The Instrument-Rate Projection under Inflation Targeting: The Norwegian Example*

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1. Introduction

Inflation targeting was introduced in New Zealand in 1990 and has since been adopted by more than 20 countries. This period of only 15 years has seen major progress in practical monetary policy. The practice of inflation targeting has led to a more systematic and consistent internal decision process (Brash 2000; Sims 2002; Svensson 2001a), much more transparent communication with the private sector (Blinder et al. 2001; Fracasso, Genberg, and Wyplosz 2003; Leeper 2003), and an unprecedented degree of accountability. The actual monetary and real stability achieved is exceptional from a historical perspective (King 2002).

Recent debate has focused on the instrument-rate assumption underlying projections of inflation and other target variables. The issue can be separated into what instrument-rate assumption is appropriate in the internal decision process and to what extent this instrument-rate assumption should be published.

With regard to the *internal decision process*, the instrument-rate assumption under which projections of the target variables are made has received considerable attention. Several central banks have used the assumption of a constant instrument rate during the entire forecast horizon. This is very problematic for several reasons. (See, for instance, Archer 2004, 2005; Bean 2004; Goodhart 2001; Heikensten 2005; Honkapohja and Mitra 2003; Leitemo 2003; Lomax 2005; Svensson 2003a; and Woodford 2005.) A few central banks have shifted to the assumption of an instrument-rate path given by market expectations of future instrument rates. This is a considerable improvement but is arguably not the best alternative.

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Furthermore, central banks normally make explicit decisions and announcements only about the current instrument rate and its level during the period until the next monetary policy decision. However, the current instrument rate matters very little for the central banks' internal projections. What matters for those projections is the *entire* instrument-rate path assumed. Similarly, the current instrument rate matters very little for private sector decisions and the economy. What matters are private sector expectations about the entire future path of the instrument rate. These expectations feed into the yield curve and thereby affect longer interest rates and asset prices, which do affect private sector decisions. The current central bank decision and announcement actually matter only through the private sector expectations of the path of future instrument rates that they give rise to. This means that, when the central bank decides on a particular current instrument level, implicitly it decides and announces an expected future instrument-rate path; that is, an instrument-rate plan. For these reasons, I believe that substantial progress can be made if central banks think explicitly in terms of entire instrument-rate plans and corresponding projections of target variables and develop a decision process where the central bank explicitly chooses such an instrument plan. Indeed, the decision process should be designed so as to end with an optimal instrument-rate plan and a corresponding optimal projection of the target variables—a projection of the instrument rate and the target variables that minimizes the central bank's loss function.

With regard to the possible *publication of an instrument-rate path*, inflation-targeting central banks typically publish their internal projections of their target variables (although some may publish projections of output or output growth rather than the output gap). When these projections are based on an assumed instrument-rate path that differs from the optimal instrument-rate plan (especially when there is no explicit optimal instrument-rate plan), the resulting projections are not the best forecasts in the sense of minimizing expected squared forecast errors. The projections are biased one way or another. Hence, they are not the best information for the private sector. Since monetary policy has an impact on the economy via the private sector expectations of inflation, output, and interest rates that it gives rise to, announcing the optimal projection (including the instrument-rate projection) and the analysis behind it would have the largest impact on private sector expectations and would be the most effective way to implement monetary policy. Since the optimal projection is the best forecast in the sense of minimizing expected squared forecast errors, it also provides the private sector with the best aggregate information for making individual decisions. Announcing the optimal projections also allows the most precise and sophisticated external evaluation of the monetary policy framework and decisions. Therefore, I believe that substantial progress can be made if inflation-targeting central banks publish and explain optimal projections, including the optimal instrument-rate plan.

The Reserve Bank of New Zealand is the pioneer not only in inflation targeting but also in introducing and publishing explicit instrument-rate paths that can be interpreted as optimal instrument-rate plans. The bank has done so since 1998 (Archer 2004, 2005; Svensson 2001a). The Reserve Bank has for many years been alone in taking this bold step. However, Norges Bank, an enthusiastic and competent newcomer to the inflation-targeting camp, has recently started to publish explicitly optimal instrument-rate paths with uncertainty bands, together with criteria for optimal inflation and output-gap projections and other innovations in transparent

monetary policy (Norges Bank 2005; Qvigstad 2005). This should be an example to other central banks.

Section 2 discusses the instrument-rate assumption, and Section 3 discusses transparency and communication issues. Section 4 presents the Norwegian example. Section 5 presents some conclusions.

2. The Instrument-Rate Projection

Because of lags in the transmission mechanism between monetary policy actions and effects on the economy and the target variables, good monetary policy must be forward looking and rely on projections of the target variables. Before the instrument-rate decision, the Monetary Policy Committee (MPC) is normally presented with a number of alternative projections of the target variables, conditional on alternative assumptions about the state of the economy, the development of various exogenous variables, the transmission mechanism, and so forth.[1] In particular, those projections are conditional on some assumption about the instrument-rate path; that is, the instrument-rate projection.

