

Approaches to Clarifying the Conditionality in the Committee's Forward Guidance

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1. Introduction and Summary

The statement the FOMC released following its August meeting included forward guidance noting that “the Committee currently anticipates that economic conditions—including low rates of resource utilization and a subdued outlook for inflation over the medium run—are likely to warrant exceptionally low levels for the federal funds rate at least through mid-2013.” This memo explores a range of issues related to forward guidance. In particular, we discuss:

- Financial market reactions to, and interpretations of, the contingent forward guidance in the August statement;
- The potential benefits and pitfalls associated with quantifying the economic conditions to which that forward guidance refers;
- The pros and cons of giving context to quantitative forward guidance by specifying a numerical objective for longer-term inflation and by providing a Committee estimate of the longer-run equilibrium rate of unemployment; and
- How more explicit forward guidance might be tailored to provide additional near-term stimulus, if the Committee judged such a step to be appropriate.

Broadly speaking, forward guidance is a tool the FOMC can use to clarify market participants' understanding of the Committee's objectives and of its policy intentions. Accordingly, the FOMC can—among other things—use forward guidance to align market expectations of future monetary policy with the Committee's own expectations when those two sets of expectations diverge for reasons other than differences in views about the underlying economic outlook. Forward guidance can potentially provide additional stimulus through lower medium-term real interest rates if market participants initially underestimate the FOMC's willingness to pursue persistently accommodative monetary policy over the medium term. In addition, if forward guidance improves investors' understanding of the Committee's reaction function, such guidance can make it more likely that investors' responses to incoming data will move medium- and longer-term rates in a direction and by an amount that is consistent with the Committee's thinking about the likely future path of short-term rates.²

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² Some argue that forward guidance could have additional beneficial effects on the public's expectations by serving as a commitment device. According to this argument, if the Committee were to announce, say, its intention to keep short-term interest rates near zero until certain economic conditions were met, private agents would be confident that the FOMC would indeed do so on the expectation that the Committee would be unwilling to suffer the loss in reputation associated with a failure to follow through on a high-profile pledge. As a result, the stated policy would be more likely to shift the public's expectations for short-term interest rates, inflation, and other factors in the desired directions. Other potential commitment devices include open market operations in support of forward guidance, such as those discussed in section 5.

The forward guidance in the August statement reduced investors' perception of the likelihood of an increase in the federal funds rate before mid-2013 and so contributed to somewhat lower short- and medium-term rates. Market participants appear to understand that the August statement links the timing of an increase in the funds rate to the future paths of unemployment and inflation and to the evolving economic outlook, and that it does not rule out an increase before mid-2013.³ However, market participants indicate they do not have a clear understanding of the economic conditions that would lead the Committee to raise the target funds rate sooner (or appreciably later) than mid-2013. Moreover, the August statement does not speak to the issue of how rapidly the Committee might normalize the stance of policy once liftoff occurs.

Policymakers may want to consider whether to clarify their forward guidance by offering a more explicit statement of the conditions that could lead the Committee to begin raising rates; in particular, the Committee might want to consider specifying threshold values of inflation and unemployment that could lead to an increase in the funds rate, instead of, or in addition to, projecting a date. The FOMC may also want to consider linking its forward guidance to a more explicit statement of the longer-run values of inflation and unemployment that it sees as consistent with its dual mandate. Finally, policymakers may want to consider whether to expand their existing guidance about exit strategy by providing some information about their likely policy strategy once they begin raising the funds rate.

Staff analysis of the potential performance of quantitative, state-contingent, forward guidance suggests that:

- Forward guidance has the potential to provide significant additional stimulus if it credibly signals that the Committee will be more accommodative than the public already anticipates. To a degree, more stimulus could be provided solely by providing information that changes people's views about the conditions that will govern the onset of tightening, if that additional information leads them to anticipate a longer period of near-zero rates than they now expect. Simultaneously providing information about the Committee's intended strategy after it begins to tighten could make forward guidance even more effective if the Committee were to indicate that, once it begins to tighten, it intends to raise rates less rapidly than the public now expects.
- Given the range of shocks likely to buffet the economy going forward, considerable uncertainty attends any calendar date estimate for the onset of policy firming. This result argues in favor of relying on state-contingent forms of forward guidance, and not on guidance geared purely to specific calendar dates.
- Analysis using the baseline forecast from the August Tealbook, alternative scenarios, and stochastic simulations suggests that announcing inflation and unemployment conditions that would warrant keeping the funds rate near zero (or, equivalently, announcing inflation and unemployment thresholds that could warrant raising the funds rate) would likely perform reasonably well in a variety of circumstances.

³ This outcome is consistent with the experience of foreign central banks that have employed conditional policy guidance. Their experience is summarized in Appendix A; perhaps the key observation is that, in each case, market participants appear to have understood that the forward guidance was conditional even though many news reports described the guidance as if it were an unconditional commitment.

The analysis supporting these conclusions relies on the staff's estimate that there is now appreciable slack in labor markets; it also depends on the behavioral realism of the models the staff employs. Policymakers may be skeptical of the estimate, the models, or both. In particular, policymakers may be skeptical of a key assumption embedded in the simulations: that longer-run inflation expectations will remain tied down by the Committee's unchanged long-run inflation goal even if the Committee allows medium-term inflation to run somewhat higher for a time. If longer-term inflation expectations were to move up, the result could be a larger and longer-lasting divergence between actual inflation and the Committee's desired level of inflation and a consequent need to run the economy somewhat below potential to return inflation to the Committee's objective, thereby offsetting the initial gains from promoting a more rapid recovery.

We turn next to a more detailed review of financial market reactions to the forward guidance in the August statement. That review is followed by a discussion of illustrative language that the Committee could use as a starting point in discussing more explicit forward guidance. In subsequent sections of this memo, we summarize model simulations that aim to give some insight into the macroeconomic effects of signaling that the Committee intends to keep short-term interest rates near zero longer than market participants currently expect. We also use model simulations to assess the extent to which unexpected changes in economic conditions would advance or delay the onset of tightening both under standard policy rules and based on specific inflation and unemployment thresholds. Finally, the memo briefly discusses the pros and cons of capping Treasury yields at maturities out to a year or more as a way of reinforcing the Committee's forward guidance. We do not consider the changes to the forward guidance that would become necessary if the Committee were to make a major change in its policy framework—to nominal GDP targeting or price level targeting, for example.

2. Financial Market Effects of the Recent Change in the FOMC's Forward Guidance

a. What has been the market reaction to the August statement?

The August FOMC statement prompted significant declines in implied rates on short- and intermediate-term interest rate futures, suggesting that the Committee's forward guidance led market participants to revise down their expectations for the path of the target federal funds rate over the next several years.⁴ For example, the implied federal funds rates derived from Eurodollar futures contracts maturing in March 2013 and June 2013 declined by 22 and 26 basis points, respectively, after the announcement (Figure 1). The flatter expected path for money market rates was reflected in yields on Treasury securities with maturities of 2 to 10 years, which declined by 6 to 14 basis points, on net, over the 2 hours following the release of the statement.

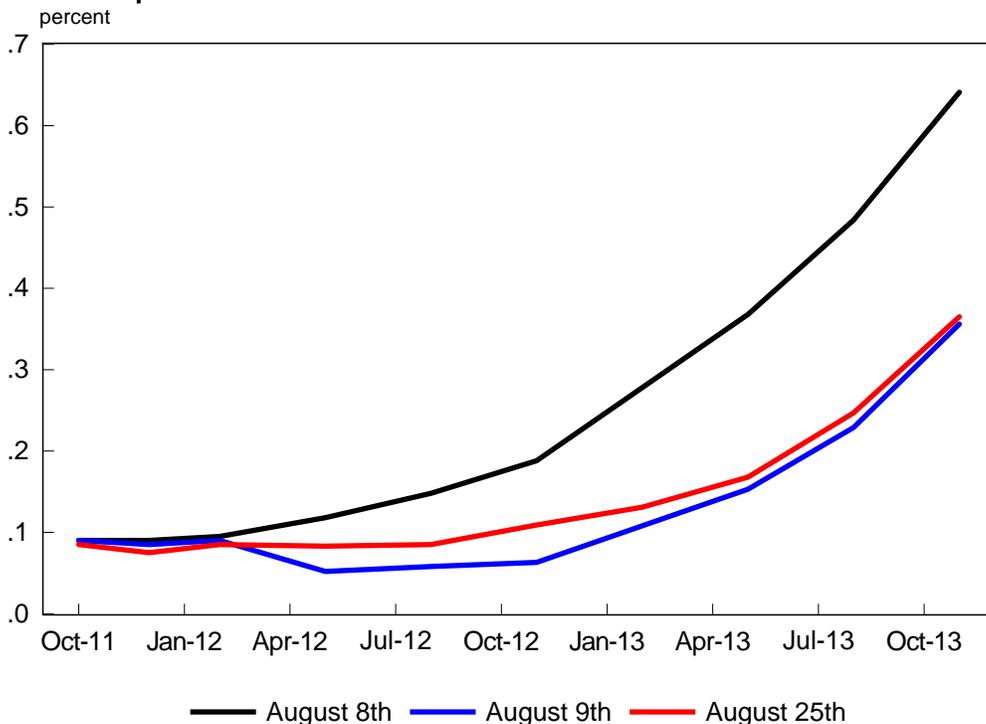
The guidance also appears to have reduced uncertainty about the path of short-term rates. Option-implied volatilities on Eurodollar futures contracts declined substantially after the statement's release, supporting the conclusion that a portion of the declines in implied rates was due to reduced uncertainty about the target path (Figure 2).⁵ Realized volatilities of Eurodollar futures implied rates, measured at daily and at intraday frequencies, also have declined notably

⁴ More detail on the market reaction can be found at <https://marketsource.ny.frb.org/publish/view/mt081211kjd.pdf>

⁵ Option-implied volatilities on Eurodollar futures are measured using basis point implied volatility, computed by multiplying price implied volatility from Bloomberg by the level of the underlying futures implied rate.

Figure 1

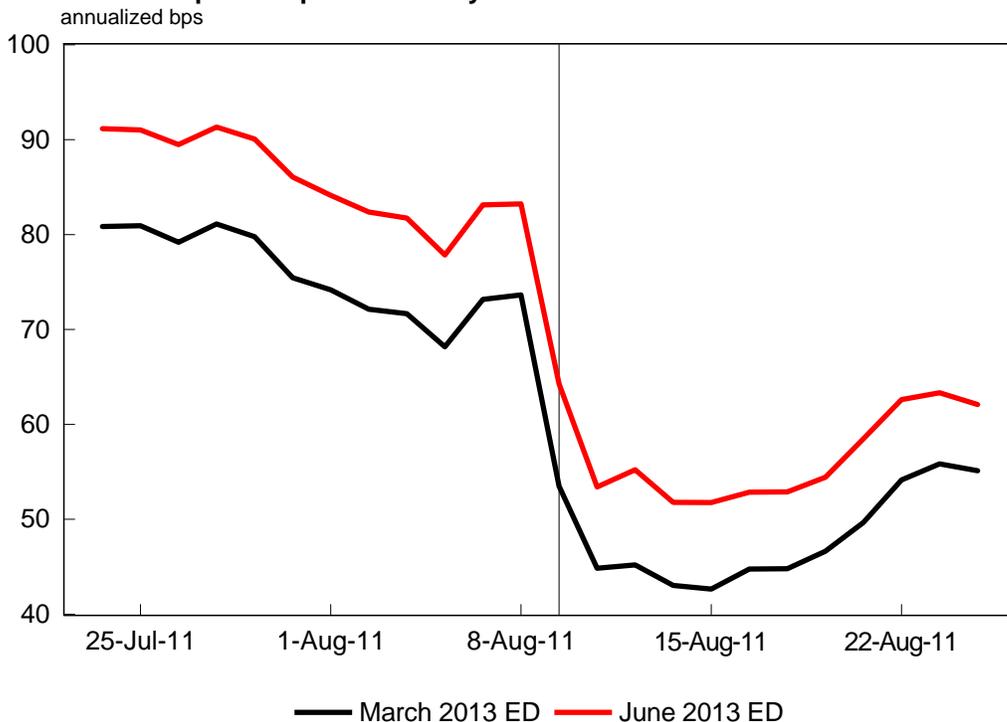
Implied Federal Funds Rates Derived from Interest Rate Futures



Notes: Implied rates through February 2012 are derived from federal funds futures contracts. Implied rates after February 2012 are derived from Eurodollar futures contracts adjusted using Libor-federal funds basis swaps. Estimates assume zero term premiums in all contracts. Dates shown on the x-axis correspond to the middle of the period covered by the underlying deposit contract.

Figure 2

Option-Implied Volatility on Eurodollar Futures Contracts



Notes: The vertical line denotes the August FOMC.

since the August meeting (Figure 3). In addition, implied rates appear to have become somewhat less responsive to economic news and to asset prices that reflect investors' economic outlook, including the S&P 500 and breakeven rates of inflation measured using TIPS.

While the declines in implied rates and volatilities have retraced modestly in subsequent weeks, both remain noticeably lower than prior to the August FOMC meeting. As of September 8, interest rate futures appeared to be pricing in a roughly unchanged policy rate through the summer of 2013. This reading seems broadly consistent with the responses to a special question on the September 2011 Blue Chip Financial Forecasts survey in which 78 percent of respondents indicated that they expect the target rate to remain in its current range "until mid-2013."⁶

b. Do markets read the language as a conditional expectation or as a pledge?

The behavior of asset prices generally indicates that the forward guidance is not seen as a firm pledge to maintain the current target range through mid-2013. First, as noted above, implied rates on contracts maturing in mid-2013 rose in the weeks following the August FOMC meeting, and interest rate futures curves are modestly upward sloping between December 2012 and June 2013. Neither the increase in implied rates nor the positive slope would be expected if market participants saw the target range as certain to remain unchanged through mid-2013.⁷ Second, although there were sharp declines in implied and realized volatilities following the meeting, these volatilities remain noticeably above zero, indicating that there remains some uncertainty about the target through mid-2013. Finally, there do not appear to be any sharp discontinuities in implied rates or volatilities from contracts maturing just before and after mid-2013.

Recent market commentary supports the idea that the forward guidance is viewed as conditional on the evolution of the economic outlook. However, most market contacts view the guidance as "raising the bar" for increasing the target rate. In particular, they appear to believe that the Committee would need to see a more substantial improvement in the outlook for economic activity or a larger deterioration in the outlook for inflation in order to raise the target rate prior to mid-2013 than previously would have been the case.

