

CLASS II FOMC — RESTRICTED (FR)

Brian Doyle
Linda Kole
Paul Wood
January 3, 2007

The Experience of Foreign Central Banks with Published Forecasts¹

1. Introduction

This paper surveys how the publication of forecasts by nine foreign central banks has influenced their conduct and communication of monetary policy.² All central banks in the advanced foreign economies have started to publish some sort of forecast in the past fifteen years or so.³ These forecasts are typically published in a quarterly report, which also documents recent developments in the economy and may provide answers to policy-related questions. One motivation for publishing the forecast has been the growing recognition that independent central banks need to be accountable to the public. The forecast demonstrates the analysis and reasoning behind monetary policy decisions, which may help the public better understand monetary policy and may build confidence and credibility. Another motivation is the belief that publication of forecasts may help anchor inflation expectations and thereby make monetary policy more effective and lower the economic cost of achieving price stability. In this discussion we will cover foreign central banks' experience with respect to ownership and production of the forecast, content (e.g. horizon, variables included, policy rate assumption, uncertainty), specifics of publication, and consequences of publication.

To summarize the main points in this paper:

- Most of the central banks we surveyed make their published forecast a prominent part of their communications. Central banks with inflation targets regularly discuss where inflation is expected to be in the next few years relative to their inflation objective.
- In most cases, the published forecast is that of the policymakers, but how involved policymakers are in producing the forecast varies considerably across institutions.
- A few of the central banks publicly show members' dissents with the baseline forecast.

¹ Meredith Beechey, David Bowman, Tom Connors, Spencer Dale, Matthew Denes, Etienne Gagnon, Dale Henderson, Steven Kamin, Karen Johnson, Michael Leahy, Athanasios Orphanides, Nathan Palmer, David Wilcox, and others contributed material or comments for this note. We would also like to thank [Name withheld] (Norges Bank), [Name withheld] (Swiss National Bank), [Name withheld] (Bank of Japan), [Name withheld] (Bank of Canada), [Name withheld] (Sveriges Riksbank), [Name withheld] (formerly at the Reserve Bank of New Zealand), and [Name withheld] (Reserve Bank of Australia) for information on their institutions.

² We study self-described inflation targeters—Bank of Canada (BoC), Bank of England (BoE), Bank of Sweden (Sveriges Riksbank), Bank of Norway (Norges Bank), Reserve Bank of New Zealand (RBNZ), Reserve Bank of Australia (RBA)—as well as the European Central Bank (ECB), the Bank of Japan (BoJ) and the Swiss National Bank (SNB).

³ The Federal Reserve Board led the way in this regard: it has published policymakers' projections of both inflation and economic activity in its semi-annual *Monetary Policy Report* since July 1979.

CLASS II FOMC — RESTRICTED (FR)

- The extent of detail in the published forecasts varies considerably across central banks. Some banks publish numerical forecasts (in graphs or tables) going out several years for a large number of economic variables, some are explicit about the conditioning assumptions underlying their forecasts, and some provide a detailed description of the uncertainty surrounding the forecast. In contrast, at others the published forecast is descriptive, with few or no tables or charts, a shorter forecast horizon, vaguely defined conditioning assumptions, and relatively little discussion of risks. Table 1 summarizes these details.
- On balance, the extent of detail published has increased over time. Although some central banks have kept their discussions of the outlook mainly qualitative and focused on inflation and its risks, others have lengthened the forecast horizon, increased the number of variables published (including the output gap), included more information about conditioning assumptions such as the path of the policy interest rate, and provided more information about how uncertain their forecasts are.
- Most central banks publish a forecast three or four times a year, at the time of a policy meeting or shortly thereafter, and all hold press conferences or testify in front of their countries' legislature.
- Many observers seem to agree that published forecasts have improved the communication of central banks. In addition, one might interpret the increasing number of central banks who publish a forecast and the increased detail of those forecasts as a sign that central banks have found published forecasts useful. However, we do not find much quantitative evidence that publishing forecasts has improved monetary policy communications or economic outcomes (just as it has been difficult to find clear evidence that a formal inflation target leads to better inflation performance).
- Despite substantial differences across central banks in the content and characterization of published forecasts, we cannot discern substantial differences in how these publications affected market expectations or economic performance. More forecast detail may not necessarily be better, or central banks may be trying to achieve different purposes with their published forecasts.
- Various assessments of central banks' forecasts have been published, and generally they find that central banks have good track records, at least compared with outside forecasters. When obvious forecast errors are made, central banks often explain them in their regular reports, or in speeches and testimonies.
- Although central banks occasionally have confronted difficulties associated with their forecasts, we were unable to find any episodes where the problems were serious.

2. Why Central Banks Should (or Should Not) Publish Forecasts

While this paper cannot do justice to the burgeoning literature on monetary policy,

Table 1: Details on Publicly Available Central Bank Forecasts

	New Zealand	Canada	United Kingdom	Sweden	Australia	Norway	ECB	Switzerland	Japan
Forecast first published	June 1988	May 1995	February 1993	October 1993	January 1995	December 1994	December 2000	December 1999	October 2000
Whose Forecast?	Governor	Governing Council	Monetary Policy Committee	Executive Board	Entire Bank	Executive Board	Staff	Entire Bank	Policy Board
# of members	1	6	9	6	7	7	18	3	9
Where forecasts are published	Monetary Policy Statement	Monetary Policy Report and Monetary Policy Report Update	Inflation Report	Inflation Report	Statement on Monetary Policy	Inflation Report	ECB Staff Macroeconomic Projections and Eurosystem Staff Macroeconomic Projections	Monetary Policy Report (in Quarterly Bulletin)	Outlook for Economic Activity and Prices
How Dissent of Forecast is Noted			In Minutes	In Minutes		In Proceedings (only released after 12 years)			Range, central tendency, and median of Board members' forecasts. In minutes.
Other commentary at release	Press conference and presentation to Bank's Board	Press conference, testimony to Parliament after Full Report	Press conference, testimony to Parliament	Press conference; Semi-annual testimony to Rikstag	Semi-annual testimony to Parliament	Press conference	Press conference	Press conference (2/year)	Press conference
Timing of release relative to policy meeting	Day of policy announcement	Within 1 week after policy announcement	6 days after policy announcement	Day of policy announcement	Monday following Tuesday of policy announcement	Day of policy announcement	Day of policy announcement	Day of policy announcement	Day of policy announcement
When is forecast finalized	In practice about 2 week prior to publication	At policy meeting (Friday before announcement)	At policy meeting	About 1 week before publication	2 days before publication	About 5 days prior to publication	About 2 weeks before publication	About 2 weeks prior to policy meeting	At policy meeting
Forecasting process (for policy makers)	Staff presents initial forecast to Governor and advisers; Revises after receiving comments	Council writes down after receiving staff forecast	Iterative process between staff and MPC	Staff forecast presented to Executive Board for approval	Governor comments on Staff forecast; Governor presents to Policy Board	Staff presents initial forecast to Governor; Revises after receiving comments	Staff forecast; 2 members of Gov. Council have joint responsibility to oversee	Staff forecast with only limited input from Board	Board members write down after receiving staff forecast
Frequency of forecast	Quarterly	Full report semi-annually, updates in remaining quarters	Quarterly	3 times a year	Quarterly	3 times a year	Quarterly (Both Semi-annually)	Quarterly	Semi-annual
Frequency of variables forecast	Annual in tables, higher frequency in charts	Quarterly in near-term, annual for later years	Quarterly	Annual in tables, higher frequency in charts	No precise numbers	Annual in tables, higher frequency in charts	Annual	Quarterly in chart, no precise data for GDP	Annual (fiscal years)

