surprise to many in the market and this no doubt factored importantly into the low grades for communication effectiveness.

The FOMC leadership evidently felt in both cases that it was important to prepare the market for a likely change in the course of policy in the not-too distant future. These “warnings” were not unconditional, but the performance conditions attached were inevitably underappreciated. In the end, strong time-based expectations that were set up led to complications with communication when no action was taken at the September meeting.

4.2 More systematic evidence from the Primary Dealers Survey

Chart 4.2 presents the same information as in Chart 4.1, but we sort by date instead of the average communication scores. We also calculate the average communication score for the meetings prior to June 2013, and for the meetings after June 2013 including the June 2013 meeting itself. As the chart shows, the average communication score for the Federal Reserve has dropped significantly: it was 0.495 prior to June 2013, and -0.05 afterward.
We do not attempt to directly link the sizable decline in communication scores with time-based forward guidance. But one of our key arguments is that time-based forward guidance is not useful in an environment where monetary policy is no longer constrained by the zero lower bound. The continued use of time-based forward guidance even during the period in which the Federal Reserve is moving toward policy normalization may be partially responsible for the lower scores in the post June 2013 period.

To buttress this argument, we examine interest rate movements on days on which an FOMC statement is released versus days on which major macroeconomic announcements are made. First, in Chart 4.3, we relate the absolute value of the single day change in the 2-year
Treasury yield for each FOMC meeting day to the communication score for that meeting from the Primary Dealers Survey. We focus on the 2-year Treasury yield because the zero lower bound constraint during the post 2008 period leads to little movement in 1-year or shorter maturity Treasury yields (See Hanson and Stein (2015) and Swanson and Williams (2014)). Chart 4.3 shows a negative relation: the single-day absolute value of the change in the 2-year Treasury yield is higher for FOMC meetings to which dealers assign lower communication scores. A univariate regression of the yield change on the communication score produces a coefficient estimate of -0.04 that is statistically distinct from zero at the one percent level of confidence. The worst possible communication score is associated with an 8 basis point move in the 2-year Treasury yield relative to almost no movement in the yield for the best possible score.

**Chart 4.3: Communication Grades and Interest Rate Movements**
Market participants assign lower communication scores to meetings which result in large movements in interest rates. As we show in section 3, good communication should be associated with markets incorporating macroeconomic news into interest rates in the direction the Federal Reserve wants. These two insights suggest that a useful measure of communication quality is the relative movement in interest rates on FOMC days versus days of major macroeconomic news.

The left panel of Chart 4.4 plots the average absolute value of the single day change in the yield on the 2-year Treasury for three sets of days: those with an FOMC announcement, those with major macroeconomic news announcements, and other days. The major macroeconomic news announcements are those for which Swanson and Williams (2014) show the most statistically powerful effect on yields: new home sales, non-farm payrolls, and retail
sales excluding autos. We plot the average interest rates responses for the three types of days by year from 2010 to 2015. So for example, in 2010, the average absolute value of the change in the 2-year Treasury rate on days of major macroeconomic news was 4 basis points, almost twice as much as on other days. In 2010, the change in the 2-year Treasury rate was larger on macroeconomic announcement days relative to FOMC statement days.

**Chart 4.4: Single Day Absolute Value Changes of 2-Year Treasury Yield, 2010-2015**

The right panel plots the ratio of absolute changes in the 2-year yield by year for FOMC announcement days relative to macroeconomic news days. As it shows, the relative importance of FOMC announcement days increased in 2014 and 2015. Indeed, as the blue bars in the left panel show, interest rate movements on FOMC days have increased quite dramatically.

To put the magnitude in historical perspective, Chart 4.4 plots the ratio of the absolute changes in 2-year yields on FOMC days relative to macro news days all the way back to 1994 when the FOMC began making its decisions on rates publicly known. As it shows, the ratio is
higher than the 2014-2015 period in only one other time: during the recession of 2007 to 2009. If we exclude these year, 2014 and 2015 have the highest ratio of interest rate movements on FOMC days relative to macro announcement days.