The decision process results in a decision about the level of the instrument rate for the immediate future. Implicitly or explicitly, however, this decision is actually about an instrument-rate plan. The optimal instrument-rate plan is the instrument-rate plan that results in an optimal projection of the target variables, the projection that minimizes the intertemporal loss function. This projection is also the best forecast, in the sense of minimizing expected squared forecast errors.[2]

2.1 The instrument-rate assumption underlying projections of the target variables

Traditionally, several inflation-targeting central banks have used projections based on an assumption of a constant instrument rate (CIR) over the forecast horizon. If then, everything else being equal, the inflation projection is higher (lower) than the inflation target at some given horizon, usually about 8 quarters, this has been interpreted as indicating that sooner or later the instrument rate needs to be raised (lowered).

1. I use *Monetary Policy Committee* (MPC) as the generic term for the monetary policy decision-making body of a central bank, even when the bank has a single decision maker.

2. I use the following terminology: *Feasible* projections (or the set of feasible projections) are the (mean) projections of the instrument rate and the target variables that are consistent with the central bank's information; more specifically, its estimate of the state of the economy, view of the transmission mechanism, and forecast of exogenous variables. The *optimal* projection is the central bank's preferred feasible projection of the instrument rate and the target variables; that is, the feasible projection that best achieves the central bank's objective. More specifically, the optimal projection is the feasible projection that minimizes the central bank's intertemporal loss function. The *best forecast* is the projection that best predicts the actual future path of the variables in question; more precisely, the projection that minimizes expected squared forecast errors. A *conditional forecast* is a projection that minimizes expected squared forecast errors subject to some particular assumption, such as a particular path of the instrument rate. The *unconditional forecast* is the best projection given available information, including information about monetary policy. Therefore, the unconditional forecast is the same as the best forecast.

However, there are numerous problems with the CIR assumption.[3] These problems include:

- A CIR is often unrealistic. This implies that the resulting projection of inflation and the output gap is unrealistic and is not the best forecast of future inflation and the output gap. This, in turn, makes it difficult and misleading to compare these projections with those of other forecasters, since those forecasters normally would assume more realistic underlying instrument-rate paths. It also makes it difficult and misleading to compare the projections with actual outcomes and in this way assess the forecast performance of the central bank.

- A CIR often differs from market expectations of future interest rates (ME). Current asset prices, such as exchange rates, stock-market prices, bond prices, house prices, and so forth, depend on these market expectations. Typically, the current market prices of these assets are used as inputs in central bank projections rather than the hypothetical asset prices that would result if market participants actually expected a CIR. Hence, the central bank projections end up using many inputs that are inconsistent with the CIR, making the projections themselves inherently inconsistent and misleading. Put differently, they are not consistent CIR projections but a mixture of projections based partly on the CIR, partly on ME.

- When ME differ from the CIR, central banks typically would not like ME to adjust towards the CIR. If that would happen, it might result in drastic and unwelcome changes in asset prices. Hence, central banks using CIR projections would normally not like the private sector to take the CIR assumption seriously.

- For a CIR, most projection models are unstable, and for a longer horizon the inflation and output-gap projection tends to increase or decrease at an increasing rate, making longer-term projections more or less useless. This has induced central banks to avoid plotting such projections for longer horizons, so as not to display the problems with CIR projections too openly. Projection models with forward-looking variables are indeterminate for a CIR. Determinacy is then restored by the assumed shift to some endogenous instrument setting in the form of an ad hoc reaction function beyond the forecast horizon. That shift is then often associated with a drastic and awkward jump in the instrument rate, and the projection for shorter horizons depends on the assumed future endogenous policy. Alternatively, the projection model assumes that the instrument rate follows some determinacy-inducing ad hoc reaction function, but unanticipated shocks to the instrument rate make it constant for many quarters.[4]

For these reasons, the CIR assumption for projections is inherently problematic and confusing. Since there are better alternatives, it should be abandoned sooner rather than later. Several

3. These problems are detailed in Archer (2004, 2005); Bean (2004); Goodhart (2001); Heikensten (2005); Honkapohja and Mitra (2003); Leitemo (2003); Lomax (2005); Svensson (2003a); and Woodford (2005).

4. See Leeper and Zha (2002) for a formalization of this idea with an estimated reaction function; the shocks are, in practice, assumed to be unanticipated and not to affect market expectations, although they will be conspicuously serially correlated for many quarters.

central banks have, indeed, abandoned the CIR assumption (Norges Bank, the Bank of England, and Sveriges Riksbank, for instance). The Reserve Bank of New Zealand has used projections based on a time-varying instrument-rate path for many years.