Table 1 (continued): Details on Publicly Available Central Bank Forecasts

	New Zealand	Canada	United Kingdom	Sweden	Australia	Norway	ECB	Switzerland	Japan
Variables forecasted in tables or charts									
Inflation measures	CPI, underlying inflation, import and export prices, terms of trade, foreign inflation	CPI; CPI excl. 8 volatile components and indirect taxes; CPI excl. ind. taxes	CPI (HICP)	CPI; CPI excl. interest and indirect taxes, import and domestic prices, foreign	No (A qualitative forecast is provided)	CPI excluding energy and real taxes, CPI, import prices, domestic prices, foreign CPI	Euro-area CPI (HICP)	CPI	CPI excluding fresh food, Domestic Corporate Goods inflation
GDP growth	Yes and its components	Yes, and its components	Yes	Yes, and its components	No	Yes and some components	Yes, and components	Yes	Yes
Output gap	Yes	No	No	No	No	Yes	No	No	No
Other	Many including: exchange rate, productivity, foreign GDP, current account balance, fiscal balance, labor market variables.	Foreign GDP, oil prices conditioned on futures markets	None	Productivity, labor market variables, fiscal balance, Foreign GDP, oil prices, exchange rate.	None	Exchange rate, employment growth, unemployment rate, wage growth, foreign GDP	None	Foreign GDP, oil prices	None
Conditioning assumption for interest rate	Published forecast	Not specified	Market expectations and constant path	Market expectations; will publish forecast	Constant path	Published forecast	Market expectations	Constant path	Market expectations
How forecasts are presented	Tables; charts for inflation and GDP	GDP and inflation in tables and charts; rest only described in text	“Fan” charts, data provided 2 weeks after publication	“Fan” charts for inflation, tables and charts	Qualitative description with a few numbers for reference	“Fan” charts for key variables, table of means	Range of values in table	Chart for inflation; description of GDP; rest tables	Range and median of individual members’ forecasts
Forecast horizon	3 years	2 to 3 years	3 years; 2 years conditioned on unchanged policy	3 to 4 years	2 years	3 to 4 years	Current year and next	3 years	Current and next fiscal year
How risks to forecast are expressed									
Distribution measures	No	No	“Fan” charts, data provided 2 weeks after publication	“Fan” chart for inflation	No	“Fan” charts	Range	No	No
Alternative scenarios	Yes	No	No	No	No	No	No	No	No
Discussion of risks	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes

CLASS II FOMC — RESTRICTED (FR)

communication, and the role of forecasts,⁴ the basic arguments in favor of publishing forecasts and providing more detailed forecasts are as follows:

1. These actions increase the accountability of central banks, which have been given the authority by governments to make decisions that can have important consequences for economic performance. Letting the public know how monetary policy decisions are made and how they relate to the economic outlook are thus seen as providing a check on this delegated authority, which is an important part of governance in a democratic society.
2. All central banks, whether they explicitly target inflation or not, aim for price stability (however defined). Publishing a forecast may help the public form accurate expectations, making it easier for the central bank to anchor pricing behavior and to improve its leverage over financial conditions.⁵
3. Providing forecasts of other key variables such as GDP or the unemployment rate may be valuable in reducing uncertainty about the actual objectives of monetary policy. Most (if not all) central banks try to achieve price stability without generating unnecessary real economic variability. A published forecast that provides information on the central bank's outlook and its goals may improve markets' and the public's ability to anticipate changes in official interest rates, which may help stabilize the economy. Some have argued that a central bank should also publish an interest rate forecast or go even further and publish its objective function, arguing that these actions would increase the predictability of policy in ways that are likely to improve the central bank's ability to achieve its stabilization objectives.⁶

Those who argue against the release of detailed forecasts tend to believe that more information may be detrimental to peoples' understanding of the most important message (presumably the inflation goal and how it can be achieved). If too many variables are forecast, the message might get clouded and cause public confusion. In addition, particular variables, for example the output gap, may be difficult for the public to understand.⁷ Others worry that if a central bank releases a

⁴ Svensson has made several seminal contributions and has been a leading proponent of central banks' publishing details behind their forecasts. For instance, Svensson (1997) argued the case for releasing central bank inflation and output forecasts. Svensson (2002) advocated that the central bank should clarify the weight it attaches to real economic stability in relation to achieving its inflation objective. Blinder et al. (2001) analyzed how central banks signal their intentions through their talk and Fracasso et al. (2003) assessed the quality of central banks' regular reporting. Geraats (2002) and Woodford (2005) provided good overviews of arguments for central bank transparency.

⁵ Orphanides and Williams (2004) model how an inflation target can help anchor inflation expectations by making it easier to estimate future inflation.

⁶ See Svensson (various papers), Woodford (2005), Faust and Leeper (2005), and Rudebusch and Williams (2006). However, Faust and Henderson (2004) point out that, even in a fairly simple economy, an objective function can be complex.

⁷ For example, Mishkin (2004) asserts that a central bank should not publish certain variables that may be

CLASS II FOMC — RESTRICTED (FR)

forecast that later is proved to be wrong, it could lose some credibility, which may damage policy effectiveness. A related point, especially for interest rate forecasts, is that some forecasts may be interpreted by the public as a commitment, leading to problems down the road if that commitment is not met.⁸

3. Why Do Foreign Central Banks Say They Publish Forecasts?

Policymakers have discussed many of the reasons cited in the previous section for why they publish their forecasts and how much detail they publish, but accountability was the most prominent reason cited by the first banks to publish forecasts. In its summary of the Reserve Bank of New Zealand Act of 1989, the Reserve Bank noted that publishing a forecast “is crucial to holding the Bank and the Governor accountable for the outcome of monetary policy.” Likewise, in October 1992, Chancellor of the Exchequer Norman Lamont asked for the BoE to publish an Inflation Report “to make the formation of policy more transparent and our decisions more accountable.”⁹

Publishing a forecast is now seen by many as part of a broader monetary policy framework. Almost all inflation-targeting central banks currently integrate their inflation objective into their discussion of their forecast, noting where they expect inflation to be relative to the objective over the course of the forecast. Central banks who do not refer to themselves as inflation targeters, such as the ECB and BoJ, make reference to their forecasts when discussing policy decisions, but the connection is not as close as for inflation targeters.

This said, although all the central banks studied have explicit numerical inflation objectives, beginning to publish a forecast did not necessarily coincide with the adoption of an inflation objective or an “inflation targeting” framework. For instance, the RBNZ, the first inflation-targeting central bank, was already publishing details of its forecast at the time the government stipulated its inflation objective, although the reforms at the Bank changed how that forecast was presented. Similarly, the Norges Bank began publishing its *Inflation Report* even when its primary goal was to meet an exchange rate target, a number of years before it began inflation

misinterpreted by the public or by financial markets, such as the output gap and the central bank’s objective function. He says that publishing information is beneficial only to the extent that it serves to simplify communication with the public and to help central banks conduct monetary policy. The publication of output gaps and an objective function that includes them is problematic because of the tricky measurement issues associated with output gaps and because the public may come to see the mission of the central bank as eliminating short-run output fluctuations.

⁸ Another point made by Morris and Shin (2002) is that if agents have private information, the central bank’s forecast may make signals from financial markets or from surveys less useful. However, Svensson (2005) and Woodford (2005) point out that this result only holds in a very special case.

⁹ Recall that at this time the Chancellor of the Exchequer still made monetary policy decisions on the advice of the Bank of England. The Bank was not granted independence until 1997.

CLASS II FOMC — RESTRICTED (FR)

targeting in March 2001. In contrast, the Bank of Canada and the Reserve Bank of Australia did not publish any forecast for a number of years after adopting an inflation target.

4. Ownership and Production of the Forecast

For most of the central banks studied, the published forecast is intended to represent the views of the policymakers rather than the staff. What differs across institutions is how much the policymakers interact with the staff in creating the forecast and whether policymakers who disagree with the baseline forecast can signal their dissent. The first page of table 1 summarizes some of these details.