**Chart 4.5: Single Day Absolute Value Changes of 2-Year Treasury Yield, 1994-2015**

The evidence in Charts 4.4 and 4.5 points to interest rates reacting more to FOMC meeting dates than to other macroeconomic news, especially in the last two years. This in our view is a worrisome trend given that good communication should be associated with a transparent central bank reaction function where markets react to macroeconomic news automatically. Together with Chart 4.3 which shows a decline in the average communication score by primary dealers since 2013, the evidence suggests that communication by the Federal Reserve could be improved. We focus on recommendations in the next section.

**Section 5: How Might Fed Communication Be Improved?**
The Federal Reserve has clearly made substantial improvements in its communication strategy in the last twenty years. It provides far more information to the public and the markets about what its actual policies are and how they react to economic data, both in longer and more detailed FOMC statements, through the release of minutes three weeks after the FOMC meeting, and press conferences immediately after FOMC meetings. In addition, the Federal Reserve has joined the ranks of inflation targeting central banks by adopting an explicit 2% inflation objective which helps to anchor inflation expectations, a central element in achieving successful monetary policy outcomes.

5.1 Lessons about the effectiveness of forward guidance

The next step in advancing Fed communication is forward guidance. Forward guidance has a number of subtleties and our theoretical and empirical analysis provides several lessons about the effectiveness of forward guidance. The lessons are as follows:

1. Data-based forward guidance, a description of how future policy rates react to future data, that is the policy reaction function, leads to desirable expectation dynamics. When the data reveals a negative shock to the economy, the data-based forward guidance indicates that future policy rates will likely be lower. Market expectations of future policy rates then fall, leading to lower longer-term interest rates, which has an expansionary effect on economic activity and inflation. In other words, with data-based forward guidance, the markets do some heavy lifting for monetary policy: a negative shock leads to an easing of financial market conditions that offset the negative shock.
2. Time-based forward guidance, that is, a commitment to set future policy rates at specific levels at specific calendar dates, has undesirable expectation dynamics. When a negative shock hits the economy, time-based forward guidance does not result in a fall in market expectations of future policy rates, so longer-term interest rates do not fall, and therefore do not provide an expansionary effect on economic activity and inflation. Even worse, if the negative shock lowers expectation of future inflation, with nominal interest rates unchanged, real interest rates rise. The result is a tightening of financial conditions that reinforces the negative shock, making the economy worse off.

3. In line with the theoretical results, the empirical evidence provides support for a differential effect of data-based and time-based forward guidance on longer-term interest rates when there is a shock to the economy. We find that longer-term interest rates are more responsive to incoming economic data when the Fed pursues data-based forward guidance than when it pursues time-based forward guidance.

4. Empirical evidence also finds that time-based forward guidance results in lower uncertainty for long-term interest rates than does data-based forward guidance. Although this lower uncertainty might at times be desirable when the economy requires more stimulus, it does lead to higher leverage which could make the financial system less stable.

5. Empirical evidence finds that the Summary of Economic Projections (SEP) in which FOMC participants provide their projections of the federal funds, rate,
unemployment, real GDP and inflation, are helpful in providing information to the markets about the Fed’s policy reaction function.

6. Time-based forward guidance is often intended to be far more data-based than the public or markets understand. When the FOMC or FOMC participants have used calendar dates to discuss forward guidance, they have always added qualifying statements that the timing of the actual policies are conditional on how economic data evolves. However, the media downplays these qualifying statements in their reporting of forward guidance, so the public thinks of this forward guidance as being unconditional. Market participants also often view forward guidance which mentions calendar dates as purely time-based with no conditionality.

