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**Forward Guidance By Inflation-Targeting Central Banks**

*Michael Woodford*

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*Department of Economics  
Columbia University  
New York, NY 10027*

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# Forward Guidance by Inflation-Targeting Central Banks \*

Michael Woodford  
Columbia University

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One of the notable features of inflation targeting as an approach to the conduct of monetary policy has been the increased degree of transparency on the part of inflation-targeting central banks, not only as to their decisions but also with regard to the goals that policy seeks to achieve and the reasoning behind individual decisions. The degree to which this makes it appropriate, or even necessary, for inflation-targeting central banks to speak in advance about future policy decisions has been a topic of debate,<sup>1</sup> but over time, inflation-targeting central banks such as the Reserve Bank of New Zealand, the Norges Bank, and Sveriges Riksbank have also led the way in increasing the degree of explicit communication about the likely forward path of short-term interest rates on a regular basis.

More recently, many central banks have found immediate cuts in their policy rate an insufficient response to the effects of the global financial crisis, and this has led to increased interest in explicit “forward guidance” about future interest-rate policy as an additional policy tool. This raises questions about the usefulness of this additional dimension of policy in the context of the kind of forecast-targeting procedures already used by many of the leading inflation-targeting central banks. Notably, the UK Treasury’s recent review of the monetary policy framework of the Bank of England (HM Treasury, 2013) requests the Bank’s Monetary Policy Committee to assess the merits of “the use of intermediate thresholds” as an additional element of policy, and to report on the outcome of that assessment later this year.

Here I first review the general role of discussions of the forward path of the policy rate, and of explicit intermediate targets for policy, as elements of an inflation forecast-targeting approach to monetary policy. I then turn to the special role of forward guidance in the case that a central bank finds itself constrained by a practical lower bound on where it can (or is willing to) set its policy rate. I review recent experience with various approaches to forward guidance in that situation, including the Federal Reserve’s December 2012 introduction of quantitative “thresholds,” and discuss the appropriate role of such intermediate targets in a forecast-targeting framework.

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<sup>1</sup>See, e.g., Goodhart (2005) for a skeptical discussion.

# 1 The Forward Path of Policy in a Forecast-Targeting Framework

Central banks with explicit inflation targets have emphasized from the start that it is not reasonable to expect a central bank to be able to keep the measured rate of inflation exactly equal to the target rate at all times. They have in particular stressed that it is difficult for a shift in monetary policy, even a relatively drastic one, to greatly affect the rate of inflation over the near term (that is, for at least several months following the meeting at which a policy decision is taken); and they have accordingly stressed that the goal of policy should instead be to ensure that inflation can be expected to return to the target rate fairly soon, even when it currently differs from that rate. Hence both policy decisions and communication with the public about those decisions have come to focus on projections for the future path of the economy (and in particular, projections for one or more measures of inflation), and the extent to which these are consistent with the bank's official target.

But while inflation-targeting central banks have in this sense necessarily adopted a *forward-looking* approach to monetary policy, it has not obviously followed that the policy framework requires explicit consideration in advance of an intended forward path for the policy rate, or other policy instruments, still less any communication with the public about the policy committee's thoughts on that matter. Some early discussions of inflation-forecast targeting made it appear that one should be able to determine the appropriate current setting for the policy rate simply by reference to a projection for future inflation conditional on that rate, without having to make any specific assumption about future policy decisions. For example, in the early exposition of inflation-forecast targeting by Svensson (1997), a model is assumed in which the policy rate affects economic activity only with a lag of a year, and activity affects inflation, but only with an additional lag of a year. (Both effects are purely backward-looking; expectations play no role in the determination of either output or inflation.) Hence the model can be reduced to a single structural equation of the form

$$\pi_t = u_t - \gamma i_{t-2}, \tag{1.1}$$

where  $\pi_t$  is the inflation rate,  $i_t$  is the policy rate,  $u_t$  is a composite of all of the other factors influencing inflation (assumed to evolve independently of the path of the policy rate), periods correspond to years, and  $\gamma > 0$  is a constant coefficient.

It is then easily shown that the policy that minimizes the expected squared deviation of the inflation rate from the inflation target  $\pi^*$  is one that sets  $i_t$  each period so as to ensure that the inflation forecast satisfies

$$E_t \pi_{t+2} = \pi^*; \tag{1.2}$$

if the forecast is produced using the model (1.1), this will require that

$$i_t = \gamma^{-1} [E_t u_{t+2} - \pi^*]. \tag{1.3}$$

Note that the optimization required in order to determine the setting (1.3) for  $i_t$  can be carried out without considering how  $i_\tau$  will be set for any  $\tau > t$ . Each meeting of the policy committee can be treated as an involving an independent decision, and the inflation target alone suffices to allow a determinate decision on each occasion and to allow the decision to be justified to the public by reference to the target criterion (1.2).

However, these conclusions depend on overly simplistic features of the proposed model. The model (1.1) assumes not merely that interest-rate decisions have delayed effects, but that there are *no* effects until the future horizon (two years later) at which the main effect will suddenly occur. If one grants that the largest effects occur with a delay, it is more reasonable to suppose that a policy change *begins* to have an effect at some point prior to the date at which the *largest* effect occurs. Yet even this small modification of one's assumptions would have important consequences for the forecast-targeting exercise.

Suppose, for example, that inflation is determined by a purely backward-looking model of the form

$$\pi_t = u_t - \gamma_1 i_{t-1} - \gamma_2 i_{t-2}, \tag{1.4}$$

where  $\gamma_2 > \gamma_1 > 0$ , so that an increase in the policy rate lowers inflation to some extent in the following year, but by an even greater amount in the year after that. And suppose that the central bank wishes to conduct policy so as to minimize a loss function of the form

$$E_t \sum_{T=t}^{\infty} \beta^{T-t} (\pi_T - \pi^*)^2, \tag{1.5}$$

for some discount factor  $0 < \beta < 1$ . The optimal policy can no longer be characterized as setting the policy rate each period so as to ensure that inflation is forecasted to

equal the target at the shortest horizon at which inflation can be affected. This would now require using policy to ensure that

$$E_t \pi_{t+1} = \pi^*, \quad (1.6)$$

which would require that

$$i_t = \gamma_1^{-1} [E_t u_{t+1} - \pi^* - \gamma_2 i_{t-1}]. \quad (1.7)$$

But since the evolution of  $u_t$  (and hence of the forecasts  $E_t u_{t+1}$ ) is independent of the path of the policy rate, (1.7) would imply explosive dynamics of the policy rate.

Assuming that such an explosive path for the policy rate is infeasible, it will not in fact be possible to ensure that (1.6) is satisfied at all times. It will then not be possible to determine the optimal choice for  $i_t$  each period simply by seeking to minimize  $E_t[(\pi_{t+1} - \pi^*)^2]$  given the effect of  $i_t$  on  $\pi_{t+1}$ , and trusting that further delayed effects of the current policy decision can be costlessly offset by adjustments of subsequent policy. Instead, it will be necessary to take into account the consequences of the choice of  $i_t$  for the expected values of all of the terms in (1.5), which will require a consideration at time  $t$  of how policy should be conducted later.

Let  $V_{t-1}(i_{t-2})$  denote the minimum achievable value of the conditional expectation at  $t-1$  of the objective (1.5), under optimal choices of the policy rate from date  $t-1$  onward, but taking as given the past policy decision  $i_{t-2}$ . Then the policy decision at any date  $t$  can be expressed as the choice of  $i_t$  so as to minimize

$$E_t[(\pi_{t+1} - \pi^*)^2 + \beta V_{t+1}(i_t)],$$

subject to the constraint that  $\pi_{t+1}$  will be determined by (1.4). But this problem cannot be solved without evaluating  $E_t[V_{t+1}(i_t)]$ , which requires a consideration of how policy is expected to be conducted at  $t+1$  and later (indeed, into the indefinite future).

Hence optimal policy, and indeed an internally consistent forecast-targeting exercise, will almost inevitably require a determination at each decision point of what the entire anticipated *forward path* of the policy rate should be, even though this need not mean that a once-and-for-all decision about policy is made at some initial date, and then simply executed thereafter. In practice, the number of future contingencies that may arise will be much too large to make it possible to solve explicitly

for a state-contingent policy years in advance and be content to simply implement it thereafter by deciding which of the contingencies that had been previously foreseen as possible has actually occurred. At the same time, some assessment of the dependence of  $E_t[V_{t+1}(i_t)]$  on the value of  $i_t$  is necessary, and this requires a forecast of how policy is expected to be made subsequently, even if it is inevitable that actual future policy will depend on complications that cannot yet be anticipated.

## 1.1 Medium-Run Forecast Targeting without Choosing a Forward Path

In practice, inflation-targeting central banks have not supposed that their procedures should seek to ensure that forecasted inflation must equal the target rate at the shortest horizon at which inflation can still be influenced, if indeed such a horizon can even be defined. It has generally been recognized that returning inflation to the target rate as quickly as possible would not necessarily be optimal; the focus has instead often been on ensuring that inflation should return to target *over some specified horizon*, where the horizon is chosen to be far enough in the future to ensure not only that inflation can actually be controlled with some accuracy over that horizon, but that always planning to return inflation to the target rate over that horizon should not require excessively sharp adjustments of real variables, while it is still near enough to maintain a reasonably tight bound on the implied variability of the inflation rate around its target value. (Typically, horizons two to three years in the future have been considered suitable.)

However, early discussions of forecast targeting in this vein still often sought to make it possible for a central bank to make a separate interest-rate decision at each decision point without prejudging future policy decisions. For example, the Bank of England's forecast-targeting procedure (Vickers, 1998; Goodhart, 2001) was described as being based on a *constant-interest-rate* forecast, in which forward paths for inflation and other variables were projected under the assumption of a constant value for the policy rate over the forecast horizon. Letting  $F_{t,t+8}(i)$  be the forecast of  $\pi_{t+8}$ , the inflation rate eight quarters in the future, under the assumption that the policy rate is kept at an arbitrary level  $i$  until then,<sup>2</sup> then the procedure was

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<sup>2</sup>Note that this formulation of the exercise is only possible under the assumption that a purely backward-looking model is used to forecast inflation, as was the case at the Bank of England at

described as choosing at each decision point an operating target  $i_t$  for the policy rate so as to ensure that

$$F_{t,t+8}(i_t) = \pi^*. \quad (1.8)$$

The policy decision was then justified to the public by presenting, at the beginning of each issue of the Bank's *Inflation Report*, a figure showing the projected path of inflation under the constant-interest-rate assumption, with the interest rate at the level chosen in the most recent meeting of the Monetary Policy Committee. (The projection was presented in the form of a "fan chart," showing a probability distribution for future inflation outcomes at each horizon, rather than a point forecast.) This figure always included a horizontal line at the target inflation rate, and a dashed vertical line at the horizon eight quarters in the future, so that the eye could easily determine the extent to which the projection was consistent with the target criterion (1.8), by observing whether the modal predicted path of inflation passed through the intersection of the two lines.<sup>3</sup>

This approach had the advantage of allowing an interest-rate decision to be made at each decision point without requiring any explicit consideration of current intentions with regard to future policy. It also had the advantage of allowing definite decisions to be made about the appropriate current level of the policy rate, by making even a quarter-percent change appear quite consequential, insofar it is treated as a *permanent* change of that size in the projection exercise, rather than only a change in the target to be pursued until the next meeting. Nonetheless, there were serious conceptual problems with the approach (Goodhart, 2001; Leitimo, 2003; Honkapohja and Mitra, 2005; Woodford, 2005).

While the assumption of a future policy rate at the same level as the current operating target might seem a natural one, at least in the absence of clear reasons to expect the future to be different from the present, it is actually not at all sensible to suppose that short-term nominal interest rates should remain fixed at some 

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the time. A similar approach to inflation-forecast targeting was used for some years by Sveriges Riksbank as well (Jansson and Vredin, 2003).

<sup>3</sup>The inflation projection continues to be presented at the front of each *Inflation Report* using this format, just before the summary discussion of the most recent policy decision, though it is no longer a constant-interest-rate forecast (as discussed below). The justifications given for the policy decision in more recent years also do not suggest quite so simple a target criterion; for example, there are now frequent references to inflation projections beyond the 8-quarter horizon, as well as to the projection for output growth.



level, regardless of how inflation or other variables may evolve. Indeed, in forward-looking (rational-expectations) models of the kind that are now often used by central banks, the assumption of a constant nominal interest rate typically implies an indeterminate price level, so that it becomes impossible to solve uniquely for an inflation forecast under any such interest-rate assumption.<sup>4</sup> In models with backward-looking expectations, the model can be solved, but such policies often imply explosive inflation dynamics. Such difficulties appears to have been a frequent problem with the constant-interest rate projections of the Bank of England (Goodhart, 2001), which often showed the inflation rate passing through the target rate at the eight-quarter horizon, but not converging to it. Figure 1 provides an example. In such a case, it is not obvious why anyone should believe that policy is consistent with the inflation target, or expect that inflation expectations should be anchored as a result of a commitment to such a policy.

The most fundamental problem, however, is the internal inconsistency involved in the sequential application of such a procedure. The usefulness of a forecast-targeting procedure as a way of creating confidence that the inflation target should be expected to be satisfied in the medium run — so that it should serve to anchor medium-run expectations — depends on the public’s having reason to suppose that the central bank’s projections do indeed represent reasonable forecasts of the economy’s future evolution. But among the possible grounds for doubt is a tension inherent in the logic of a forecast-targeting procedure itself. Production of projections of the economy’s evolution years into the future requires that the central bank make assumptions about the path of policy variables, such as nominal interest rates, not merely in the immediate future, but over the entire forecast horizon (and even beyond, in the case of a forward-looking model). But while the projections must specify policy far into the future each time they are produced, in each decision cycle policy is only *chosen* for a short period of time (say, for the coming month, after which there will be another decision).

This raises a question as to whether this decision procedure should be expected to actually produce the kind of future policy that is assumed in the projections. One might imagine, for example, a central bank wishing always to choose expansionary policy at the present moment, to keep employment high, while projecting that inflation will be reduced a year or two in the future, so that the expectation of disinflation

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<sup>4</sup>See Woodford (2003, chap. 4) for examples of this problem.