The structure and size of the policy committee may influence the ownership of the forecast. Five central banks where policy responsibility rests with a small consensus-oriented committee or where the Governor has a strong influence on policy (RBNZ, BoC, RBA, Norges Bank, and SNB) publish a consensus forecast with no recorded dissents. The Sveriges Riksbank and the Bank of England, inflation targeters with somewhat larger or more diverse committees, each publish a consensus forecast but show dissents to that forecast in the minutes of the policy meetings. Two central banks that are not inflation targeters (ECB and BoJ) have large and diverse committees and do not publish a consensus forecast; they take different approaches, however, with the ECB publishing a staff forecast and the BoJ publishing the range and central tendency of individual board members' forecasts.

Whose forecast is published and how is it produced?

The Bank of England presents a forecast that belongs to the majority of the Monetary Policy Committee (MPC), which shapes the forecast hand-in-hand with the staff over the course of about four weeks. A large number of meetings between staff and the MPC and within the MPC itself are needed to iron out the particulars of the forecast. The staff uses its large dynamic general equilibrium model to present options to the committee (although alternative models are used as well); the detail in the model enables the committee to make a large number of assumptions on which to condition the forecast. The MPC asks the staff for background information and analysis to help shape its views.

Some observers both inside and outside the BoE have questioned some aspects of this approach. In his report on the workings of the Bank of England, Kohn (2001) noted a lack of clarity over how the forecast was developed and whose views it represented, given the diverse nature of the MPC. Also noting those concerns, Goodhart (2001) proposed that the Bank of England forecast be made by the staff and be the responsibility only of the governor, suggesting that such a change would clear up some of the confusion inherent in having a committee responsible for the

CLASS II FOMC — RESTRICTED (FR)

forecast. The Independent Bank of England Commission, led by the Shadow Chancellor of the Exchequer, suggested that the inflation forecast be a report *to* the MPC rather than a report *of* the MPC.¹⁰ That, however, would reduce the value of the forecast for communicating the MPC's views upon which policy is based.

With the inflation forecast playing a central role in setting and communicating monetary policy at the Bank of England, the forecasting process has taken on considerable importance. As an illustration, in 1999, the external MPC members complained that they lacked the resources needed to enter fully into the debate over the inflation forecast. In response, the outside members were each assigned two economists to assist them with their research.

At a number of other central banks, the forecast is in principle that of the policymakers but is largely generated by the staff, who receive comments from all or some policymakers before finalizing it. The Riksbank's forecast ultimately belongs to the Executive Board, but the staff presents a recommendation on the forecast to the Executive Board members, who evaluate it and commission the staff to finalize the *Inflation Report* with certain changes. At the Reserve Bank of New Zealand, monetary policy, and hence the forecast, is the sole responsibility of the Governor. The staff produces an initial forecast on which the Governor and other senior staff provide comments that are incorporated in a revised forecast. Around two and a half weeks prior to the final policy decision, the Governor makes a provisional interest rate decision on which to condition the forecast, which typically is finalized about two weeks before publication.

At two other central banks, only a subset of the policymakers provides input on the staff's work. At the Norges Bank, although the forecast belongs to the entire Executive Board, the Governor and Deputy Governor have a predominant role in the process of shaping the forecast. The forecast is produced by the staff; the Governor and Deputy Governor provide some general comments and detailed direction on the interest rate forecast, and the staff provides forecasts based on alternative interest rate paths. The main features of the analysis in the *Inflation Report* are presented to the full Executive Board for discussion at a meeting about two weeks before the *Inflation Report* is published. On the basis of the analysis and discussion, the Executive Board assesses the consequences for future interest rate developments and adopts a monetary policy strategy for the period to the next *Inflation Report*. Similarly, the RBA's forecast is generated by the staff and revised to incorporate comments from the Governor and Deputy Governor, but the other members of the Policy Board do not see the forecast until the policy meeting. The Governor decides prior to the meeting on a policy recommendation to present to the Board. The forecast presented to the Board is based on the assumption of a constant interest rate path and is updated if the Policy Board decides to change the official interest rate. Who "owns" the forecast

¹⁰ Report of the Independent Bank of England Commission (2000) p. 21.

CLASS II FOMC — RESTRICTED (FR)

at the RBA is not clear, but Bank officials describe it as a product of the “Bank as a whole”: the Governor, Deputy Governor and the Bank’s staff, but not the Policy Board.

The Bank of Canada publishes a consensus forecast of the six-member Governing Council four times a year (twice in its *Monetary Policy Report* and twice in its *Update*). The staff produces an economic projection four times a year, but it is not published and is used only as the starting point for the development of the Governing Council’s outlook. Indeed, the conditioning assumptions of the two forecasts are different. For example, the Governing Council conditions its forecast on a flat path for exchange rates, which the Council views as easier to communicate to the public, while the staff forecast uses a model to forecast exchange rates.¹¹

At the Bank of Japan, Policy Board members write down their individual forecasts, informed by the staff’s forecast, which is not published. The BoJ publishes the range and central tendency of the members’ forecasts in its semi-annual *Outlook for Economic Activity and Prices*. The report accompanying these forecasts provides a coherent description of the state of the economy and the outlook. One week before the Policy Board meeting at which the outlook report is discussed (the second meeting in April and October), the BoJ’s staff provides the text to the Board members and receives their input. At the meeting, the Board discusses the text and puts it to a vote: the description of the outlook (“The Bank’s View”) is released with the Board policy decision. According to the Bank of Japan’s October 2000 minutes, one Board member (Nakahara) argued that the Bank should release the staff forecasts with the Policy Board’s approval. The majority thought instead that the public would prefer to know the views of the Policy Board members.

In contrast, the ECB publishes staff forecasts, which are not endorsed by the Governing Council. Issing (2001) argues that the ECB staff projections only provide a particular scenario, but do not represent the ultimate synthesis of the Governing Council’s assessment of the euro-area inflation outlook. Of the four quarterly staff forecasts that are published, two are forecasts of the ECB staff and two are forecasts of the Eurosystem staff. The latter require a time-consuming process that incorporates important inputs from the staffs of the euro-area national central banks. Inside the ECB, a committee that spans two directorates (Research and Economics) coordinates the staff forecasts. Each of those directorates is overseen by a different member of the Executive Board.¹² The forecast is that of the staff, but these two members might be expected to have some influence over the general outline of the forecast.

Central banks take different approaches to when they finalize their forecast relative to the policy meeting (also see table 1). In some cases, policymakers simply produce their own forecasts as

¹¹ Although the results of the staff’s forecast are not published at the Bank of Canada, the details of the main model that the staff uses are published.

¹² The member who oversees the Economics directorate presents the forecast to the Governing Council.

CLASS II FOMC — RESTRICTED (FR)

part of the policy meeting. In other cases, forecasts are finalized without necessarily including the latest policy decision (for example when conditioned on market expectations of interest rates), or policymakers come to a tentative policy decision to incorporate into the forecast and the forecast is quickly revised if conditions change (an option often used with a predominant decision maker). Finally, prior to the MPC meeting, the Bank of England staff produces a forecast conditioned on a constant interest rate path for each plausible monetary policy decision that the MPC might take. Only the forecast based on the rate chosen is published.

How is disagreement among policy members regarding the forecast handled?

Only a few central banks publicly show members' dissents with the baseline forecast: the Norges Bank, the Bank of England, and the Riksbank. At the Norges Bank, dissent is noted in the proceedings of the policy meetings, but these proceedings are not made available until twelve years afterwards.

At the Bank of England, members of the committee may disagree with the forecast; their disagreement (without attribution) is noted in the *Inflation Report* and the alternative views are recorded without attribution in the minutes of the MPC meetings. For example, minutes for the November 2005 meeting recorded that, "For one member, there was a case for an immediate reduction in the repo rate. While the November *Inflation Report* for consumption growth appeared plausible, the central projections for investment growth and net trade seemed too optimistic." Often, identifying which member dissented is relatively easy, especially in this case where the minutes also recorded who voted for a reduction in the repo rate (Steven Nickell).¹³

At the Riksbank, attributed dissents to the forecast are shown in the published minutes of meetings. For example, the minutes of the December 4, 2002, meeting of the Riksbank's Executive Board show that Second Deputy Governor Eva Srejber entered a reservation against the decision to adopt the *Inflation Report*; she stated her broad agreement with the main scenario of the report but did not "share the majority view that the downside risks predominate over the upside risks."