7. Time-based forward guidance has sometimes put the Federal Reserve in a box. With time-based forward guidance, if new data comes in that would suggest a needed revision to the projected path of the policy rate, there may be a tendency to stick to the previously announced path. The result would then be an inappropriate setting of the policy instrument. The strong time-based forward guidance episodes during 2003-06 discussed in Section 3 is one example where this might have occurred. Alternatively, if the actual setting of the policy instrument is changed from the previously announced path, the market may take the view that the Federal Reserve has flip flopped and broken its word, thereby weakening the Fed’s credibility. The taper head-fake of September 2013 and the delay in the liftoff of the policy rate in September 2015 are examples of when this occurred.
8. Time-based forward guidance has also added more confusion in the markets than needed or desired. The time-based guidance that preceded both the tapering of QE and the liftoff of rates caused episodes of surprise to the markets when these actions were delayed, resulting in abnormally low scores for the effectiveness of Fed communication by market participants.

9. Time-based forward guidance, however, does have potential advantages over data-based guidance. Data-based guidance can be very hard to explain because it is not always easy to describe the monetary policy reaction function, and this is particularly true when the monetary policy authorities are not responding directly to quantifiable economic data, but rather to judgement about less quantifiable factors that could have an important impact on the economy. The possible lack of clarity of data-based forward guidance may sometimes make it ineffective, either because the market does not understand it, or may not find it credible. Time-based forward guidance, on the other hand, is easy to explain and is much clearer. Also its simplicity makes it more credible because it is easier to assess whether it is being carried out or not. Time-based guidance is not only more easily understood, but also for that reason more powerful than data-based guidance. For example, strong time-based forward guidance in both August 2011 and October 2015 shifted market expectations of future interest rates dramatically.

5.2 Suggested Improvements in Federal Reserve Communication

The lessons above provide guidance as to how Fed communication about forward guidance can be improved. We discuss four possible suggestions to improve communication about forward guidance.
1. Time-based forward guidance should be used in only very unusual circumstances: (1) when the zero-lower-bound on monetary policy is binding and more expansionary monetary policy is required. And (2) when all other efforts to communicate the central bank’s reaction function to markets have been unsuccessful. However, time-based forward guidance should not be used only because market forecasts of economic outcomes differ from Federal Reserve’s forecasts.

The lessons above suggest that time-based forward guidance has several undesirable attributes. Not only does it lead to undesirable expectation dynamics, but it puts the monetary policy authorities in a box, in which they either stick to the time-based forward guidance and pursue inappropriate policies, or alternatively deviate from this forward guidance, which can cause confusion and weakens the Fed’s credibility. These undesirable characteristics of time-based forward guidance might lead to the conclusion that time-based forward guidance should never be used.

In unusual circumstances, such as when monetary policy is constrained by the zero-lower-bound and it needs to be far more expansionary, time-based forward guidance might be the most effective (or best) monetary policy tool available to stimulate the economy. Other policy tools may have undesirable consequences, e.g., quantitative easing expands the Fed’s balance sheet that could lead to problems in the future (see Greenlaw, Hamilton, Hooper and Mishkin, 2013), while data-based forward guidance may be less effective and/or less credible because it is less easily understood. In situations like this, it may be better to pursue time-based forward guidance than doing nothing at all. In this light, time-based guidance may have been called for and appears to have been used effectively during 2009 to 2013 period when the zero-lower bound was binding and yet slack in the economy was very large and the inflation rate was
way too low. The Federal Reserve needed to stimulate the economy and the time-based forward
guidance used at the time was employed effectively alongside quantitative easing to lower long-
term interest rates and stimulate the economy.

Is time-based forward guidance ever justified when the Federal Reserve is not against the
zero lower bound? This is a more controversial question. Time-based forward guidance should
not be used because the Federal Reserve forecasts of the economy disagree with the market’s
forecasts. However, time-based forward guidance away from the zero lower bound could be
justified when the market’s perception of the Federal Reserve’s reaction function is incorrect,
and all other efforts by the Federal Reserve to communicate its reaction function have failed.
There are dangers in following this approach, because it may be hard to distinguish whether the
market disagreement with Federal Reserve on the future policy path is the result of differences in
forecasts on economic outcomes or the difference in views on the Federal Reserve reaction
function. In view of this uncertainty, the Federal Reserve should exercise extreme caution before
using time-based forward guidance for this purpose.