A first alternative to a CIR for the instrument-rate assumption is using the market expectations of future instrument rates (ME), where these are normally identified with forward interest rates implied by the yield curve. The Bank of England and the Riksbank use ME for their projections. ME have several advantages:

- ME are usually more realistic than the CIR, depending on the market's understanding and prediction of future instrument-rate decisions. This makes projections based on ME better forecasts of future instrument-rate decisions than CIR projections.

- Since current asset prices are conditional on ME, using current asset prices as inputs in the projections does not cause any apparent inconsistency, in contrast to what is the case for CIR projections.

Thus, ME projections are much better than CIR projections. However, using ME may be problematic if the ME are strange in some way or deviate substantially from the central bank's preferred instrument-rate plan—a situation that would indicate either a credibility problem or differences between the private sector and the central bank in their view of the state of the economy or the transmission mechanism. In such situations, the central bank may want to use ad hoc adjustments of the instrument-rate projection implied by ME. Furthermore, ME would normally not be identical to the central bank's explicit or implicit instrument plan, and the projections based on ME therefore would normally not be the best forecast, the forecast that minimizes expected squared forecast errors. Woodford (2005) provides more detailed criticism of ME.

In particular, although private sector expectations are a natural and important input in central-bank projections, it is important that they are only one set of inputs among many, and that the central bank does not respond mechanically to private sector expectations that, in turn, depend on the central bank's response. As Woodford (1994) and Bernanke and Woodford (1997) show, a mindless mechanical response to private sector expectations may lead to indeterminacy and a loss of the nominal anchor. The central bank must lead and influence market expectations, not mechanically follow them.

A second alternative for the instrument-rate assumption is an ad hoc reaction function for the instrument rate, such as a Taylor-type rule. Such an assumption results in projections where inflation eventually approaches the inflation target and the output gap eventually approaches zero. The resulting projections of the instrument rate will generally differ from ME. (To the extent that the projections are published and interpreted by the private sector as good forecasts of future instrument rates, they may bring ME closer to that instrument-rate projection.) The resulting projections of the target variables will generally not minimize an intertemporal loss function, and there is no reason why the instrument-rate projections will be good forecasts of the central bank's actual instrument-rate setting. Hence, the resulting projections are to some extent

arbitrary.[5] However, if the reaction function used is an estimate of previous policy by the central bank, the resulting projections can be interpreted as those resulting from policy as usual (Berg, Jansson, and Vredin 2004; Jansson and Vredin 2003). Essentially, the projections would be analogous to vector-autoregression forecasts. The Reserve Bank of New Zealand uses an ad hoc reaction function in its Forecast and Policy System (discussed in Archer 2004, 2005; Svensson 2001a). However, the resulting instrument-rate path is subject to considerable adjustment that reflects judgment and policy preferences, making it, for practical purposes, similar to an optimal instrument-rate plan (Archer 2005).[6]

A third alternative is an optimal instrument-rate projection, that is, the instrument-rate projection that the MPC considers best achieves the central bank's objectives. The optimal instrument-rate projection is then the central bank's own best forecast of the instrument rate. The optimal instrument-rate projection can be seen as minimizing an implicit or explicit loss function. Svensson (2003a, 2005b) argues that inflation-targeting central banks should start using an explicit loss function in the internal decision process and eventually make this loss function public. The central bank staff can present optimal projections of target variables and the instrument rate for alternative parameter values of the loss function and alternative scenarios. This can be done in several different ways, incorporating judgment as discussed in Svensson (2005a) and more concretely demonstrated by Svensson and Tetlow (2005), who describe the method of Optimal Policy Projections, a variant of which is being used by the Federal Reserve Board.[7] If the MPC agrees on an intertemporal loss function, the staff can present the MPC with optimal projections for that loss function for different scenarios (different assumptions about the state of the economy, forecasts of exogenous variables, and the transmission mechanism, for instance). If the MPC does not agree on a loss function or does not use a particular loss function, the staff can still present the relevant trade-offs for different policy choices—the set of efficient feasible projections—by presenting projections for a range of parameters of the loss function. If the MPC chooses policy in line with this, the resulting projection will be the best forecast in the sense of minimizing expected squared forecast errors. This brings me to a discussion of the actual instrument-rate decision.