Although the Bank of Japan does not publish a baseline forecast, it provides some information on the diversity of the nine Policy-Board members' forecasts through the publication of the range and the central tendency (the range excluding the highest and lowest forecast). Exhibit 1 shows

¹³ In previous years, the Bank of England reflected the diverse views of MPC members in its *Inflation Report* through the use of Table 6.B, which reported the possible effects on inflation and GDP growth of alternative assumptions, but did not identify individual members whose views might differ from the "best collective judgment" of the Committee. Table 6.B has not been used, however, since May 2002, when its primary proponent, Sushil Wadhvani, left the MPC, but it could be published again if members desired.

CLASS II FOMC — RESTRICTED (FR)

the most recently published forecast with the central tendency and median (in square brackets) in the top panel and the full range in the bottom panel. The Board members may dissent (with

Exhibit 1: Bank of Japan’s Semi-Annual Forecast, October 2006

Forecasts of the Majority of Policy Board Members^{3,4}

	y/y % chg.		
	Real GDP	Domestic CGPI	CPI (excluding fresh food)
Fiscal 2006	+2.3 to +2.5 [+2.4]	+2.9 to +3.5 [+3.0]	+0.2 to +0.3 [+0.3]
Forecasts made in April 2006	+2.1 to +3.0 [+2.4]	+1.4 to +1.8 [+1.5]	+0.6 to +0.6 [+0.6]
Fiscal 2007	+1.9 to +2.4 [+2.1]	+1.1 to +1.5 [+1.2]	+0.4 to +0.5 [+0.5]
Forecasts made in April 2006	+1.8 to +2.4 [+2.0]	+0.8 to +1.1 [+1.0]	+0.7 to +0.9 [+0.8]

Notes: 1. Brackets indicate the median of the forecasts.

2. Individual Policy Board members make the above forecasts with reference to the view of market participants regarding the future course of the policy interest rate -- a view that is incorporated in market interest rates.

³ Forecasts of the majority of Policy Board members are the figures to which the individual members attach the highest probability. They are shown as a range, with the highest and lowest figures excluded. It should be noted that the range does not indicate the forecast errors.

⁴ The forecasts of all Policy Board members are as follows.

	y/y % chg.		
	Real GDP	Domestic CGPI	CPI (excluding fresh food)
Fiscal 2006	+2.2 to +2.5	+2.9 to +3.5	+0.2 to +0.3
Forecasts made in April 2006	+2.1 to +3.0	+1.3 to +1.8	+0.5 to +0.7
Fiscal 2007	+1.8 to +2.6	+1.0 to +1.7	+0.4 to +0.6
Forecasts made in April 2006	+1.6 to +2.5	+0.7 to +1.3	+0.7 to +1.0

attribution) with “The Bank’s View,” and the reasons for their disagreement are listed in the minutes.¹⁴ The minutes also give some further hints as to the reasons behind the range of views,

¹⁴ Members have dissented on three occasions since the semi-annual report started in October 2000. For example, Policy Board member Nakahara disagreed with the outlook in October 2002: “Mr. Nakahara dissented for the following reasons. First, Outlook and Risk Assessment was generally optimistic and lacked sufficient explanation about the recent changes in the external environment, particularly the slowing global economy and the change of tone in domestic and foreign stock markets. Second, it did not explicitly touch upon deflationary concern in Japan. Third, it discussed inflation risks that were unlikely to materialize given the continuing decline in the CPI, the CSPI, and the GDP deflator, as well as the existing substantial output gap. Fourth, it did not mention how the slower growth in the monetary base might affect financial markets. And fifth, the view that the current price movements

CLASS II FOMC — RESTRICTED (FR)

recording comments on the outlook that are not attributed to any particular member or members.

5. Content of Published Forecast

The extent of detail in the published forecasts of central banks varies considerably across the banks studied here. At one end of the range, some banks publish numerical forecasts in charts or tables going out several years of a large number of economic variables, make explicit the conditioning assumptions, and provide a detailed description of the uncertainty of the forecast. At the other end of the range, the published forecast is descriptive, with few or no tables or charts, a shorter forecast horizon, vaguely defined conditioning assumptions, and no discussion of risks. The second page of table 1 summarizes the content of the published forecasts. Despite this diversity, over time most central banks have generally expanded the detail in their published forecasts, with at least some having lengthened the forecast horizon, increased the number of variables published (including the output gap), included more information about conditioning assumptions such as the path of the policy interest rate, and provided more information about how uncertain their forecasts are. Table 2 summarizes major changes to the published forecasts.

What is the forecast horizon?

As noted in table 1, the central banks we studied all publish forecasts of at least the current year and the next. A majority of the central banks publish forecasts extending three or four years out. These banks include all but the RBA, the ECB, and the BoJ.

Some central banks have lengthened their forecast horizons. For instance, the Bank of England and the Riksbank lengthened their forecast horizons from two years to three years, in August 2004 and March 2005, respectively. In each case, this forecast was conditioned on market expectations of future interest rates. The Norges Bank stretched out its forecast horizon to as long as four years in June 1999. For the Norges Bank and the Riksbank, the change was made in conjunction with a shift in their inflation targeting regimes to focus more on the medium term, especially at times when they feel their economies are subject to shocks that would have persistent effects on the economy. The Norges Bank adopted a somewhat flexible time horizon of one to three years for stabilizing inflation at the target; the Riksbank allowed for occasional deviations from its usual two-year horizon.

What forecast variables are published?

Although all central banks publish a forecast of inflation, they differ significantly in the selection

would not be a trigger suppressing economic activity was questionable, considering the fact that a decline in output prices was the most critical factor for corporate profits.”

CLASS II FOMC — RESTRICTED (FR)

Table 2: Selected Changes in Publicly Available Central Bank Forecasts

New Zealand

June 1988:	First publication of a forecast. Staff forecast in the Quarterly Bulletin.
March 1990:	First Monetary Policy Statement.
June 1992:	First section explicitly discussing risks to the forecast.
March 1997:	Greatly expanded number of variables published, including output gap.
June 1997:	Introduce forecast of Monetary Conditions Index (MCI), along with interest rate and exchange rate forecasts.
March 1999:	Discontinued forecast of MCI.
December 2000:	Reduced number of variables published and the precision of variables forecast (to nearest ½ percentage point).
May 2002:	Increased number of variables forecasted.
June 2006:	Precision of forecasts increased (to nearest 0.1 percentage point).

Canada

February 2000:	First published Monetary Policy Report Update, increasing publication frequency of forecast from semi-annual to quarterly.
April 2003:	First explicit numerical forecast of inflation (previously forecast was described in the text).
April 2004:	Extended forecast to include explicit numerical forecast of GDP growth and its components.
October 2005:	First discussion of the risks to the forecast.

United Kingdom

February 1996:	Introduced “fan” chart.
November 1997:	Started publishing forecasts of GDP growth.
February 1998:	Produced forecasts conditioned on market expectations of interest rates.
May 2002:	Discontinued Table 6B showing alternative scenarios in Inflation Report (based on MPC dissents from main forecast).
August 2004:	Started emphasizing forecasts based on market expectations of interest rates; extended forecast horizon to 3 years (only for forecast based on market expectations).

Sweden

December 1997:	Introduced a chart of the inflation forecast and an “uncertainty margin” around the inflation forecast.
September 1999:	Extended forecast to include explicit numerical forecast of GDP growth and its components. (previously forecast was described in the text)
March 2005:	Extended forecast horizon to 3 years. Started to condition forecast on market expectations of interest rates.

CLASS II FOMC — RESTRICTED (FR)

Norway

December 1998: Started conditioning projection on market expectations of interest rates
June 1999: Extended forecast horizon
December 2000: Introduced “fan” charts.
March 2001: Reduced frequency of Inflation Reports from quarterly to 3 times a year.
March 2003: Started publishing forecast of output gap and using markets’ interest rate expectations with some added comments
November 2005: First published interest rate forecast.