We believe that the current situation does not justify time-based forward guidance.
Statements along the lines of “there is a reasonable expectation of $x$ number of rate increases in
2016” could be easily misinterpreted as a stronger commitment than intended. First, we are much
closer to full employment and the zero-lower-bound on monetary policy is no longer binding.
Second, we do not believe that differences in views on the projected path of policy between the
Federal Reserve and market are due to disagreement on the Federal Reserve’s reaction function.
Therefore, the current economic environment is one where the use of time-based forward
guidance is less needed and the undesirable characteristics of time-based forward guidance argue
that it should be avoided. This would suggest that Federal Reserve pronouncements, either in
FOMC statements, press conferences or speeches should deemphasize calendar dates in discussing forward guidance.

2. Data-based forward guidance in which there is a projected path of policy rates may be too hard to explain and make credible, so it might be better not to do this type of forward guidance at all and instead revert to a weaker form of forward guidance.

Data-based forward guidance with a projected path of policy rates is a set of guidelines provided by the central bank that explains what interest rates would be expected to prevail given different possible future economic circumstances. We have argued that such data-based forward guidance creates desirable expectation dynamics that encourages markets to do some heavy lifting for the Federal Reserve, for example by immediately easing financial conditions when the economy is hit by negative shocks. However, this desirable feature of data-based forward guidance depends on two big ifs: It only produces desirable expectation dynamics if it is clearly understood by markets and if it is credible. Another way of saying this is that data-based forward guidance is darn hard to do.

Not only is data-dependent forward guidance hard to do, but as we have seen once there is a projected path of policy rates, even if the Fed clearly states that the actual path depends on the data outcomes, the markets and media may not get this. Thus trying to get any forward guidance to be data-dependent may not work and will always be interpreted as time-dependent. Then pursuing forward guidance even if data-dependence is intended, may lead to the undesirable expectations dynamics associated with time-dependence.

In addition, because data-based forward guidance in which there is a projected policy path is hard to explain, it is not clear that this form of data-based forward guidance will provide
more information on the monetary policy reaction function than no forward guidance when the zero-lower-bound is not binding. Another way of saying this is that actions may speak louder than words so data-based forward guidance using a projected policy path might not be more effective than no guidance at all. Our empirical evidence provides some support for this view because it finds that longer-term interest rate reactions to data are just as strong when there is data-based forward guidance as when there was no forward guidance at all.

Data-based forward guidance using a projected policy path is hard to do, it may not produce more information on the policy reaction function than not doing this type of guidance, and it may even result in undesirable expectations dynamics associated with time-dependent forward guidance. Given these problems, one suggestion is that it might be better not to do it at all. Indeed some central banks, such as the Bank of Canada, have argued that forward guidance of this type should be abandoned in normal times. Governor Carney (2012) has stated that “Overall research has not generally found that publishing a path leads to better outcomes”; while Governor Poloz (2013) has stated that “Essentially, the net effect of dropping forward guidance is to shift some of the policy uncertainty from the central bank’s plate back onto the market’s plate, a more desirable situation in normal times.”

The Bank of Canada has avoided providing explicit forward guidance on the future path of the policy rate with one notable exception, April 2009 when it committed to keep its policy rate at 0.25% for a period of time. However, this period was one where the zero-lower-bound was binding and the Canadian economy was weak and inflation too low, so the use of time-based forward guidance can be justified.