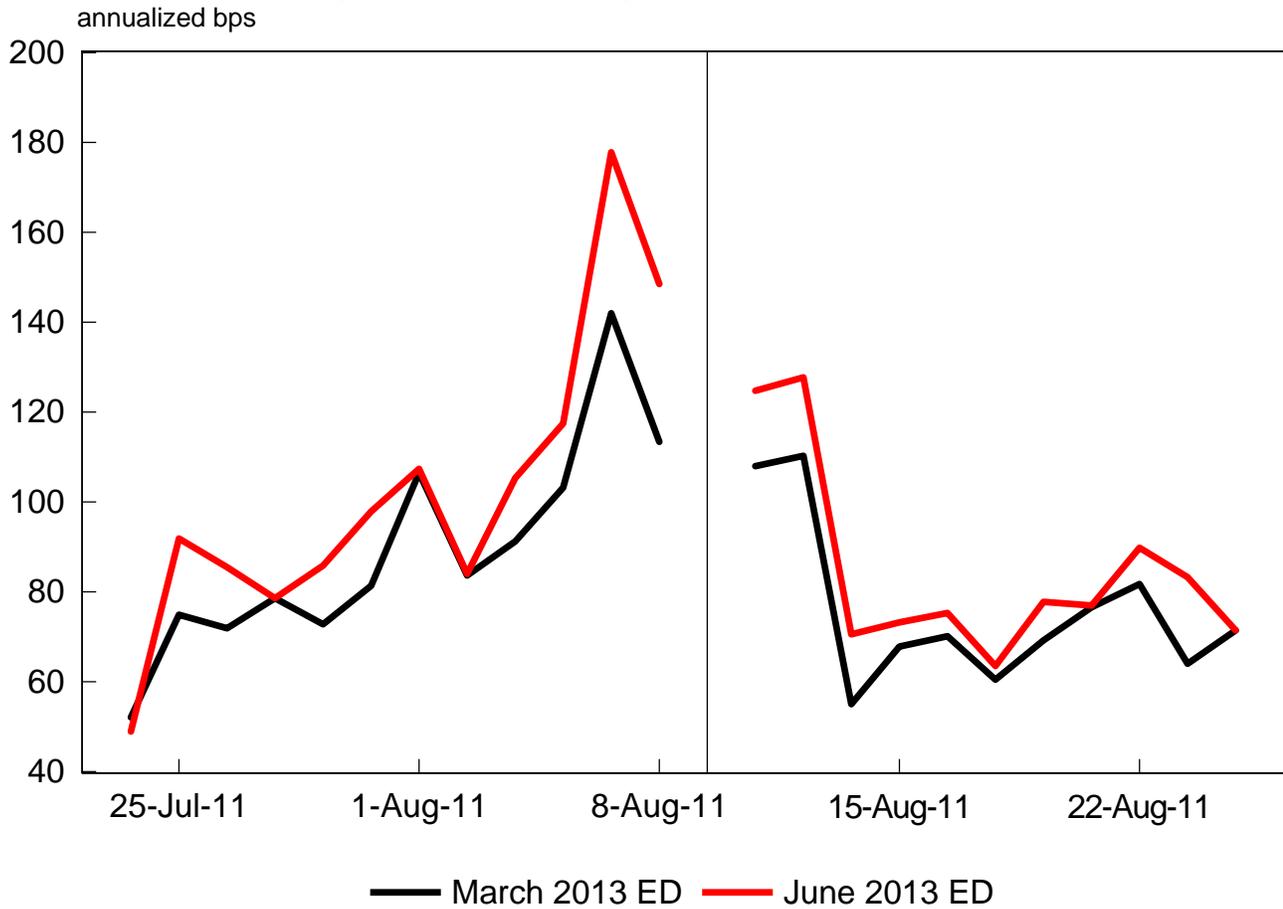
Market participants do not seem to have precise views on what economic conditions would result in an increase in the target sooner than mid-2013, on what conditions might lead the Committee to extend the date specified in the statement, or on how quickly the Committee will normalize the stance of policy once the funds rate has lifted off from zero; these issues have not been widely discussed in market commentary. However, in the September 2011 *Blue Chip Financial Forecasts* survey, only 4 percent of respondents said "the FOMC would tighten ... if the economy continues to grow at a below-trend rate but the Fed's preferred measure of inflation (PCE price index) moves above the top of the assumed target range (1.5%-2.0%) for more than three months." Of course, the volatility of the monthly price data is such that the set of states in which PCE inflation moves above 2 percent for more than three months is much larger than the

⁶ The survey was conducted during the week of August 22 and released on September 1.

⁷ However, Eurodollar futures implied rates, adjusted using Libor-federal funds basis swaps, remain slightly below 25 basis points for mid-2013. It is possible that the positive slope over the first half of 2013 reflects expectations that the effective federal funds rate will move towards the high end of the current target range at these horizons, though this seems an unlikely explanation.

Figure 3

Intraday Realized Volatility of Eurodollar Futures Contracts



Notes: Realized volatilities are computed by summing squared 10-minute changes in implied rates for each day. The vertical line denotes the August FOMC; data for this day is omitted for ease of presentation.

set of states in which inflation is projected to remain above 2 percent in the medium run. Thus, market participants may think the FOMC would tighten policy if it anticipated that inflation would move persistently above 2 percent, but not if it thought that inflation would rise only temporarily above 2 percent. Market participants generally appear to think that the Committee would raise the fed funds target before mid-2013 if necessary to prevent an increase in inflation to more than 2 percent over the subsequent couple of years, even if the unemployment rate were projected to remain well above policymakers' estimates of the longer-run equilibrium rate.

3. Clarifying the Committee's Longer-Run Objectives and its Forward Guidance

Economic agents' understanding of the reasons for the Committee's policy decisions, and thus the predictability of future monetary policy actions, might be enhanced if the Committee were to provide explicit statements about the levels of inflation and unemployment that policymakers judge to be most consistent with the dual mandate over the longer run, and about the values of those variables that they anticipate could signal a need to begin normalizing the stance of monetary policy. The Committee could, of course, determine that the Summary of Economic Projections (SEP) and the Minutes of previous FOMC meetings provide sufficient clarity about its longer-run goals and choose to clarify only the conditionality in its forward guidance.

A. Quantifying the rates of inflation and unemployment that the Committee sees as most consistent with its dual mandate

Numerical statements of the Committee's inflation goal and its estimate of the longer-run equilibrium rate of unemployment might be viewed as a natural extension of the descriptions of the Committee's objectives that have been laid out in the Summary of Economic Projections (SEP), the Minutes of FOMC meetings, and the Chairman's press briefings. Moreover, policymakers might consider it useful to state an explicit longer-run inflation goal, and also to provide a numerical estimate of the longer-run equilibrium unemployment rate, if they were to add inflation and unemployment thresholds for policy firming to the Committee's statement. Unless accompanied by an explicit longer-run inflation objective and by an estimate of the longer-run equilibrium unemployment rate, participants may fear that the threshold rates of inflation and unemployment would be misinterpreted by some market participants as corresponding to members' estimates of the mandate-consistent rates. The discussion that follows considers the principal merits and pitfalls associated with incorporating numerically explicit goals into the statement. For concreteness, we use the following language as an illustrative template. Clearly, the Committee could modify the numbers, the words, or both.

“Consistent with its statutory mandate, the Committee seeks to foster maximum employment and price stability. The Committee judges that inflation of 2 percent as measured by the price index for personal consumption expenditures is most consistent, over the longer run, with the dual mandate. Whereas monetary policy can determine the longer-run inflation rate, monetary policy does not determine the longer-run equilibrium rate of unemployment, which depends on structural economic factors that may vary over time. Currently, the Committee projects that, in the absence of further shocks to the economy, the unemployment rate would converge over time to a level around [5 to 6] percent; this projection is subject to considerable uncertainty.”

An explicit inflation goal should help to more firmly anchor longer-run inflation expectations. Because actual inflation depends in part on expectations of inflation, anchoring longer-run inflation expectations at 2 percent would aid in achieving the price stability component of the dual mandate. The Committee has, for many years, interpreted the employment component of its dual mandate as calling for monetary policy to foster conditions that help to minimize the deviations of actual unemployment from its equilibrium rate. Better-anchored inflation expectations would likely give policymakers more flexibility to ease monetary policy, in the short run, in response to negative demand shocks and could thereby contribute to achieving the employment component of the dual mandate. In addition, better-anchored inflation expectations might allow the Committee to look through supply shocks that push inflation temporarily away from its longer-run goal rather than adjusting policy in ways that reduce the temporary deviation in inflation but magnify the short-run effect on output and employment.

Although a few participants prefer a lower rate, a 2 percent goal for inflation as measured by the price index for personal consumption expenditures would line up with most Committee participants' interpretations of the price stability goal as reflected in the SEP. The illustrative language would affirm that the Committee's price-stability goal refers to overall inflation and not core inflation. The template uses "2 percent" rather than the phrase "2 percent or a bit less" used by the Chairman in prominent speeches.⁸ The latter phrase has the advantage of better representing the central tendency of Committee participants' assessment of the longer-run inflation rate that are shown in the SEP.⁹ However, stating the goal as "2 percent or a bit less" might lead some members of the public to the erroneous interpretation that the Committee has specified a narrow target band with a 2 percent ceiling. Furthermore, a reference to "2 percent or a bit less" could lead some members of the public to think that the Committee views undershooting and overshooting the inflation goal asymmetrically: that policymakers are less willing to tolerate inflation above 2 percent than below 2 percent.

One potential drawback to stating a numerical inflation goal, particularly for headline inflation, is that market participants might view such language as establishing an inflation trigger for action by the Committee. Total PCE inflation, for example, is volatile and is subject to periodic shocks from food and energy prices or changes in excise taxes, among other factors. Consequently, it can be expected to temporarily exceed 2 percent, and to fall below 2 percent, from time to time even when trend inflation is 2 percent. An explicit 2 percent inflation goal might pose a communications challenge for the Committee if, in the face of inflation above or below 2 percent, the Committee decided that no policy response was necessary because it saw above- or below-target inflation as a transitory phenomenon. To avoid this problem, most inflation-targeting central banks, though they use an overall price measure to define their medium- or longer-run inflation objective, also emphasize core inflation and other measures of "underlying" inflation in their communications.¹⁰ Core measures are less variable than all-items inflation; they can also serve as indicators of the future trend in overall inflation.

⁸ See, for example, his October 15, 2010, speech at the FRB Boston Conference on "Revisiting Monetary Policy in a Low Inflation Environment," and his August 26, 2011, speech at the FRB Kansas City Economic Symposium.

⁹ In the June 2011 SEP, the central tendency for Committee participants' projections of longer-run inflation was 1.7 to 2 percent.

¹⁰ Appendix C contains examples of the use of core, trimmed-mean, and other indicators of underlying inflation in foreign central bank communications.

We turn now to issues associated with specifying a number for the Committee's unemployment goal. The illustrative language presented above reflects a conceptual distinction between the unemployment and inflation goals: The inflation goal represents the Committee's judgment concerning a factor that the FOMC can determine in the long run; the value of the unemployment rate consistent with longer-run equilibrium in labor markets is outside the control of monetary policy. This longer-run equilibrium rate is not directly observable and likely changes over time in response to demographic trends, developments in the structure of labor markets, and perhaps other factors. Accordingly, estimates of this rate are subject to considerable uncertainty. Expressing the Committee's projection as a range is a way to underscore this uncertainty. Even though it cites a range rather than a point estimate, the illustrative language is more explicit than the Committee's August language, which refers to "levels [of the unemployment rate] that the Committee judges to be consistent with its dual mandate."

Even if the statement were to include language acknowledging that the Committee's projection of the longer-run equilibrium unemployment rate may change over time, the Committee might face a communications challenge in the wake of such a change. An increase in the Committee's estimate of the equilibrium rate, instead of being taken to be policymakers' recognition of structural change, might be perceived as a choice by the Committee to accept higher average unemployment than could be attained under an alternative monetary policy. Currently the danger of misinterpretation is latent in the estimates of the longer-run rate of unemployment reported in the SEP, but raising the profile of the Committee's estimates by including them in the FOMC statement could heighten the risk. Accordingly, the Committee might need to explain the reasons for changes in its estimates of the long-run unemployment rate, if and when these occur; presumably such changes would be explained in the Minutes of that FOMC meeting or in the accompanying SEP.

B. Quantifying the Forward Guidance

We turn next to the merits and pitfalls of various approaches to clarifying the conditionality of the forward guidance in the Committee's statement. The August statement indicated that "economic conditions—including low rates of resource utilization and a subdued outlook for inflation over the medium run—are likely to warrant exceptionally low levels for the federal funds rate at least through mid-2013." The Committee could choose to be more explicit about the conditions that underlie this assessment, thereby clarifying the rationale for the statement's reference to the mid-2013 date.

For example, consider the following possible substitute for the August language:

"The Committee anticipates that exceptionally low levels of the federal funds rate will be appropriate at least as long as the unemployment rate exceeds [7½] percent, inflation is projected to remain at or below [2½] percent in the medium-term, and longer-run inflation expectations continue to be well anchored at mandate-consistent levels. On the basis of currently available information, the Committee expects these conditions to prevail at least through mid-2013. "

In this illustrative formulation, the qualitative criteria in the August statement are replaced with state-contingent forward guidance under which the stretch of time over which the funds rate is expected to be at the effective lower bound is tied to quantitative criteria for possible policy firming. This “template” for reformulating the Committee’s forward guidance provides a convenient means of discussing several issues associated with quantitative guidance.

To provide a concrete example, the specific thresholds for unemployment and inflation shown above are chosen to be roughly consistent with the constrained optimal control simulation shown in the *Monetary Policy Strategies* section in Part B of the August Tealbook.¹¹ In that simulation, the unemployment rate reaches 7½ percent in the middle of 2013; four-quarter PCE inflation is 1¾ percent at that time but is projected to rise to a little over 2 percent some years later before returning to 2 percent. Though the simulation shows the unemployment rate reaching 7½ percent in mid-2013, and arguably shows that projected medium-term inflation would be moving up toward (though not breaching) 2½ percent in mid-2013, it is worth noting that the constrained optimal control simulation also shows the federal funds rate remaining at zero until early 2015. This policy path reflects the particular quadratic loss function used in the optimal control simulations, which may not accurately reflect policymakers’ views. Nonetheless, the optimal control exercise illustrates that policymakers might choose not to raise the federal funds rate as soon as either unemployment or inflation reaches its threshold value; accordingly, the illustrative language includes the words “at least as long as.” Of course, incoming information might lead policymakers to conclude that unemployment is likely to decline appreciably more rapidly, or that inflation is likely to run noticeably higher, than they had expected. If so, the Committee could advance the date given in the template.

One purpose of quantitative forward guidance along the lines illustrated here would be to increase the public’s understanding of the monetary policy reaction function and thus to enable market participants to ascertain how the date of policy firming might shift in response to a substantial change in the outlook. For example, if the threshold for unemployment specified in the Committee statement was 7½ percent, as above, and the modal outlook deteriorated markedly in response to a negative shock to aggregate demand, financial market participants should understand that the commencement of policy firming would be pushed back to 2014 or beyond, even before they saw any change in the FOMC statement. Presumably, this understanding would be quickly manifested in longer-term rates. Likewise, if the recovery proceeded more rapidly than expected or the inflation outlook worsened markedly, market participants would understand that the criteria would be reached earlier and that policy firming might commence sooner, perhaps in 2012. As a result, longer-term rates would rise.

Market participants already appear to have a fairly good—albeit not perfect—understanding of the Committee’s reaction function, so that bond rates to a large extent already respond in this stabilizing manner. Nonetheless, explicit state-contingent forward guidance offers the prospect of further aligning the FOMC’s intentions and the market’s expectations. Accordingly, putting explicit state-contingent guidance into the statement could allow the Committee to drop the sentence that contains the reference to “mid-2013” and avoid the need to update that sentence if

¹¹ The “constrained” optimal control simulation is the one in which the zero-lower-bound constraint on interest rates is binding. The “unconstrained” August simulation shows the funds rate rising above its current target range during the first half of 2014 after falling to –3 percent during the later part of 2012.

evolving economic conditions lead members to change their expectations of the date on which it will be appropriate to raise the funds rate. However, the Committee might prefer to retain the sentence as a way to convey information not only about its reaction function but also about its economic outlook: In the illustrative language, the “mid-2013” date would signal that the Committee sees little chance that the unemployment will reach 7½ percent before then, or that inflation pressures will intensify significantly before then.

A potential disadvantage of adopting quantitative thresholds for inflation and unemployment at this time is that, because such thresholds would require fairly significant changes in statement language, their adoption could hinder making further substantial changes in the format or content of the statement for a time, particularly if the Committee was concerned that further changes might confuse the public or undermine the FOMC’s credibility. For example, participants might worry that adopting explicit thresholds now could make it more difficult to change the Committee’s overall policy framework (perhaps by adopting nominal GDP targeting or price level targeting) in the near future even if they judged such a change appropriate in the absence of communications issues.

The hypothetical forward guidance discussed here treats the funds rate as the key instrument that the Committee would adjust in a tightening phase, and it embeds an assumption that forward guidance in the near term will focus on funds rate policy rather than balance sheet policy. This treatment is consistent with the exit strategy laid out in the June FOMC Minutes, including ending reinvestment of principal some time before raising the funds rate. Committee members might continue to believe that little would be gained from using both interest rate and balance sheet tools actively at the same time, and that clarity is best served by concentrating the forward guidance on a single instrument, namely the better-understood funds rate instrument. The essence of our discussion of the merits and pitfalls of quantitative thresholds would, however, carry through to forward guidance about balance sheet policy.

C. Framing the Inflation Threshold

We consider first the issues raised by a quantitative threshold for inflation. By providing a number, the Committee could remove the ambiguity associated with the phrase “subdued outlook for inflation”—a phrase that could be construed as connoting either mandate-consistent inflation or lower-than-mandate-consistent inflation. In contemplating a quantitative threshold for inflation, however, the Committee would need to consider whether to express the threshold in terms of actual inflation or projected inflation, or both.

The illustrative template presented earlier frames the inflation threshold in terms of projected medium-term inflation and longer-term inflation expectations:

***“The Committee anticipates that exceptionally low levels of the federal funds rate will be appropriate at least as long as the unemployment rate exceeds [7½] percent, inflation is projected to remain at or below [2½] percent in the medium-term, and longer-run inflation expectations continue to be well anchored at mandate-consistent levels.*”**

Employing projected inflation rather than actual inflation in such guidance has two possible benefits. First, the Committee may feel that the use of projections is appropriate because monetary policy needs to be forward looking. Second, actual inflation can be quite volatile over short periods of time, particularly when calculated using headline price indices. Using a twelve-month inflation rate would smooth out some of the short-run volatility, but the use of twelve-month inflation rates as a threshold would not entirely resolve the volatility issue (as is evidenced by the substantial swings in the twelve-month overall PCE inflation rate so far this year). Moreover, using twelve-month rates could build a good deal of inertia into measured inflation, and so might unduly delay necessary adjustments in the stance of monetary policy. The Committee might choose to deal with volatility and inertia by specifying the threshold criterion in terms of 3-month or 6-month inflation rates while adding that: “***Transitory increases in inflation owing to swings in the prices of volatile components of the PCE price index would not by themselves warrant an increase in the target range.***” However, such a caveat might reduce the clarity of the threshold language.