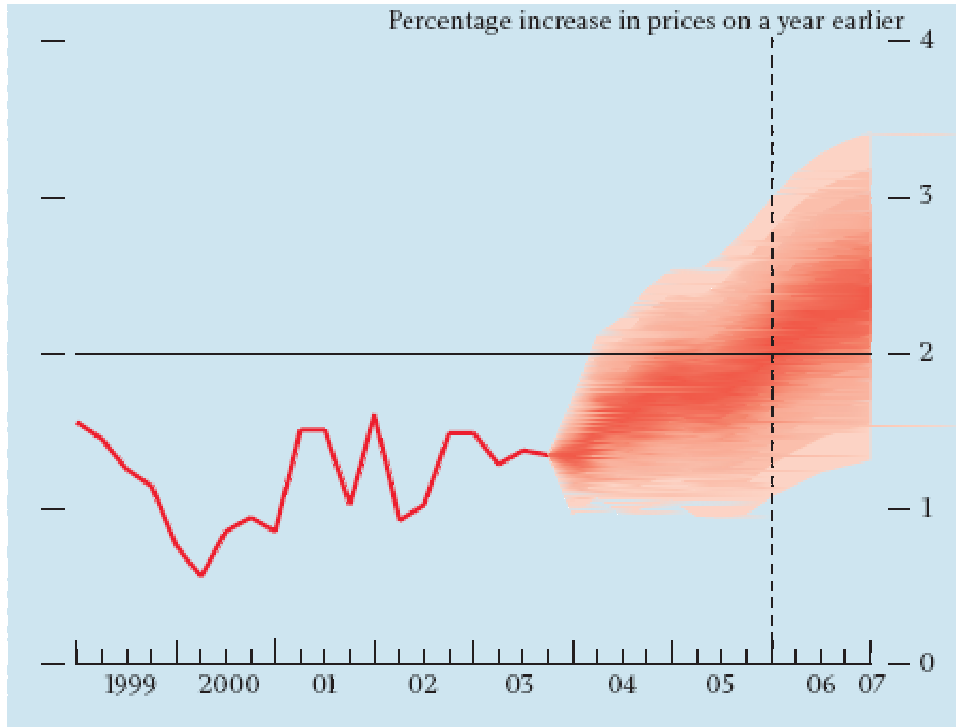


Figure 1: The Bank of England’s February 2004 CPI projection under the assumption of a constant 4.0 percent interest rate. Source: Bank of England, *Inflation Report*, August 2004.

will make it possible to have high employment with only moderate inflation. But if the procedure is one in which the disinflation is always promised two years farther in the future, private decisionmakers have no reason ever to expect any disinflation at all.

Thus a requirement for credibility of the central bank’s projections is that the forecast-targeting procedure be *intertemporally consistent*. This means that the future policy that is assumed in the projections should coincide with the policy that the procedure itself can be expected to recommend, as long as those aspects of future conditions that are outside the control of the central bank turn out in the way that is currently anticipated. But the approach to forecast-targeting represented by requirement (1.8) fails to satisfy this criterion.

The problem is that there will often be no reason to expect interest rates to remain constant over the policy horizon. Indeed, constant-interest rate projections

themselves often imply that the people making the projections should not expect the interest rate to be maintained over the forecast horizon. Consider, for example, the inflation projection shown in Figure 1, a constant-interest rate projection on the basis of which the February 2004 Bank of England *Inflation Report* concluded that a 4 percent policy rate was appropriate at that time.<sup>5</sup> The figure shows that under the assumption of a constant 4 percent policy rate, consumer price inflation was projected (under the most likely evolution, indicated by the darkest area) to pass through the target rate of 2.0 percent at the eight-quarter horizon (indicated by the vertical dashed line), and then to continue rising in the following year.

It follows that if the policy rate were to be held at 4 percent for a year, the Bank's expectation in February 2004 should have been that (under the most likely evolution, given what was known then) in February 2005 a similar exercise would forecast consumer price inflation to pass through 2.0 percent at the one-year horizon, and to exceed 2.0 percent during the second year of the projection. Hence, the Bank has essentially forecasted that in a year's time, under the most likely evolution, the policy committee would have reason to raise the policy rate. Thus the February 2004 projection itself could have been taken as evidence that the Bank should not have expected the policy rate to remain at 4 percent over the following eight quarters.

As these issues have come to be understood, a number of central banks that formerly relied upon constant-interest-rate projections (including the Bank of England, since August 2004) have switched to an alternative approach. This is the construction of projections based on *market expectations* of the future path of short-term interest rates, as inferred from the term structure of interest rates and/or futures markets. In the case that the projections constructed under this assumption satisfy the target criterion, the correct current interest-rate decision is taken to be the one consistent with market expectations. The use of projections based on market expectations allows a central bank to avoid assuming a constant interest rate when there are clear reasons to expect rates to change soon, while still not expressing any view of its own about the likely future path of interest rates.

But the market expectations approach does not really solve the problem of internal

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<sup>5</sup>In the February *Report*, only the projection up to the 8-quarter horizon was shown. The figure that has been extended to a horizon 12 quarters in the future is taken from the August 2004 *Inflation Report*, in which the Bank explained its reasons for abandoning the method of constant-interest-rate projections.

consistency just raised.<sup>6</sup> One problem is that market expectations can at most supply a single candidate forward path for policy; it is not clear what decision one is supposed to make if that path does *not* lead to projections consistent with the target criterion. Thus the procedure is incompletely specified; and if it is only the projections based on market expectations that are published, even though the central bank has chosen to contradict those expectations, the published projections cannot be expected to shape private decisionmakers' forecasts of the economy's evolution.

Moreover, even if the forward path implied by market expectations does lead to projections that fulfill the target criterion, the exercise is not intertemporally consistent if this path does not in fact correspond to the central bank's *own* forecast of the likely future path of interest rates. Why should it count as a justification of a current interest-rate decision that this would be the first step along a path that *would* imply satisfaction of the target criterion, but that the central bank does not actually expect to be followed? And why should anyone who correctly understands the central bank's procedures base their own forecasts on published projections constructed on such an assumption?

## 1.2 Sequential Choice of a Forward Path

In fact, there is no possibility of an intertemporally consistent forecast-targeting procedure that does not require the central bank to *model its own likely future conduct* as part of the projection exercise. Approaches like both of those just described — which introduce an artificial assumption about the path of interest rates in order to allow the central bank to avoid expressing any view about policy decisions that need not yet be made — necessarily result in inconsistencies. Instead, a consistent projection exercise must make assumptions that allow the evolution of the central bank's policy instrument to be projected, along with the projections for inflation and other endogenous variables.

In such a case, it would be possible, but somewhat awkward, for the central bank to remain silent about the implications of its assumptions for the forward path of interest rates; and so it is natural to include an interest-rate projection among the projections that are discussed in the *Monetary Policy Report*.<sup>7</sup> This has been done

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<sup>6</sup>For further discussion of problems with this approach, see Woodford (2005) and Rosenberg (2007).

<sup>7</sup>Since one is talking about projections for the paths of endogenous variables, rather than an-

for the past decade now by the Reserve Bank of New Zealand, and is now done by the Norges Bank (since 2005) and the Riksbank (since 2007) as well. In the case of the latter two central banks, “fan charts” (similar to the one shown in Figure 1) are presented for the policy rate; this (among other things) makes it clear that the path is simply a forecast, rather than a definite intention that has already been formulated, let alone a promise.

But how should future policy be specified in such an exercise? It is sometimes suggested that the monetary policy committee should conceive of its task as the choice of a *path* for interest rates, rather than a single number for the current operating target, in each decision cycle. Discussions of the feasibility of such an approach have often stressed the potential difficulty of committee voting on a decision with so many dimensions.<sup>8</sup> And when announcing its intention to begin publishing its own view of the path of the policy rate, the Riksbank (Rosenberg, 2007) indicated that it would publish “forecasts ... based on an interest-rate path chosen by the Executive Board.”<sup>9</sup>

However, the idea that one should simply ask the policy committee to decide which forward path for interest rates they prefer, presumably after asking their staff to produce projections for other variables conditional on each path that is considered, is problematic on several grounds that have nothing to do with the complexity of the decision or the need for a committee to agree among themselves. First of all, the specification of future policy by a simple path for a short-term nominal interest rate, independently of how endogenous variables may develop, is never a sensible

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nouncing an intention, there is no reason why there need be a projection for only one interest rate, or even for the interest rate that is most emphasized to be the policy rate. Nonetheless, there are obvious advantages in giving primarily emphasis to only a small number of key variables; and it might seem disingenuous not to offer a view of the path of the policy rate, given that this is most directly under the bank’s own control.

<sup>8</sup>See, for example, Goodhart (2005) for a skeptical view; Svensson (2007) responds by proposing a voting mechanism intended to overcome potential intransitivities in majority preferences over alternative paths.

<sup>9</sup>It is likely, of course, that this was only a loose way of speaking in a statement intended for a non-technical audience, and that the intention was to indicate that the Executive Board would have to endorse the assumptions about future policy involved in generating projections of an endogenous interest-rate path. The change in procedure does seem to have meant that the Executive Board is now required to approve the assumptions made in the projections in a way that was not previously true; this has made it necessary to allow for possible revisions in the projections following the meeting at which the policy decision is made (Sveriges Riksbank, 2007, p. 21.)

choice, and is unlikely to lead to well-behaved results in a sensible model. (The problems mentioned above in connection with the assumption of a constant interest-rate path apply equally to *any* specification of an exogenous path; they do not result from the assumption that the interest rate does not vary with time, but from the assumption that it is independent of outcomes for inflation and other variables.) Moreover, the assumption of a specific path for interest rates, unaffected by future shocks, would seem to require one to publish a specific path for this variable, alongside the fan charts for variables such as inflation; but this would encourage the dangerous misunderstanding that the bank has already committed itself to follow a definite path long in advance.

Even supposing that these technical issues have been finessed,<sup>10</sup> there remains the more fundamental problem of the intertemporal consistency of the procedure. Here it is important to realize that the mere use of a *consistent criterion* over time to rank alternative projected paths for the endogenous variables — not just a criterion that provides a transitive ordering of outcomes within each decision cycle, but one that ranks different possible paths the same way, regardless of the date at which the decision is being made — is not enough to ensure intertemporal consistency, in the sense defined above. Thus the problems of choosing a forward path for policy are not resolved simply by asking the members of the policy committee to agree on a loss function that they will then use (for an entire sequence of meetings) to rank alternative possible outcomes, as proposed by Svensson (2007).

Even in the case of a single decisionmaker who minimizes a well-defined loss function that remains the same over time, using a correct economic model that also remains the same over time, and who never makes any calculation errors, the choice of a new optimal path for policy each period will not general lead to intertemporal consistency. For in the case of a forward-looking model of the transmission mechanism, the procedure will lead to the choice of a forward path for policy that one will not be lead by the same procedure to continue in subsequent decision cycles, even if

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<sup>10</sup>For example, one might specify future policy by a policy rule, such a Taylor rule, with some number of free parameters that are optimized, in each decision cycle, so as to result in projections that are acceptable to the monetary policy committee. If only rules that are considered that imply a determinate equilibrium, the first problem is avoided. And since the rule that is chosen would make the interest rate endogenous, an assumption about the distribution of shocks in each future period would result in a probability distribution for future interest rates, just as for the future inflation rate.

there have been no unexpected developments in the meantime.

The reason is the same as in the celebrated argument of Kydland and Prescott (1977) for the “time inconsistency of optimal plans”: the forward path chosen at one time will take account of the benefits at earlier dates of certain expectations about policy at the later dates, but as the later dates approach (and the earlier expectations are now historical facts), there will no longer be a reason to take into account any effect of the policy chosen for those dates on earlier expectations. This problem does not arise solely in connection with the bias in the average rate of inflation chosen by a sequential optimizer, as in the example of Kydland and Prescott (1977). One may solve the problem of “inflationary bias” by assigning the central bank a loss function in which the target level of the output gap is not higher than the level consistent on average with its inflation target, but the optimal dynamic responses to shocks are still not generally the ones that would be chosen under sequential (or discretionary) optimization.<sup>11</sup>

### 1.3 Using a Target Criterion to Determine the Forward Path

An alternative approach, that avoids this problem, is to determine the forward path of policy as that path which results in projections that satisfy a *sequence* of quantitative target criteria, one for each of a sequence of future horizons. It is true that a *single* criterion — say, involving the projections for 8 quarters in the future only — can determine only a single dimension of policy, and thus can only determine an entire path if one is constrained to consider only a one-parameter family of possible paths (such as constant-interest-rate paths). But a sequence of similar criteria can independently determine the stance of policy at each of a sequence of dates, and thus can determine the entire forward path of policy. Moreover, if the sequence of

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<sup>11</sup>In the literature on inflation targeting, it is sometimes supposed instead that there is no problem with allowing a central bank complete discretion in its choice of the instrument settings that will minimize its loss function, as long as the loss function involves an output-gap target that is consistent with the inflation target; hence inflation targeting is argued to differ from purely discretionary policy *only* in the fact that policy is made on the basis of a loss function with this property. King (1997) obtains a formal result to this effect, but in the context of a model where the aggregate-supply relation is assumed to be of the “New Classical” form assumed by Kydland and Prescott (1977). The result is in fact dependent on extremely special properties of that form of aggregate-supply relation; see Woodford (2003, chap. 7) for further discussion.

target criteria for different horizons are of the *same form* — *i.e.*, if the target criterion is independent of the horizon — then the forecast-targeting procedure will be intertemporally consistent.

As a practical example, consider the targeting procedure used by the Norges Bank in 2005-06. Each issue of the Bank’s *Inflation Report* included a box labeled “Criteria for an appropriate future interest rate path.”<sup>12</sup> According to the first of the criteria listed, “inflation should be stabilized near the target [*i.e.*, 2.5 percent per year] within a reasonable time horizon, normally 1-3 years,” and moving *toward* that target rate even sooner. This criterion alone would sound similar to the Bank of England target criterion mentioned above, except with greater vagueness about the horizon. But there is then a second criterion: that “the inflation gap [the amount by which actual inflation exceeds the medium-run target rate] and the output gap should be in reasonable proportion to each other until they close,” and in particular that the two gaps “should normally not be positive or negative at the same time.”

The second criterion indicates not only what the projections should look like in some medium run, but also what the *transition path* should look like: there should be an inverse relation between the inflation gap and the output gap, with the two gaps shrinking to zero together. In order to allow visual inspection of the extent to which the projections satisfy this criterion, the Norges Bank presents a figure in which the projections for its preferred measures of inflation<sup>13</sup> and of the output gap are superimposed. A criterion of this kind can determine the entire forward path for policy. And with such a criterion, it is not necessary to specify independently the rate at which the inflation rate should be projected to approach the target rate; the appropriate rate is exactly the rate that allows the output gap to remain in the desired proportion to the inflation gap. (Under such a criterion, the inflation gap *will* be projected to close eventually, as long as it is not possible to have a non-zero permanent output gap.)

The criterion just cited applies to each of a sequence of future horizons. It can be

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<sup>12</sup>The criteria used starting in 2005, when the Norges Bank first began to announce a forward path for the policy rate as part of its explanation of its recent policy decisions, are discussed in more detail in Qvigstad (2006). Beginning with the 2007/1 issue of the Bank’s *Monetary Policy Report*, the description of the criterion used to select the forward path of policy has been less explicit; see Qvigstad (2008) for a more recent discussion of the criteria.

<sup>13</sup>The inflation measure emphasized by the Norges Bank in its targeting procedure, CPI-ATE, is a consumer price index that is adjusted for tax changes and energy prices.



represented formally as the requirement that

$$(\pi_{t+h,t} - \pi^*) + \phi x_{t+h,t} = 0 \tag{1.9}$$

for each horizon  $h \geq \underline{h}$ , for some coefficient  $\phi > 0$ . Here  $y_{t+h,t}$  denotes the projected value at date  $t$  of some variable  $y$ , at a horizon  $h$  periods in the future;  $\underline{h} \geq 0$  indicates the shortest horizon at which it is still possible for policy to affect the projections, and I shall assume that a sequence of criteria (1.9) for  $h \geq \underline{h}$  suffices to uniquely determine the acceptable projections (including an implied forward path for policy).<sup>14</sup>

Suppose also that the central bank's forecast of its own forecasts in future decision cycles satisfy the principle that one should expect one's future forecasts to be the same as one's current forecasts (except, of course, as a result of developments that cannot currently be foreseen), so that

$$[y_{t+h_2,t+h_1}]_t = y_{t+h_2,t}$$

for any horizons  $h_2 \geq h_1 \geq 0$ . Then if at date  $t$  a forward path for policy is chosen that leads to projections satisfying (1.9) for each  $h \geq \underline{h}$ , it should also be projected at that time that at any later date  $t + h_1$ , the continuation of that same path should lead to projections satisfying a corresponding sequential criterion, since at date  $t$  the bank should project that

$$[(\pi_{t+h_2,t+h_1} - \pi^*) + \phi x_{t+h_2,t+h_1}]_t = 0$$

for all horizons  $h_2 \geq h_1 + \underline{h}$ . This makes the procedure of choosing a forward path for policy on such a basis intertemporally consistent.