2.2 The instrument-rate decision

The assumption about the current instrument rate, the instrument rate for the next month or two, matters very little for the central bank's projections. What matters for the projections is the assumption about the entire future instrument-rate path. Similarly, the current instrument rate matters very little for private sector economic decisions. Instead, what matters are private sector expectations about future instrument rates. These expectations feed into the yield curve and affect longer interest rates and asset prices that do matter for private sector decisions. The current instrument rate and central bank announcement matter and have an effect on the economy essentially only through the private sector expectations about future instrument rates and about aggregate future inflation and output that they give rise to. Indeed, it is paradoxical that so much

5. See Svensson (2003b) for a more general critique of simple instrument rules such as Taylor rules.
6. The particular reaction function used before any judgmental and policy adjustments, a variant of a so-called forecast-based Taylor rule originating with Bank of Canada's Quarterly Projection Model, has some particular problems that are discussed in Svensson (2001b).
7. By central bank *judgment*, I mean information, knowledge, and views beyond the scope of a particular model.

attention and discussion are focused on current instrument-rate settings and levels, when what matters are the related plans and expectations about future instrument rates. As is becoming increasingly well known, and as Woodford (2004) and Svensson and Woodford (2005) have emphasized, modern monetary policy is essentially the management of private sector expectations.

Since the current instrument rate has very little importance and it is the entire future instrument-rate path that matters, explicitly or implicitly, the central bank instrument decision is really a decision about the future path of the instrument rate; i.e., about an instrument-rate plan. To some extent this is becoming increasingly recognized. A good example is the increased attention paid to some key words in FOMC statements indicating future instrument-rate setting: "policy accommodation can be maintained for a *considerable period*," "[the Committee] can be patient in removing its policy accommodation," and "policy accommodation can be removed at a pace that is likely to be measured" (italics added).[8]

My conclusion from this is that central banks should be more specific, systematic, and transparent about instrument-rate paths and plans. Since the decision about the instrument rate is in effect a decision about the instrument-rate path, it is better that this is explicitly acknowledged. Maintaining that the decision is about the current instrument-rate level alone is both misdirected and misleading. Indeed, throughout the decision process, it should be natural to think in terms of alternative instrument-rate paths and plans, not about the instrument rate during the next month or two. Similarly, it should be natural to think in terms of entire projection paths of future target variables, not just the current level or the target variables or the projection at some particular horizon, such as 8 quarters. Furthermore, as made clear in the discussion of the use of explicit loss functions in Svensson (2005b), such loss functions induce rankings of entire projection paths, not projections at particular horizons. Indeed, the monetary policy transmission mechanism should be seen as a mapping from an instrument-rate path to target-variable paths, not as a mapping from a current instrument-rate level to a level of the target variables at some particular horizon.

Goodhart (2001, 2005) and Mishkin (2004) have argued that it is too difficult for an MPC to agree on a path (a sequence of numbers) rather than a current instrument-rate decision (one single number). I argue that it is necessary and not too difficult. In particular, it is already being done. MPCs all over the globe decide on projections of inflation and output all the time. Projections are paths, sequences of numbers. There is not a big difference between agreeing on an instrument-rate path and an inflation path. Furthermore, some MPCs are already explicitly deciding on instrument-rate paths—the Reserve Bank of New Zealand and Norges Bank, for instance.

In particular, majority voting about paths is completely feasible. I have suggested a procedure in Svensson (2003a). Suppose that each MPC member has a preferred instrument-rate plan for the current and future instrument rate in the form of a path. Plot all those paths in a graph with time on the horizontal axis and the instrument rate on the vertical axis. Then, for each future date on

8. Imagine how much more transparent this communication would have been if the FOMC instead would have plotted an instrument-rate projection, as the RBNZ and Norges Bank are already doing!

the horizontal axis, pick the median instrument-rate level. Recall the Median-Voter Theorem: The outcome of majority voting about a single variable is the level preferred by the median voter. This is the Median-Voter Theorem applied to a path, as if the MPC members were simultaneously voting about the instrument rate at the current and future dates. The procedure results in the median instrument-rate plan. Let this median instrument-rate plan be the starting point for a new round of voting. Let each MPC member suggest some modification of the median instrument-rate plan, and take the median of those suggestions, corresponding to majority voting about the modifications. I would be very surprised if this procedure does not converge to a reasonably consistent compromise within a couple of rounds.[9]

Figure 2.1 illustrates a situation with three MPC members. One member prefers the instrument-rate plan AC, where A corresponds to the preferred current instrument-rate setting. A second member prefers the instrument-rate plan BC. These members agree on the instrument rate far into the future, but disagree on the time to get to that level and on the current instrument-rate level. A third member prefers the instrument-rate plan DE, with a lower current level and a lower future level than the other two. The median instrument rate for each date results in the median instrument rate BC. For this simple configuration of individual instrument-rate plans, the procedure converges in one step.[10]

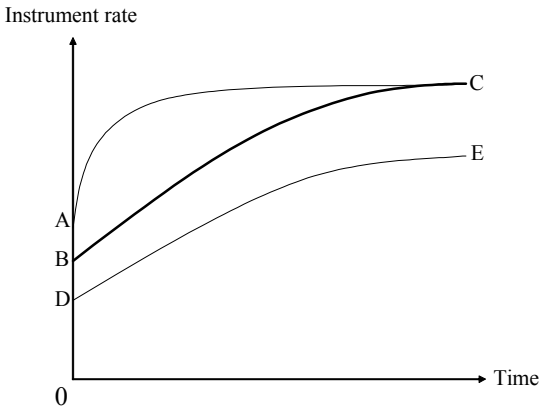


Figure 2.1: Voting about instrument-rate plans

3. Transparency and Communication Issues

The internal forecasting and decision process and the bank's external announcement and communication process are distinct, although the appropriate announcement and communication are an important part of managing private sector expectations and thereby implementing

9. Relying on the median instrument-rate plan also has the attractive property that outliers are disregarded; extreme MPC members will have little or no influence on the resulting instrument-rate plan.