European Central Bank

September 2004: Started publishing ECB staff forecast (increasing frequency of published forecasts from semi-annually to quarterly).
June 2006: Started conditioning on market expectations of interest rates (the ECB previously conditioned on a constant interest rate path).

Switzerland

March 2003: Increased frequency of forecast to quarterly from semi-annually.

Japan

April 2006: Started conditioning on market expectations of interest rates (the BoJ previously conditioned on a constant interest rate path).

CLASS II FOMC — RESTRICTED (FR)

of other forecasted variables that are published. The second page of table 1 lists the variables for which numerical forecasts are published by each of the central banks, either in a table or chart. At the opposite extremes are the RBNZ, which publishes forecasts of a host of series in tables and charts, and the RBA, which provides a description of its inflation forecast with just a few references to numbers in the text.

For example, the RBA's November 2006 statement on monetary policy says that:

“...The forecasts envisage GDP growth will be held down somewhat by the drought over the next year, with a modest pick-up to around 3¼ percent thereafter. While exports of raw materials should grow strongly, and the house-building sector is expected to recover gradually, growth in consumer demand is expected to remain moderate and growth in investment is expected to slow from recent very high rates.

With only a modest easing in capacity constraints expected over the forecast period, the generalized price pressures currently evident in the economy are likely to continue in the near term. The central forecast is that underlying inflation will remain at around 3 percent over the next year. Thereafter, it may decline slightly but is likely to remain near the top of the target band....”

This statement is not accompanied by any tables or charts and concludes with a very short description of the risks to the inflation forecast. The RBA has gradually provided more detailed descriptions over time; it started targeting inflation without providing a forecast at all.

In contrast, the RBNZ regularly publishes forecasts of a large number of variables (see exhibit 2, below) including GDP and its components, a number of measures of inflation, an exchange rate, and an interest rate.¹⁵ Often the Reserve Bank will also publish explicit forecasts of a variety of other variables to provide more details on parts of the forecast that play an important role in its description of the outlook. For example, the RBNZ has recently published a forecast of CPI inflation excluding petrol costs.¹⁶

Between these two extremes, all of the other central banks publish numerical forecasts of inflation and output, but in some cases not much more. For example, the Bank of England only publishes forecasts for CPI inflation and GDP growth, though it does provide a fan chart around

¹⁵ The variables published include underlying inflation, a nominal trade-weighted exchange rate, 90-day bank bill rate, the composition of GDP growth, world GDP and CPI inflation, the household saving rate, terms of trade, current account balance, fiscal balance, unemployment rate, labor productivity, employment growth, the output gap, potential output growth, labor costs, and import and export prices.

¹⁶ Other recent forecasts include net permanent immigration, the effective mortgage rate, and tradables inflation.

CLASS II FOMC — RESTRICTED (FR)

these variables.¹⁷ However, the central banks in Sweden and Norway are closer to the RBNZ, publishing forecasts of additional measures of inflation, components of GDP, and some other variables.

Exhibit 2: Forecast Summary Table, Reserve Bank of New Zealand, September 2006

Table C

Summary of economic projections

(Annual percent change, unless specified otherwise)

March year	Actuals							Projections		
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Price measures										
CPI	1.7	3.1	2.6	2.5	1.5	2.8	3.3	3.9	2.7	2.6
Labour costs	1.4	1.6	2.1	2.2	2.1	2.5	3.0	2.8	2.6	2.3
Import prices (in New Zealand dollars)	11.2	7.4	-2.9	-11.1	-10.5	0.5	6.8	9.9	3	2.9
Export prices (in New Zealand dollars)	9.9	20.6	-3.5	-15.5	-5.1	4.9	3.7	2.9	3.4	3.0
Monetary conditions										
90-day rate (year average)	5.2	6.6	5.4	5.9	5.3	6.5	7.3	7.6	7.5	7
TWI (year average)	56.1	50.4	50.3	56.4	63.6	67.1	70.0	63.7	62.2	59.9
Output										
GDP (production, annual average % change)	5.3	2.1	3.9	4.7	3.6	3.7	2.2	1.8	2.4	2.7
GDP (production, March qtr to March qtr)	5.8	0.9	4.8	4.2	4.8	2.2	2.0	2.2	2.5	2.7
Output gap (% of potential GDP, year average)	0.4	-0.4	0.2	1.3	1.5	1.9	1.0	-0.3	-0.7	-0.6
Labour market										
Total employment	1.5	2.3	3.5	1.5	3.1	3.4	2.6	1.5	0	0.4
Unemployment rate (March qtr, s.a.)	6.3	5.3	5.2	4.8	4.2	3.8	3.9	4.1	4.7	5
Trend labour productivity (annual % change)	1.5	1.6	1.5	1.2	0.9	0.7	0.7	1.0	1.4	1.8
Key balances										
Government operating balance (% of GDP, year to June)	1.4	1.2	1.9	1.5	5.2	4.1	5.4	4.1	2.9	2.2
Current account balance (% of GDP, year to March)	-6.4	-4.4	-3.1	-3.6	-4.8	-7.4	-9.3	-8.8	-8	-6.7
Terms of trade (OTI measure, annual average % change)	-0.2	4.4	4.2	-5.7	3.9	5.8	-0.8	-5.2	-1.5	0.1
Household savings rate (% of disposable income, year to March)	-1.6	-5.1	-5.2	-11.7	-12.4	-14.8	-14.7	-12.3	-11	-9.7
World economy										
World GDP (annual average % change)	4.3	3.8	1.6	3.0	3.3	3.6	3.6	3.7	3.3	3.3
World CPI inflation	1.9	2.7	1.4	2.2	1.5	2.1	2.5	2.6	2.1	2.1

s.a. = seasonally adjusted

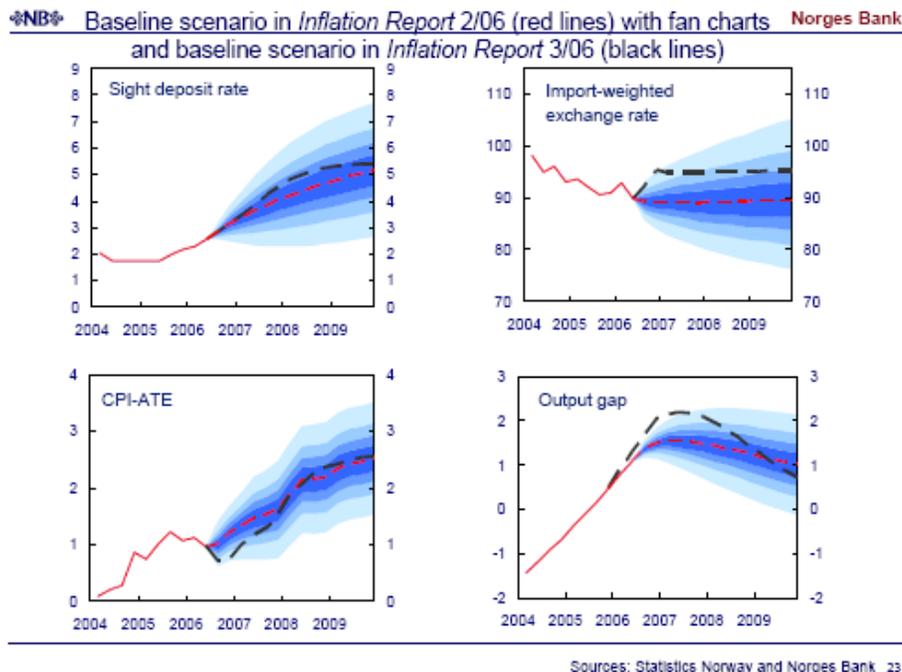
The RBNZ and the Norges Bank are the only two central banks to provide an explicit forecast of the output gap. The RBNZ publishes its forecast of the output gap in a table (see exhibit 2), whereas the Norges Bank presents its output gap forecast in a “fan” chart (see exhibit 3, bottom right panel) where the forecast is a distribution of outcomes. Many of the other central banks, while they do not publish an explicit forecast of the output gap, make reference to it, to potential output growth, or to other capacity measures when describing their forecast for inflation and occasionally provide an implicit forecast of these variables in the text. One concern with publishing output gap forecasts is that the output gap is very difficult to measure in real time: Orphanides (2001) points out that for the United States, these measurement errors have been

¹⁷ Although quarterly numerical parameters for the fan chart are posted about a week later on the Bank of England’s web site, only the fan chart itself is shown in the Inflation Report, so that press reports will focus on the contours of and uncertainty surrounding the forecast, rather than the BoE’s central tendency.