An alternative for dealing with the volatility issue would be to frame the inflation threshold in terms of core inflation.¹² A focus on core inflation might be perceived as inconsistent with the statement’s recent focus on the outlook for total inflation over the medium term. The Committee may nevertheless consider it worthwhile to specify a threshold in terms of core inflation and to explain this choice by pointing to core inflation’s ability to forecast overall inflation. This two-pronged approach would be consistent with the practice of advanced economy inflation targeting central banks. Almost all specify their inflation objective in terms of an overall consumer price index. The basis for this choice is that an overall index is most easily understood and is the most relevant barometer of households’ purchasing power. Nonetheless, in making monetary policy and in explaining their policy decisions, these central banks typically draw heavily on the information provided in core price indexes.¹³ That said, even core inflation has some transitory variability, so framing the inflation threshold in terms of core would not avoid the issue entirely.

Alternatively, Committee members might prefer to base a forward-looking inflation threshold on the forecasts of overall inflation contained in the SEP. While such thresholds would be in keeping with the notion that monetary policy decisions should be forward-looking, using the SEP forecasts as thresholds would be problematic because Committee participants base those forecasts on their individual assessments of “appropriate policy,” which may not coincide with the forward guidance contained in the statement. The approach illustrated above is a method for asserting a collective view among Committee participants, but that view may not always be easy to reconcile with the projections shown in the SEP.

Of course, using market-based measures of expected inflation as a threshold could suffer from a similar problem: Market participants’ expectations of future inflation will reflect their sense of the Committee’s reaction function as well as their forecasts of the variables in that function; their expectations may not always be consistent with the Committee’s forward guidance. Even so, it seems quite likely that the FOMC would interpret an appreciable change in longer-run inflation expectations as indicating a need to review, if not change, the stance of monetary policy.

¹² For the purposes of comparison, the standard deviation of overall PCE inflation (measured on a four-quarter basis) has been 0.9 percentage point since 1995; for core PCE inflation, the corresponding figure is 0.4 percentage point.

¹³ Appendix C contains examples of the use of such indicators in foreign central bank communications.

D. Framing the Unemployment Threshold

The use of an unemployment threshold in the statement raises somewhat different issues. Because unemployment is a smoother variable than inflation, the volatility issues discussed above for the inflation criteria would not figure prominently in the case of an unemployment threshold. On the other hand, specifying an unemployment threshold would be complicated by revisions in the Committee's estimates of the longer-run equilibrium rate of unemployment. If Committee participants' estimates of that rate were to change, the value assigned to the unemployment threshold in the statement language presumably would also need to be changed; otherwise, the Committee would, in effect, be changing its reaction function.

E. Framing Thresholds to Provide More Stimulus

In addition to using more explicit forward guidance to improve public understanding of the Committee's likely reaction to changes in the economic outlook, the FOMC could use forward guidance to provide more stimulus with the aim of achieving a more rapid convergence to maximum employment. To do so, the Committee would have to adopt unemployment and inflation thresholds that indicate it expects to hold the federal funds rate near zero for a longer period than market participants already anticipate.

F. Providing Forward Guidance Regarding Policy Following Lift-off

Staff analysis summarized in the next section suggests that forward guidance could be more effective in providing stimulus if, in addition to providing information about the conditions that would be likely to result in a rate hike, it also indicated that the Committee will likely adjust the funds rate gradually following the first increase. For example, the Committee could extend the illustrative forward guidance discussed earlier by adding the sentence shown in bold, below:

*“The Committee anticipates that exceptionally low levels of the federal funds rate will be appropriate at least as long as the unemployment rate exceeds [7½] percent, inflation is projected to remain at or below [2½] percent in the medium-term, and longer-run inflation expectations continue to be well anchored at mandate-consistent levels. On the basis of currently available information, the Committee expects these conditions to prevail at least through mid-2013. **Once it begins the process of normalizing the stance of monetary policy, the Committee expects to proceed at a pace that will promote continuing economic expansion, inflation near mandate-consistent levels over the medium-term, and well-anchored longer-run inflation expectations.**”*

Such language might suggest that the Committee would be willing to tolerate some inflation overshooting on the way to its longer-run inflation goal or, more generally, that the Committee was likely to tighten the stance of policy less quickly than market participants might otherwise expect. The added sentence is intended to increase the confidence of market participants that the Committee will take care to not increase the federal funds rate so rapidly that the recovery could stall, even if the resulting path for policy risked allowing inflation to rise somewhat above the Committee's longer-run objective of 2 percent. However, the sentence also suggests that there is

a limit to the Committee's flexibility, so that inflation will be maintained near mandate-consistent levels and longer-run inflation expectations will not be allowed to rise significantly.

4. Lessons from FRB/US Model Simulations for Forward Guidance

The preceding section outlined how forward guidance conditioned on economic developments could both clarify the Committee's objectives and potentially contribute to shifts in expectations that would help stabilize inflation and real activity. In this section, we explore the likely macroeconomic effects of such guidance using simulations of the FRB/US model. We begin by investigating the potential for the Committee to provide additional economic stimulus through forward guidance about its strategy for responding over time to the baseline economic conditions reported in the August Tealbook. The strategies considered here include guidance about the conditions that would trigger the onset of tightening, and guidance about the Committee's actions and objectives after tightening begins. In light of the highly uncertain outlook for real activity and inflation, we also consider how forward guidance might perform in the face of unexpected economic disturbances as well as errors in the FOMC's estimates of the equilibrium unemployment rate.

A. Can forward guidance be used to provide significant additional stimulus?

If the Committee were to announce its intention to keep the federal funds rate near zero for appreciably longer than the public currently expects, and if the public were to view such an announcement as credible, then the FOMC should, in principle, be able to stimulate real activity and boost inflation in the near term. Specifically, such a strategy should increase expected inflation and lower the expected path of short-term interest rates (especially when expressed in real terms). As result, real long-term interest rates should decline today, leading to a general improvement in financial conditions and stronger real activity.

This standard economic story is supported by simulations of the FRB/US model under rational expectations. We start by assuming that private agents initially expect the economy to evolve along the lines shown in the August Tealbook baseline, in which monetary policy—following the prescriptions of the baseline outcome-based policy rule—begins to tighten during the second half of 2013.¹⁴ We then assume that the Committee surprises the public by announcing its intention to keep the federal funds rate near zero longer than expected—either to the end of 2013, the end of 2014, or the end of 2015. Beyond these dates, monetary policy is assumed to be guided by the prescriptions of the baseline policy rule. In all cases, the public understands the announced policy and views it as fully credible, both with regard to the Committee's stated intention to keep the funds rate very low in the near-to-medium term and its commitment to stabilize inflation at 2 percent in the longer run.

The panels of Figure 4 show how the funds rate, unemployment rate, and core PCE inflation would evolve over time under each policy. As expected, extending the period of near-zero short-term interest rates improves macroeconomic performance. For example, the unemployment rate (lower-left panel) falls modestly faster relative to baseline (solid black line) if the funds rate is

¹⁴ Documentation for the outcome-based policy rule, which is estimated using data from 1988 to 2006 and so approximates the FOMC's average behavior, is provided in Appendix B of Tealbook Book B.

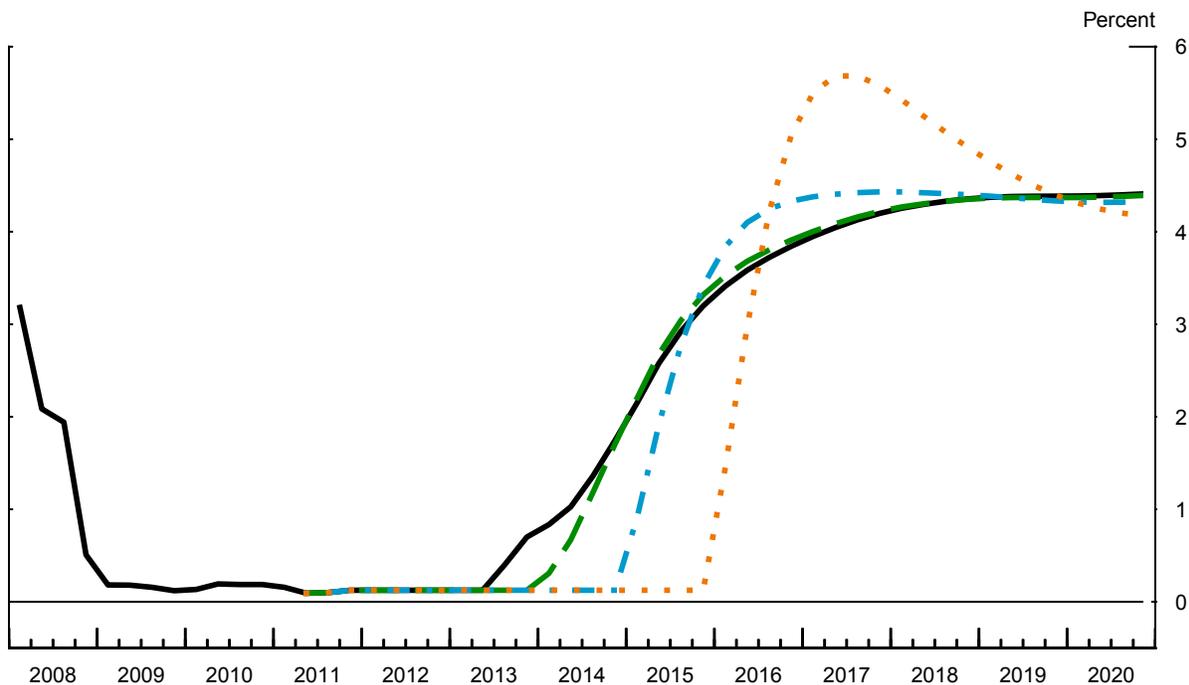
Figure 4

Implications of Committing to Keep the Funds Rate Near Zero Thru different Dates

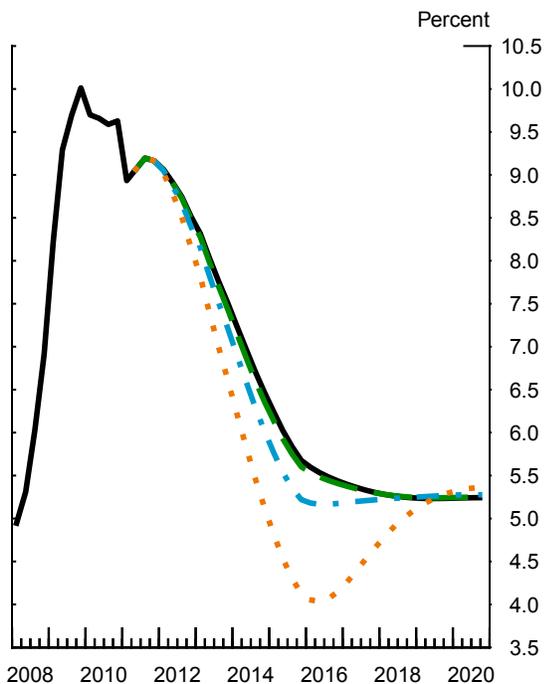
Funds Rate Follows the Prescriptions of the Outcome-Based Rule After Liftoff

- Extended Tealbook baseline
- - - Funds rate near zero until 2013q4
- . - . Funds rate near zero until 2014q4
- Funds rate near zero until 2015q4

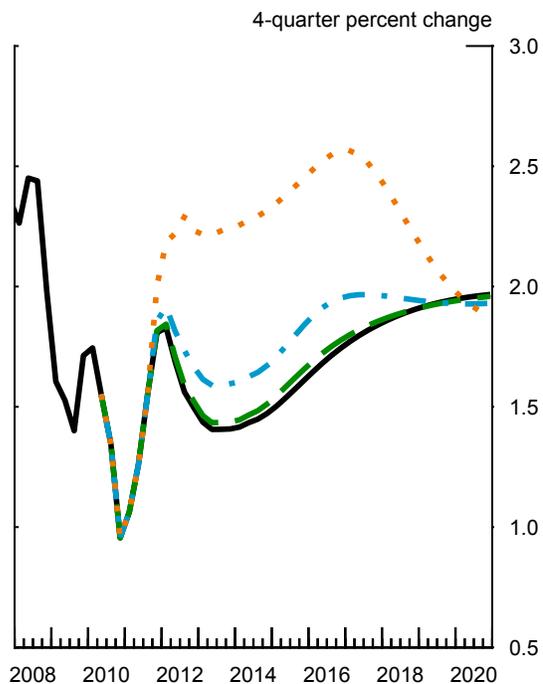
Federal Funds Rate



Unemployment Rate



PCE Prices excluding Food and Energy



held near zero through the end of 2014 (dot-dashed blue line), and much faster if the onset of tightening is delayed until late 2015 (dotted red line). Correspondingly, core inflation runs above baseline (lower-right panel) under all three policies, and appreciably so in the 2015 case. In fact, the 2015 strategy—which is rather extreme by historical standards—causes inflation and unemployment to temporarily overshoot their longer-run equilibrium values, so that inflation peaks at 2½ percent in the middle of the decade and unemployment briefly falls to 4 percent. Participants might view these outcomes for real activity and inflation as preferable to the baseline outlook despite the overshooting.¹⁵

As noted in the previous section, calendar-based guidance of the sort considered in Figure 4 is problematic because it does not provide the public with any information about how the date of liftoff might revise in response to evolving economic circumstances. For that reason, the Committee may prefer to express forward guidance about the conditions for keeping the funds rate near zero in terms of quantitative thresholds for unemployment and inflation. Choosing those thresholds is not straightforward, however, because they should depend on policymakers' preferences regarding output and inflation, as well as on their assessments of aspects of the economy that are imprecisely estimated, such as the equilibrium unemployment rate.

Table 1 (on the next page) provides some perspective on this issue, viewed through the prism of the Taylor (1999) rule. Specifically, the table reports threshold values of the unemployment rate that, if actual labor market conditions were this weak or worse, would be consistent with keeping the funds rate at or below zero according to the prescriptions of the rule. As the various entries in the upper portion of the table indicate, these threshold values depend importantly on both the estimated value of the equilibrium unemployment rate (U^*) and the actual rate of core PCE inflation (π). For example, if core inflation was currently running at 2 percent, and U^* was estimated to be 5 percent, then the rule would call for the funds rate to remain at zero as long as the actual unemployment rate was above 6.6 percent. But if inflation was running at 3 percent and U^* was thought to be close to 6 percent, then the rule would call for tightening to begin once the unemployment rate fell below 8.2 percent. In the context of the baseline Tealbook projection, in which inflation remains somewhat below 2 percent into the second half of the decade and the NAIRU gradually declines from 6 percent in late 2012 to 5¼ percent by late 2015, the implied unemployment threshold would be a little below 7 percent.¹⁶

A different perspective on threshold values is provided by the optimal policy simulations reported in Part B of the August Tealbook. Given the staff's assessment of the economic outlook as of early August, constrained optimal policy called for keeping the funds rate near zero through the end of 2014. Under this policy, the simulation results suggested that the unemployment rate would stand at about 5.6 percent at the time policy begins firming, while inflation would be close to 2 percent.

¹⁵ These results are broadly corroborated by simulations of the staff's two DSGE models, EDO and SIGMA.

¹⁶ Other calculations (not reported) show that threshold values are not sensitive to modest variations in the inflation target, are relatively insensitive to reasonable variations in estimates of the equilibrium real interest rate, but increase roughly ½ percentage point if the assumed value of the Okun's Law coefficient—used to translate the rule's standard output gap term into an unemployment gap—is set to the lower end of its estimated range (2.0) instead of the value assumed in the table (2.5).

Table 1
 Threshold Unemployment (U) Values for Raising the Federal Funds Rate (R) Above Zero
 Implied by the Taylor (1999) Rule Under Various Assumptions

$$\text{Rule: } R(t) = R^* + 1.5 \pi(t) - 0.5 \pi^* - 2.5 [U(t) - U^*]$$

	Equilibrium Unemployment Rate (U*)		
	5.0	5.5	6.0
Equilibrium real interest rate (R*) = 2 and inflation target (π^*) = 2.0			
Actual core PCE inflation (π) = 2.0	6.6	7.1	7.6
Actual core PCE inflation (π) = 2.5	6.9	7.4	7.9
Actual core PCE inflation (π) = 3.0	7.2	7.7	8.2

Note: the specification of the rule translates the standard output gap term into an unemployment gap using an Okun's Law coefficient equal to 2.5. The rule does not take account of the extent of monetary accommodation provided by Federal Reserve asset purchases at the time of lift-off.