I believe that this kind of targeting procedure provides the most appealing solution to the problem of intertemporal consistency. The way in which the target criterion is used to determine an appropriate forward path for policy is essentially the same as under the procedure used by the Bank of England prior to 2004, as discussed above, except without either the arbitrary emphasis on a single horizon or the arbitrary restriction to forward paths for policy involving a constant interest rate. Since forecast-targeting central banks already publish charts showing their projections for

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<sup>14</sup>See Svensson and Woodford (2005) for algebraic analysis of a specific example. In the case considered there, prices and spending decisions are each predetermined a period in advance, so that  $\underline{h} = 1$ .

each of a sequence of future horizons, rather than only presenting a set of numerical forecasts for a specific horizon, discussion of a target criterion that should apply at each horizon is fairly straightforward within the existing frameworks for deliberation and communication about policy, as the example of the Norges Bank shows. Moreover, both the Norges Bank and the Riksbank now discuss quite explicitly the fact that their targeting procedures involve the choice of a forward path for policy, and publish “fan charts” for the paths of short-term nominal interest rates implicit in their projections. Hence this aspect of the recommended approach is entirely possible within the context of existing procedures as well.

The main practical obstacle to such an approach, I believe, is that it would require a central bank to adopt a highly structured approach to policy deliberations, and to describe that approach rather explicitly to the public. It would require the bank to be more open about its own view of the likely future evolution of policy than even some forecast-targeting central banks have been willing to be thus far. And it would require the bank to discuss explicitly the nature of the trade-offs that determine an acceptable transition path following a disturbance, and not merely the nature of the “medium-run” targets that one hopes to reach some years in the future. The latter goal will almost surely require that a bank be explicit about the ways in which projections for variables other than a single measure of inflation are relevant to judgments about the appropriate stance of policy. Even though all inflation-targeting central banks appear to care about projections for real variables as well as inflation,<sup>15</sup> most have been quite cautious about discussing the way in which this may factor into their policy decisions. But this would have to be different if forecast targeting were to be adopted by an institution with a “dual mandate” like the U.S. Federal Reserve (at least, in the absence of a substantial modification of the Federal Reserve Act by Congress). And even in the case of other central banks, I believe that it would greatly enhance the transparency of policymaking — and ultimately, the credibility of their commitments to inflation control, by making clearer the extent to which temporary failures to return inflation immediately to its medium-run target level are nonetheless consistent with a systematic approach to policy that does indeed guarantee stability

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<sup>15</sup>For example, the summary justification of current policy in the introduction to each issue of the Bank of England’s *Inflation Report* always begins by discussing the projection for real GDP growth before turning to the inflation projection, despite the apparent concern with the inflation projection alone in the simple target criterion discussed above.

of inflation over the medium run.

## 1.4 Which Form of Target Criterion?

These general considerations do not mean that the specific form of target criterion (1.9) used by the Norges Bank in the period just cited is necessarily the one that should be adopted. In the context of a simple New Keynesian DSGE model, one can show (Woodford, 2003, chap. 7) that an optimal policy commitment involves maintaining proportionality, not between deviations of the inflation rate from its long-run target and the output gap, but between deviations of the inflation rate from target and the *change* in the output gap. That is, rather than requiring that  $(\pi_t - \pi^*) + \phi x_t$  be projected to equal zero at all future horizons, one should commit to a forward path of policy under which  $(\pi_t - \pi^*) + \phi(x_t - x_{t-1})$  is projected to equal zero at all horizons.<sup>16</sup> Like the Norges Bank criterion, this one implies that both inflation and the output gap should be stabilized, in the absence of “cost-push shocks” that make the two stabilization goals mutually incompatible; and that in the event of such a disturbance, both the inflation gap and the output gap should be allowed to vary, each in order to reduce the amount of adjustment that is required by the other.

The dynamic criterion differs from the Norges Bank criterion, however, in that it implies that if inflation is allowed to increase, and the output gap to decrease, in response to a positive cost-push shock, a *below-target* inflation rate should subsequently be aimed at, as the output gap returns to its normal level (since the output gap is then *increasing*), rather than continuing to aim at an inflation rate *above target* (because the output gap remains negative, albeit to a decreasing extent). If the dynamic response is credible, an expectation of subsequent disinflation should reduce incentives for wage and price increases during the period of the cost-push shock, at any given level of economic activity, and so should shift the short-run Phillips curve tradeoff in a way that tends to offset some of the effects of a cost-push shock. This allows a superior degree of achievement of the stabilization objectives than would be possible under the Norges Bank criterion.

An alternative way of seeing the difference between the two target criteria is to

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<sup>16</sup>Svensson and Woodford (2005) extend this analysis to an arguably more realistic model in which monetary policy changes can affect inflation and output only with a one-period lag, and show that a target criterion of the same form continues to characterize optimal policy, except that the criterion must be projected to hold only at horizons one period or farther in the future.

note that the dynamic criterion can alternatively be expressed in a *level* form, as a requirement that the condition

$$p_t + \phi x_t = p_t^*, \quad (1.10)$$

be projected to be satisfied at all future horizons, where  $p_t$  is the log of the general price, and  $p_t^*$  is a deterministic target path for the log price level, growing at a constant rate  $\pi^*$  each period. Satisfaction of (1.10) each period would imply that

$$\pi_t + \phi(x_t - x_{t-1}) = \pi^* \quad (1.11)$$

each period, and vice versa, assuming that the initial level  $p_{-1}^*$  for the target path is chosen so that (1.10) is satisfied by the (historically given) data for the period just before the first period in which either of the target criteria will be enforced.

But (1.10) and (1.11) are only equivalent under the assumption that either target criterion can be precisely satisfied by the realized values of inflation and the output gap each period. Under the more realistic assumption that target misses of some size will constantly occur, even if the target criterion is *projected* at each decision point to be satisfied in all future periods. That is, the requirement that a central bank's projections satisfy

$$[(\pi_{t+h} - \pi^*) + \phi(x_{t+h} - x_{t+h-1})]_{,t} = 0 \quad (1.12)$$

for all horizons  $h \geq 0$  at each decision point  $t$  is not equivalent to requiring them to satisfy

$$[(p_{t+h} - p_{t+h}^*) + \phi x_{t+h}]_{,t} = 0 \quad (1.13)$$

each period. In the former case, the target  $p_t^*$  for the “output-gap adjusted price level”  $p_t + \phi x_t$  used in period  $t$  is effectively adjusted, relative to the target for the same variable used in the period  $t - 1$  projection exercise, by an amount equal to the target miss  $p_{t-1} + \phi x_{t-1} - p_{t-1}^*$  in the previous period; in the latter case, instead, the target path  $\{p_t^*\}$  remains predetermined. Thus the “level” version of the target criterion incorporates a commitment to subsequent correction of past target misses, while the first-differenced (or “growth-rate”) version does not.

Such a commitment to error-correction increases the robustness of the forecast-targeting procedure to errors of judgment on the part of the central bank.<sup>17</sup> There is less reason to worry that a sustained departure of the actual inflation rate from

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<sup>17</sup>See Woodford (2011, 2012a) for further discussion of this issue.

the target rate can occur, simply as a result of a persistent bias in the central bank’s inflation forecast, that allows it to project at each decision point that (1.11) will be satisfied, though in fact the output-gap-adjusted inflation rate (*i.e.*, the left-hand side of (1.11)) exceeds  $\pi^*$  each period. Under the level version of the target criterion, a positive overshoot in one period requires the central bank to aim for an output-gap-adjusted inflation rate in subsequent periods that is *less* than  $\pi^*$ , and subsequent overshooting in the same direction (resulting from a systematic bias in the central bank’s projections) will further increase the size of the correction that is called for. Eventually, the central bank will be required to aim at a value of the gap-adjusted inflation rate that is sufficiently far below  $\pi^*$  that the actual outcome will not exceed  $\pi^*$  on average, even given the bias in the central bank’s projections.<sup>18</sup>

Hence continuing excess inflation will not result, even if the bias in the central bank’s projections is never recognized and corrected by adjustment of the forecasting model. And even assuming eventual learning on the part of the central bank, the losses that result while the learning takes place are reduced in the case of a forecast-targeting exercise using criterion (1.10) rather than (1.11), as shown in a quantitative example by Aoki and Nikolov (2005).<sup>19</sup>

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<sup>18</sup>Svensson (2012) argues for the importance of adopting procedures that can ensure that the actual outcome will not differ substantially from the target rate when averaged over a sufficient number of years, and discusses commitment to a level target (a price level target, in his case) as one way of achieving it. He also suggests, however, that “a less dramatic change” would be to target a five- to ten-year moving average of inflation, as proposed by Nessen and Vestin (2005). Because of the desirability of adopting an intermediate target criterion to determine short-term policy that involves real activity as well as inflation, one might alternatively wish to target a moving average of the gap-adjusted inflation rate, or (for the sake of a simpler proposal) a moving average of nominal GDP growth. Proposals of this kind have similar virtues as a level target, as long as the moving average is not too short, though I believe that a level target would be simpler both to implement and to explain.

<sup>19</sup>One possible source of bias in the central bank’s projections is mis-estimation of the natural rate of output, and hence of the output gap, which, as Orphanides (2003) shows from historical experience, might well persist for years. A target criterion that ties the acceptable level of inflation to the growth rate of the output gap, rather than its level — (1.11) as opposed to (1.9) — already reduces the risk that persistent inflation can be generated from a persistent bias in the central bank’s estimate of the output gap, as Orphanides discusses (in arguing for a variant Taylor rule that responds to inflation and the growth of the output gap, rather than inflation and the level of the output gap, as proposed by Taylor, 1993). But the level version of the target criterion reduces the possibility of a substantial unplanned cumulative increase in the price level still further. On

A level version of the target criterion is also more robust to the occurrence of target misses owing to factors outside of the central bank’s control, as opposed to errors in the central bank’s forecasts. These include the fact that, inevitably, the central bank must choose its instrument setting without full information about the values of the current structural disturbances, so that even if the criterion is (correctly) projected to hold, conditional on the information available to the monetary policy committee at the time of its decision, the actual values of the structural disturbances not exactly known to the committee will almost certainly result in its not holding exactly. Woodford (2011) discusses how to characterize an optimal policy commitment under such an informational constraint, and shows that it involves a commitment to error-correction of the same sign as automatically occurs under a level criterion such as (1.10).<sup>20</sup> The same result applies when the failure to achieve the target criterion results from a constraint on the degree to which the policy instrument can currently be moved, rather than a lack of more precise information about how it should be set. Hence there are substantial advantages to the level version of the target criterion when the central bank is constrained by an effective lower bound on the level of its policy rate, as discussed in section 2.

The numerical value of the coefficient  $\phi$  in the target criterion (1.10) that is best depends on the relative importance assigned to inflation stabilization and output-gap stabilization respectively.<sup>21</sup> In the case that  $\phi = 1$ , the proposed target criterion has an especially simple interpretation, as it can alternative be written in the form

$$Y_t = Y_t^*, \tag{1.14}$$

where  $Y_t \equiv p_t + y_t$  is the log of nominal GDP (if  $y_t$  is the log of real GDP), and the advantages of a level target in minimizing the effects of mis-estimation of the output gap, see Gorodnichenko and Shapiro (2006).

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<sup>20</sup>The optimal commitment actually involves a slightly *stronger* degree of error-correction than the level criterion prescribes; when imperfect information results in a gap-adjusted inflation rate higher than  $\pi^*$ , the subsequent target should be reduced by an amount slightly *greater* than the size of the target overshoot, though the multiplicative factor approaches 1 as the rate of time discounting in the central bank’s stabilization objective approaches zero. Even allowing for discounting, error-correction of the kind prescribed by the level version of the full-information optimal target criterion is clearly desirable relative to the criterion with no such correction at all.

<sup>21</sup>Woodford (2003, 2011) shows how the optimal coefficient depends both on the coefficients of the policymaker’s loss function and the slope of the Phillips-curve tradeoff.

target  $Y_t^*$  is given by

$$Y_t^* = y_t^n + \pi^* \cdot t, \quad (1.15)$$

where  $y_t^n$  is the log of the natural rate of output (so that the output gap is defined as  $x_t \equiv y_t - y_t^n$ ). In this case, the target criterion can be expressed as a target path for the level of nominal GDP, a concept that is easier to explain than a target path for the output-gap-adjusted price level. Setting the coefficient  $\phi$  equal to 1 might be viewed as representing a “balanced approach” to the dual goals of inflation and output-gap stabilization, and avoids the need to justify using a particular numerical value in the criterion (1.10). Hence this particular form of intermediate target criterion is likely to be an especially practical way of achieving the general objectives discussed above.

## 2 Forward Guidance at the Interest-Rate Lower Bound

Thus far I have discussed reasons for a central bank to be explicit about its intended future conduct of policy — both in its internal deliberations and in its explanations of its policy decisions to the public — as a routine element of the conduct of monetary policy. But there are special reasons for explicit discussion of future policy in the case that a central bank reaches the effective lower bound for its policy rate, as has occurred for a number of central banks since the fall of 2008.<sup>22</sup> It is no accident that these circumstances have resulted in increased interest in explicit forward guidance as a policy tool.

There are two main advantages for a central bank from talking explicitly about its future policy, rather than simply allowing the public to form its own expectations about policy on the basis of observed behavior. First of all, in the absence of explanations by the central bank itself, misunderstandings of its policy intentions may easily develop, and this should not be left to chance, since uncertainty about how

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<sup>22</sup>In some cases, like those of the U.S. Federal Reserve, the Bank of England, and the Bank of Japan, banks have kept their policy rates at levels that they have regarded as lower bounds continuously since late 2008 or early 2009, without achieving a degree of expansion of aggregate sufficient for full utilization of productive capacity, so that the question whether forward guidance can provide further stimulus continues to be relevant. In other cases, like those of the Bank of Canada and Sveriges Riksbank, effective lower bounds were reached in the first half of 2009, but the constraint remained relevant only during 2009-10.

policy will be interpreted implies uncertainty about the effects of the policy. Explicit explanations of policy are most likely to be needed in unusual circumstances, or when a central bank intends to act in ways that could not easily be predicted from its previous behavior.

Hence it is not surprising that explicit forward guidance by central banks has increased precisely in a period when unprecedented policy actions are being taken, so that past rules of thumb are no longer adequate predictors of behavior. At the same time, a situation in which the current policy rate is constrained by floor on the level of short-term rates that the central bank is willing to contemplate<sup>23</sup> is also one in which expectational errors should be particularly costly. For one reason, the social cost of an expectational error that makes aggregate demand lower by a given number of percentage points (because of a mistaken expectation that future policy will be tighter than a correct forecast would have indicated) is greater, the greater the extent to which demand already falls short of the efficient level of activity. If a binding interest-rate lower bound results in a larger negative output gap than would be allowed to exist otherwise (since further interest-rate cuts would otherwise occur and reduce the gap), this is reason to be particularly concerned to minimize potential expectational errors at such a time.