However, there is a weaker form of data-based forward guidance, which has been used by the Federal Reserve in its regular post-meeting statements since their inception in 1999. This
does not involve a projected path of policy rates but does specify a “balance of risks” that is tied to specific economic outcomes and serves as an implicit “policy bias.” The advantage of this approach is that it provides some forward guidance in the near term, but has less risk of a market misinterpretation that it is a time-based commitment. Because it does not directly discuss the future policy path, this weak form of forward guidance may convey less information about the reaction of future policy to incoming economic data. This approach could be improved by reverting to the more explicit policy bias or directive tilt formulation that was initially introduced in 1999 but soon dropped in favor of the less explicit balance of risks formulation. The balance of risks refers to economic conditions, and on some occasions these risks have been conflicting. For example, in the late summer and fall of 2007 as the financial crisis was growing, the Committee saw both upside risks to inflation and downside risks to growth. While it did give some indication of how these risks were balanced, a clearer signal to the markets would have been to say more explicitly how it saw the current policy bias, or which direction it expected to see policy move if a change were to occur at the next meeting.

3. Make forward guidance more data-dependent by emphasizing the uncertainty around the policy path and how the path would change with economic outcomes.

Despite the difficulties of doing data-dependent forward guidance with a future policy rate path successfully, there are two arguments for the Federal Reserve to stick with this form of forward guidance, but make it more effective.

First, with the publication of the projected policy rate path, the Fed is stuck with this form of forward guidance. One problem with increases in transparency is that they can never be taken back. Once the increase in transparency occurs, going back on it is likely to be viewed by the
public and the politicians as an attempt to hide something. This would be particularly true in the current political environment in which the Federal Reserve is continually under attack. One example is the taping of the FOMC meetings and publication of transcripts five years later. Mishkin (2004) has argued that transparency can go too far and that publication of the transcripts has been detrimental to good policymaking. Not being able to take back transparency means that the policy rate projections are here to stay and the Fed cannot avoid forward guidance because these projections will be interpreted as such.

Second, data-based forward guidance with a projected policy path can provide more information about the policy reaction function than no forward guidance at all. Clearly, when the zero-lower-bound is binding so there is no available action on the policy rate, there is nothing to be gleaned from the Fed’s policy actions about the Fed’s reaction function. However, even when the zero-lower-bound is not binding, the information about the policy reaction function can only be obtained over time as more data on policy actions become available. Furthermore, there are times when either unforeseen circumstances or learning about how the economy works requires a change in the reaction function. Deriving the policy reaction function from past data would then be misleading about the current policy reaction function. Data-based forward guidance using a policy path rate, in contrast to no guidance, can provide information on changes in the policy reaction function because of unforeseen events or changes in the Fed’s view of how the economy works.

But, as discussed, data-based forward guidance which provides a projected policy path is hard to do and may lead to interpretation as time-based. We have two recommendations as to how forward guidance can be improved to avoid these problems.
First, any discussion of data-based forward guidance requires that the public and markets understand that there is tremendous uncertainty about the outcomes of the actual policy path because of uncertainty about future economic data. One excellent approach to doing so is that used by the central bank of Norway, the Norges Bank. The Norges bank does provide a baseline projected policy path, but it also provides a fan chart showing the confidence intervals around the baseline policy path. However, the governance structure of the Federal Reserve System makes providing such a fan chart very difficult. There are up to nineteen participants (seven governors and twelve Federal Reserve Bank presidents) in the FOMC meeting that make policy decisions. It would be extremely difficult to derive a probability distribution for the path of future policy rates from these participants.

Nevertheless, even if a fan chart for the future path of the policy rate is impossible to produce, Federal Reserve officials could provide far more communication on how uncertain the future policy path actually is. Indeed, as is true for any probability distribution, Federal Reserve officials could emphasize that the probability that the actual policy path will match the median of the FOMC participants’ policy path is necessarily near zero. Fed communication by individual FOMC participants, particularly the Chair, should provide far more information on the uncertainty about where future policy rates might be. Indeed, one possibility is that individual FOMC participants could provide information about how uncertain they are about their views of where policy rates should be in the future.

Second, information about how the policy path might change if data comes in differently than expected would provide far more information about the policy reaction function than is currently provided. The Norges Bank does this by providing several scenarios as to how the policy path would change when economic outcomes change. Again, because the FOMC cannot
speak with one voice, it might be up to FOMC participants to describe these different scenarios. Alternatively, the FOMC might delegate to the Chair to provide information on how the committee’s view of the future policy path might change under different scenarios for data outcomes.