We can also use simulations from FRB/US to explore the stimulative effect of setting the threshold value for unemployment at different rates, ranging from 6 percent to 7½ percent. In all of these simulations, we hold the inflation threshold constant at 2½ percent; consistent with the discussion in the previous section, the inflation threshold is expressed in terms of projected headline PCE inflation two to three years ahead.¹⁷ As before, the public initially expects the economy to evolve as projected in the August Tealbook baseline. But after the Committee announces the unemployment and inflation thresholds, the public (correctly) understands that once a breach of either threshold occurs, the FOMC will instead follow the prescriptions of the baseline outcome-based policy rule.¹⁸

The results from this experiment are summarized in Figure 5. As expected, lowering the value of the unemployment threshold helps to stimulate real activity and boost inflation relative to baseline, because it signals that the start of policy firming will be postponed until a later date (holding underlying economic conditions constant). However, the figure shows that the amount of stimulus provided by this trigger strategy would be quite limited unless the unemployment threshold was set at a relatively low level. For example, choosing a threshold of 7 percent (red lines) does very little to speed up the simulated pace of the recovery or boost inflation relative to baseline (black lines) because it implies only a modest delay in the onset of tightening. In contrast, a threshold of 6 percent (orange lines) yields more appreciable results in terms of lower unemployment and higher inflation, although the amount of stimulus provided even in this case is limited by the fact that the forward guidance does not change the public's views about the Committee's longer-run behavior.

If the Committee were willing to signal its intention to pursue a more accommodative policy than the market would ordinarily expect even after liftoff, or if the adoption of conditional forward guidance led investors to expect the FOMC to pursue such a policy, then forward guidance could provide more appreciable economic stimulus. An illustration of this possibility is reported in Figure 6. Here, the Committee announces both unemployment and inflation thresholds for keeping the funds rate near zero, as well as a somewhat different strategy than originally expected for setting policy thereafter. Specifically, the Committee announces that policy in the longer run will be set using an inertial version of the Taylor (1999) rule that, among other things, responds less vigorously than the baseline outcome-based rule to the projected quickening in the pace of activity after 2013.¹⁹ As a result, this rule implies a somewhat more accommodative stance of monetary policy later in the decade relative to baseline.

As indicated by the blue lines in Figure 6, the inertial Taylor rule with an unemployment threshold of 7.5 percent is indeed more persistently accommodative than the baseline policy.

¹⁷ Because headline inflation in the baseline projection runs persistently below 2 percent in 2012 and beyond, setting the inflation threshold to 2 percent would not affect the simulation results.

¹⁸ In all the simulations reported in this section, we implicitly assume that the size and composition of the SOMA portfolio over time conforms to the baseline projections reported in the August Tealbook.

¹⁹ The inertial version of the Taylor (1999) rule takes the form $R(t) = .85 R(t-1) + .15 [R^* + 1.5\pi(t) - 0.5\pi^* + 1.0Y(t)]$. In this expression, R denotes the nominal federal funds rate; R^* is the equilibrium real interest rate (assumed to equal 2 percent); π is the four-quarter rate of core PCE inflation; π^* is the inflation target (assumed to equal 2 percent); and Y is the output gap. The more accommodative behavior of this rule later in the decade largely reflects the property that the Taylor rule responds to the level but not to the change in the output gap, whereas the outcome-based rule responds to both.

Figure 5
Economic Outlook Under Different Unemployment Thresholds for Ending the Near-Zero Funds Rate Policy and Switching to the Outcome-Based Rule, Conditional on an Inflation Threshold of 2.5 Percent and August TB Baseline Conditions

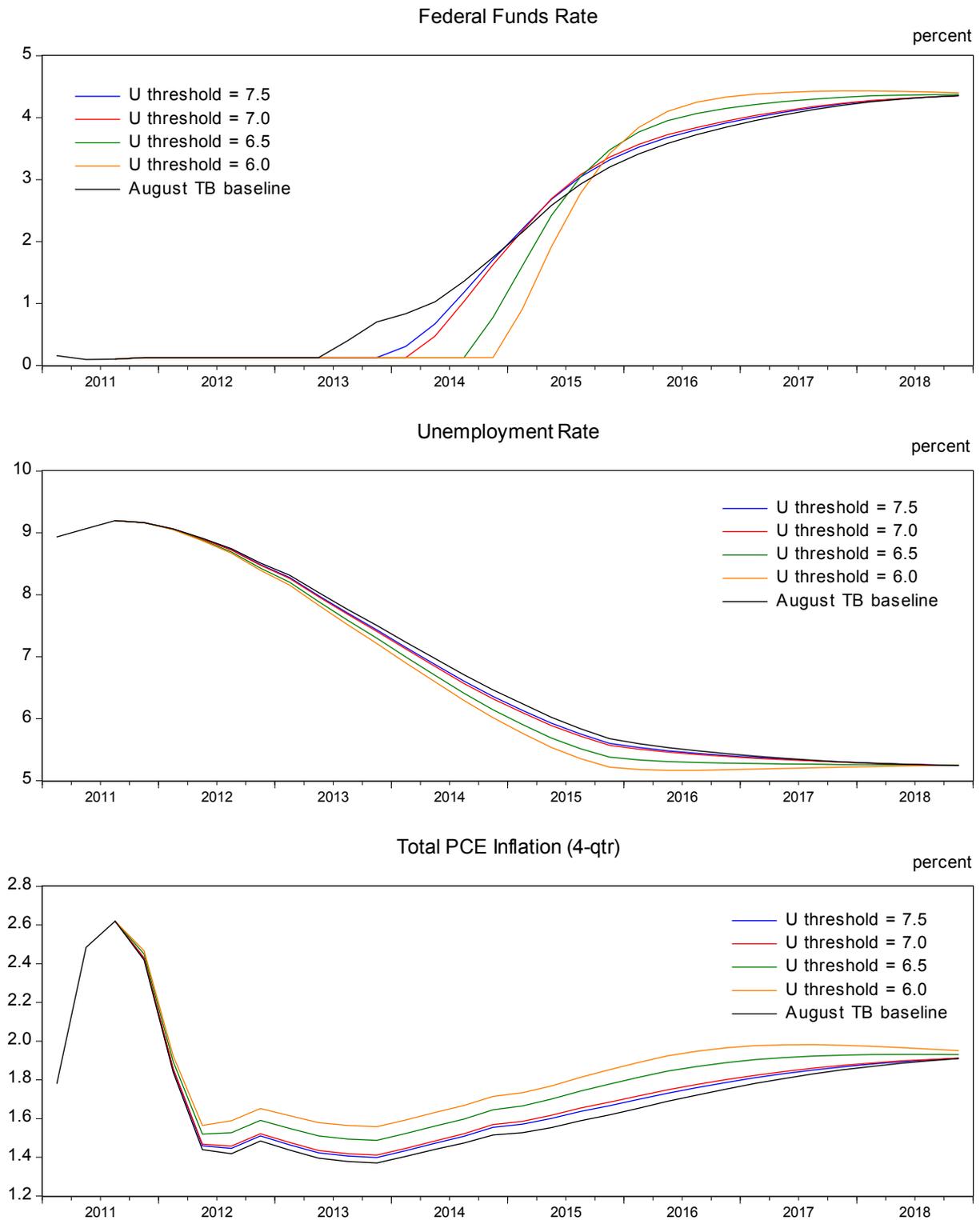
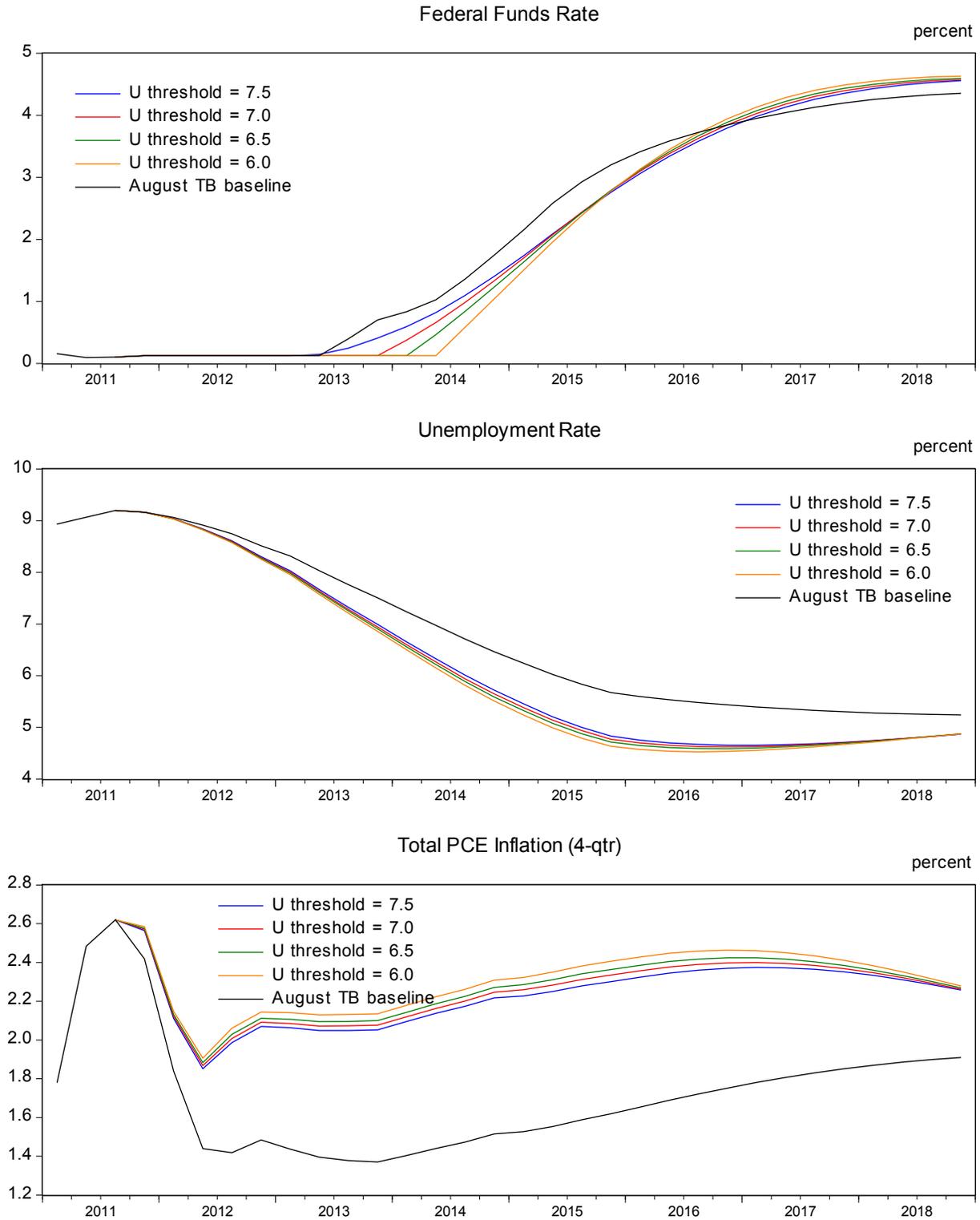


Figure 6
Economic Outlook Under Different Unemployment Thresholds for Ending the Near-Zero Funds Rate Policy and Switching to the Inertial Taylor 1999 Rule, Conditional on an Inflation Threshold of 2.5 Percent and August Baseline Conditions



Importantly, it keeps the path of the nominal funds rate at or below baseline through the end of the decade despite noticeably stronger real activity and higher inflation, thereby inducing lower real short-term interest rates for many years.²⁰ Investors' expectations of persistently lower short-term rates lead in turn to an improvement in near-term financial conditions and so accelerate the pace of the recovery relative to baseline. In addition, stronger real activity and higher expected future inflation cause inflation to run modestly above 2 percent through the end of the decade. As indicated by the red, green, and orange lines, somewhat better economic performance could be achieved by combining the Taylor rule policy with unemployment trigger thresholds below 7.5 percent, although the marginal benefits would be fairly modest.²¹ Finally, we would note that these strategies yields paths for inflation and real activity that are quite similar to those achieved under the constrained optimal policy simulation reported in the August Tealbook. In other words, the inertial Taylor rule does a reasonably good job of replicating the optimal-policy solution under these conditions, in large part because both strategies are sufficiently stimulative later in the decade to yield rates of inflation that are modestly above the Committee's assumed long-run objective for a few years.

These results suggest that the Committee may wish buttress its forward guidance about the conditions for keeping the funds rate near zero by signaling its intention to remove policy accommodation only gradually for a time after the onset of policy firming. In doing so, it would presumably not attempt to provide guidance about its policy "rule," given that the FOMC's decisions are guided by a much broader set of considerations than accounted for in most rules. However, the Committee might be able to achieve a similar result by indicating, as in the language discussed above, that it intends to normalize the stance of monetary policy with an eye on sustaining the expansion and is willing to tolerate inflation somewhat above the long-run objective for a time if longer-term inflation expectations remain well anchored. Such guidance could be strengthened if the Committee stated that it intends to push inflation modestly above the long-run inflation objective for a time later in the decade. Based on simulations from FRB/US and other staff models, such a policy—if deemed credible by the public—could lower unemployment appreciably faster and bring inflation somewhat above 2 percent.

B. How well should forward guidance be expected to work in a stochastic environment?

Given the inherently uncertain nature of the outlook, considerable uncertainty must attend the date on which tightening will begin, assuming that the Committee eschews unqualified promises about the date of liftoff and instead adjusts its policy actions in response to innovations in actual and projected real activity and inflation. This point is illustrated by the upper panel of Figure 7,

²⁰ The simulation results reported in Figure 6 for the combination of an inflation threshold of 2.5 percent, and unemployment threshold of 7.5 percent, and the inertial Taylor rule (the blue lines) are identical to what would be generated if the funds rate always followed the prescriptions of the rule. The irrelevance of the announced thresholds in this particular case follows from the fact that the unemployment rate would have already declined to 7.5 percent, and projected inflation would still be below 2.5 percent, at the time the rule would call for liftoff. Accordingly, there would be no marginal benefit of announcing these particular threshold values given the baseline outlook, although there might be if the economy were to evolve differently than expected.

²¹ The marginal benefit of announcing thresholds for unemployment and inflation could be appreciably larger if those announcements bolstered the credibility of Committee statements that the FOMC intends to pursue a more accommodative monetary policy after liftoff. In the simulations, this potential "bolstering" benefit does not arise because the switch to the inertial Taylor rule enjoys complete credibility by assumption.

which shows the frequency distribution for the date of the commencement of policy tightening based on stochastic simulations of the FRB/US model, conditional on the August Tealbook baseline outlook and assuming that policy follows the prescriptions of the inertial Taylor rule described earlier. As can be seen, the distribution indicates considerable odds that conditions could evolve in a manner that would either call for raising the federal funds before the second half of 2013, or keeping it at near zero well after 2013.²² These results support the argument of the previous section that conditional forward guidance in the form of thresholds is probably preferable to “hard” calendar-based guidance.

Not surprisingly, these estimated probabilities are sensitive to the specific rule used to set monetary policy in the stochastic simulations. For example, as shown in the bottom panel of Figure 7, the simulated distribution changes modestly when monetary policy follows a trigger strategy. Under this strategy, the FOMC keeps the funds rate near zero until either the unemployment falls below 7 percent or the medium-term projection for headline PCE inflation rises above 2½ percent; after this point, monetary policy follows the prescriptions of the inertial Taylor rule. As under the inertial Taylor rule policy, uncertainty about the date of liftoff remains considerable although—with the distribution having shifted a little to the right—the likelihood of an early tightening is somewhat diminished. Choosing a higher inflation threshold or a lower unemployment threshold would reduce the likelihood further. In contrast, following the outcome-based rule in place of the inertial Taylor rule would shift the distribution to the left.

In thinking about the advisability of announcing the conditions the Committee sees as consistent with keeping the funds rate near zero, an important concern is that such guidance may lead to undesirable outcomes in the face of some types of shocks or because the Committee has misjudged some key aspect of the economy. In general, demand shocks do not pose a problem for conditional strategies, in the sense that the forward guidance provided under such strategies is consistent with the prescribed response of simple policy rules to such shocks. The situation might be quite different with respect to supply shocks, however, especially if the Committee were slow to recognize their implications for the equilibrium rate of unemployment.