10. For an MPC with an even number of voters, the median curve can be defined as the average of the two middle curves. When the Governor has the decisive vote in case of a tie, the Governor's vote would decide which of the two middle curves is the median. If the MPC members' individual instrument-rate plans intersect, the median curve may consist of segments of different members' plans. Then a few rounds of voting may be required for a reasonably smooth and consistent median plan.

monetary policy. From a transparency and accountability point of view, it is desirable that the central bank's reporting is a correct representation of the internal forecast/decision process and its results. However, I see no problem with the bank trying out different internal procedures for some period and only announcing them later, when the bank has decided which procedures to follow.

Since monetary policy has an impact on the economy via the private sector expectations of inflation, output, and instrument rates that it gives rise to, announcing the optimal projection—including the instrument-rate projection—and the analysis behind it would have the largest impact on private sector expectations and be the most effective way to implement monetary policy. Since the optimal projection is the best projection in the sense of minimizing expected squared forecast errors, it also provides the private sector with the best aggregate information for making individual decisions. Announcing the optimal projections also allows the most precise and sophisticated external evaluation of the monetary policy framework and decisions.[11]

The announcement of the optimal instrument-rate projection could include fan charts to emphasize that the projection is a probability distribution conditional on current information and judgment, and that only with probability zero would future decisions be exactly equal to the central projection. Goodhart (2005) and Mishkin (2004) have warned that the instrument-rate projection might be interpreted as an unconditional commitment. Some special explanation may, indeed, be required to emphasize that the instrument-rate projection is not a commitment but only the best forecast, the best plan, conditional on current information and judgment, and that future decisions and future projections would normally change owing to new information and judgment. Experience from New Zealand indicates that the market and private sector have no problems understanding that projections are conditioned on current information and will change with new information (Archer 2004, 2005; Svensson 2001a). Future experience from Norway will undoubtedly indicate the same thing. Furthermore, educating the market and the general public about monetary policy is a natural part of successful inflation targeting.

Note that the above discussion concerns conveying the bank's optimal *projection* of inflation, the output gap, and the instrument rate to the private sector. It does not attempt to convey the bank's *reaction function*; that is, how the current instrument setting depends on current information and judgment. This reaction function is, in my view, too complex to ever be explicitly expressed, not even within the bank. The current information and judgment are simply too complex for this, and the optimal instrument-rate decision depends in a complex way on all the information and judgment used in the forecasting process. I argue this case in more detail in Svensson (2003b,

11. Morris and Shin (2002) have presented a result indicating that more public information may reduce social welfare. This result has received considerable attention and has been interpreted as an anti-transparency result (Amato, Morris, and Shin 2002; Amato and Shin 2003; and *Economist* 2004). However, Svensson (2006) shows that the result has been misinterpreted and is actually *pro* transparency: Except in very special circumstances, when the precision of the private information is more than eight times higher than the precision of the public information, more public information increases social welfare. In particular, for a conservative benchmark of equal precision in public and private information, social welfare is higher than in a situation without public information. Woodford (2005) shows that a slight change in the social welfare measure so that it is proportional to the individual welfare also makes social welfare increasing in transparency.

2005a). The reaction function is, in my view, best left implicit. Fortunately, the decision process proposed above does not require the central bank's reaction function to be explicit.[12]

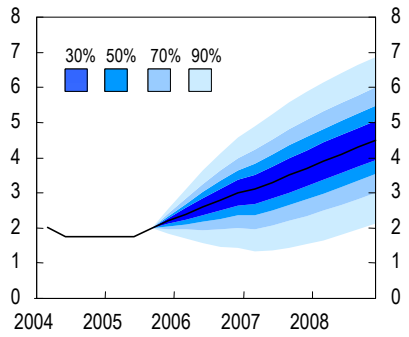
4. The Norwegian Example

The Reserve Bank of New Zealand is the pioneer in inflation targeting. It is also the pioneer in introducing and publishing explicit instrument-rate paths and has done so since 1998 (Archer 2004, 2005; Svensson 2001a). Norges Bank is an enthusiastic and competent newcomer to the inflation-targeting camp. An evaluation of monetary policy in Norway by Svensson, Houg, Solheim, and Steigum (2002) gave the bank excellent marks. In its *Inflation Report* of November 2005 (Norges Bank 2005), the bank has made monetary policy history by publishing an explicitly optimal instrument-rate path with uncertainty bands together with criteria for optimal inflation and output-gap projections and other innovations in transparent monetary policy. This section briefly discusses the Norwegian example. Qvigstad (2005) provides a more analytic background to this development; Norges Bank 2005 provides more details.