CLASS II FOMC — RESTRICTED (FR)

quite large. In part for this reason, the Bank of Canada provides a confidence band around its estimate of the recent evolution of the output gap.

Exhibit 3: Forecast Charts, Norges Bank, November 2006



A number of central banks publish assumptions or forecasts for exchange rates and oil prices. In several cases, the assumption for exchange rates is a constant path, but the RBNZ, Norges Bank, and Riksbank all publish exchange rate forecasts that are not necessarily constant. Oil prices are often assumed to follow the path derived from futures markets. The RBNZ has on occasion published a forecast of house price inflation. No central bank that we know of publishes a forecast of equity market prices.

The RBNZ and the Riksbank publish forecasts of the government fiscal balance. Although we know of no sharp conflicts in either case between the government and the central bank over their published forecasts, the RBNZ has on occasion highlighted the differences. In its December 1996 Monetary Policy Statement, just after a general election, the Bank noted that its “economic projections—which embody a less optimistic outlook for economic growth than those of the Treasury—also lead us to project markedly smaller fiscal surpluses than those expected by the Treasury.” This said, when both the government and the central bank publish macroeconomic forecasts, conflicting views of the outlook potentially may complicate the relationship between the two entities.

Central banks generally have increased over time the number of variables for which they publish

CLASS II FOMC — RESTRICTED (FR)

forecasts. Initially, many central banks published only inflation forecasts. Explicit GDP forecasts were added at the BoE, Riksbank, and BoC in November 1997, September 1999, and April 2004, respectively. In Canada, early published forecasts did not even include an explicit numerical forecast of inflation. Output gap and interest rate forecasts (see next section) were also added in some countries. One, albeit temporary, exception was that the RBNZ dramatically cut the number of published forecasted series in December 2000, only to include some of those variables again in May 2002.¹⁸ The reason given for the reduction in published forecasts was that “the level of detail previously published added little, and may sometimes have created misleading impressions. The previous forecast provided so much detail that a false impression may have been created that monetary policy depended heavily on highly detailed and mechanistic economic forecasts.”¹⁹ The increase in published variables in 2002 occurred after the Bank had to respond to repeated questions from outside analysts that in most cases were easily addressed by providing more detail about the forecasts.

What assumptions are made about the policy rate?

There is also considerable variation across central banks in how they treat policy rates when making their forecasts. Table 1 shows that, of the central banks studied here, four banks condition on an interest rate path derived from futures markets, one conditions on an unchanged path, two do not specify their interest rate path, and two central banks publish their own interest rate forecasts (and another is expected to do so soon).²⁰

This aspect of publicly available forecasts is perhaps the one that has changed the most recently. Whereas a few years ago most central banks published baseline forecasts that were conditioned on a path where the nominal policy rate does not change, now only the Swiss National Bank does. Under this constant path, the presumed intent of policymakers is not to suggest that policy will adhere to this rate path. Rather, the presumed intent is to suggest that policymakers will adjust the current policy interest rate to bring the inflation forecast near its target by the end of the forecast period. In contrast, the Bank of England, the Riksbank, the European Central Bank, and the Bank of Japan, now publish their forecasts based on the assumption of market expectations of policy interest rates.²¹ The Bank of England shows a separate inflation fan chart

¹⁸ To get some idea of the magnitude of the cut, the RBNZ eliminated six of its eight tables providing detail on the forecast in December 2000. In May 2002, one table’s worth of series was added back.

¹⁹ Reserve Bank Assistant Governor David Archer, as reported in the December 2000 Monetary Policy Statement.

²⁰ The interest rate forecasts produced by central banks are unconditional forecasts, where the term “unconditional” means that the forecast has not been conditioned on some exogenous path, in this case a path for interest rates. These central banks update their forecasts for interest rates as they receive new data.

²¹ Most of these central banks detail the implied interest rate path from market instruments in their published forecast. The Bank of Japan notes that although its forecasts are mostly based on market expectations, members are not bound to follow that implied path explicitly.

CLASS II FOMC — RESTRICTED (FR)

based on the assumption that policy rates remain unchanged.²²

A forecast conditioned on market expectations of interest rates may be more informative during a period when monetary policy is expected to change. Such an assumption could suggest more clearly the cumulative change in interest rates that the central bank thinks necessary to bring inflation and output closer into line with its objectives, if the forecasts, in fact, come back towards the objective. In addition, an unchanged interest rate path set at a level that is either “too high” or “too low” will potentially result in forecasts where either inflation or output growth will eventually drop or rise sharply.²³ Since this phenomenon is more likely to happen the longer the forecast horizon, it is probably not a coincidence that moves away from a constant interest rate assumption and moves to extend the forecast horizon tended to happen around the same time.

Conditioning the forecast on interest rates implied by futures markets may entail some problems. Some might perceive that using financial markets’ expectations gives too much influence to the markets in monetary policy decisions. Recently, labor unions in Sweden have worried about precisely this latter point, and have pushed the Riksbank to consider providing its own forecast of interest rates, which it will likely start doing soon. Second, others might worry that such a path for interest rates would be perceived as a commitment by the central bank. Third, some researchers suggest that using market expectations as a conditioning assumption may be inconsistent with models that the central bank is using to generate forecasts. Finally, Faust and Leeper (2005) argue that conditional forecasts are not very informative about the central banks’ preferences over its objectives or the likely path of policy: a forecast conditioned on market interest rates is not more informative than any other conditional forecast.

Two central banks publish their own forecast of policy interest rates.²⁴ Since 1997, the Reserve Bank of New Zealand has published a forecast of the interest rate path. This forecast is the one that would be consistent with inflation moving to the middle of the target range over a horizon of one to two years, and the RBNZ uses that policy forecast as the basis for its inflation and GDP forecasts. This forecast is primarily model-based, using a monetary policy reaction function to generate the interest rate path. The Governor does make some adjustments to the forecast for

²² Usually the forecast based on market rates is the only one presented in the *Inflation Report*’s introduction, but in August 2005, the forecast based on a constant rate path was included to highlight the different implications of those paths. Market expectations of future rates were considerably lower than anyone on the MPC thought was reasonable; the forecast conditioned on this path had inflation overshooting the 2-percent inflation target at the two-year horizon, while the one conditioned on a constant-rate path was close to the target. Governor Mervyn King also pointed out the differences between the two forecasts in his press conference on the report.

²³ Forecasts that are produced from models are perhaps more likely to be subject to this effect.

²⁴ The Colombian central bank (not studied here) also published a projection for the policy interest rate path but discontinued that practice in June 2004 following a period when exchange rate appreciation prompted the bank to ease policy rather than to tighten as it had previously projected.