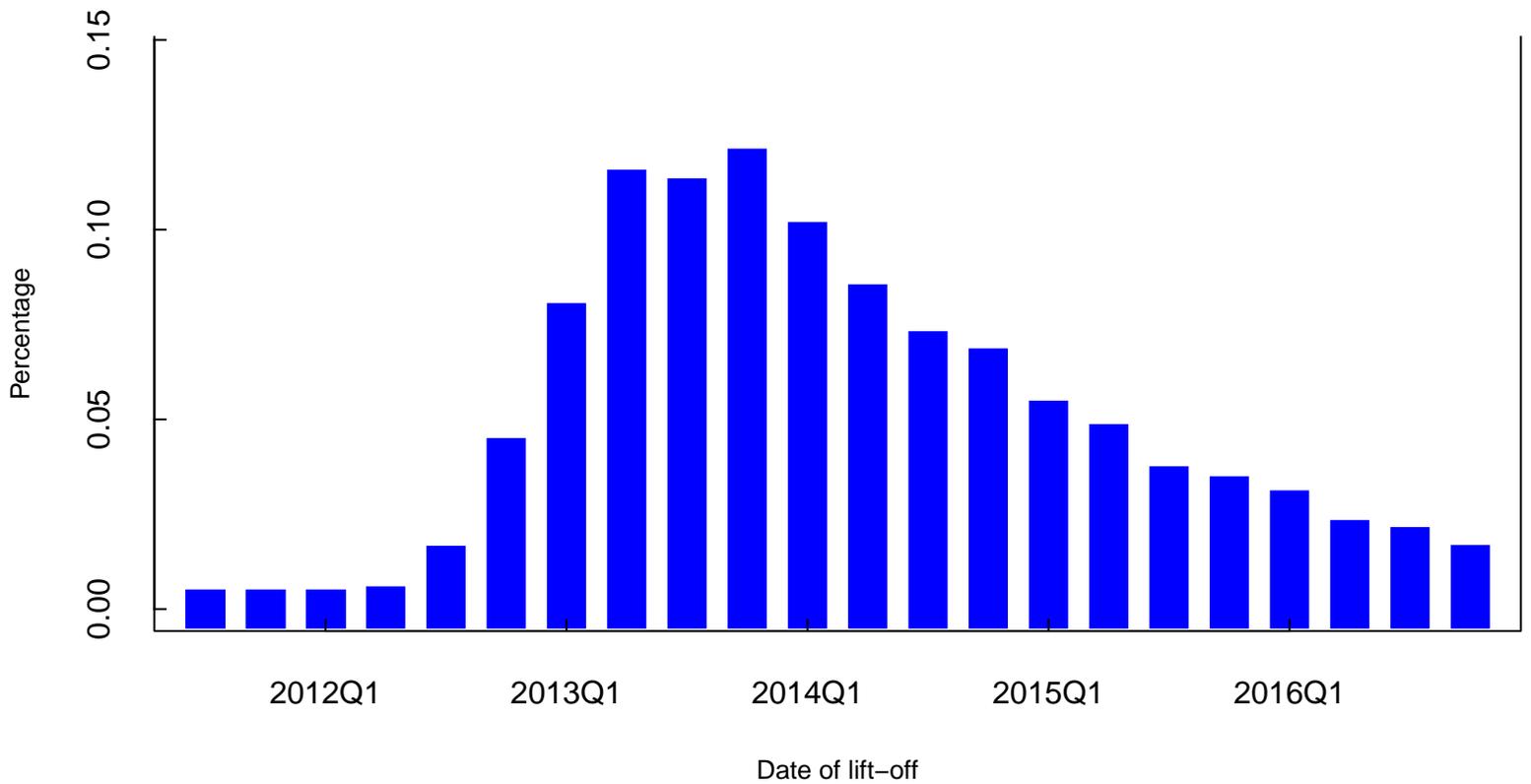
To explore this possibility, we consider an alternative “lower aggregate supply” scenario, reported as the blue dotted lines in Figure 8. In this scenario, the actual equilibrium unemployment rate is 7 percent, as opposed to the baseline assumption of 6 percent, and the output gap is currently about 3 percent, instead of close to 6 percent as in the Tealbook. While agents in the economy are assumed to correctly assess the size of the gap, policymakers initially believe that the larger estimate is correct, and only gradually (over five years) come to appreciate that slack is less than they had estimated. Under these conditions, the unemployment rate is little

²² We should note that these probability estimates are somewhat affected by an interaction of the inertial Taylor rule with the zero lower bound. This influence arises because the rule’s prescriptions depend in part on the actual value of the lagged funds rate, and not on what that value would have been in the absence of the zero lower bound constraint. Because the rule currently calls for the nominal funds rate to be well below zero, an “unconstrained” version of the rule would—relative to the results reported in Figure 7—be less likely to call for raising the funds rate over the next two or three years in the event that real activity and inflation were to come in substantially stronger than in the baseline forecast. Similar considerations affect probability estimates generated using any inertial policy rule, including the outcome-based rule (although this phenomenon is especially important with regards to the prescriptions of the first-difference rule that are regularly reported in Part B of the Tealbook, as its specification causes the current upward bias imparted by the zero lower bound constraint to persist for an extremely long time).

Figure 7

Frequency Distribution of the Onset of Policy Tightening for the Inertial Taylor Rule

Without 5 nounced Hhresholds



Unemployment Threshold = 7%; Inflation Threshold = 2.5%

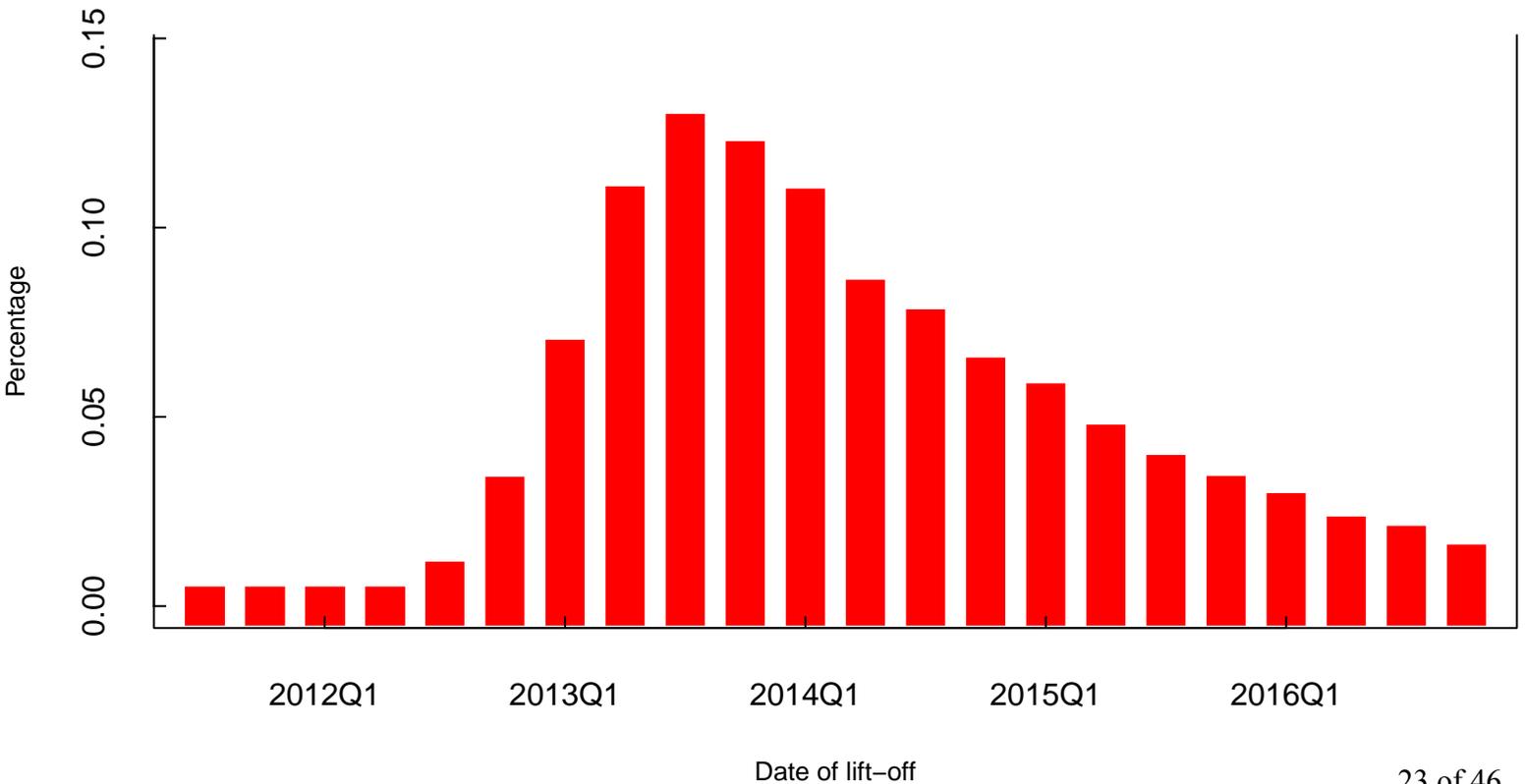


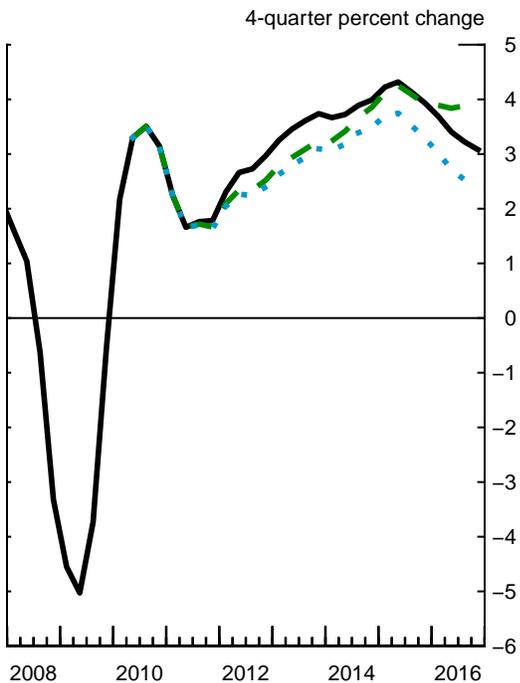
Figure 8

Alternative Scenario Results Under Outcome-Based Rule

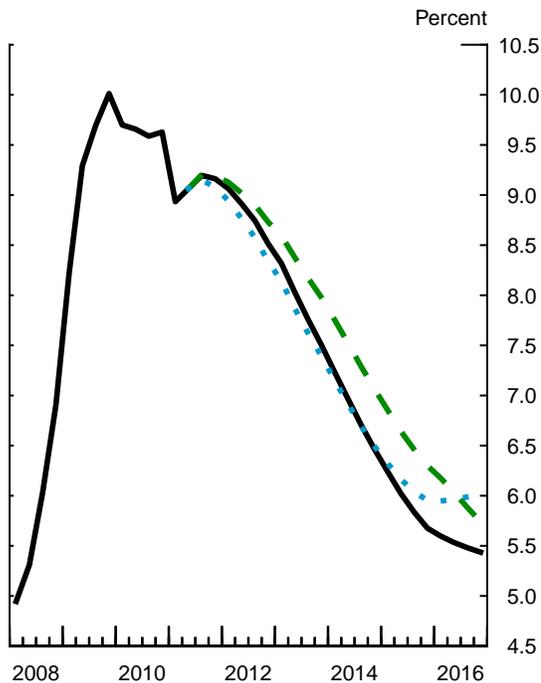
— Extended Tealbook baseline
 ··· Lower aggregate supply scenario

- - - Commodity price pressures scenario

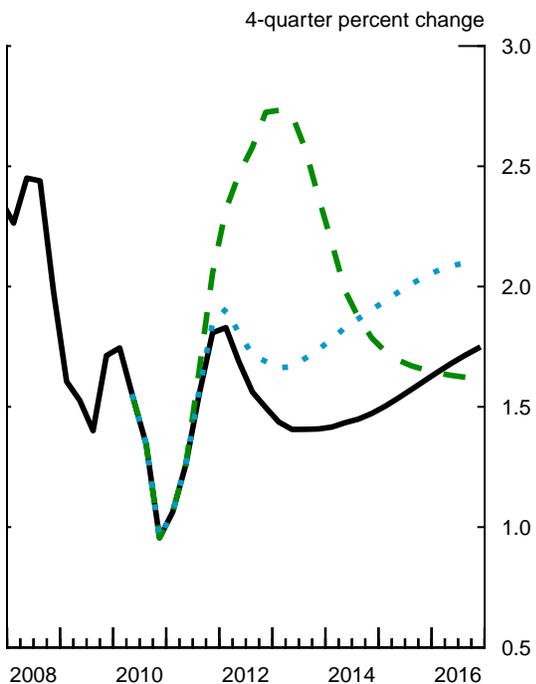
Real GDP



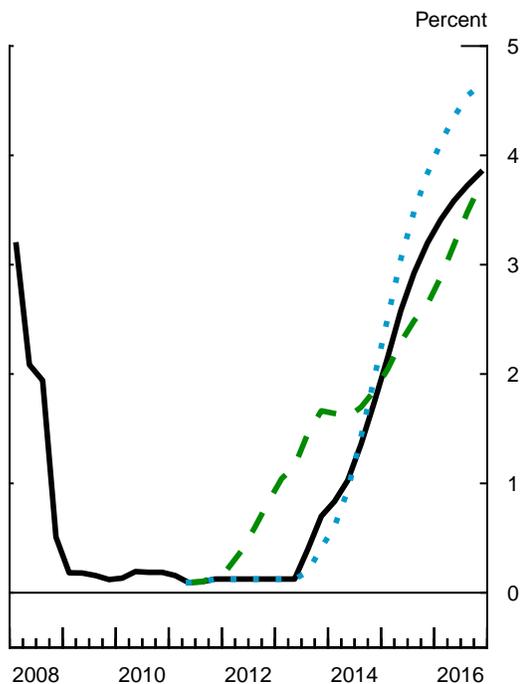
Unemployment Rate



PCE Prices excluding Food and Energy



Federal Funds Rate



different from baseline but labor market slack is persistently smaller, in large part because policymakers—following the prescriptions of the outcome-based rule based on their flawed estimates of the output gap—choose a policy that is easier than they intend it to be. As a result, inflation is noticeably higher. Nevertheless, the simulated outcomes for real activity and inflation in the scenario do not suggest that policymakers should have much *ex post* regret about any forward guidance they might have initially provided about the conditions governing the onset of tightening. For example, let us suppose that the Committee had initially announced that, consistent with the baseline projection, the funds rate would be likely to stay near zero as long as the unemployment rate remained above 7½ percent and the medium-term inflation projection remains at or below 2 percent. In the end, this guidance would turn out to be quite accurate, despite a severe overestimate of the true degree of slack in the economy.

Although these simulation results may seem reassuring, several caveats apply. First, the actual overestimate of economic slack could be even greater than that considered in this scenario. Second, inflation may be more responsive to economic activity than the FRB/US model suggests, although recent observations do not lend much support to this possibility. Third, we cannot rule out the possibility that long-term inflation expectations could become unanchored if the Committee were seen as persistently overestimating potential output by a substantial amount, although in such instances the pace of policymakers' learning would presumably be accelerated. Finally, even if conditions were to evolve as outlined in the scenario, the FOMC might still face communications challenges related to the need to update the public about its changing estimates of slack.

Committee participants might worry that other supply shocks could also be a source of regret about conditional forward guidance. To examine this risk, we consider a scenario in which, relative to baseline, oil prices jump by more than \$50 per barrel over two years, the relative price of non-oil imports accelerates by nearly 4 percentage points, and relative food prices climb by 5 percent, resulting in a significant (albeit transitory) surge in both headline and core inflation. Results from this “commodity price pressures” scenario are plotted as the green dashed lines in Figure 8. As can be seen in the lower left panel, core PCE inflation peaks near 2¾ percent early in 2013 before moderating substantially; total PCE inflation follows a similar but more pronounced pattern. Under the outcome-based rule, which responds to lagged core inflation and not expected future inflation, these transitory price developments cause the federal funds rate to start rising in early 2012, much sooner than projected under the baseline outlook. The surge in prices seems like it could cause a central bank using conditional forward guidance to experience some regret. For example, let us suppose that policymakers had previously announced their intention to keep the funds rate near zero as long as the unemployment rate was above 7½ percent and the medium-term outlook for total inflation was at or below 2½ percent. Even though these thresholds would not be formally breached during the price shock, and even though continuing to hold the funds rate at zero into 2013 would be a better response to the temporary price surge than following the prescriptions of the outcome-based rule, policymakers might nonetheless feel uncomfortable with this strategy given that many forecasters would probably be projecting inflation to run close to or above 2½ percent for several years.