In addition, in a situation where the policy rate is expected to remain fixed for

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<sup>23</sup>The “effective lower bound” to which I refer here is not necessarily a technical constraint on the level of overnight interest rates that could be achieved. None of the central banks that I have described as constrained by their self-imposed lower bounds have actually reduced their targets for their policy rates all the way to zero, the rate of return on currency. (Some would question whether even zero is a genuine lower bound for overnight interest rates, given the existence of at least modest holding costs for currency.) The Federal Reserve has maintained an official target band between zero and 25 basis points for the federal funds rate, and has continued to pay 25 basis points of interest on reserves held overnight at the Fed, so that the funds rate has continued to trade ten basis points or more above zero. The Bank of Canada and Sveriges Riksbank never reduced their policy rates below 25 basis points. Nonetheless, all of these banks held their policy rates fixed at these floors for extended periods, and, as discussed below, announced an intention to keep them there as a substitute for a further immediate interest-rate cut. In other words, the floors were *treated* as lower bounds on the targets for the policy rate that would be considered, even if the constraints were prudential rather than technical in nature. The most commonly offered reason for not considering a further immediate cut in the policy rate has been concern for the consequences for private financial intermediaries of a complete elimination of any spread between the return on currency and money-market interest rates.



a substantial period (because the interest-rate lower bound is expected to continue to bind), but the question is whether people have correct expectations about what will happen *after* that period, New Keynesian models typically imply that changes in expectations about what will happen after the several quarters of constant policy rate will have *larger* consequences for near-term aggregate demand and economic activity than if policy were expected to be conducted over that period in a “standard” way — in accordance with the Taylor rule, or with the reaction function of an inflation-targeting central bank under normal conditions — so that the policy rate would vary with economic activity and with inflation. If increased pessimism about future output or inflation does not lead to anticipated declines in the policy rate, owing to the expectation that the policy rate will already be at its lower bound, the resulting contraction in current demand — and hence the reduction in current output, employment and inflation — will be greater. Furthermore, to the extent that this mechanism is expected to result in lower output and inflation at future dates in the period when the lower bound still binds, such an expectation should produce even lower output and inflation, through a self-amplifying process.

Hence output and inflation in a period when the lower bound is a binding constraint should be particularly sensitive to changes in expectations about macroeconomic conditions once the lower bound no longer prevents the central bank from achieving its normal stabilization objectives.<sup>24</sup> This explains the fact that in the numerical example of Eggertsson and Woodford (2003), even a commitment to a modestly expansionary policy after it would become possible to achieve the central bank’s normal objectives has a dramatic effect on the severity of the output collapse and deflation that are predicted in the period when the interest-rate lower bound is

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<sup>24</sup>The reason for this is closely related to the observation above that New Keynesian models commonly imply that a commitment to a fixed nominal interest rate forever results in indeterminacy of equilibrium. Mathematically, this indeterminacy reflects the fact that when the nominal interest rate is fixed and assumed not to vary with changes in output or inflation, the mapping from expected future macroeconomic conditions into current conditions has an eigenvalue greater than one, so that the deviation from steady-state values that must be expected a period in the future in order to generate a given size deviation from steady-state values now is smaller in magnitude than the current deviation that is produced. If the constant nominal interest rate is extended indefinitely into the future, this makes it possible for bounded departures from the steady-state values to be purely self-fulfilling. But even if the constant nominal interest rate lasts for only a finite time, the same result implies that small changes in expectations about conditions later can generate larger changes in current conditions.

binding.

A second reason why forward guidance may be needed — that again has particular force when the interest-rate lower bound is reached — is in order to facilitate *commitment* on the part of the central bank. As Krugman (1998) emphasizes using a simple two-period model, and Eggertsson and Woodford (2003) show in the context of a more fully articulated dynamic model, the future policy that one wishes for people to anticipate is one that the central bank will not have a motive to implement later, if it makes its decisions then in a *purely forward-looking* way, on the basis of its usual stabilization objectives. Hence a desirable outcome requires commitment, just as in the analysis of Kydland and Prescott (1977) — even though in this case, the problem is a lack of motive *ex post* to be as expansionary as one wanted people earlier to expect, rather than a lack of motive *ex post* to control inflation as tightly as one wanted them to expect. In practice, the most logical way to make such commitment achievable and credible is by *publicly stating the commitment*, in a way that is sufficiently unambiguous to make it embarrassing for policymakers to simply ignore the existence of the commitment when making decisions at a later time.

These considerations establish a straightforward case for the benefits that should be attainable, at least in principle, from the right kind of advance discussion of future policy intentions. On the other hand, some caution is appropriate as to the conditions under which such an approach should be expected to work. It does not make sense to suppose that *merely expressing* the view of the economy's future path that the central bank would currently wish for people to believe will automatically make them believe it. If speech were enough, without any demonstrable intention to *act* differently as well, this would be magic indeed — for it would allow the central bank to stimulate greater spending while constrained by the interest-rate lower bound, by telling people that they should expect expansionary policy later, and then *also* fully achieve its subsequent stabilization objectives, by behaving in a way that is appropriate to conditions at the time and paying no attention to past forecasts. But there would be no reason for people believe central-bank speech offered in that spirit.

Hence it is important, under such an approach to policy, that the central bank not merely give thought to the future course of conduct that it would like for people to anticipate, and offer this as a forecast that it would like them to believe. It must also think about how it intends to approach policy decisions in the future, so that the policy that it wants people to anticipate will actually be put into effect, and about

how the fact that this history-dependent approach to policy has been institutionalized can be made visible to people outside its own building. These matters are not simple ones, and require considerable attention to the way the central bank communicates about its objectives, procedures and decisions. The problem is all the more difficult when one must communicate about how an unprecedented situation will be dealt with.

## 2.1 Date-Based Forward Guidance During the Recent Crisis

As mentioned above, the global financial crisis that reached its most intense phase after the fall of 2008 resulted in many central banks slashing their policy rates to their effective lower bounds by early in 2009 (if not even sooner); yet economic activity remained far below potential and unemployment surged. The desire to provide further stimulus to aggregate demand other than through further cuts in the policy rate led to experimentation with a variety of types of “unconventional” policies, including unprecedented uses of explicit forward guidance. In particular, several central banks made statements indicating that they expected to maintain a fixed policy rate for a specific period of time.

A particularly explicit example of forward guidance was the Bank of Canada’s statement on April 21, 2009, which announced the following:

The Bank of Canada today announced that it is lowering its target for the overnight rate by one-quarter of a percentage point to 1/4 per cent, which the Bank judges to be the effective lower bound for that rate.... 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.

While the statement included the announcement of a reduction in the current target rate, it *also* offered explicit guidance about where the target should be expected to be, extending more than a year into the future. The release of the statement had an almost instantaneous effect on market expectations about the future path of the

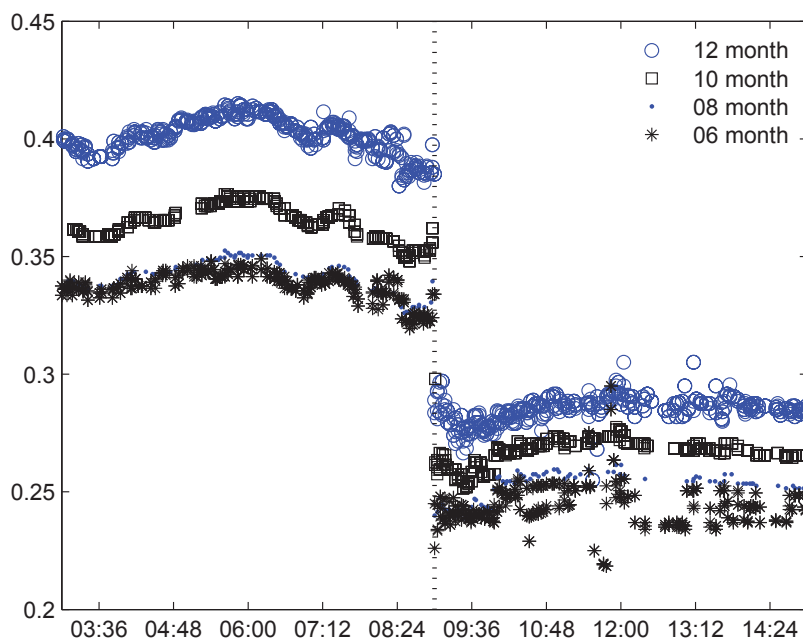


Figure 2: Intraday OIS rates in Canada on April 21, 2009. The dotted vertical line indicates the time of release of the Bank of Canada’s announcement of its “conditional commitment” to maintain its policy rate target at 25 basis points through the end of the second quarter of 2010. Source: Bloomberg.

policy rate, as indicated by trading in overnight interest-rate swap (OIS) contracts (Figure 2).

The tick-by-tick transactions data plotted in the figure show that market OIS rates fell almost instantaneously at the time that the announcement was made (9:00 AM EST, shown by the vertical line). This was evidently an effect of the statement; yet since the statement included the announcement of an immediate target rate reduction, one might wonder if the moves in the OIS rates reflected simply the typical implications of a cut in the current target for rates months in the future, rather than any additional effects of the “conditional commitment.” It is useful to note not only that OIS rates for maturities as long as six to twelve months fall, but that the longer maturities *fall more*; that is, not only does the OIS yield curve fall in response to the announcement, but it *flattens*. This implies either that expectations of policy rates

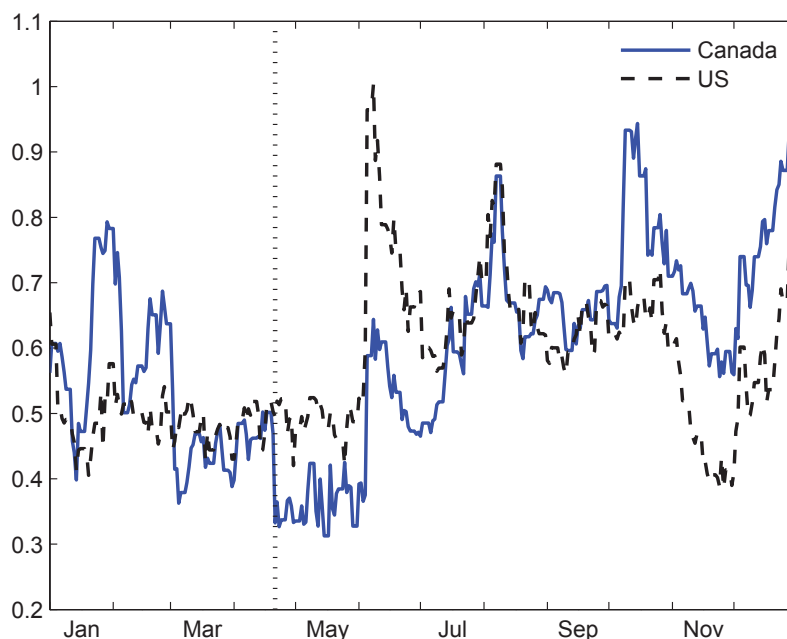


Figure 3: The forward rate (for the period between 6 and 12 months in the future) implied by the term structure of OIS rates (see text for explanation), for both the Canadian dollar and the US dollar, over the course of 2009. The dotted vertical line marks the date of the announcement of the Bank of Canada’s “conditional commitment.” Daily data. Source: Bloomberg.

for months in early 2010 fall even more than do nearer-term expectations, or that uncertainty about the path of the policy rate over the coming year has been substantially reduced (reducing the term premium). Either of these interpretations is a plausible consequence of the Bank’s unprecedented (albeit conditional) commitment to a particular value for the policy rate over the coming year, on the assumption that it is (at least partially) *believed*; neither would be expected to follow from a simple announcement of a cut in the current policy rate, which would typically steepen the yield curve.

The apparent effect on expected future interest rates persisted for at least several weeks following this announcement. Figure 3 plots the path over the course of 2009

of a forward rate  $f_t^{(t+6,12)}$  defined implicitly by the equation

$$(1 + i_t^{(12)})^{12} = (1 + i_t^{(6)})^6 (1 + f_t^{(t+6,12)})^6,$$

where  $i_t^{(n)}$  is the  $n$ -month OIS rate. If the  $n$ -month OIS rate is interpreted as a market forecast of the average overnight policy rate over the next  $n$  months,<sup>25</sup> then  $f_t^{(t+6,12)}$  would correspond to the market forecast of the average policy rate over a time window between 6 and 12 months in the future. The figure shows that this forward rate falls by 10 to 15 basis points on the date of the announcement (shown by the vertical line), and also that it remains at roughly its new level for the next several weeks. Moreover, there is no similar decline in the corresponding US forward rate during those weeks (as Chehal and Trehan, 2009, also note); this suggests that changed expectations about future Bank of Canada policy, rather than news about the economic outlook (which is typically highly correlated with the outlook for the US) are responsible.

This seems a fairly clear example of interest-rate expectations being changed by explicit forward guidance from a central bank. It should not surprise one that the clearest such evidence occurs in the case where a central bank most clearly indicated its intention to provide such guidance — both referring to its statement as having made a “conditional *commitment*”<sup>26</sup> rather than simply offering a forecast, and stating its intention to “provide more explicit guidance” in order to “influence [longer-term] rates.” Yet even in this case, market beliefs do not simply come to accept that the announced path for the policy rate will be followed with certainty. One observes in Figure 2 that while the OIS rates for maturities between 6 and 12 months all fall, the rates for 10 and 12-month maturities do not fall all the way to 25 basis points, even though the announced path involves a policy rate of 25 basis points extending more than 12 months into the future.

One might say that this means that the Bank’s commitment is not completely credible. Actually, the Bank did not purport to make an ironclad commitment; it consistently refers to having made a “*conditional* commitment,” and the conditionality on “the inflation outlook” is clear in the part of the statement quoted above. It appears that, at the time of the announcement, the escape clause was not expected

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<sup>25</sup>This is an over-simplification, as it neglects the consequences of interest-rate risk over that horizon.

<sup>26</sup>The word “commitment” is used in the title of the press release, as well as in the text.

to be invoked with any very great probability within the coming six months, but that a somewhat higher chance of a rise in inflation triggering early termination of the commitment was allowed for over the 12-month horizon.

One also observes from Figure 3 that, during the first week of June the forward rate shot up again, to a level greater than 50 basis points (and higher than in the period before the “conditional commitment”). Since at this point in time, the period to which the commitment applied still included all of the next 12 months, one can only conclude that markets had developed more serious doubts about whether the policy rate would really remain at the floor through June 2010. These seem to have resulted from developments in the US; the figure also shows that the corresponding US forward rate shot up by an even larger amount. The spike in US OIS rates occurred on June 5, 2009, in response to a better-than-expected US Department of Labor report that “raised hopes” that the US economy was “on the road to recovery,” according to the *Financial Times* (Guha *et al.*, 2009), and resulted in “the futures market pricing in at least one rate increase by the Fed by the end of the year,” despite protests by Fed officials that such talk was premature. Traders in Canadian dollar OIS contracts were evidently either skeptical that the Bank of Canada would fail to follow such a move by the Fed, or expected that rapid improvement in the US economy would bring similar consequences for the Canadian economy, and hence a change in the outlook for Canadian inflation. In the latter case, they did not necessarily disbelieve the conditional commitment; but it became less the determinant of their interest-rate expectations, as the likelihood of the relevance of the escape clause increased.