In each *Inflation Report*, Norges Bank states (Norges Bank 2005): "The operational target of monetary policy is low and stable inflation, with annual consumer price inflation of approximately 2.5 per cent over time. In general, direct effects on consumer prices resulting from changes in interest rates, taxes, excise duties and extraordinary temporary disturbances are not taken into account." In line with this, Norges Bank focuses on changes in the CPI-ATE, the consumer price index adjusted for taxes and excluding energy products. Furthermore, the bank is explicit about being a *flexible* inflation targeter and in explaining what that means: Norges Bank operates a flexible inflation-targeting regime, so that weight is given to both variability in inflation and variability in output and employment. Thus, Norges Bank can be seen as attempting to stabilize both the inflation gap (the gap between inflation and the inflation target) and the output gap, which is consistent with minimizing a conventional intertemporal quadratic loss function (Qvigstad 2005).

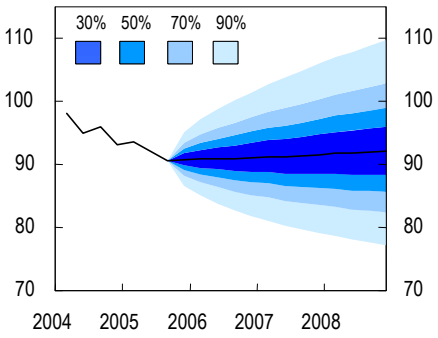
12. Although it is in principle true that inflation targeting, as stated by King (1996), can be described as (1) an ex ante inflation target and (2) an optimal instrument-rate response to observable shocks, in practice, the number of different potential shocks is so large that the optimal response to all possible observable shocks cannot be made explicit.

Chart 1.5a The sight deposit rate in the baseline scenario with fan chart. Per cent. Quarterly figures. 04Q1–08Q4



Source : Norges Bank

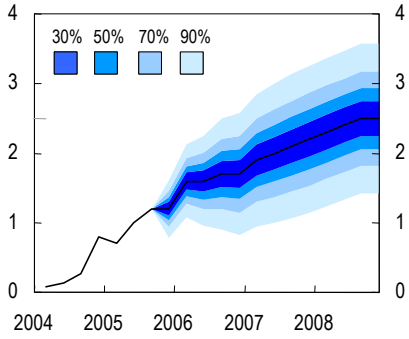
Chart 1.5b Import-weighted exchange rate (I-44)[1] in the baseline scenario with fan chart. Quarterly figures. 04Q1–08Q4



1) A rising curve denotes a weaker krone exchange rate. It is assumed that strengthening by a certain percentage is just as likely as weakening by the same percentage.

Source : Norges Bank

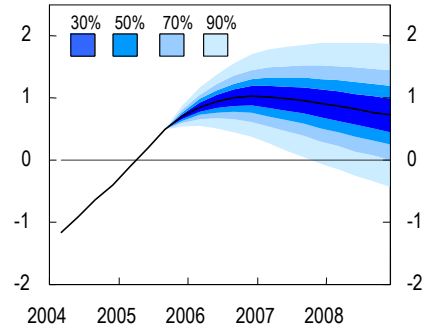
Chart 1.5c Projected CPI-ATE in the baseline scenario[1] with fan chart. Per cent. 4-quarter change. 04Q1–08Q4



1) Other measures of underlying inflation are shown in a separate box in Section 2.

Sources : Statistics Norway and Norges Bank

Chart 1.5d Estimated output gap in the baseline scenario[1] with fan chart. Per cent. Quarterly figures. 04Q1–08Q4



1) Uncertainty concerning the current situation is not taken into account in the calculation.

Source : Norges Bank

Charts 1.5a–d in the *Inflation Report* show the optimal projections in the report's baseline scenario of, respectively, the instrument rate (the so-called sight deposit rate), the exchange rate (import-weighted), inflation (CPI-ATE), and the output gap.