We conclude this section by exploring the likely performance of forward guidance when the economy is buffeted by a wide range of shocks, using stochastic simulations of the FRB/US

model in which monetary policy is guided by inflation and unemployment thresholds. Specifically, monetary policy in these simulations keeps the funds rate near zero as long as specified unemployment and expected inflation conditions are met; once these thresholds are breached, policy follows the prescriptions of a specified policy rule. For this experiment, we consider various sets of unemployment and inflation thresholds; we also consider results for two different policy rules—the outcome-based rule and the inertial version of the Taylor (1999) rule. We highlight three main results from this analysis.

- Relative to strategies in which the funds rate always follows the prescriptions of the outcome-based policy rule, threshold strategies deliver better average economic performance over the next several years. To make that assessment, we specify a loss function equal to the sum from late 2011 through 2016 of the squared deviations of the unemployment rate from the NAIRU and of inflation from its assumed target of 2 percent. We then compute the loss associated with each stochastic simulation. Table 2, on the following page, reports median losses (and other statistics) across the simulations under the outcome-based rule for various combinations of threshold values; in the table, the loss statistics are normalized by the expected loss when policymakers eschew thresholds and always follow the rule. As the table shows, median losses are uniformly lower for trigger strategies relative to those incurred by always following the simple policy rules, particularly in the case of the outcome-based rule. In addition, all the combinations of inflation and unemployment thresholds considered in our analysis perform about equally well.²³
- Forward guidance could frequently lead to situations in which one of the announced thresholds for keeping the funds rate near zero is breached, yet monetary policy—following the prescriptions of simple policy rules—would subsequently want to keep the funds rate at, or return the funds rate to, a very low level. This result is documented in Table 3 (following Table 2), which reports the frequency of cases in which, at least once between now and late 2016, the funds rate would still be near zero despite the unemployment or the inflation threshold having been breached four quarters earlier. As can be seen, the frequency of such an event ranges from 6 percent to almost 100 percent across the various combinations of thresholds, indicating that this form of “regret” could occur frequently. (Such an event would be particularly likely if the average level of inflation in the absence of shocks was expected to be somewhat above 2 percent, as is the case under the inertial Taylor rule.) Based on the range of threshold values reported in the table, policymakers could best reduce the likelihood of this form of regret by choosing a high value for the inflation threshold and a low value for the unemployment threshold.

²³ Other simulation results (not shown) suggest that combining the inertial Taylor rule policy with unemployment and inflation thresholds would yield little or no improvement in macroeconomic performance relative to that obtained by always following the prescriptions of the Taylor rule; in particular, loss statistics would all round to 1.0. This irrelevancy result arises because, for the set of threshold values considered in Table 2, and given the baseline conditions used to generate the stochastic simulations, trigger strategies rarely call for the average stance of policy to deviate materially from that prescribed by the inertial Taylor rule.

Table 2

Distributional Statistics for Losses Incurred Under Trigger Strategies Conditioned on Various Thresholds for Unemployment and Inflation. Assuming that Monetary Policy Reverts to the Outcome-Based Rule After Either Threshold Is Breached

	Lower 10 percent bound	Upper 90 percent bound	Median
Threshold settings			
Inflation = 2.25, unemployment = 6.5	.933	.963	.943
Inflation = 2.25, unemployment = 7.0	.936	.963	.942
Inflation = 2.25, unemployment = 7.5	.940	.964	.943
Inflation = 2.50, unemployment = 6.5	.929	.965	.939
Inflation = 2.50, unemployment = 7.0	.931	.964	.938
Inflation = 2.50, unemployment = 7.5	.937	.965	.941
Inflation = 2.75, unemployment = 6.5	.930	.965	.941
Inflation = 2.75, unemployment = 7.0	.931	.965	.938
Inflation = 2.75, unemployment = 7.5	.937	.965	.941

Note. For each stochastic simulation, losses are computed as the sum of squared deviations of the unemployment rate from the NAIRU and inflation from 2 percent over the period 2011:Q4 to 2016:Q4. Reported medians for each specific trigger strategy have been normalized by median losses when policy always follows the outcome-based rule. Lower 10 percent bound and upper 10 percent bound loss statistics are similarly normalized by the corresponding statistic computed when policy always follows the outcome-based rule.

Table 3
 Probability of the Funds Rate Being Near Zero Four Quarters After Breaching the Thresholds for
 Inflation or Unemployment, Under Either the Outcome-Based Rule or the Inertial Taylor Rule

	Inflation Threshold Breached First	Unemployment Threshold Breached First	Either Threshold Breached
Threshold settings used with the outcome-based rule			
Inflation = 2.25, unemployment = 6.5	7.1	3.0	10.1
Inflation = 2.25, unemployment = 7.0	8.8	5.9	14.7
Inflation = 2.25, unemployment = 7.5	11.1	10.2	21.3
Inflation = 2.50, unemployment = 6.5	3.3	2.8	6.2
Inflation = 2.50, unemployment = 7.0	5.1	5.9	11.0
Inflation = 2.50, unemployment = 7.5	6.8	10.0	16.8
Inflation = 2.75, unemployment = 6.5	3.1	2.7	5.8
Inflation = 2.75, unemployment = 7.0	4.7	5.7	10.4
Inflation = 2.75, unemployment = 7.5	8.8	10.0	18.8
Threshold settings used with the inertial Taylor rule			
Inflation = 2.25, unemployment = 6.5	98.3	0.0	98.3
Inflation = 2.25, unemployment = 7.0	98.3	0.0	98.3
Inflation = 2.25, unemployment = 7.5	98.3	0.0	98.3
Inflation = 2.50, unemployment = 6.5	43.7	6.8	50.5
Inflation = 2.50, unemployment = 7.0	46.1	13.8	60.0
Inflation = 2.50, unemployment = 7.5	49.3	26.5	75.7
Inflation = 2.75, unemployment = 6.5	15.8	5.1	20.9
Inflation = 2.75, unemployment = 7.0	18.1	11.4	29.5
Inflation = 2.75, unemployment = 7.5	21.4	21.9	43.2

- The simulations can also be used to gain perspective on which of the two thresholds is likely to be breached first when policy is guided by the inertial Taylor rule (Figure 9). As can be seen, low thresholds for both inflation and the unemployment rate (the red lines) make it very unlikely that the unemployment rate trigger will ever be invoked; they also imply that the inflation threshold could be breached quite early. Such an outcome might be viewed as unbalanced, in some sense, and unlikely to influence private agents' expectations in a helpful manner. By contrast, somewhat higher trigger values, shown by the blue lines, both defer the most likely date of liftoff from the effective lower bound and balance the likelihood that either condition will be triggered.

C. Caveats

A few caveats are in order concerning the simulation analysis presented in this section. First, our arguments and simulations are predicated on assumptions regarding expectations formation and the credibility of policy. For example, the deterministic simulations considered in the first part of this section all assume that the FOMC carries out the announced policy in its entirety, and that the public—which has a full understanding of the economy—has complete confidence from the outset that it will do so. These are strong assumptions. If the central bank lacks credibility, so that its policies are not believed at the outset, then the benefits of the forward guidance are likely to be less. On the other hand, if private agents have only an imperfect understanding of monetary policy and the broader economy, and do not fully understand the extent to which the Committee's future actions are likely to support economic recovery, then additional forward guidance that improved their understanding could be more effective than indicated by the rational-expectation simulation results reported here.

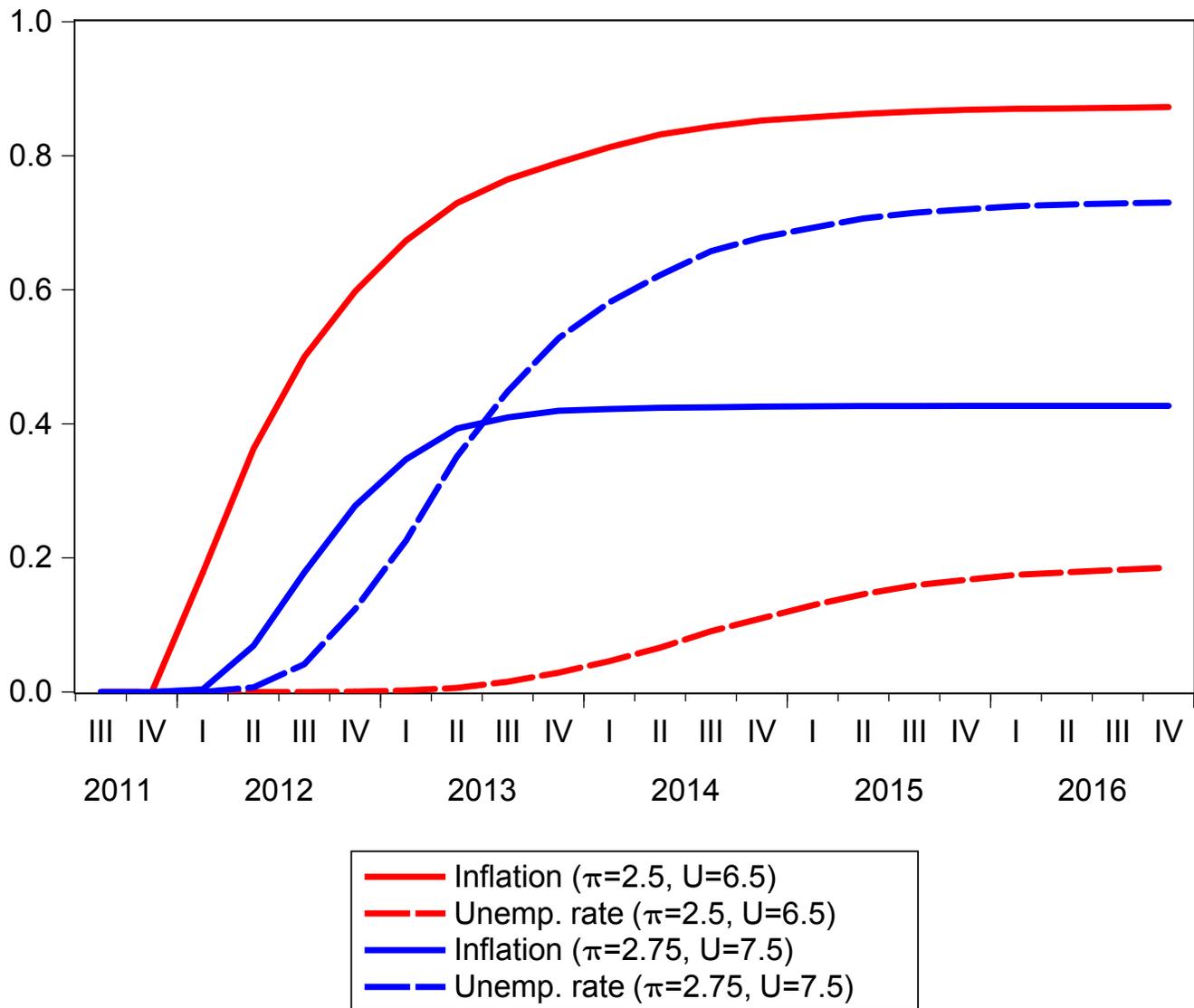
Second, as noted earlier, trigger strategies can be thought of as variations on simple policy rules, and hence raise similar issues with regard to the ability of policy rules to adequately approximate the actual behavior of policymakers. For example, there may be sequences of shocks, or revelations of model misspecifications, that could lead the Committee to modify or abandon altogether any announced policy. That said, not all abandonments are equal: Ending a policy because it is obviously wrong or no longer appropriate (implying that all parties would agree with the FOMC's decision) would imply different consequences for credibility than would abandoning a policy for what might appear to be opportunistic reasons. Even so, any decision to abandon an announced policy could reduce confidence in policymakers' abilities to some extent.

Third, our analysis has relied on a single model of the economy, FRB/US, raising the possibility that the results presented above might not be replicated by other models, even in qualitative terms. Although we recognize that this risk may be significant, we take some comfort from the fact that we have run a limited number of experiments using the EDO and SIGMA models, and these simulations broadly support the conclusions reported here.

Finally, we note that forward guidance, by itself, is merely a tool used to implement a given monetary policy strategy. The moderate potential gains identified here could be altered by the adoption of a different strategy, including ones that involve more appreciable changes in the Committee's operations and communications, such as price level targeting or nominal GDP targeting. Such strategies, by more aggressively and clearly signaling that the FOMC intends to

Figure 9

**Cumulative Probability of 1st Trigger, by Variable
(inertial Taylor rule using different thresholds)**



pursue a persistently easier stance of monetary policy in the medium run, could potentially yield more pronounced economic benefits than the ones considered in this memo.

5. Capping Short-Term Rates to Support the Committee's Forward Guidance

A. Announcement effects

To increase the impact of the forward guidance language, the Desk could be instructed to use open market operations to cap Treasury interest rates at appropriate maturities. For example, to support the forward guidance language from the August FOMC meeting, the Desk might be instructed to cap rates on all Treasury securities that mature through June 2013 at 25 basis points.²⁴ This instruction presumably would be in both the FOMC statement and the directive.²⁵

Implementing a ceiling on Treasury rates could help to incorporate the forward guidance on short term rates into term rates. Rates on instruments not covered by the rate cap should be strongly influenced through arbitrage between yields on Treasury securities and those on other instruments. The rate cap as described here would include not just Treasury bills but also Treasury coupon securities that mature before mid-2013. Including coupon securities would more effectively cap rates, but would give rise to operational challenges discussed below.

However, the added impact of an accompanying rate cap could be limited, particularly if forward guidance on the federal funds rate target is seen as credible and as extending to an implied commitment on the interest on excess reserves (IOER) rate. In recent months, even ahead of the introduction of the new forward guidance language for the federal funds rate, yields on Treasury bills, even those with maturities as long as a year, have been well below the upper end of the federal funds rate target range and the IOER rate.²⁶ The introduction of a rate cap could, however, reduce market expectations that the Committee would tighten policy ahead of the forward guidance date.

B. Portfolio effects

So long as the market viewed as unlikely the possibility that the Committee would begin to tighten policy before the maturity date of the longest-term security covered by the rate cap, the need for Desk purchases and balance sheet expansion would likely be relatively small.

²⁴ If the forward guidance language were to take the form of, for example, a commitment to maintain the current federal funds rate target range until the unemployment rate had fallen to a specified level, then a cap on Treasury bill rates might be specified through the date corresponding to when the unemployment rate was currently expected to reach that level.

²⁵ In this discussion, we assume that the ceiling on Treasury rates is unconditional at least through the specified date, although it could be extended. Alternatively, the duration of the rate cap could be made conditional in the same way as the forward guidance for the federal funds rate target. Doing so would likely further increase the incentives market participants would have to sell Treasury securities under the cap to the Desk immediately should expectations for the timing of a possible lifting of short term rates (accompanied now by an expected earlier removal of the rate cap) be shifted forward, as discussed below.

²⁶ Over 2009 and the first half of 2010, one-year bill rates were generally above 25 basis points. Some of this gap may have reflected expectations of eventual tightening, but much of it likely reflected a term premium. A rate cap could be effective in reducing term premiums that would otherwise place rates above the ceiling, and without the Desk necessarily having to arrange large scale purchases.

Moreover, any Desk purchases that were needed to enforce the rate cap would be done in the context of rate targeting, not to achieve a pre-designated expansion of the balance sheet, and any portfolio expansion associated with the cap would have a natural exit, in the current case by mid-2013, when the last of any securities purchased to enforce the rate cap would mature. However, the upside risks to the size of the SOMA portfolio could become significant if the market began to believe that the forward guidance overestimated how long the Committee would ultimately maintain its near-zero target for the federal funds rate (and the 25 basis point IOER rate).

Expectations of higher rates ahead of the removal of the cap for Treasury rates would create an incentive for holders of Treasury securities that mature before mid-2013 to sell those securities to the Desk (without capital losses) and invest in instruments not covered by the rate cap because the latter instruments would provide higher yields than the capped yield on covered Treasury securities. The existing spread between the top of the federal funds rate target range (and IOER rate) and Treasury yields provides insurance against small shifts in expectations for future policy tightening leading to large scale Desk purchases. But once a shift in expectations for the first tightening moved risk-adjusted rates decisively, there would be no natural limit to the quantity of bills that market participants would seek to sell to the Desk. In these circumstances, the SOMA portfolio might expand quite significantly. Although the expansion would be only temporary, the Treasury bill market could be seriously disrupted during this interval: There could be significant outflows from Treasury-only money funds; Treasury bill auction rates could come in slightly above the cap to induce bidders to participate by creating arbitrage profits; and there could be very large demand to borrow securities subject to the cap. In addition, during a period between the date on which the IOER rate was raised and the cap on bill rates ended, Federal Reserve net income would be depressed.²⁷

The Federal Reserve could structure the rate cap in a manner that would limit the risks to the size of its balance sheet. It could, for example, announce that it is prepared to buy securities at the price corresponding to the rate cap only on the day after an FOMC meeting, and only after meetings at which the Committee reaffirms the rate cap. Or it could cap rates at 25 basis points out to 1 year, and at 50 basis points between 1 and 2 years, allowing for two-way risk in securities with maturities over a year.