The subsequent experiments of the Federal Reserve with announcements that the federal funds rate was expected to remain at its current floor for a stated period of time similarly had measurable effects on market expectations of the future path of the funds rate, as illustrated for example by OIS rates. As is discussed further in a later section, these statements by the FOMC had less of the character of an announcement of a policy *intention* than was true of the Bank of Canada’s “conditional commitment”; instead, the FOMC was careful only to offer a forecast of what is most likely to occur, given its current information. Nonetheless, these statements as well did seem to move market expectations.

The FOMC began using forward guidance as soon as its effective lower bound for the funds rate target was reached. In its post-meeting statement released on December 16, 2008, it announced that the funds rate target was being cut to what has

thus far been its lower bound, namely a band between zero and 25 basis points (with interest being paid on reserves at a rate of 25 basis points); but the same statement announced that this level of the target was expected to be maintained “for some time.” In its statement of March 18, 2009, this declaration was strengthened (without any change in the target band), to state that conditions were likely to warrant a low funds rate “for an extended period.” (These indications, not specifying an exact time period, were similar in style to the FOMC’s reference, beginning in August 2003, to maintaining accommodation “for a considerable period,” as an alternative to further cuts in the current funds rate target.<sup>27</sup>) A more aggressive form of forward guidance was first adopted in the statement of August 9, 2011, in which the main news was the line: “The Committee currently anticipates that economic conditions ... are likely to warrant exceptionally low levels of the federal funds rate at least through mid-2013.” The forward guidance was further strengthened in the statement released on January 25, 2012, to say “... at least through late 2014.” On September 13, 2012, the date was moved back to “at least through mid-2015,” in addition to other changes in the forward guidance that are discussed further below.

The cleanest tests of the effects of forward guidance are provided by the August 2011 and January 2012 statement releases; not only did these statements both include very precise specifications of a future funds rate path quite far into the future — that in each case made a stronger statement than the Committee had previously been willing to make, and came as something of a surprise — but in these cases, unlike the first two, the statement did not also contain important policy changes of any *other* sort at the same time.<sup>28</sup> Figures 4 and 5 show intraday data for US dollar OIS contracts, on the days that these two statements were released. In each case, there is a clear, immediate effect on expectations of the future path of the funds rate: OIS rates fall, despite the fact that the current funds rate target remained unchanged.

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<sup>27</sup>See Woodford (2005) for discussion of this earlier episode.

<sup>28</sup>The statement on December 16, 2008 had, among other things, announced a substantial cut in the current funds rate target; abandoned the FOMC’s previous practice of announcing a point target, in favor of a band; and announced that the Fed would “purchase large quantities of agency debt and mortgage-backed securities.” The statement on March 18, 2009, had not announced any change in the funds rate target, but specified the amounts of various types of long-term securities that would be purchased. The statement on September 13, 2012 also announced a new, open-ended program of purchases of mortgage-backed securities, and this aspect of the statement attracted the greatest attention in the financial press.



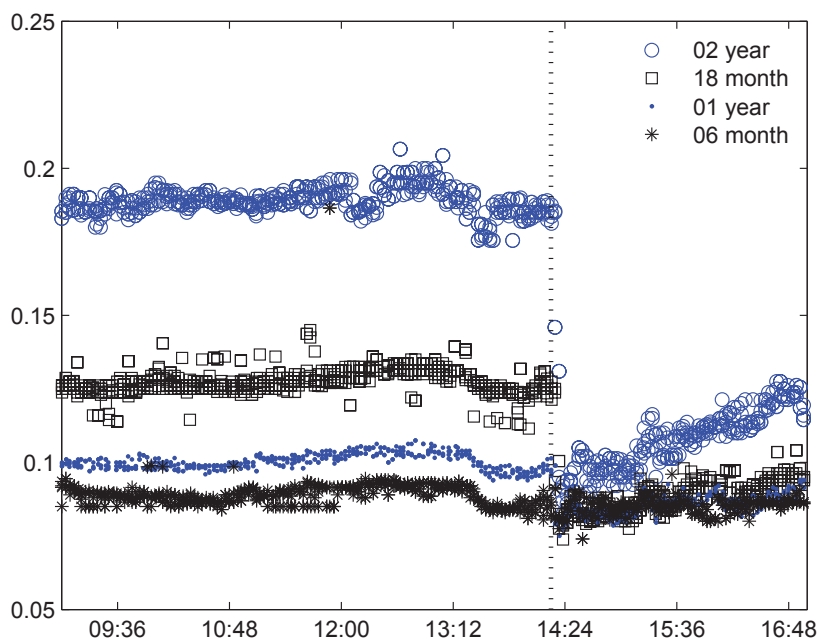


Figure 4: Intraday US dollar OIS rates on August 9, 2011. The dotted vertical line indicates the time of release of the FOMC statement indicating an expectation that the funds rate target would remain unchanged “at least through mid-2013.” Source: Bloomberg.

Moreover, there is a clear flattening of the OIS yield curve in each case. In Figure 4, the 6-month OIS rate is essentially unaffected (it continues to trade in the area of 9 basis points); this makes sense, given that the FOMC had already indicated that its existing target (which had resulted in a funds rate a little below 10 basis points) should be maintained “for an extended period” (evidently taken to mean at least 6 months). Longer-term OIS rates (especially the 18-month and two-year rates) immediately fall, however, to levels barely above 10 basis points; this is what one would expect if market participants believed that the FOMC would with high probability maintain its current target for two years into the future. In Figure 5, the one-year OIS rate (now trading just above 10 basis points) is barely affected; this makes sense, given that the FOMC’s existing forward guidance already extended more than a year into the future (“at least through mid-2013”). The two-year, three-year,

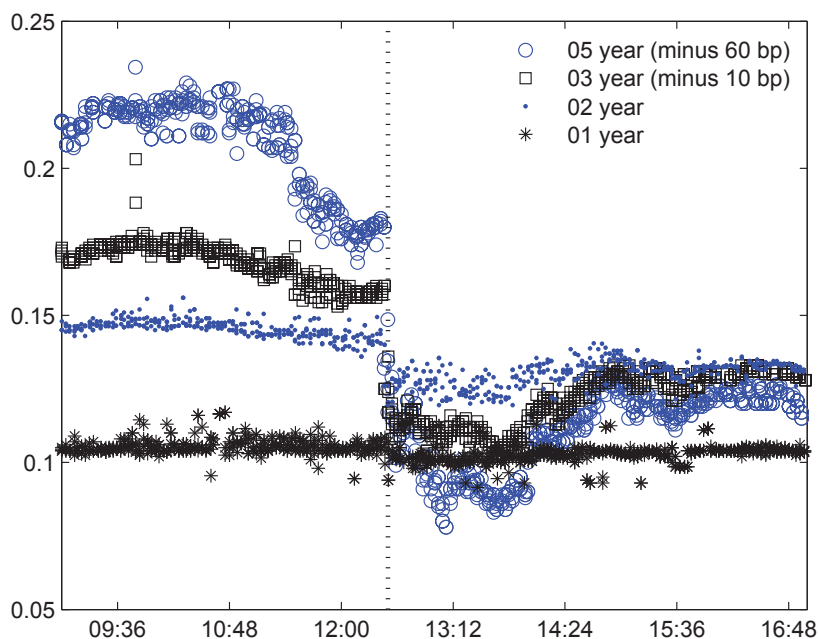


Figure 5: Intraday US dollar OIS rates on January 25, 2012. The dotted vertical line indicates the time of release of the FOMC statement indicating an expectation that the funds rate target would remain unchanged “at least through late 2014.” Source: Bloomberg.

and five-year rates instead immediately decline; these contracts all relate to periods that were not completely covered by the already existing forward guidance, so that the extension of the horizon through late 2014 should have mattered, if believed, for the pricing of these contracts.

It is true that in Figure 5, the two-year and three-year OIS do not fall all the way to the level of the one-year rate,<sup>29</sup> despite the fact that the FOMC now announced that it anticipated maintaining its target unchanged for a period extending nearly three years into the future. Evidently market participants did not attach a 100 percent probability to maintenance of an unchanged target for that long. But as in the case of the Bank of Canada’s forward guidance, one cannot really say that

<sup>29</sup>Note that in the figure, the three-year rate has been shifted down by 10 basis points, in order to show the several series on a single graph. This contract continues to trade at a rate above 20 basis points, contrary to how the figure may appear.

this shows that they did not believe *what they were told*, for the FOMC did not commit itself to maintain the target come what may for that period of time; it stated only that it *anticipated* conditions that would warrant such behavior. (There is a clear implication that not all conditions would.) The statement does seem to have had a definite impact on the expected forward path of the funds rate over a horizon extending years into the future, despite the fact that it was far from an unconditional commitment.

Swanson and Williams (2012) provide a variety of other sorts of evidence suggesting that these announcements had substantial effects on market expectations regarding the future path of interest rates.<sup>30</sup> After the FOMC's introduction of the "mid-2013" language in August 2011, the median forecast of the length of time that the funds rate target would remain unchanged in the Blue Chip survey of professional forecasters jumped from only three to four quarters to seven or more quarters, in accordance with the new FOMC prediction. Moreover, the market pricing of a variety of types of financial instruments also changed after this date in a way consistent with market expectations of a substantially reduced probability of any increase in short-term interest rates over the next few quarters. For example, Swanson and Williams find that the probability of the federal funds rate remaining below 50 basis points several months into the future that could be inferred from daily data on interest-rate options spiked up, and remained between 80 and 90 percent on most days, after the introduction of the "mid-2013" language. They also show that Eurodollar futures prices (for contracts settling several quarters in the future) became much less sensitive to macroeconomic data releases, consistent with a market belief that the path of the federal funds rate would be insensitive to macroeconomic conditions; the sensitivity of longer-horizon contracts to macroeconomic developments was further reduced after the extension of the date to "late 2014." Raskin (2013) extends these results, focusing on the probability distributions for future levels of the federal funds rate at different horizons implied by interest-rate options. He finds not only that the implied probability of a future funds rate below 0.5 percent at horizons a year or more in the future shot up and remained permanently higher after the introduction of the "mid-2013" language, but also that the sensitivity of the distribution of possible future funds rates to macroeconomic news decreased with the introduction of the "mid-2013" language, and again further with the introduction of the "late 2014"

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<sup>30</sup>See also Woodford (2012b) for a more detailed discussion of this evidence than is provided here.

language.

These results provide fairly clear evidence of substantial changes in market expectations regarding the future evolution of interest rates, in the direction of increased confidence that short-term rates would remain close to zero for several quarters. Yet it is difficult — especially in the case of the evidence regarding sensitivity to macroeconomic news, which, because of the method used (essentially, observation of how rolling regression coefficients change over time), cannot localize the changes in beliefs very precisely in time — to be certain that the change in beliefs should be attributed to the FOMC’s statements, rather than simply to market participants’ increasing doubts that conditions would warrant an increase in the funds rate target anytime soon, as a consequence of other kinds of macroeconomic news. And even to the extent that one accepts that the timing of the changes in expectations suggests that the FOMC’s changes in communication policy were an important part of the news, there remains the question whether what this conveyed was *news about the economic outlook* or *news about the FOMC’s approach to the conduct of policy*. I return to this issue in section 2.3 below.

## 2.2 Date-Based Forward Guidance in an Inflation-Forecast Targeting Regime

The examples given in the previous section indicate that central-bank statements can influence the interest-rate expectations of market participants, in the case of central banks (such as the Bank of Canada and the Federal Reserve) that did not ordinarily offer guidance about the likely future path of their policy rates, outside of the unusual circumstances associated with reaching the interest-rate lower bound. But as discussed in section 1, there is a case for the desirability of *routinely* publishing the central bank’s projections of the forward path of the policy rate, as part of an inflation-forecast targeting procedure. If this is done, is there *also* room for forward guidance of the more special kind that the Bank of Canada and the Fed have sought to use, in the case that a bank finds itself constrained by the effective lower bound for its policy rate? The case of Sveriges Riksbank is of particular interest in this regard. As noted in section 1, the Riksbank has since February 2007 included in each issue of its *Monetary Policy Report* a projected forward path for the repo rate (the Riksbank’s

operating target for the overnight rate<sup>31</sup>), which is the ordinary instrument of policy. While in this sense the Riksbank had begun to routinely use forward guidance as a dimension of policy even prior to the global financial crisis, in the aftermath of the crisis the Riksbank has also announced on more than one occasion that its policy rate would remain fixed for a specified period of time, as a substitute for a larger immediate cut in the policy rate — a form of forward guidance with important similarities to the more *ad hoc* announcements discussed in the previous section.

In a review of Sweden’s experience, Deputy Governor Lars Svensson (2010) argues that, through December 2008, the Riksbank had been relatively successful at “managing expectations” through its policy. Often, he notes, market expectations were already fairly close to the announced forward path for the repo rate [the Riksbank’s operating target for the overnight rate<sup>32</sup>] prior to the announcement, which he regards as an indication that the bank had succeeded in conducting a predictable policy and in making the systematic character of its policy evident to the public. “When there were some discrepancies,” he writes, “in most cases the market adjusted its expectations towards the [announced] policy-rate path after the announcement” (p. 48).

The effects of the Riksbank’s more recent experiments with announcements of an anticipated duration for the current repo rate have been more mixed. On April 21, 2009 (a few hours before the Bank of Canada announcement discussed above), the Riksbank announced a cut of the repo rate to 50 basis points, together with a statement that “the repo rate is expected to remain at a low level until the beginning of 2011,” a date nearly two years in the future. The statement was accompanied by the release of a *Monetary Policy Update*, with a projected forward path which showed the repo rate at a constant level of 50 basis points through the end of 2010, as shown in Figure 6.

The figure shows the actual path of the repo rate as a solid black line (a step function); the projected forward path from April onward that was published on April

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<sup>31</sup>It is called “the repo rate” because at one time the bank’s policy was implemented through lending at that rate under repurchase agreements, though this is not currently the case. It now defines the center of a corridor for the overnight rate, 20 basis points in width, maintained by the Riksbank.

<sup>32</sup>It is called “the repo rate” because at one time the bank’s policy was implemented through lending at that rate under repurchase agreements, though this is not currently the case. It now defines the center of a corridor for the overnight rate, 20 basis points in width, maintained by the Riksbank.