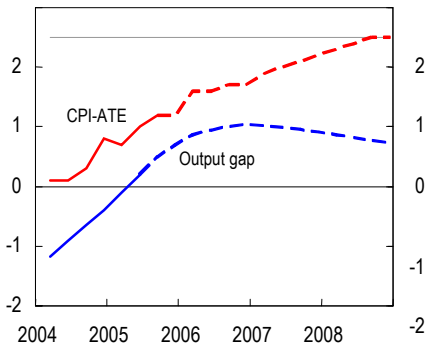
That the bank is a flexible inflation targeter and puts weight on stabilizing both the inflation gap and the output gap is emphasized in Chart 1.7, where the inflation and output-gap projections are displayed in the same graph with the same scale. As seen in Chart 1.7, inflation is currently below the 2.5 per cent target in Norway, and the bank projects that inflation will gradually rise towards the target and reach that at the end of 2008. The projected rise in inflation is brought about by a projected positive output gap. These projections of the bank's target variables require an instrument-rate projection as displayed in Chart 1.5a. The editorial of the report states that the interest rate path presented provides a reasonable balance between the objectives of monetary policy. This may be interpreted as the inflation, output-gap, and instrument-rate projections in Charts 1.5a–d providing optimal projections of these variables.

The bank also provides six criteria for an "appropriate" instrument-rate path. These criteria are discussed and justified in detail in Qvigstad (2005). They can be understood as verbal forms of optimality conditions, the optimal *targeting rules* that Svensson (2003b) advocates rather than instrument rules such as Taylor rules. Norges Bank's criteria are reproduced in the appendix.

The bank also provides optimal projections of the instrument rate, inflation, and the output gap for alternative scenarios. Charts 1.9a–c show such projections for two alternative scenarios: one with stronger trade shifts (leading to lower import prices) and lower wage growth, and one with inflation rising more rapidly than predicted.

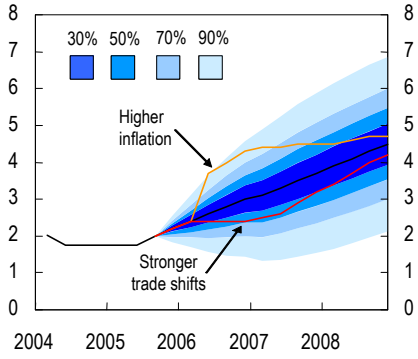
As explained in Qvigstad (2005) and Norges Bank (2005), the bank cross-checks its optimal instrument-rate path against various simple instrument rules and indicators that are less dependent on a specific analytical framework and specific forecasts for the Norwegian economy. Chart 1.10 provides a comparison with market expectations of future instrument rates as represented by forward interest rates. Chart 1.11 compares the instrument rate with alternative simple instrument rules. Chart 1.12 provides a comparison with an empirical reaction function estimated from previous instrument-rate responses.

Chart 1.7 Projections for the CPI-ATE and output gap in the baseline scenario. Per cent. Quarterly figures. 04Q1–08Q4



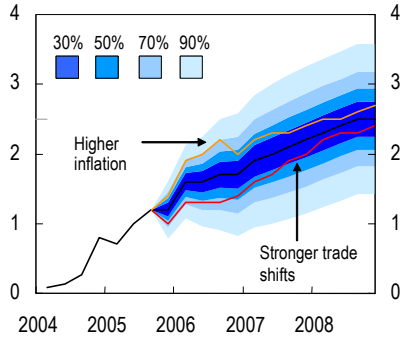
Sources: Statistics Norway and Norges Bank

Chart 1.9a Sight deposit rate in the baseline scenario and in the alternatives with stronger trade shifts and lower wage growth (red line) and higher inflation (yellow line). Per cent. Quarterly figures. 04Q1–08Q4



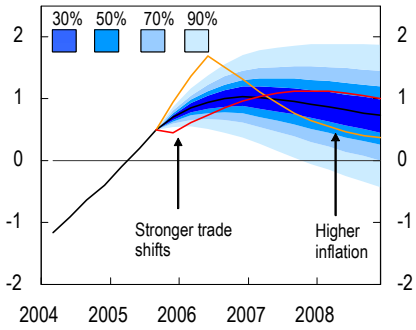
Source: Norges Bank

Chart 1.9b Projected CPI-ATE in the baseline scenario and in the alternatives with stronger trade shifts and lower wage growth (red line) and higher inflation (yellow line). Per cent. 4-quarter change. 04Q1–08Q4



Sources: Statistics Norway and Norges Bank

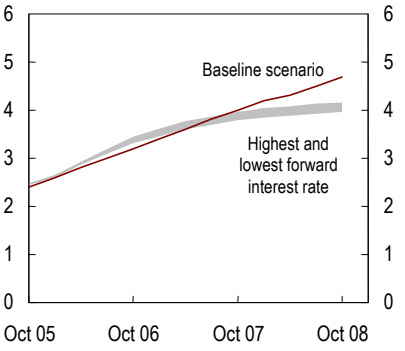
Chart 1.9c Estimated output gap in the baseline scenario[1]) and in the alternatives with stronger trade shifts and lower wage growth (red line) and higher inflation (yellow line). Per cent. Quarterly figures. 04Q1–08Q4



1) Uncertainty concerning the current situation is not taken into account in the calculation.