C. Operational challenges

The Desk's operational procedures and operating systems for arranging outright purchases could be adapted to implement a rate cap on Treasury securities. But rather than providing continuous enforcement, full allotment purchase operations at the rate cap would be arranged on a discrete schedule, probably at most once per day. As discussed above, actual operations may not be needed most days, but the Desk would still always need to be prepared to act and perhaps even to arrange operations with no expectation of any participation. Under current procedures outright purchases are arranged exclusively with or through primary dealers, and modifying procedures to allow the Desk to transact with others would be costly.

²⁷ Consolidated Federal Reserve net income and Treasury interest payments should not be affected. In this note, we also do not consider the issues that might arise if the Treasury chose to increase its issuance of bills to take advantage of a rate cap.

Inasmuch as short-dated Treasury notes as well as Treasury bills would be covered by the cap, separate operations would be needed for the two types of securities (which trade with different pricing conventions) because FedTrade has not been set up to evaluate bills and notes jointly. If TIPS were included, they also would require distinct treatment. Some of these operational challenges might be sidestepped if enforcement of the rate cap were achieved through the sale of options rather than outright purchases of securities, although other, probably more complex, operational challenges would likely arise in that case.

Appendix A: Foreign Central Bank Experience with Conditional Policy Guidance

In recent years, several foreign central banks—the Bank of Canada, the Reserve Bank of New Zealand (RBNZ), and the Swedish Riksbank—have provided forward guidance about the date when their policy rates would next be changed.²⁸ In an effort to ease monetary policy further in April 2009, in the midst of the global financial crisis, each of these central banks first stated that they expected the policy rate to remain at its current low level for at least a year (until the end of second quarter of 2010 for the Bank of Canada, the latter part of 2010 for the RBNZ, and the beginning of 2011 for the Riksbank). At that time, the central projection of each central bank was for a near-term contraction in output, with a recovery beginning in 2010, and low inflation, with the rate of inflation not returning to target until 2011.

The monetary policy statements from each of these central banks tried to make clear that the guidance was conditional. For example, the Bank of Canada’s statement referred to its guidance as its “conditional commitment” and the Bank stated that the next policy move was “conditional on the outlook for inflation.”²⁹ The RBNZ and the Riksbank had been publishing forecasts of their policy rate conditional on the outlook for the economy for some time already.³⁰ As usual, the Riksbank’s statement emphasized that “the future direction for monetary policy... depend[ed on]... the prospects for inflation and economic activity.” To underscore this point, the Riksbank occasionally went further by providing scenarios under which the policy rate might need to rise more quickly than anticipated or remain low for a longer period of time.

Market participants appear to have understood that the forward guidance was conditional, even though many news reports treated the guidance as an unconditional commitment to keep interest rates low until the specified dates.³¹ In the event, all three central banks ended up raising rates before the date that they had first projected in their April 2009 statements. Before they raised rates, policy expectations derived from overnight index swap rates moved up and down as market participants updated their views on the timing of the policy move. For the RBNZ and Riksbank, changes in expected policy rates also reflected updated guidance issued at subsequent meetings. For the most part, these changes in the estimated date of first policy tightening resulted in little market reaction. However, in New Zealand, soon after the RBNZ’s initial guidance, markets came to expect earlier policy tightening, with subsequent policy statements restraining these expectations somewhat. Thus, in December 2009, when the RBNZ changed its statement to suggest an earlier mid-2010 “lift off” date for the overnight cash rate, this statement touched off market expectations of a much earlier tightening.

²⁸ See Appendix B for excerpts from each central bank’s policy statements, and for links to the full statements.

²⁹ The phrase “conditional commitment” does not appear to represent an effort on the part of the Bank of Canada to communicate that the Bank had temporarily changed its policy reaction function.

³⁰ For a more extensive overview of foreign central banks’ experience publishing forecasts of policy rates see the memos “Incorporating FOMC Participants’ Policy Expectations into the SEP,” by Spencer Krane, Andrew Levin, and Loretta J. Mester (August [Need date posted], 2011), and “The Experience of Foreign Central Banks with Published Forecasts,” by Brian Doyle, Linda Kole, and Paul Wood (January 3, 2007).

³¹ Richhild Moessner and William Nelson (in “Central Bank Policy Rate Guidance and Financial Market Functioning,” *International Journal of Central Banking*, vol. 4(4), December 2008, pp. 193–206) find that market participants seemed to understand the conditional nature of the guidance provided by the Federal Reserve and the European Central Bank between 2003 and 2007, and by the RBNZ’s policy forecasts. Although implied volatilities of interest rate changes declined, they did not decline more than realized volatilities, and policy rate futures continued to react to incoming data.

On balance, the effect on interest rates of date-specific forward guidance appears to have been small, but significant. Immediately after the guidance was first issued, market expectations of the future path of monetary policy moved notably, consistent with the guidance. After its April 2009 statement, policy expectations through the first quarter of 2010 for the Bank of Canada (as shown in the top left of Figure A1) immediately fell to the target of 25 basis points. Similarly, expected policy rates for the RBNZ (top middle) declined about 10 basis points. In contrast, in the Riksbank's case, policy expectations rose to the newly-announced target of 50 basis points, as markets had expected an even lower rate prior to the policy meeting.³² Interest rates at longer horizons in Canada and New Zealand also declined after their central banks' announcements, with two-year yields declining about 10 and 25 basis points, respectively.

These declines in two-year yields were fully reversed by the end of May 2009 in both Canada and New Zealand. Moreover, the overall changes in the expected path for policy rates during the spring of 2010 were quite similar for the Bank of Canada, which provided date-specific forward guidance, and the European Central Bank and the Bank of England, which did not (see the middle panels of Figure A1).³³ But these subsequent movements in interest rates do not necessarily imply that the guidance was ineffective. A number of factors determine interest rates for longer maturities; among these, improving signals of a global recovery were probably the most prominent during the middle of 2009. Indeed, research by He (2010) suggests that the Bank of Canada's announcement may have led to sustained downward pressure on longer-term interest rates even after controlling for the effects of other macroeconomic variables.³⁴

Another potential benefit of more explicit forward guidance is decreased dispersion of market expectations of future interest rates. Here, too, the evidence is mixed, but some simple analysis suggests that the guidance may have had an effect. The bottom panels of Figure A1 plot the standard deviation of the one-year-ahead forecasts of three-month interest rates as surveyed by Consensus Forecasts. For both the Bank of Canada and the Riksbank, the standard deviation does not appear to change from before to after forward guidance was issued. It is possible however, that forward guidance by these central banks prevented sharper movements in the distribution of market expectations; for both the Bank of England and the Federal Reserve, which issued less explicit forward guidance, the standard deviation varies more, though it is not clear whether such movements are statistically significant.

To our knowledge, only the Bank of Japan has given forward guidance that involved an explicit threshold condition. In October 2003, the Bank of Japan clarified the conditions under which it would exit its quantitative easing policy (QEP), stating that year-over-year inflation would have to turn positive for at least a few months before the Bank would end QEP. This guidance was not explicitly conditioned on other outcomes, such as economic growth. The effectiveness of this conditional guidance is difficult to assess; however, some work points to some small effects

³² The Riksbank subsequently cut its policy rate another 25 basis points at its meeting on July 2, 2009.

³³ Chehal and Trehan (2009) point out that policy expectations and longer-term interest rates in Canada and the United States also evolved in a similar manner in the months following the Bank of Canada's April announcement, despite the Federal Reserve's less explicit guidance. See Puneet Chehal and Bharat Trehan, "Talking about Tomorrow's Monetary Policy Today," *FRBSF Economic Letter*, 2009-35, Federal Reserve Bank of San Francisco, November, 2009.

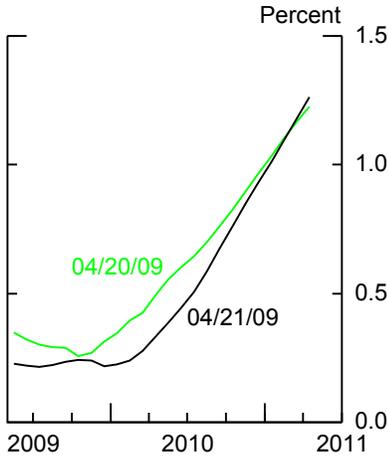
³⁴ Zhongfang He (2010), "Evaluating the Effect of the Bank of Canada's Conditional Commitment Policy," Bank of Canada Discussion Paper 2010-11.

Figure A.1

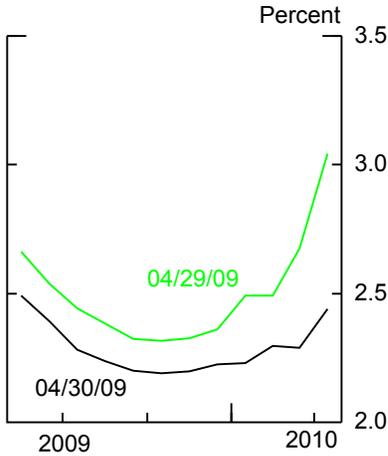
Foreign Experience with Forward Guidance

Monetary Policy Expectations from Overnight Index Swaps

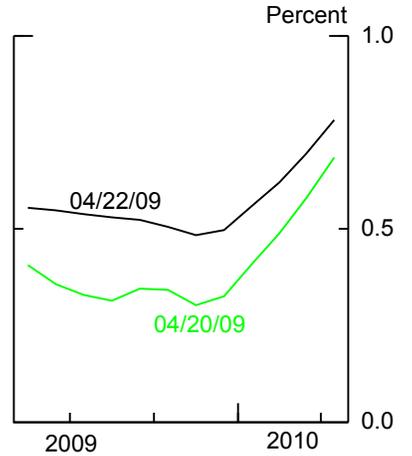
Bank of Canada



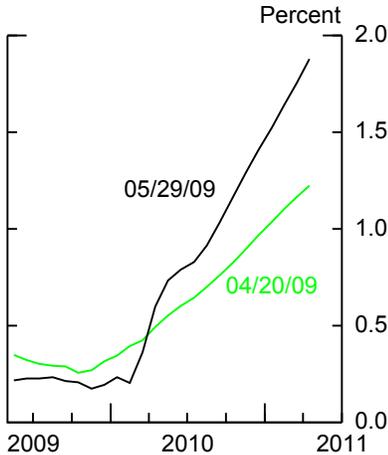
Reserve Bank of New Zealand



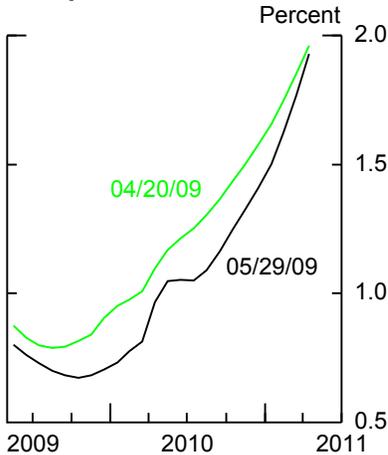
Swedish Riksbank



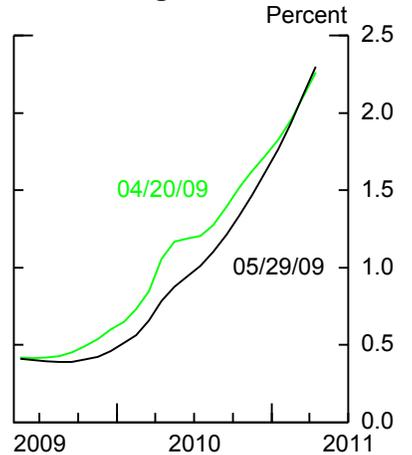
Bank of Canada



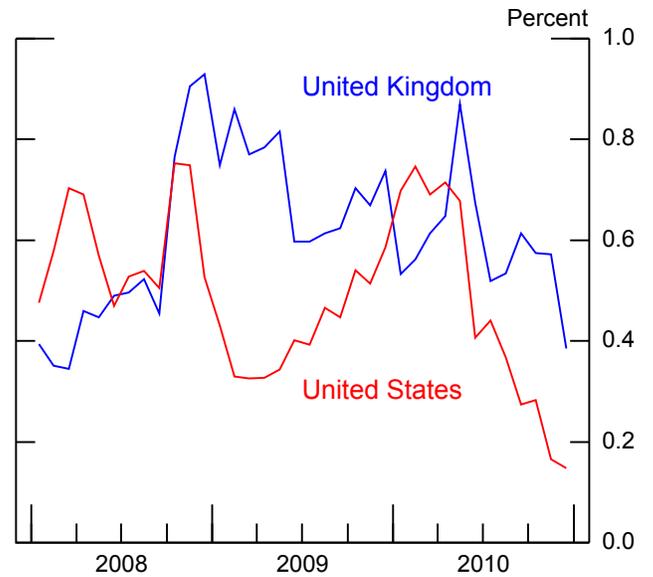
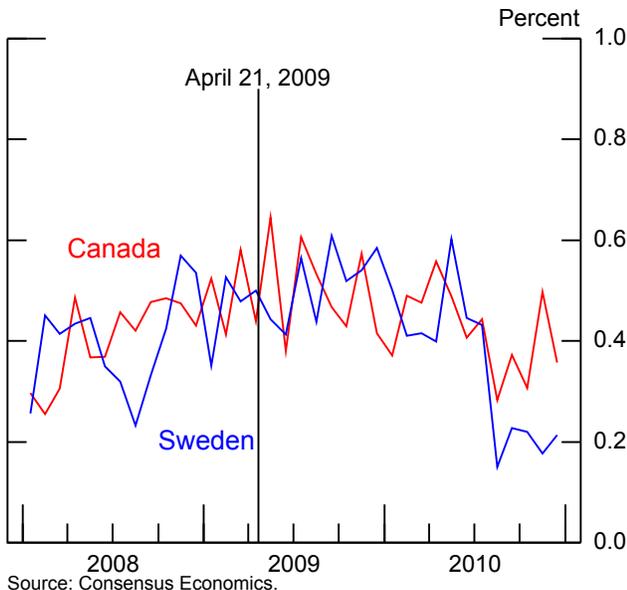
European Central Bank



Bank of England



Standard Deviation of One-Year Ahead Forecasts of Three-Month Interest Rates*



Source: Consensus Economics.

on longer-term interest rates of the greater commitment to the QEP implied by the guidance. For example, Baba *et al.* (2005) find that the commitment to the QEP lowered longer-term Japanese government bond yields by around 20 basis points, but this interpretation is subject to the caveat that the effect reflects both the Bank of Japan's statement and the associated policy actions.³⁵

³⁵ See Naohiko Baba, Shinichi Nishioka, Nobuyuki Oda, Masaaki Shirakawa, Kazuo Ueda, and Hiroshi Ugai (2005), "Japan's Deflation, Problems in the Financial System, and Monetary Policy," *Monetary and Economic Studies*, February 2005, pp. 47-112. The December 2008 memo to the FOMC by David Bowman and Brian Doyle ("Effects of the Bank of Japan's Communication Strategy at the Zero Lower Bound") offers a more comprehensive discussion of the Bank of Japan's communication policy in the QEP period.

Appendix B: Foreign Central Bank Announcements Regarding Policy Rate Paths

Bank of Canada

March 3, 2009

“Consistent with returning total CPI inflation to 2 percent, the target for the overnight rate can be expected to remain at this level or lower at least until there are clear signs that excess supply in the economy is being taken up.”

<http://www.bankofcanada.ca/2009/03/press-releases/fad-press-release-2009-03-03/>

April 21, 2009

“With monetary policy now operating at the effective lower bound for the overnight policy rate, it is appropriate to provide more explicit guidance than is usual regarding its future path so as to influence rates at longer maturities. Conditional on the outlook for inflation, the target overnight rate can be expected to remain at its current level until the end of the second quarter of 2010 in order to achieve the inflation target. The Bank will continue to provide such guidance in its scheduled interest rate announcements as long as the overnight rate is at the effective lower bound.”

<http://www.bankofcanada.ca/2009/04/press-releases/fad-press-release-2009-04-21/>

June 4, 2009 - March 2, 2010

“Conditional on the current outlook for inflation, the target overnight rate can be expected to remain at its current level until the end of the second quarter of 2010 in order to achieve the inflation target.”