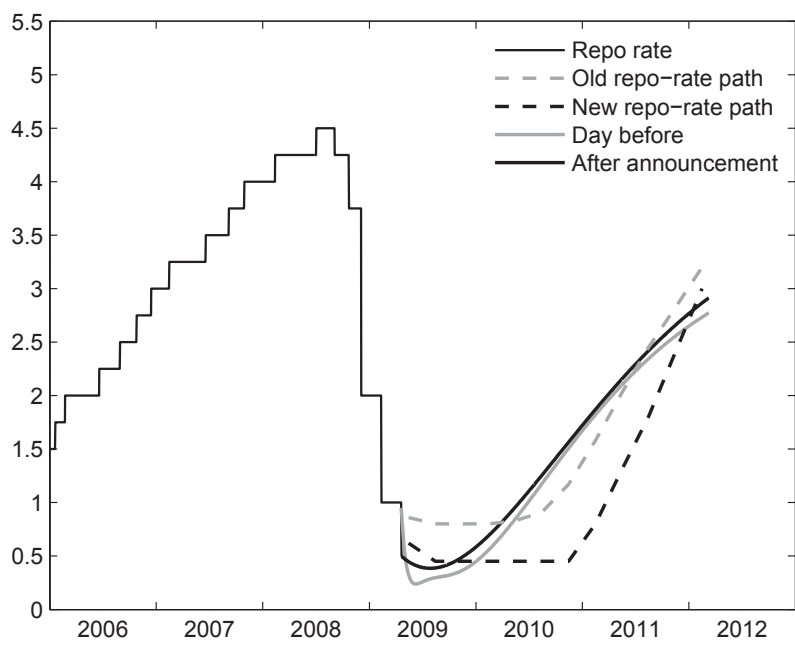


Figure 6: Market expectations of the forward path of the repo rate in Sweden, before and after the Riksbank’s press release on April 21, 2009 that indicated that the repo rate was “expected to remain at a low level until the beginning of 2011.” Source: Sveriges Riksbank.

21; the market expected forward path, as inferred by the Riksbank on the basis of interest-rate forward and swap rates<sup>33</sup> the day before the announcement; and the corresponding market expected forward path after the announcement.<sup>34</sup> Market participants evidently had expected an even larger cut in the repo rate than occurred, and for the repo rate to remain lower, at least for some months, than was indicated by the projected path. In response to the announcement, the market expected path rose, though still remaining lower than the path projected by the Riksbank, for the first few months after April. By early 2010, market participants had anticipated that

<sup>33</sup>See Svensson (2010, footnote 7) for more details. The implied forward rates include corrections for credit risk and maturity premia.

<sup>34</sup>The figure also shows the Riksbank’s previously announced repo-rate path, from February, so as to show to what extent the new path represented a change from the bank’s own most recent forecast.

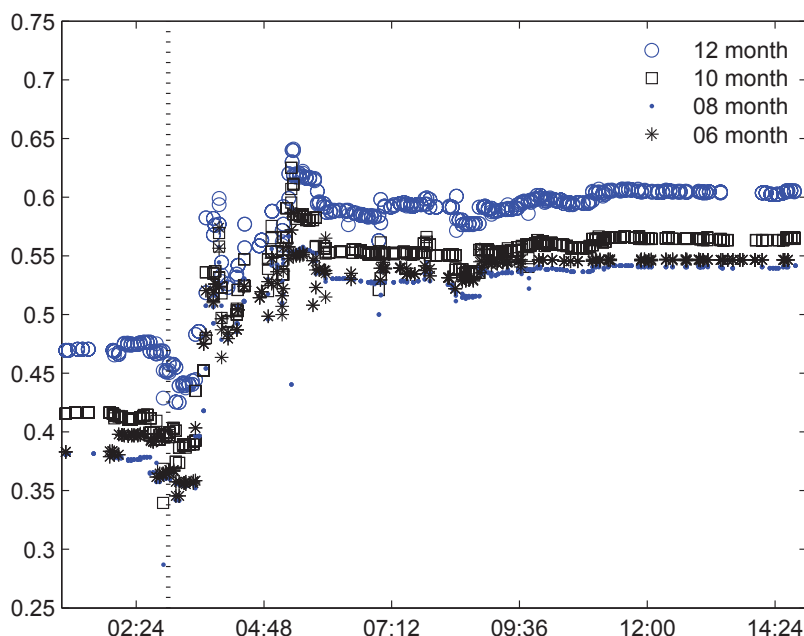


Figure 7: Intraday Swedish OIS rates on April 21, 2009. The dotted vertical line indicates the time of the Riksbank’s press release (9AM in Sweden, or 3AM EST). Source: Bloomberg.

the repo rate would already be rising above 50 basis points, whereas the Riksbank projected it to remain at 50 basis points for another year; but in response to the announcement, the market expected path for 2010 rose still further.

The result is that an announcement that was intended to shift *down* the anticipated forward path of rates, by announcing that a low rate would be maintained until the beginning of 2011, and so to immediately lower longer-term interest rates, had exactly the opposite effect: long rates rose, because the entire anticipated forward path of rates shifted *up*. What went wrong? While many things happened from one day to the next — as noted above, the Bank of Canada introduced its own “conditional commitment” six hours after the Riksbank’s announcement — it seems clear that it was the Riksbank’s announcement that moved market expectations. Figure 7 shows the intraday OIS rates for Sweden on April 21, with the time of the release of the *Monetary Policy Update* shown; the entire term structure of OIS rates moved up

within two hours of the release, and well before any news from North America.

What seems to have happened is that market participants took on board *part* of the Riksbank’s forward guidance, and modified their own forecasts to conform more with it: the projection of a path that never fell below 50 points convinced many that (contrary to prior expectations) the Riksbank would not cut the repo rate below that level. This implied an increase in the projected path for the next two quarters. But since the news, as far as market participants were concerned, was that the Riksbank was less inclined toward interest-rate cuts than they had supposed, the *entire* path was also shifted up.

In fact, the Riksbank’s projected forward path contained *two* notable features: it was announced that the repo rate was projected to remain low for nearly two years into the future, *and*, quite remarkably relative to prior figures, it was projected to remain absolutely constant over that time — the only obvious reason for which would have to have been a decision to treat 50 basis points as the effective lower bound. It is true that the April *Monetary Policy Update* contained no announcement that this was a lower bound; it even referred to “some probability of further cuts in the future.” But as Svensson (2010) notes, it also emphasized that “the repo rate is now close to its lower limit,” and stated that “with a repo rate at this level, the traditional monetary policy has largely reached its lower limit.” Moreover, immediately after admitting the possibility in principle of further cuts, it cautioned: “But when the repo rate is at such low levels, one must consider the fact that this could have negative effects on the functioning of the financial markets.” It is easy enough to see how market participants could have read such remarks as indicating an intention by the Riksbank not to reduce the rate below 50 basis points (at least, under any but exceedingly dire circumstances). Such an announcement would, of course, be precisely the sort that should most affect market expectations: because it was interpreted as revealing something not previously known about the central bank’s *intentions* with regard to policy, rather than the central bank’s judgments about the economic outlook — and so, a matter about which the bank could undoubtedly be regarded as the most knowledgeable authority.<sup>35</sup>

The Riksbank’s other message — that it expected not to raise the repo rate before 2011 — evidently made less of an impression. One reason might have been an assumption that this reflected the Riksbank’s pessimism about the Swedish economy, and

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<sup>35</sup>Nonetheless, the Riksbank did cut the rate further at its July meeting, as discussed below.



market participants might have been more optimistic, and so expected rate increases to be justified sooner than the bank anticipated. Svensson (2010) argues instead that survey data on traders' forecasts of inflation and growth indicate that they were no more optimistic than the Riksbank, and hence that market participants simply did not accept the Riksbank's forecasts about *its own future approach to policy*.

Why might this have been? It is notable that a large (and persistent) discrepancy between the forward paths announced by the Riksbank and those expected by market participants appeared only when the Riksbank began attempting to use projections of a policy rate that would remain fixed for an unusually long time, as a consequence of having reached its (self-imposed) lower bound. One may conjecture that the Riksbank sought, as an alternative to a deeper immediate interest-rate cut, to signal that rates would be kept low for a longer time than would ordinarily have been expected; and this supposition about future policy was incorporated into its projections. But this change in the assumption made about future policy was not credible to market participants, perhaps because no adequate explanation was given of how policy decisions would be made in the future. The mere fact that the Riksbank announced that it projected a low path for the repo rate until 2011 was not enough; market participants needed to have a view of how the Riksbank would make decisions in the future that would justify such a path (given their expectations regarding the economy's evolution), and evidently they were not provided with one.

Similar problems of credibility seem to have persisted since then. In July 2009, the Riksbank announced a further cut in the repo rate, to 25 basis points, but now only indicated that the target was expected to remain at its low level "until autumn 2010." (This might be considered to vindicate skeptics who had not believed the April projection of a low rate through the beginning of 2011.) As shown in Figure 8, this announcement did shift down market expectations of the forward path, but market participants continued to forecast that the repo rate would not remain at that level past the end of 2009, and expected it to be around 100 basis points by autumn 2010. (In fact, it was only raised to 50 basis points in July 2010 and to 75 basis points in September.) This apparent failure to credit the Riksbank's view of the length of time that the target would remain low made policy effectively tighter (in terms of its consequences for longer-term interest rates and hence for spending decisions) during 2009 than the Riksbank's projection assumed it would be.

Once the Riksbank began tightening policy again, market expectations continued

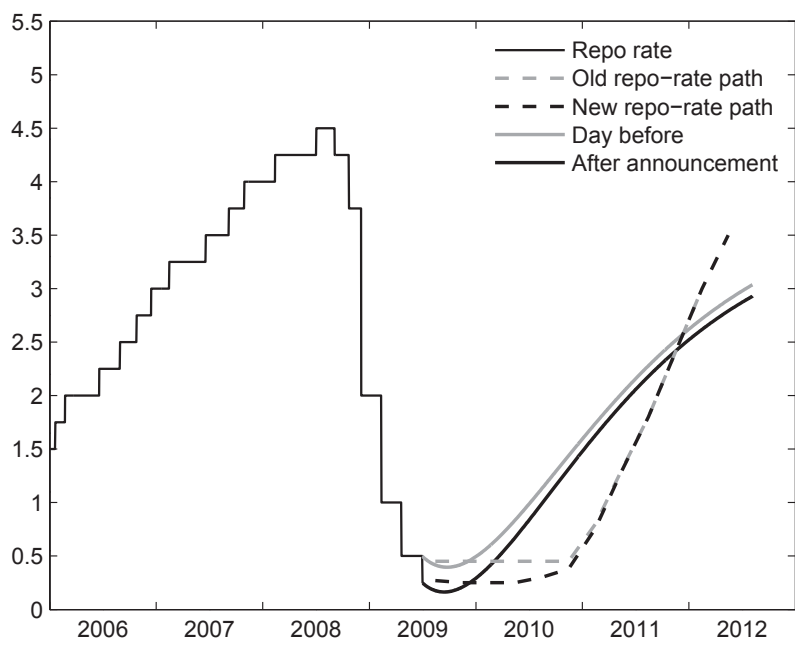


Figure 8: Market expectations of the forward path of the repo rate in Sweden, before and after the Riksbank’s press release on July 2, 2009, announcing an additional cut in the repo rate, and a shortening of the time that the low target was expected to be maintained. Source: Sveriges Riksbank.

to diverge from the Riksbank’s announced forward paths, but now in the direction of anticipating a *lower* future path for the repo rate than the Riksbank. For example, Figure 9 shows the market expected forward paths before and after the Riksbank’s press release on September 7, 2011. In this release, the Riksbank announced that the repo rate target would remain at 2.0 percent, rather than continuing to increase as it had previously projected,<sup>36</sup> owing to deterioration in global growth prospects. However, this was referred to as only a decision to “postpone continued increases somewhat”; the new, lower repo rate path continued to show the repo rate steadily rising over the next three years. Market expectations prior to the announcement had instead been for cuts in the repo rate to begin by later in the year and to

<sup>36</sup>The dashed grey line in the figure shows the repo rate path that had been projected in July, showing a steady series of small increases continuing into 2014.

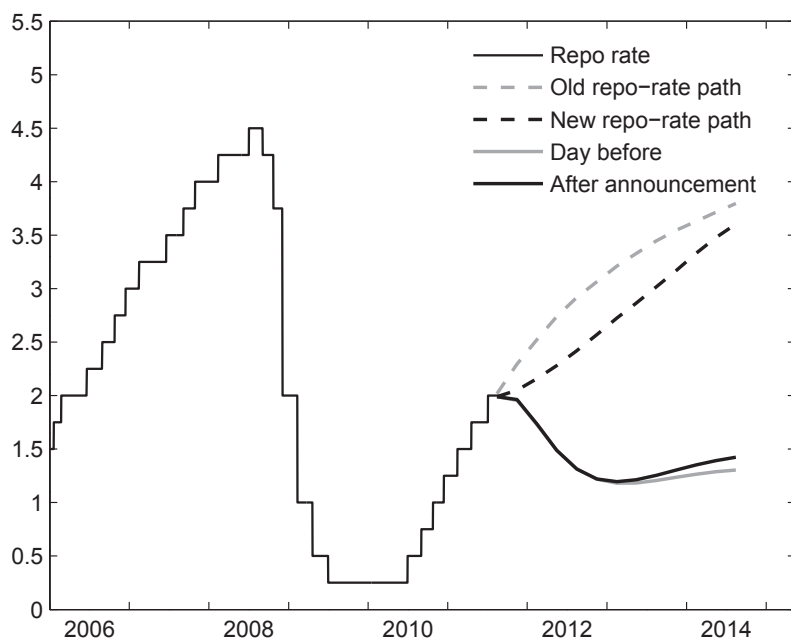


Figure 9: Market expectations of the forward path of the repo rate in Sweden, before and after the Riksbank’s press release on September 7, 2011, announcing a “postponement” of further increases in the rate. Source: Sveriges Riksbank.

continue through 2012; and the Riksbank’s announcement had very little effect on those expectations, despite the reiteration of the Riksbank’s expectation that the repo rate would continue on an upward path. In fact, there were no further target increases, and the timing of the first two target decreases (in December 2011 and February 2012) essentially followed the path anticipated by the markets back in September.

Svensson (2011) provides a variety of possible reasons for market expectations of a lower rate path than the one announced by the Riksbank.<sup>37</sup> These are all reasons why expectations about future economic conditions might plausibly have differed from the Riksbank’s assumptions; for example, he notes that market expectations regarding the future path of US interest rates indicated lower rates than the path assumed by the Riksbank in its projections. Under this interpretation, market participants may

<sup>37</sup>His discussion refers to an earlier stage in the Riksbank’s series of repo rate increases in 2010, when market expectations consistently failed to extrapolate a series of rate increases continuing to as high a level as the path projected by the Riksbank.

have accepted the Riksbank’s forecast of how it would behave *if* conditions evolved as it assumed, but doubted that those conditions would be realized. But an alternative possibility is that market participants did not assign much weight to the Riksbank’s assertions about its future intentions.<sup>38</sup> If so, it is possible that the attempt to use forward guidance more aggressively after April 2009 resulted in a loss of market confidence in the informativeness of the Riksbank’s projections.

Why would statements of an apparently similar form by the Bank of Canada and the Federal Reserve have apparently had effects closer to those that were intended? A possible explanation is that forward guidance outside the context of routine predictions about the future path of interest rates is more easily interpreted as revealing central-bank *policy intentions*. Information about policy intentions is likely to affect the expectations of market participants more than information about the central bank’s view of the economic outlook, because the way in which the bank intends to conduct policy is a matter about which the bank obviously knows more than do outsiders, no matter how closely they follow economic news. And a statement that is viewed as expressing a *commitment*, that by virtue of its having been stated should at least to some extent constrain future policy decisions, should be most informative of all.