CLASS II FOMC — RESTRICTED (FR)

interest rates, but it is not clear that the forecast necessarily represents what the Governor actually would do if things were to develop in the way the forecast anticipates.²⁵

From June 1997 until the late 1990s, the RBNZ published its interest rate forecast as part of its forecast of a monetary conditions index (MCI), a weighted-average of the short-term interest rate and the trade-weighted exchange rate. The MCI was used to guide and describe monetary policy.²⁶ The RBNZ ultimately found the MCI unsatisfactory as market participants tended to expect the RBNZ to automatically adjust interest rates in response to exchange rate movements. The Bank had difficulty communicating the difference between exchange rate shocks that it would offset (portfolio shocks) and exchange rate shocks that it would not offset (real shocks), illustrating the potential pitfalls associated with publishing forecasts of intermediate targets or indicators to communicate about monetary policy.²⁷

Starting with its November 2005 Inflation Report, the Norges Bank began publishing its own interest rate forecasts and its own exchange rate forecasts, with “fan charts” showing the probability distribution around each baseline forecast. As noted above, the Governor’s main input into the forecasting process is to provide extensive feedback on the interest rate path; however the initial path is produced using a simple reaction function including output gaps and inflation. This reaction function is meant to approximate a more complex rule that reflects all of the objectives that the Governor is trying to balance, and therefore the parameters of the reaction function are updated to reflect his guidance. These parameters are not published; however, the Norges Bank’s use of alternative scenarios may communicate some information about its policy reaction function. The Bank compares the new projection of the interest rate path with that in the previous Report, and shows the change in the interest rate path due to the change in the inflation projection and the change due to the change in the projection for the output gap. Any remaining change may suggest a change in the reaction function parameters.

What is the main forecast scenario?

For the Swiss National Bank, RBA, and the Riksbank, the main scenario is the most likely path (the mode of the distribution of the policymakers’ consensus forecast). The Riksbank’s *Inflation Report* also has a table that reports the mean. The central tendency of the BoE’s forecast distribution (its “fan” charts, shown in exhibit 4) corresponds to the mode of the distribution of outcomes for a given profile of interest rates. However, the BoE uses the mean forecast in

²⁵ The Bank of Canada’s staff projections also incorporate a policy reaction function, but those projections are not published and are only one input into the Governing Council’s published outlook.

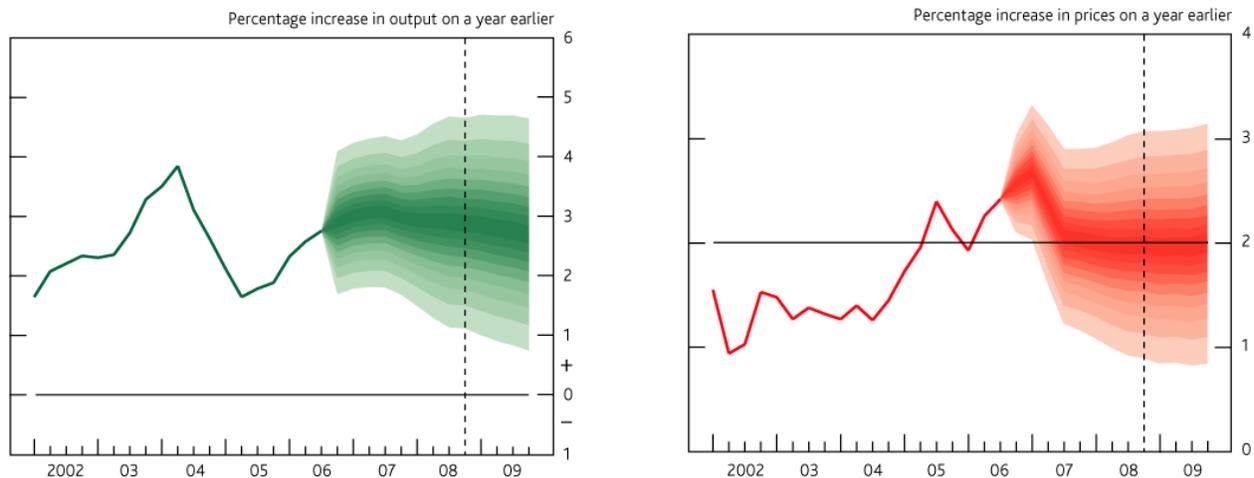
²⁶ The Bank of Canada also used an MCI to communicate information about monetary policy, without providing a forecast of it. See Longworth and Freedman (2000) for further details.

²⁷ See Svensson (2001).

CLASS II FOMC — RESTRICTED (FR)

making comparisons with outside forecasts and (ex-post) with actual outcomes, because the BoE considers the mean to be the single statistic that best reflects the entire probability distribution (including the balance of risks). In contrast, the Bank of Japan does not publish one scenario, but rather a complete and a trimmed range of individual Policy Board members' forecasts²⁸ as well as the median of those forecasts. These ranges describe the dispersion of Committee members' views, rather than the members' views about the dispersion of possible outcomes.

Exhibit 4: Fan charts from the Bank of England, November 2006
(GDP left, CPI right)



How is uncertainty conveyed in the presentation of the forecasts?

The central banks studied generally have sought to convey that their forecasts are subject to uncertainty and are unlikely to be exactly realized. However, there is a wide range of practice in characterizing forecast uncertainty. In most central banks, the published report includes a discussion of some of the main risks to the forecast. In some cases, the report also makes an assessment about whether these risks are skewed to the upside or the downside. The Bank of England, Bank of Canada, and Bank of Japan are among those that characterize the balance of risks to the forecast.

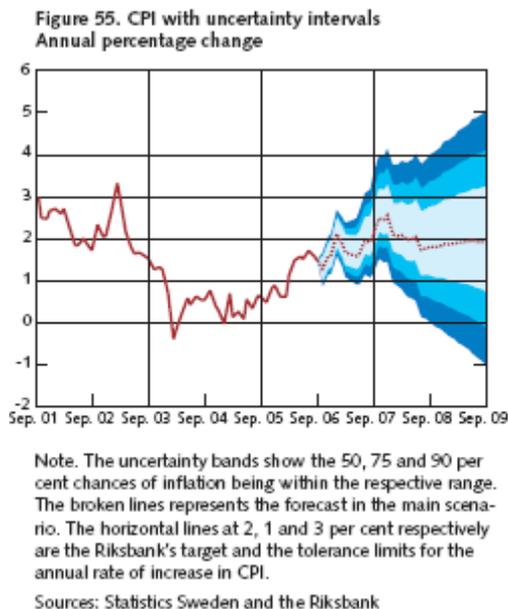
Since February 1996, the Bank of England has presented a probability distribution (“fan” chart) of possible outcomes to reflect the range of uncertainty around the policymakers’ consensus forecast over the forecast period (see exhibit 4). The Riksbank and Norges Bank also later adopted this approach (see exhibits 5 and 2, respectively). The Riksbank points out that not only the point estimate but also the whole distribution matters for the policy decision. In that way, the presentation of a probability distribution helps to communicate the Executive Board’s outlook and its rationale for policy decisions. At the Riksbank, the staff fits a two-piece normal distribution around the modal forecast of several variables considered to be determinants of

²⁸ These forecasts are the figures to which the individual members attach the highest probability.

CLASS II FOMC — RESTRICTED (FR)

inflation. These distributions are weighted together to obtain a distribution for the inflation forecast that is presented to the Executive Board. The Board members have the opportunity to express a view about whether they would like the variance or skewness to be tweaked. The consensus of these views is formally known as their “risk assessment.”

Exhibit 5: Riksbank’s CPI Forecast, Third-Quarter 2006



The procedure for preparing fan charts at the Bank of England is similar to that of the Riksbank but the MPC members are more directly involved in the forecast at each stage. As at the Riksbank, MPC members express views as to whether they believe uncertainty is higher or lower than average and whether there is skewness. The Norges Bank also discusses uncertainty in its *Inflation Report* and includes fan charts for inflation and the output gap.²⁹ For other forecast variables, such as foreign GDP and foreign inflation, a table is shown with specific numbers.

The ECB conveys forecast uncertainty by expressing its forecasts as ranges (see exhibit 6). The width of the ranges is based on the differences between actual outcomes and projections by the Eurosystem staff in recent years.³⁰

²⁹ In contrast to the fan charts we described above, the forecast uncertainty bands that are shown in the Greenbook are produced using stochastic simulations of the FRB/US model and checked against a method that uses actual Greenbook forecast errors (since the late 1970s). These methods are described in a memorandum to the FOMC by David Reifschneider, Robert Tetlow, and Peter Tulip (March 11, 2004).