<http://www.bankofcanada.ca/2010/03/press-releases/maintains-overnight-rate-target-reiterates-conditional-commitment-2/>

April 20, 2010

“In response to the sharp, synchronous global recession, the Bank lowered its target rate rapidly over the course of 2008 and early 2009 to its lowest possible level. With its conditional commitment introduced in April 2009, the Bank also provided exceptional guidance on the likely path of its target rate. This unconventional policy provided considerable additional stimulus during a period of very weak economic conditions and major downside risks to the global and Canadian economies. With recent improvements in the economic outlook, the need for such extraordinary policy is now passing, and it is appropriate to begin to lessen the degree of monetary stimulus. The extent and timing will depend on the outlook for economic activity and inflation, and will be consistent with achieving the 2 per cent inflation target.”

<http://www.bankofcanada.ca/2010/04/press-releases/fad-press-release-2010-04-20/>

The overnight interest rate target was increased 50 basis points at the June 1, 2010 meeting.

Swedish Riksbank

December 4, 2008

“...A much lower repo rate and repo rate path are needed to counteract economic developments being too weak and inflation being too low.... The Executive Board of the Riksbank therefore decided to cut the repo rate by 1.75 percentage points to 2 per cent. After this the repo rate may in principle remain unchanged over the coming year.

The future direction for monetary policy will depend on how new information on economic developments abroad and in Sweden will affect the prospects for inflation and economic activity in Sweden.”

<http://www.riksbank.com/templates/Page.aspx?id=29849>

February 11, 2009

“...A lower repo rate and repo rate path are needed to counteract production and employment being too weak and inflation becoming too low. The Executive Board of the Riksbank has therefore decided to cut the repo rate by 1 percentage point to 1 per cent. The interest rate may need to be cut slightly more over the coming six months....”

<http://www.riksbank.com/templates/Page.aspx?id=30512>

April 21, 2009

“...A lower repo rate and repo rate path are needed to counteract production and employment being too weak and to attain the inflation target of 2 per cent. The Executive Board of the Riksbank has therefore decided to cut the repo rate to 0.5 per cent with some probability of further cuts in the future.... The repo rate is expected to remain at a low level until the beginning of 2011. If economic activity deteriorates more than expected in the future, the Riksbank has the possibility to resort to other measures....

Lars E.O. Svensson entered a reservation against the decision and advocated a cut in the repo rate to 0.25 per cent and an interest rate path where the repo rate is kept at this low level for a longer period of time, some quarters into 2011....”

<http://www.riksbank.com/templates/Page.aspx?id=31356>

July 2, 2009

“...A lower repo rate and repo rate path are needed to counteract the fall in production and employment and to attain the inflation target of 2 per cent. The Executive Board of the Riksbank has therefore decided to cut the repo rate to 0.25 per cent. The repo rate is expected to remain at this low level until autumn 2010....

The economic outlook is still uncertain. When the turnaround comes, the upturn may be stronger than in the main scenario. However, it could also be the case that the recovery will take longer than expected. The future direction for monetary policy will therefore depend on how new

information on economic developments abroad and in Sweden will affect the prospects for inflation and economic activity in Sweden....

Deputy Governor Lars E.O. Svensson entered a reservation against the decision and advocated cutting the repo rate to 0 per cent and a repo rate path in line with the scenario for a lower repo rate in the Monetary Policy Report, so that the repo rate would be kept at this level for one year....”

<http://www.riksbank.com/templates/Page.aspx?id=32047>

September 3, 2009

“...The repo rate needs to be low over a long period of time to come to enable a stable recovery in the economy and to attain the inflation target of 2 per cent. The Executive Board of the Riksbank has therefore decided to hold the repo rate unchanged at 0.25 per cent. The repo rate is expected to remain at this low level until autumn 2010....

Deputy Governor Lars E.O. Svensson entered a reservation against the decision and advocated cutting the repo rate to 0 per cent and a repo rate path that meant the repo rate would be kept at this level for one year ahead....

<http://www.riksbank.com/templates/Page.aspx?id=32575>

December 16, 2009

“...The repo rate needs to be low over a long period of time to attain the inflation target of 2 per cent and to support the economic recovery. The Executive Board of the Riksbank has therefore decided to hold the repo rate unchanged at 0.25 per cent and the repo rate is expected to remain at this level until autumn 2010. After this the repo rate will be raised towards more normal levels....

The future direction for monetary policy will depend, as always, on how economic developments abroad and in Sweden will affect the prospects for inflation and economic activity in Sweden.

Deputy Governor Lars E.O. Svensson entered a reservation against the decision and advocated cutting the repo rate to 0 per cent and a repo rate path 0.25 per cent below the path of the main scenario until the third quarter of 2010....

Deputy Governors Lars Nyberg and Barbro Wickman-Parak supported the decision to hold the repo rate unchanged at 0.25 per cent, but entered reservations against the repo rate path in the Monetary Policy Update.... They considered that it would be necessary to raise the interest rate sooner than indicated by the proposed interest rate path, but that the path would then not need to be so steep during the remaining forecast period.”

<http://www.riksbank.com/templates/Page.aspx?id=42886>

February 11, 2010

“...In order for inflation to reach the target of 2 per cent and to support the recovery of the economy, the interest rate needs to remain low. The Executive Board of the Riksbank has therefore decided to leave the repo rate unchanged at 0.25 per cent.

...The information received since December indicates a continued normalisation of the financial markets and a somewhat stronger development of the economy. All in all, this means that the risk of a major setback in the recovery of the economy has declined and that the upturn therefore rests on more solid ground. There may thus be a need to adjust monetary policy to more normal conditions somewhat sooner than was assumed in December. The current assessment of the Executive Board of the Riksbank is that the repo rate will be increased in the summer or early autumn. At the same time, the assessment now is that it will be possible to make the increases in the slightly longer term more gradually and the forecast for the repo rate in the longer term has therefore been adjusted downwards somewhat....

The future direction for monetary policy will depend, as always, on how economic developments abroad and in Sweden affect the prospects for inflation and economic activity in Sweden. If, for example, wage increases are higher or the krona is weaker than expected, it may be necessary to increase the repo rate more quickly. If, on the other hand, wages increase more slowly or the supply of labour is higher, monetary policy may need to be more expansionary than in the forecast.

Deputy Governor Lars E.O. Svensson entered a reservation against the decision and advocated cutting the repo rate to 0 per cent and thereafter a repo rate path 0.25 per cent below the path of the main scenario through the fourth quarter of 2010....

<http://www.riksbank.com/templates/Page.aspx?id=43339>

April 20, 2010

“...The repo rate needs to remain low for inflation to attain the target of 2 per cent, and to support the recovery of the economy. Given this, the Executive Board of the Riksbank has decided to hold the repo rate unchanged at 0.25 per cent.

The financial markets are more stable now and the recovery in the economy is continuing. It is therefore appropriate to gradually move towards a more normal monetary policy. The Executive Board's assessment is that it will begin to increase the repo rate in the summer or early autumn....

As always, the forecasts made now regarding the economy and monetary policy are based on the information currently available and new information further ahead may lead to changes in these forecasts.”

<http://www.riksbank.com/templates/Page.aspx?id=43888>

The Riksbank raised its repo rate 25 basis points at its July 7, 2010 meeting.

Reserve Bank of New Zealand

April 30, 2009

“...We expect the large decline in the OCR over the past year to pass through to more borrowers over coming quarters as existing fixed-rate mortgages come up for re-pricing. This, together with the stimulus from fiscal policy, will act to support the New Zealand economy and eventually see activity trough and pick up thereafter. However, the scale of the global financial crisis and domestic adjustments underway are such that it is likely to be some time before economic activity returns to robust and healthy levels.

We consider it appropriate to provide further policy stimulus to the economy. We expect to keep the OCR at or below the current level through until the latter part of 2010. The OCR could still move modestly lower over the coming quarters”

<http://www.rbnz.govt.nz/news/2009/3621204.html>

July 30,2009

“...We consider it appropriate to continue to provide substantial monetary policy stimulus to the economy. The OCR could still move modestly lower over the coming quarters. We continue to expect to keep the OCR at or below the current level through until the latter part of 2010.”

<http://www.rbnz.govt.nz/news/2009/3710786.html>

September 10, 2009

“...As we have said previously, the forecast recovery in economic activity is based on monetary policy continuing to provide substantial support to the economy. We expect such support will be needed for some time. As a result, we continue to expect to keep the OCR at or below the current level through until the latter part of 2010.”

<http://www.rbnz.govt.nz/news/2009/3745217.html>

October 29, 2009

“...The forecast recovery in economic activity is based on fiscal and monetary policy continuing to provide substantial support to the economy. We think such support remains appropriate. Further ahead, removing some of the current fiscal stimulus is likely to reduce the work that monetary policy will otherwise need to do.

In contrast to current market pricing, we see no urgency to begin withdrawing monetary policy stimulus, and we expect to keep the OCR at the current level until the second half of 2010.”

<http://www.rbnz.govt.nz/news/2009/3793883.html>

December 10, 2009

“...If the economy continues to recover, conditions may support beginning to remove monetary stimulus around the middle of 2010. Recent tightening in financial conditions, driven by a higher

exchange rate, increased long-term interest rates and a wider gap between the OCR and bank funding costs, reduces the need for more immediate action.”

<http://www.rbnz.govt.nz/news/2009/3846324.html>

January 28, 2010

“...If the economy continues to recover in line with our December projections, we would expect to begin removing policy stimulus around the middle of 2010.”

<http://www.rbnz.govt.nz/news/2010/3886943.html>

March 11, 2010

“...Higher bank funding costs have reduced the level of stimulus that would normally be associated with any given level of the OCR. We expect these costs to persist over the projection reducing the extent of future increases in the OCR. Fiscal consolidation would also help reduce the work that monetary policy might otherwise need to do.

We continue to expect to begin removing policy stimulus around the middle of 2010.”

<http://www.rbnz.govt.nz/news/2010/3924699.html>

April 29, 2010

“On balance, we continue to expect the New Zealand economy to recover in line with or slightly faster than our March *Statement* projection. Annual CPI inflation, which has been close to 2 percent for the past year, is expected to track within the target range over the medium term.

As previously indicated, we expect to begin removing policy stimulus over the coming months, provided the economy continues to evolve as projected.

The increased wedge between the OCR and lending rates, as well as a steeply positive-sloped interest rate curve, is expected to make OCR increases more effective than in the past. Accordingly, these factors should reduce the extent to which the OCR will need to be increased relative to previous cycles.”

<http://www.rbnz.govt.nz/news/2010/3970584.html>

Appendix C: Foreign Central Bank Discussion of Alternative Inflation Measures

Almost all advanced foreign economy central banks use an overall consumer price index as the target index in their inflation objective. The rationale that central banks give for targeting the overall CPI is that it is broad, familiar to the public, and the most relevant index for consumers' cost of living. However, many of these banks make heavy use of other price indexes when formulating and communicating policy. Many of these other measures exclude volatile components, such as food and energy prices, to look through transitory shocks to prices. The measures may also drop components such as mortgage interest payments or indirect taxes that are directly affected by either monetary or fiscal policy. Indeed, in some economies, such as the euro area, the United Kingdom, and Australia, the "overall" inflation measure excludes mortgage interest payments. Some central banks also consider trimmed mean or weighted median inflation as another measure of underlying inflationary pressures.³⁶

The following excerpts provide some documentation for how various advanced foreign economy central banks use alternative measures of inflation in their formulation of monetary policy:

Reserve Bank of Australia

"The second point concerns the measurement and definition of inflation. The inflation target refers to the headline CPI, though the Bank also looks at measures of underlying inflation. Over time, measures of underlying inflation and the CPI move closely together, though the headline CPI is more volatile... as it is more affected by temporary factors, such as changes in petrol prices. The medium-term focus of the inflation target provides the Bank with the flexibility to 'look through' temporary fluctuations in the CPI."

<http://www.rba.gov.au/education/monetary-policy.html>

Bank of Canada

From the Bank of Canada's Annual Report 2000: "The inflation-control target is expressed in terms of the year-over-year rate of increase in the total CPI. This is the best available measure of the changes in the cost of living for most Canadian households. Although the target is specified in terms of the total CPI, the Bank uses the core CPI (the CPI excluding eight of the most volatile components as well as the effect of changes in indirect taxes on the remaining components) as a guide to its policy actions.

Many of the short-run movements in the total CPI are caused by fluctuations in the prices of eight of the most volatile components that cannot be offset by monetary policy, since the effects of policy are spread over longer periods. By removing these transitory influences, core CPI inflation provides a better measure of the underlying trend of inflation and is, therefore, a more appropriate guide for policy.

³⁶ For a more complete discussion of the measure of inflation used in inflation objectives see the FOMC memo entitled, "Foreign Experience with the Formulation and Discussion of Inflation Objectives," by Brian Doyle, Linda Kole, and Paul Wood, March 8, 2007.

Provided fluctuations in the prices of eight of the most volatile components have only temporary effects on inflation, the total and core measures of the CPI would move in a similar fashion over the medium term.”

<http://www.bankofcanada.ca/rates/indicators/key-variables/inflation-control-target/>

Bank of Japan

Members of the Bank of Japan’s policy board both discuss and forecast two alternative measures of inflation.

From the July 2011 minutes: “...Next, members discussed price developments in Japan. Some members commented that the pace of increase in the CGPI [domestic corporate goods price index] was slowing of late against the backdrop that international commodity prices had been more or less flat recently. Members shared the view that the year-on-year rate of change in the CPI (excluding fresh food) was likely to be slightly positive for the time being and also into the future as the aggregate supply and demand balance improved as a trend.... With regard to prices, many members expressed the opinion that the year-on-year rates of change in the CGPI and the CPI (excluding fresh food) were likely to be broadly in line with the April forecasts.”

http://www.boj.or.jp/en/mopo/mpmsche_minu/minu_2011/g110712.pdf

Reserve Bank of New Zealand

“2. Policy target

- a. In pursuing the objective of a stable general level of prices, the Bank shall monitor prices as measured by a range of price indices. The price stability target will be defined in terms of the All Groups Consumers Price Index (CPI), as published by Statistics New Zealand....

3. Inflation variations around target

- a. For a variety of reasons, the actual annual rate of CPI inflation will vary around the medium-term trend of inflation, which is the focus of the policy target. Amongst these reasons, there is a range of events whose impact would normally be temporary. Such events include, for example, shifts in the aggregate price level as a result of exceptional movements in the prices of commodities traded in world markets, changes in indirect taxes, significant government policy changes that directly affect prices, or a natural disaster affecting a major part of the economy.
- b. When disturbances of the kind described in clause 3(a) arise, the Bank will respond consistent with meeting its medium-term target.”

<http://www.rbnz.govt.nz/monpol/pta/3517828.html>

Norges Bank (Norway)

“The Government has defined an inflation target for monetary policy in Norway. Norges Bank’s conduct of monetary policy shall be oriented towards low and stable inflation.

The operational target of monetary policy shall be annual consumer price inflation of close to 2.5 per cent over time. Monetary policy shall also contribute to stabilising output and employment.

In general, direct effects on consumer prices resulting from changes in interest rates, taxes, excise duties and extraordinary temporary disturbances shall not be taken into account. In real time it will always be difficult to determine which price movements are permanent and those which only have short-term effects on the CPI. There is no one indicator that provides a precise picture of underlying inflationary pressures in all situations. Different measures of underlying inflation are discussed in *Monetary Policy Report*.”

<http://www.norges-bank.no/en/price-stability/monetary-policy-in-norway/the-objective-of-monetary-policy/>

Swedish Riksbank

“...But even if the inflation target is formulated in terms of the CPI, other measures of inflation may be usable for analysing and forecasting the development of inflation. The CPI is often affected by factors expected to have only a temporary impact on inflation, and which the Riksbank should not therefore react to. To describe the development of inflation and to better explain the structure of monetary policy, the Riksbank may then choose to highlight various measures of what is known as underlying inflation. These measures have been adjusted for price fluctuations that are expected to have temporary effects on the CPI, but not to affect the trend. This can include, for instance, mortgage interest expenditure, which directly affects the CPI when the Riksbank adjusts the repo rate. Over time, cuts and increases in the repo rate offset one another, and therefore do not influence the interest expenditure in the CPI in the long term. But during certain periods, when the repo rate is raised or cut substantially, there can be a significant difference between CPI inflation and an inflation measure adjusted for the direct effects of interest rate changes. The oil price is another example of a component that one may sometimes be justified in excluding from CPI inflation.”

http://www.riksbank.com/upload/Dokument_riksbank/Kat_publicerat/Rapporter/2010/Monetary_policy_2010.pdf