The Bank of Canada’s “conditional commitment” in April 2009 seems to have been one of the examples of forward guidance that most clearly changed market expectations, and this is also the case in which a central bank came closest to committing itself to a future course of action. The Bank of Canada did not shy away from using the word “commitment” in its press release, even if this was qualified by the word “conditional,” and the nature of the conditionality was not fully spelled out. Other central banks, such as the Federal Reserve, have not gone as far; the FOMC’s statements have referred only to what the Committee currently anticipates that future conditions will warrant. Yet even in these cases, observers may well have assumed that the unusual announcement made sense only if interpreted as a commitment, and indeed a good deal of commentary interpreted the FOMC’s statements this way (and discussed whether the supposed promise was credible). To the extent that reasons are given for a commitment to make sense — as in the case of the Bank of Canada’s

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<sup>38</sup>An awareness of divisions within the Executive Board may have contributed to such skepticism. Deputy Governors Karolina Ekholm and Lars Svensson have repeatedly dissented from the policy decisions of the majority, in favor of lower repo-rate paths, since July 2010.

explicit reference to its desire to “influence rates” through “forward guidance” — the interpretation as a commitment is also more likely.

Releases of central-bank projections of the path of interest rates, in the context of a more general discussion of the central bank’s forecast of the economy’s evolution over the next few years, are less susceptible to interpretation as a commitment, or even as an expression of a definite intention about future policy that has already been formed. Apart from the fact that the central banks that use this communication strategy take pains to emphasize in the accompanying text that their projections for the policy rate are merely forecasts conditional on current information, the format in which the projections are presented also makes this evident. But to the extent that such projections are viewed simply as following from the bank’s forecast of the economy’s evolution, including a forecast of the evolution of the policy rate given how it is typically adjusted in response to varying economic conditions, then they provide news that should change other market observers’ forecasts of the future path of interest rates *only* to the extent to which they are thought to reflect superior information about the economic outlook that is available to the central bank. Other close observers of the economy may or may not believe this is true; and even when they do believe they can learn something from what the central bank reveals about its information, their own assessment of the best forecast will in general not put a weight of 100 percent on the central bank’s forecast.

I have remarked above that the degree to which market participants have regarded the Riksbank’s projected repo rate path as informative about the likely future path of the repo rate more than a few months into the future seems to have decreased since April 2009, when the target reached a level that the Riksbank was reluctant to go below, and a statement that the target should remain at that rate for a specific (fairly long) time was offered instead of a sharper immediate reduction. This may well have been interpreted as a departure from the bank’s previous practice in the way it produced its projections — but *not*, evidently, because the bank was now interpreted as making a commitment that it could be counted upon to fulfill.

A possible reason for the reduced credibility of the longer-horizon projections at this point is that this was the first occasion on which the announced path reflected a projection of future policy decisions that were *history-dependent* to any significant extent — that is, an assumption about future policy that differed from what one would expect that policy to be simply on the basis of conditions at the time. The

reason why it would be desirable for policy to be expected to be history-dependent, under precisely the circumstances reached by the Riksbank in April 2009, has already been explained above, in section 1: the anticipation *at the time of the binding lower bound* of a lower subsequent repo rate than *would be desirable on purely forward-looking grounds* at the later date could have beneficial (stimulative) effects at the time of the binding constraint, albeit at the cost of less successful stabilization later. This may well be the sort of calculation that led the Riksbank to choose a repo rate path that indicated low rates so far into the future as it did. But in the absence of any intention to actually make policy decisions in a history-dependent way later — or at any rate, in the absence of an explanation of the procedures that would be followed in the future, that made it *credible* that future policy would be made in that way — there would be no reason for market expectations about the future conduct of policy to change.

The Riksbank’s official description of its approach to monetary policy states that “in connection with every monetary policy decision, the Executive Board makes an assessment of the repo-rate path needed for monetary policy to be well-balanced” (Sveriges Riksbank, 2010, p. 14). The document goes on to explain the competing considerations that must be taken into account in such an assessment; there is no suggestion that the exercise is anything but a purely forward-looking consideration, repeated afresh in each decision cycle, of which of the feasible forward paths for the economy from that date onward is most desirable, from the standpoint of a criterion that involves both the rate of inflation (and its distance from the official inflation target of 2.0 percent) and the level of real activity. Indeed, it stresses that the appropriate repo-rate path will be reassessed in each decision cycle, so that “the interest rate path is a forecast, not a promise” (p. 15).

If the model of the economy used in such an assessment of the possible forward paths at a given point in time incorporates forward-looking private-sector behavior — as the Riksbank’s RAMSES model (Adolfson *et al.*, 2007) certainly does — and if the model is solved under the assumption that the projected forward path of the policy rate is anticipated by those forward-looking decisionmakers, then it might easily be concluded that the most desirable forward path at a given point in time is one which assumes history-dependent policy later. This is particularly likely to be the case when the current policy rate is constrained at its lower bound. But in such a case, repetition of the forward-looking exercise at the later date will not result in a decision

to continue the interest-rate path previously projected, *even if there have been no surprise developments in the meantime*; for a forward-looking assessment of “well-balanced policy” at the later date will take no account of the effects of expected policy at that date on decisions expected to be taken in the private-sector earlier, according to the policy projections made at the earlier date.<sup>39</sup>

A purely forward-looking forecast-targeting exercise of such a kind would accordingly be intertemporally inconsistent, as discussed in section 1. This means that there would be no reason for market participants to hold the expectations assumed in the projection exercise, even if they perfectly understand the central bank’s decision procedure. The problem might be that they understand it too well — that they have a more accurate forecast of the way that future policy will be made than the one assumed in the projection exercise.

I do not mean to imply that a time-consistent procedure, that assumes that future policy will be determined in a purely forward-looking way, would necessarily be superior. Such a targeting procedure would be intertemporally consistent, but the equilibrium implemented will generally be suboptimal, from the standpoint of the criterion used by the bank itself to rank possible forward paths. In particular, in a situation where the lower bound on the policy rate becomes a binding constraint, an inability to commit to a history-dependent policy would mean acceptance of a low-output trap, and of the fact that interest-rate policy can accomplish nothing more once the lower bound on the current overnight rate is reached. What is needed in order to achieve a better outcome, despite a correct understanding of the determinants of future policy on the part of market participants, is for the central bank to adopt procedures under which it will indeed implement a history-dependent policy, and then to make its intentions clear to market participants. In fact, it does need to offer a “promise,” and not merely a “forecast” — though the required form of promise need not be a commitment to a specific pre-announced path for the policy rate.

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<sup>39</sup>In discussing this pitfall of a forecast-targeting approach to monetary policy, I do not mean to assert that the approach described is necessarily that of Riksbank. At least some members of the Riksbank’s Executive Board clearly understand the analytical point made here, and approaches to forecast targeting that would institutionalize history-dependence are discussed, for example, in Svensson and Woodford (2005) and Svensson (2005, 2007). It is not clear, however, that current Riksbank policy institutionalizes history-dependence of this sort, and still less that market participants have been given a reason to expect this.

## 2.3 The Federal Reserve’s “Thresholds” for Withdrawal of Policy Accommodation

The Federal Reserve’s approach to forward guidance has changed in important respects over the past year. Rather than the simple date-based approach described in section 2.1, the FOMC’s more recent statements have sought to define the future economic conditions that should determine when a withdrawal of current unusually accommodative measures should begin. A first step in this direction occurred with the FOMC’s statement of September 13, 2012. In addition to extending the date until which the “exceptionally low” federal funds rate target was anticipated to be warranted (“at least through mid-2015”), the statement included new language indicating that “if the outlook for the labor market does not improve substantially,” the Committee would continue its program of MBS purchases, “undertake additional asset purchases, and employ its other policy tools as appropriate until such improvement is achieved in a context of price stability.”

While referring primarily to the conditions under which asset purchases would continue or even be increased, this statement indicated for the first time a specific economic goal that would need to be achieved in order for less aggressively expansionary policies to be appropriate. It also indicated for the first time that “the Committee expects that a highly accommodative stance of monetary policy will remain appropriate for a considerable time after the economic recovery strengthens.” This sentence refers more directly to intentions with regard to interest-rate policy, and also mentions a condition relating to the state of the real economy in connection with the timing of the eventual withdrawal of the current highly accommodative policy.

An even more dramatic change in the forward guidance with regard to interest-rate policy came with the statement released on December 12, 2012, in which the reference to a particular date until which the federal funds rate target would remain unchanged was eliminated, in favor of a discussion of the economic conditions under which it would be appropriate to begin raising it. In addition to again indicating the expectation that accommodation would “remain appropriate for a considerable time after ... the economic recovery strengthens,” the FOMC indicated that it “currently anticipates that [the current] exceptionally low range for the federal funds rate will be appropriate at least as long as the unemployment rate remains above 6-1/2 percent, inflation between one and two years ahead is projected to be no more than a half



percentage point above the Committee’s 2 percent longer-run goal, and longer-term inflation expectations continue to be well anchored.” In addition to these necessary conditions for a withdrawal of accommodation, the statement indicated that the timing would also depend on “other information, including additional measures of labor market conditions, indicators of inflation pressures and inflation expectations, and readings on financial developments.” This reference to particular future economic conditions, and above all the specification of precise quantitative “thresholds” for two variables (the unemployment rate and the inflation projection), has attracted considerable comment, including the directive mentioned in the introduction, requesting the Bank of England to conduct a formal assessment of the possible usefulness of such thresholds within the context of the Bank’s inflation targeting regime.

The FOMC’s move away from date-based forward guidance has much to recommend it. If viewed as an actual *commitment* not to raise the federal funds rate before the stated date, regardless of what might happen in the meantime, such a policy would be far from best — indeed, in the case of a commitment extending two years or more into the future, it could prove quite reckless. It is important to note that this is *not* the type of policy recommended by theoretical accounts of the desirability of forward guidance. Campbell *et al.* (2012) refer to the “late 2014” statement language introduced in January 2012 as implementing “the policy recommendations of Eggertsson and Woodford (2003),” but Eggertsson and Woodford (2003) do not argue for the desirability of a commitment to keep the policy rate at zero for a fixed period of time. They argue for the desirability of a commitment to conduct policy in a different way than a discretionary central banker would wish to, *ex post*, and show that in their New Keynesian model) the optimal commitment involves keeping the policy rate at zero for some time after the point at which a forward-looking inflation-targeting bank (or a bank following a forward-looking “Taylor Rule” would begin to raise interest rates. But the date  $T$  until which the policy rate should be kept at zero is not a date that can be announced with certainty at the time of the shock that causes the zero lower bound to bind; its optimal value depends on how the economy develops.<sup>40</sup>

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<sup>40</sup>In their paper, they illustrate numerically how it should depend on the length of time for which the natural rate of interest remains abnormally low; and they give a more general analytical characterization of the optimal policy commitment that implies that  $T$  should depend on the evolution of cost-push disturbances as well.

The reason for this is simple: the interest rate that will be optimal, simply from the standpoint of its suitability to the conditions that have arisen *ex post*, will generally be state-contingent. An optimal commitment will generally specify a different policy than this, in order to take account of the effects of the anticipation of policy at earlier dates. But, at least to a first approximation, the latter effects depend only on the average level of interest rates that are expected at the later date, averaging over all of the various situations that might arise; so this consideration makes little change in the way in which it is desirable for interest-rate policy to *differ across states* at the later date.

In fact, the FOMC’s date-based forward guidance was never expressed as a commitment in any event; the Committee was careful only to offer statements about what it “currently anticipate[d]” — and indeed, not what it anticipated about future policy decisions, but only what it anticipated that future “economic conditions [were] likely to warrant.” Thus it offered only its own *predictions* of what was coming, with no indication that this represented a *decision* to behave in a different way.<sup>41</sup> It was thus always possible to interpret the FOMC’s announcements about future policy as simply reflecting changes in the Committee’s view of likely future economic conditions, and hence the path of the funds rate that could be expected under their normal reaction function. For example, when the FOMC announced in January 2012 that “the Committee ... currently anticipates that economic conditions ... are likely to warrant exceptionally low levels for the federal funds rate at least through late 2014,” the headline of the *New York Times* online story about the announcement was “Fed Signals That a Full Recovery Is Years Away” (*New York Times*, 2012).

But if an announcement that the date  $T$  at which the policy rate will first rise above its lower bound has moved farther into the future is interpreted as meaning that the first date at which a standard (purely forward-looking) Taylor Rule would require a policy rate above the floor has moved farther into the future because of a weakening of the economic outlook — without in any way challenging the expectation that the bank will, as always, follow such a rule — then the announcement (if also believed) should have a *contractionary* effect on aggregate demand, rather than an expansionary one. For rather than implying that, at a certain point in the future, interest rates will

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<sup>41</sup>This was even more obviously true of the forward guidance provided by the FOMC’s decision to begin including information about individual committee members’ forecasts of the future federal funds rate in the quarterly Survey of Economic Projections.

be held lower than one would have expected prior to the announcement (so that real incomes at that time will be greater than would previously have been expected, and likely inflation as well), the announcement would instead imply that real incomes at that time will be *lower* than would previously have been expected (and likely inflation as well) — which change in anticipations should reduce current willingness to spend rather than increasing it. Forward guidance of this kind would have a perverse effect, and be worse than not commenting on the outlook for future interest rates at all.

The only way to avoid this pitfall is to accompany any discussion of the forward path of interest rates with an explanation of the considerations behind it — in particular, of the policy commitments that the anticipated forward path reflects. Discussion of the forward path of interest rates implied by a central bank’s policy commitments may well be useful, as discussed in section 1. But this does not mean that presentation of the implied forward path for interest rates suffices as an explanation of the bank’s policy commitments.

The new form of forward guidance used in the FOMC’s statements since September 2012 represents an important step in this direction, by providing information about the *economic conditions* that will need to be observed in order for the removal of policy accommodation to begin. A discussion cast in these terms is more likely to be understood as a *commitment*, and not a mere *forecast* of future conditions, and also represents a more reasonable form of commitment to make. In addition, the explicit statement in September that low rates would “remain appropriate for a considerable time after ... the economic recovery strengthens” sought to counter the interpretation that moving the anticipated “lift-off” date back to “mid-2015” represented merely increased pessimism about the timing of the recovery, and also provided, for the first time, at least an oblique indication of a decision to behave differently than the Committee’s usual reaction function would have dictated. The more specific quantitative criteria included in the December 2012 statement, together with the abandonment of any reference to a particular “lift-off” date, made both the state-contingency of the new guidance, and the extent to which it represented a shift in the reaction function relative to previous policy, even more evident.

Because of the wide attention that this development has received, it is worth commenting on the general desirability of the particular formulation chosen by the FOMC for its new form of forward guidance. The reference to a quantitative “threshold” for the unemployment rate is the feature that has attracted the greatest comment, with

some presenting this as a repudiation of an inflation-targeting approach. But I do not believe that reference to an explicit quantitative target that involves the real economy, as opposed to one that refers *only* to the path of some general price index, should be viewed as incompatible with inflation targeting.

As discussed in section 1, the specification of a definite (and non-time-varying) medium-run target for inflation does not in itself suffice to determine how short-run policy decisions should be made, or how they should be expected to be made in various future contingencies; and in my view, a fully-specified inflation forecast-targeting procedure — one that actually makes it possible for the central bank to publicly justify its policy decisions by explaining how they are dictated by its policy targets — requires the medium-run inflation target to be supplemented by an intermediate *target criterion* to determine the short-run policy decision at each decision point. Given an objective for policy that takes into account real stabilization goals alongside the goal of inflation stabilization,<sup>42</sup> and the fact that a tradeoff between inflation and real activity does exist in the short run, a desirable intermediate target criterion will involve some measure of real activity or employment, rather than being a function of inflation or a price index alone. The “output-gap-adjusted price level target” proposed by Eggertsson and Woodford (2003) provides an example; the nominal GDP level target path proposed by Woodford (2012b) is another.