Source: Norges Bank

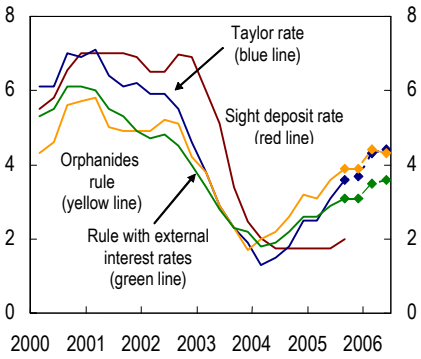
Chart 1.10 3-month money market rate in the baseline scenario[1]) and band with highest and lowest forward interest rate last 10 days.[2]) Per cent. Quarterly figures. 05Q4–08Q4



1) The money market rate is normally about ¼ percentage point higher than the sight deposit rate.
2) Highest and lowest forward interest rate in the period 14–27 Oct. 2005.

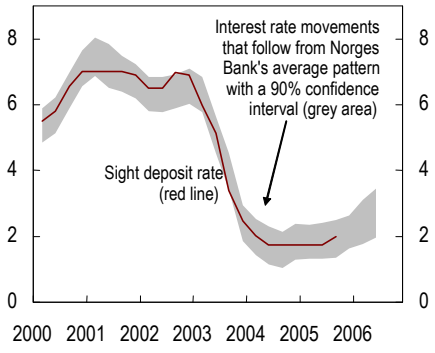
Source: Norges Bank

Chart 1.11 Sight deposit rate, Taylor rule, Orphanides rule and rule with external interest rates. Inflation as in the baseline scenario. Per cent. Quarterly figures. 00Q1–06Q2



Sources: Statistics Norway and Norges Bank

Chart 1.12 Sight deposit rate and interest rate developments that follow from Norges Bank's average pattern for the setting of interest rates.[1]) Per cent. Quarterly figures. 00Q1–06Q2



1) The interest rate movements are explained by developments in inflation, mainland GDP growth, wage growth, and 3-month interest rates among trading partners. See Inflation Report 3/04 for further discussion.

Source: Norges Bank

5. Conclusions

The introduction of inflation targeting has implied major progress in practical monetary policy. Recent debate has focused on the nature of the instrument-rate assumption underlying published projections of inflation and other target variables and whether the corresponding instrument-rate projection should be published together with the central bank's other forecasts.

The MPC, the decision-making body of the central bank, should make explicit decisions on instrument-rate plans—the entire path of current and future instrument rates—rather than just the current instrument rate, since what matters for the bank's projections of the target variables and for private sector decisions is the entire path of interest rates, not just the interest rate for the first few months. The MPC should decide on its optimal instrument-rate plan, the plan that best achieves the bank's objectives for its target variables, inflation and the output gap. This optimal instrument-rate plan is also the bank's own best forecast of future instrument rates.

The bank should publish this optimal instrument-rate plan together with the corresponding projections of inflation and the output gap. This set of projections is then the bank's best forecast of future instrument rates, inflation, and output gaps. Publishing this set of projections and the underlying analysis and justification provides the best information for the private sector, the most effective implementation of monetary policy and management of private sector expectations, the best information for external evaluation of policy and therefore the best accountability, and the best internal incentives for the bank to do its job right.

Norges Bank has set a model for other central banks in publishing such projections, with fan charts indicating the degree of uncertainty and with ample discussion and justification of the projections, including alternative scenarios, cross-checking with alternative policy rules, and the application of a list of criteria for optimal instrument-rate projections.

Appendix

From Norges Bank 2005:

Criteria for an appropriate future interest rate path

The following criteria may be useful in assessing whether a future interest rate path appears reasonable compared with the monetary policy objective.

1. If monetary policy is to anchor inflation expectations around the target, the interest rate must be set so that inflation moves towards the target. Inflation should be stabilized near the target within a reasonable time horizon, normally 1–3 years. For the same reason, inflation should also be moving towards the target well before the end of the three-year period.

2. Assuming that inflation expectations are anchored around the target, the inflation gap and the output gap should be in reasonable proportion to each other until they close.[1]

3. Interest rate developments, particularly in the next few months, should result in acceptable developments in inflation and output also under alternative, albeit not unrealistic, assumptions concerning the economic situation and the functioning of the economy.

4. The interest rate should normally be changed gradually so that we can assess the effects of interest rate changes and other new information about economic developments.

5. Interest rate setting must also be assessed in the light of developments in property prices and credit. Wide fluctuations in these variables may, in turn, constitute a source of instability in demand and output in the somewhat longer run.

6. It may also be useful to cross-check by assessing interest rate setting in the light of some simple monetary policy rules. If the interest rate deviates systematically and substantially from simple rules, it should be possible to explain the reasons for this.

1. The inflation gap is the difference between actual inflation and the inflation target of 2.5 per cent. The output gap measures the percentage difference between actual and projected potential mainland GDP.

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