4. The financial press and market participants should fixate less on dates, and more on the evolution of the Federal Reserve reaction function

As detailed in the introduction, the financial press and even market participants display tunnel-vision focus on time-based forward guidance, often ignoring the conditionality of the statements being made. This makes it difficult for Federal Reserve officials who may be trying to communicate a reaction function, rather than calendar dates of when rates will change. Instead of a unique focus on dates, the financial press should make some effort in trying to understand the evolution of the reaction function. This may be more difficult to do, but it ultimately the most important piece of information the market needs. As we have shown above, we cannot blame Federal Reserve officials alone if the market believes the central bank is engaging in strong time-based forward guidance. The statements by Federal Reserve officials almost always contain a high degree of conditionality, and yet the financial press routinely ignores it.

5. The Summary of Economic Projections could be made more informative about FOMC participants’ policy reaction functions.

An additional recommendation that is more technical is to change to the manner in which the Summary of Economic Projections is reported. As discussed earlier, policy reaction functions estimated from median projections of the policy rate, unemployment, real GDP growth and
inflation can differ substantially from the policy reaction functions of individual FOMC participants. Currently, the FOMC’s Survey of Economic Projections does not provide links for each FOMC participant between the dots of projections for the different variables. The Survey of Economic Projections could make it much easier to estimate the different policy reaction functions by publishing the economic forecast of each participant alongside the individual dot forecasts that are already made available (of course, without revealing the identity of the individual associated with any particular forecast). The Fed already compiles such information and publishes it as part of a detailed SEP compilation that is made available alongside the FOMC meeting transcripts that are made available with a lengthy delay of 5 years (for example, see Table 2 in this document:


Releasing this type of detailed information to the public at the same time as the SEP might provide additional clarity in identifying the reaction function of each participant of the FOMC. The evidence from Carlstrom and Jacobson (2015) at the Federal Reserve Bank of Cleveland using the Survey of Professional Forecasters shows that using median forecasts to estimate the policy reaction function may provide little information about each individual’s reaction function. Having information about the participants’ individual reaction functions might enable markets to make better inferences about the FOMC policy reaction function, given that certain participants have more influence on policy decisions than others. Also, including a table similar to the one in FOMC transcripts directly links economic forecasts to interest rate projections of each participant, putting greater emphasis on the data dependency of the interest rate projections.
6. Conclusion

This paper reviews Federal Reserve communication about monetary policy over the last twenty years. Although the Fed has made substantial progress in improving its monetary policy communication, we argue that it has become too focused on time-based forward guidance in which the Fed outlines future moves in policy rates based on calendar time. We present both theory and empirical evidence which suggests that time-based forward guidance leads to undesirable expectations dynamics that can lead to poor economic outcomes. We therefore recommend that time-based forward guidance should only be used in extremely unusual circumstances when: 1) the zero-lower bound on monetary policy is binding and more expansionary policy is needed, or 2) exhaustive efforts to communicate the central bank’s reaction function to markets has failed. We believe that neither of these conditions holds currently.

Although data-based forward guidance, in which the Federal Reserve provides information about how the future policy path reacts to incoming economic data, leads to desirable expectation dynamics that enables the markets to do some of the heavy lifting for the Federal Reserve, it is very hard to provide such guidance without it being misinterpreted as time-based forward guidance, with its undesirable characteristics. In other words, data-based forward guidance in which there is a projection of future policy rates is very hard to do well. There are two responses to the view that this form of data-based forward guidance is hard to do. One is to abandon doing it altogether. The alternative is to take steps to make this kind of forward guidance clearer and less subject to misinterpretation as time-based forward guidance. We make several suggestions along these lines, and we hope that they can help the Federal Reserve to improve its monetary policy communication.
References


Financial Studies at the Goethe University, and the Georgetown Center for Economic Research at Georgetown University, March 21.