A commitment to an intermediate target criterion other than a pure inflation target need not undermine the credibility of a central bank’s claim to conduct policy so as to ensure a definite (and unchanging) medium-run rate of inflation. The intermediate target criterion can (and in my view should) be chosen so as to *imply* a definite long-run rate of inflation, equal to the inflation target, and should furthermore imply that inflation should be expected to return to the vicinity of the target over the span of a few quarters except under highly unusual circumstances. A target criterion of the form (1.10), for example, where the target path  $p_t^*$  grows linearly at the rate  $\pi^*$  (the constant inflation target), has the property that if (1.10) is expected to hold at all times, then the fact that the output gap is not expected to be different from zero

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<sup>42</sup>Most inflation targeting central banks are clearly expected to take such additional objectives into account, even if they have not been spelled out as precisely as the inflation target has been. In the case of the Federal Reserve, the fact that the goal of “maximum employment” is assigned the same status as “price stability” in the Federal Reserve Account makes it even clearer that concern for the real economy is appropriate under the form of flexible inflation targeting practiced by the Fed.

on average in the long run, independently of monetary policy, will necessarily imply that in the long run, the log price index  $p_t$  should also be expected to grow at the rate  $\pi^*$ . (Even supposing, more realistically, that the central bank will not be able to ensure that (1.10) holds exactly at all times, the conclusion will still follow as long as it is understood that the central bank is committed to prevent discrepancies between the left and right-hand sides of (1.10) from persisting for too long a time.)

As noted above, a nominal GDP level path target, defined by (1.15), is just a special case of this; hence the same argument applies to a target criterion of this latter form. Moreover, even if the term  $y_t^n$  in (1.15) is replaced by some other estimate of the potential output trend, as long as the discrepancy between the estimate of potential that is implicit in the NGDP target path will not differ from the actual natural rate of output by an amount that is allowed to *grow cumulatively* over the long run, commitment to the NGDP target path should imply that the long-run inflation rate will necessarily equal  $\pi^*$ .

The kind of thresholds announced by the FOMC are not obviously inconsistent with the Fed's long run inflation target (announced in January 2012, and reaffirmed in January 2013), either. First, the announced thresholds are meant to determine policy only until "liftoff" from the current near-zero level of the federal funds rate occurs; they do not specify how interest-rate decisions will be made thereafter, and so are consistent with an expectation that policy thereafter will be conducted in a way that ensures an average inflation rate of 2 percent per year. Second, even the specification of the economic conditions required to consider raising the funds rate target refers explicitly to "the Committee's 2 percent longer-run goal" for inflation, and indicates that rates could be raised (even with unemployment still above 6-1/2 percent) if inflation is projected to be too far above that rate (or if inflation expectations are too far out of line with the target).

Nonetheless, the kind of thresholds adopted allow more grounds for doubt about the FOMC's long-run policy intentions than was necessary. First, the short-run policy regime that has been announced appears to represent a break from the guidelines used to make decisions about interest-rate policy in the recent past; but the fact that the reaction function can evidently suddenly change — with no need to justify the new rule as following from the same principles as had underlain past policy, but applied in a different situation than those confronted in the past — might reasonably create doubts about how suddenly and how soon other new policies could be announced in

the future.

Second, the new short-run regime is not specified with sufficient completeness for it to be clear how large a cumulative increase in prices might be allowed before the return to a more standard approach to policy. It is true that the FOMC only states that the near-zero federal funds rate will be maintained as long as projected inflation remains below 2.5 percent; but it does not actually commit to *raising* rates in the event that this threshold is breached, it simply does not commit *not* to raise them in that case. Because *two* thresholds are specified — one for the unemployment rate and one for the inflation projection — as determinants of a single decision, it is unclear what should be expected to happen in the event that the two indicators give opposite signals — that is, if the inflation projection were to exceed 2.5 percent while unemployment remains well above 6.5 percent. To the extent that one fears that the FOMC would find it difficult to tighten policy while unemployment remained above the announced threshold, after having offered a precise numerical benchmark, one would have reason to fear a scenario under which inflation could be allowed to run above the long-run target rate for a considerable period or to a considerable extent, as a result of a mis-judgment of the current location of the natural rate of unemployment.

An alternative approach would have had significant advantages on these dimensions. The FOMC might instead have committed themselves to maintain a federal funds rate near zero as long as the level of nominal GDP continues to fall short of a target path, while explaining that they would raise the federal funds rate target when necessary to prevent NGDP from overshooting that path; thereafter, they could explain, the funds rate would be managed so as to keep NGDP close to the path. The target path might be chosen in accordance with (1.15); that is, the target path for the log of NGDP could be chosen to equal the log of the FOMC's estimate of the path of potential real GDP, plus a nominal factor that grows deterministically at a constant rate corresponding to the long-run inflation target. The initial level of the nominal factor could be chosen so that the announced target path would represent a continuation of the path of nominal GDP prior to the crisis — that is, prior to the point at which it ceased to be possible for the Fed to keep nominal GDP on its prior trend path using its normal procedures.

Figure 10 illustrates what such a target path might look like, under the current situation of the US economy. The target level shown is equal to the Congressional

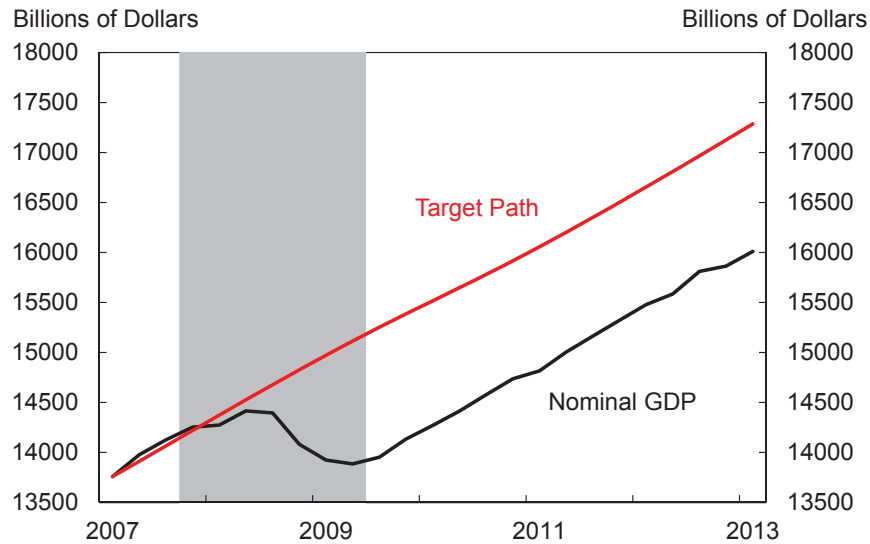


Figure 10: US nominal GDP compared with a target path based on the CBO estimate of potential real GDP, as explained in the text. Source: Bureau of Economic Analysis and Congressional Budget Office.

Budget Office’s 2012 estimate of the path of US real GDP, plus a nominal factor growing at a constant rate of 2 percent per year, with the intercept chosen so that the nominal GDP target exactly equals actual nominal GDP in the first quarter of 2007, the last quarter in which real GDP was (according to the CBO) at potential, and one prior to the sharp drop in nominal GDP relative to its previous trend — hence a quarter in which one might suppose that the FOMC achieved a level of nominal expenditure reasonably close to the one that it desired. (The initial level of the target path might be determined in a different way, for example so as to splice the target path going forward with an estimated trend for the years immediately prior to the crisis, without materially changing the message of Figure 10.)

One observes that since the onset of the financial crisis, nominal GDP has fallen well below this target path, and continues to run below it — still about 8 percentage

points below as of the first quarter of 2013, with little sign that the gap is closing.<sup>43</sup> Hence a commitment to maintain the federal funds rate near zero until this gap is closed would imply that the funds rate target would not be increased anytime soon; indeed, a substantial acceleration of the growth rate of nominal GDP would be required in order for the funds rate to be raised before the end of 2015, as currently expected by most members of the FOMC (Federal Open Market Committee, 2013).

At the same time, it would also achieve the other goal of the FOMC's thresholds, namely, placing a bound on the amount of inflation that the policy might turn out to involve, by strictly limiting the cumulative nominal growth that would be allowed. To the extent that one expects that eventually, real GDP must return to the path of potential estimated by the CBO — which must almost certainly be the case, if the CBO's estimate of potential is correct — then the *cumulative* inflation resulting from the policy, integrating forward from 2007Q1, can be no more than two percent per year. Greater inflation would be possible if the CBO's estimate turned out to be incorrect, and the target path were not adjusted in response to the changed estimate of potential; but even then, the number of percentage points of cumulative growth in the price level that could result would be limited by the number of percentage points by which the CBO has over-estimated potential, and this would be unlikely to be large.

At the same time, this alternative form of intermediate target would avoid the disadvantages of the FOMC's thresholds cited above. Because a threshold for a single variable (albeit one that involves *both* the general level of prices and the real economy) would be offered as the criterion for determining when it is appropriate to tighten policy, the criterion offered would be more complete, and so would allow less ambiguity to remain — both about how much nominal growth might be allowed for the sake of the FOMC's goals for the real economy, and about whether policy might be tightened prematurely owing to an inflation scare. It ought to have a particular advantage in bounding uncertainty about future inflation, because it would involve a commitment to a nominal *level* variable, rather than only a growth rate; hence the policy would ensure that *actual* nominal growth would be limited, and not merely the amount of growth that was *forecasted* some years in advance.

And if the NGDP level path were determined in the way proposed above, it would

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<sup>43</sup>The cumulative decline in the gap has been less than 0.8 percentage points since 2009Q4, a rate of convergence of less than a quarter of a percentage point per year.



be possible to present the policy as simply extending the principles that have guided FOMC policy in the past to novel circumstances, rather than a break with past policy; the temporary period of unusually accommodative policy would be justified by the fact that nominal GDP had been allowed to fall below its previous trend path to an unusual extent. Even more importantly, the policy announced for the next few years would be completely consistent with the policy that the FOMC would also want the public to anticipate will be followed farther in the future. The near-term commitment would be to increasing nominal GDP fast enough to return to the target path; but since the target path is chosen to be one that, if followed for a period of years, would guarantee an average inflation rate near the declared long-run target rate, an expectation that the FOMC would continue to make interest-rate policy on the basis of that target path would be fully consistent with what the FOMC has said about its longer-term policy intentions.

Thus the particular form of thresholds adopted by the FOMC are not obviously ideal, even as a solution for the special circumstances currently facing the Fed, and under the institutional constraints resulting from the Fed's history, legislative mandate, and declared policy commitments. It is even less apparent that they should be adopted by other inflation-targeting central banks, in the case that they find themselves constrained by an effective lower bound on their policy rate. As I have argued above, a bank that seeks to practice inflation-forecast targeting needs in any event an intermediate target criterion as a basis for the forecast-targeting exercise through which short-term policy decisions are made, and this criterion should be one that is consistent with — indeed, the consistent pursuit of which should imply achievement of — the bank's inflation target in the medium-to-long run. (A fixed target for the unemployment rate, for example, would thus be unsuitable as a proposal of this form.) And if the target criterion that is adopted has the right form — specifically, if it specifies a target path for the level of some nominal variable and not merely the projected rate of growth looking forward from each date — there will be no need to change its form in response to a series of target misses owing to a binding interest-rate lower bound. A commitment to a target criterion such as a nominal GDP level path would already solve the problem which the FOMC's thresholds are intended to address, so that there would be no advantage to an introduction of temporary, *ad hoc* thresholds as a modification of the standard forecast-targeting procedure.

### 3 Conclusion

Inflation-targeting central banks have been notable for the amount of information that they provide to the public, not only about their longer-run goals, but about the way in which they expect to conduct policy in the future in order to achieve those goals. For reasons discussed above, I regard this development as a positive one. Greater clarity within the policy committee itself about the way in which policy is expected to be conducted in the future is likely to lead to more coherent policy decisions, and greater clarity on the part of the public as to how policy will be conducted is likely to improve the degree to which the central bank can count on achieving the effects that it intends through its policy. The value of this dimension of policy has become all the more apparent under the conditions recently encountered by many central banks, in which they have found themselves constrained by an effective lower bound on their policy rates.

But while the procedures developed by inflation-targeting central banks over the first two decades of inflation targeting represent important advances in the practice of central banking, and while important progress has been made over the course of that period — especially by methodological innovators like Sveriges Riksbank and Norges Bank — there remain dimensions on which the practice of inflation-forecast targeting could still be improved, relating to the degree to which explicit guidance is given about the way in which future policy decisions will be made. Two of these are of particular importance: the adoption of a more explicit intermediate target criterion to guide short-term policy decisions, that would explain how the projected effects of monetary policy on the real economy are traded off against its projected effects on inflation, and the introduction of a commitment to error-correction into the forecast-targeting procedure, by targeting the cumulative growth in a nominal variable (such as nominal GDP), rather than only its expected growth rate looking forward.

In my view, such changes could be viewed as a completion of the program of flexible inflation targeting, making the meaning of the central bank's policy commitments more explicit and enhancing the transparency of decisionmaking, rather than a modification of the objectives of policy, or even a fundamental change in the basic approach. Nonetheless, I believe that they would go a considerable way toward answering many of the critics who argue that inflation targeting has failed as an

approach, and should be replaced. In particular, they would address two important difficulties exposed by recent developments. The first is the observation that in countries where (implicit or explicit) inflation targeting has achieved considerable stability of the inflation rate over the past two decades, even large variations in the output gap now seem to result in only mild changes in inflation or in inflation expectations; but this raises doubts about whether success in containing inflation and inflation expectations within acceptable bounds should be considered sufficient grounds for regarding monetary policy as successful. Some would draw the conclusion that inflation targets should be abandoned. The adoption of an intermediate target criterion, such as a target path for nominal GDP, that is however chosen to be consistent with (and indeed to deliver) the target inflation rate over the medium run, can address this objection, by providing a basis for short-run policy decisions that clearly would not ignore the level of real activity, while nonetheless retaining the focus on delivering a particular inflation rate over the medium run.

The second difficulty is the possibility that policy can be constrained by an effective lower bound on the policy rate. An expectation that the central bank will remain committed to a strict inflation target limits its ability to create the sort of expectations about future policy that provide the only channel through which interest-rate policy can provide additional macroeconomic stimulus in such a situation (as emphasized by Krugman, 1998); hence some would argue that the recognition that such a situation can arise in practice, and not only in theory, is a ground for abandoning inflation targets. But if inflation targeting is implemented through a commitment to a target path for the level of nominal GDP (or a similar nominal level variable), then a period of persistent target shortfalls owing to the binding lower-bound constraint on policy will require (and should be expected to require) a period of unusually aggressive easing to catch up with the target path again. Thus it should automatically create the kind of expectations regarding future policy that Krugman (1998) and others have called for, but without requiring even a temporary abandonment of standard policy targets. If the practice of inflation-forecast targeting is developed in this way, there will be less reason to doubt its suitability as an approach to the conduct of monetary policy adequate to the challenges of the twenty-first century.

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