³⁰ The width of the ranges is twice the average absolute value of these differences.

CLASS II FOMC — RESTRICTED (FR)

Exhibit 6: European Central Bank, Staff Forecast, September 2006

Table A Macroeconomic projections for the euro area			
(average annual percentage changes) ^{1), 2)}			
	2005	2006	2007
HICP	2.2	2.3-2.5	1.9-2.9
Real GDP	1.5	2.2-2.8	1.6-2.6
Private consumption	1.5	1.8-2.2	0.9-2.1
Government consumption	1.3	1.0-2.0	0.7-1.7
Gross fixed capital formation	2.7	3.0-4.6	2.1-5.3
Exports (goods and services)	4.2	6.0-8.8	3.4-6.6
Imports (goods and services)	5.2	5.7-8.7	3.1-6.5

1) For each variable and horizon, ranges are based on the average absolute difference between actual outcomes and previous projections by euro area central banks. The projections for real GDP and its components refer to working-day-adjusted data. The projections for exports and imports include intra-euro area trade.

2) The September 2006 projections for the first time include Slovenia as part of the euro area in the euro area projections for 2007. The weight of Slovenia in euro area GDP in 2005 was 0.3%. The annual percentage changes for 2007 are based on a euro area composition that includes Slovenia already in 2006.

The RBNZ for a few years tried to convey uncertainty by scaling back the level of precision in its forecasts, reporting to the nearest ½ percentage point and later to the nearest ¼ percentage point rather than to the tenth decimal place. A report by Svensson (2001) on the RBNZ suggested that it follow the lead of the Bank of England and the Riksbank and convey uncertainty with confidence intervals. In June 2006 the Reserve Bank returned to reporting forecasts in tenths of a percentage point, but did not adopt confidence intervals for its forecasts.

The RBNZ instead conveys uncertainty in its forecast by a discussion of the risks, and also by presenting alternative scenarios to highlight the possible results of changes in key assumptions. For example, the June 2006 Monetary Policy Statement presented inflation and interest rate paths under the assumption that higher oil prices would lead to higher inflation expectations, and the September Statement looked at scenarios where inflationary pressures from domestic demand growth were higher and lower than in the baseline forecast.

6. Presentation of Published Forecast

What is the frequency of published forecasts versus the frequency of meetings?

Generally, most central banks have moved to publishing their forecast around three or four times a year. As noted in table 2, a number of the central banks studied here have increased the

CLASS II FOMC — RESTRICTED (FR)

frequency of their forecasts from semi-annual to quarterly, including the RBNZ, the Swiss National Bank, the ECB, and the Bank of Canada. For both the Bank of Canada and the ECB, two of these forecasts are reported as shorter updates. In the case of the ECB, the two more thorough-going forecasts are those of the whole Eurosystem staff, produced in a time-consuming process whereby the ECB staff interacts with the staffs of the member central banks. The other two times a year (those added in 2004), the forecast is that of the ECB staff alone, done in the same overall manner as the Eurosystem staff forecast, but without the extensive input of the member central bank staffs. In contrast, the Norges Bank reduced the number of *Inflation Reports* per year from four to three in 2001, and the Riksbank did the same in 2006.³¹

Publishing forecasts three or four times a year means that almost none of the central banks studied (the SNB, which only meets once a quarter, being the exception) publishes a new forecast for each meeting.³² Thus the discussion of policy actions issued to the public after meetings often focuses on how new information may have changed the outlook since the last forecast, rather than pointing to a new staff or policy board forecast. For instance, the Bank of England's Monetary Policy Committee meets twelve times a year, but produces and publishes a forecast only quarterly. Although the MPC can make a policy move at any of its meetings, around $\frac{3}{4}$ of all interest rate changes in the past five years have occurred at the four meetings a year that correspond to the release of its Inflation Report. Some other central banks are also more likely to change their policy rates at a meeting after which a forecast is published, but to a lesser extent than at the BoE.

When is the forecast released relative to the timing of the policy meeting?

The published forecast is most often released at the same time as a policy announcement. In a few cases, such as the BoE, BoC and RBA, the forecast and accompanying commentary are published within a week after the meeting.

What kind of commentary is released along with the forecasts?

All the central banks studied release commentary on the economy along with their forecasts; for most of them, the forecast is published as an integral part of an inflation report, with extensive commentary on current developments and the outlook. For example, the Riksbank organizes its whole *Inflation Report* as a discussion of the consequences of various factors for the inflation

³¹ For relatively small central banks, staff resources may be a motivating factor in reducing the number of published forecasts.

³² Some central banks produce unpublished forecasts for the remaining policy meetings. For example, the Riksbank produces an Update to the Inflation Report (the Inflationssuppföljning) which contains a forecast of all the main variables.

CLASS II FOMC — RESTRICTED (FR)

forecast. In contrast, the ECB includes its relatively brief discussion of the outlook as an article (four times a year) in its monthly bulletin and does not integrate the outlook with the analysis of the euro-area economy that is found elsewhere in the monthly bulletin; it does not publish a separate inflation report.

Almost all of the central banks make some policymaker (usually the governor or central bank president) publicly available for questions in some way following the release of the forecast: the most common means is through a press conference (table 1). At the Bank of England, Mervyn King held a press conference upon the release of the Inflation Report when he was deputy governor and chief economist, and he has continued to do so as governor. ECB President Trichet holds a press conference after each of the monthly meetings of the Governing Council, including the four at which the quarterly staff forecast is released.

Many central banks also have their heads testify about the outlook before their legislatures, including the governors of the Bank of Canada, the Riksbank, the Bank of England and the Reserve Bank of Australia. In all cases, these testimonies occur before a sub-committee of the legislature whose responsibilities include the legislation for the central bank, such as a finance committee or a treasury committee. In New Zealand, the governor presents the outlook to the RBNZ's Board, which consists of government-appointed overseers of monetary policy.

7. Consequences of Publishing Forecasts

Observers seem to generally agree that the published forecasts of central banks have improved central bank communications, and many have praised central banks for the quality of their forecast publications. Greater communication by central banks may have increased political or public support for central bank independence. In addition, the fact that more central banks have started publishing forecasts and that central banks have in most cases broadened the amount of detail in their published forecasts might be taken as evidence of the usefulness with which these institutions regard them.

However, we do not have much quantitative evidence to support the view that publishing forecasts has improved monetary policy communications or outcomes. In principle, information from central banks that increases markets' and the public's understanding of the central bank's view of the economy and the central bank's goals may make it easier to predict monetary policy actions on the basis of incoming data. Some researchers have presented evidence that official interest rate changes have become more predictable in a number of advanced economies, including the United States, and that the smaller response of market interest rates to a change in

CLASS II FOMC — RESTRICTED (FR)

official rates is associated with greater central bank “transparency.”³³ Although these studies do not look directly at the effects of published forecasts, they make use of indexes of transparency that include the publishing of a forecast or the extent of detail in the published forecast. Fracasso et al. (2003) provides some more direct evidence by looking at how the quality of inflation reports affects the extent of official interest rate surprises (a measure of how predictable policy rate changes are) in a panel of inflation targeters. They find that higher-quality inflation reports are associated with smaller monetary policy surprises. However, it is not clear in which direction the causality runs; moreover, their sample includes many emerging market economies, which generally have lower quality ratings on their inflation reports and greater interest rate surprises.³⁴

Although the release of a central-bank forecast does seem to affect short-term interest rates (see below), we cannot reliably detect any significant effects of publishing a forecast on most other macroeconomic outcomes.³⁵ As noted in our January 2005 background paper for the FOMC, we reached a similar conclusion for the adoption of an explicit numerical inflation objective: Because central banks have similar objectives for monetary policy and we have only a relatively short data sample, we can probably only rule out the conclusion that self-described “inflation targeting” (IT) central banks and non-IT banks have dramatically different outcomes. We also reviewed some research suggesting that, although not definitive, the weight of the evidence favored the view that long-term inflation expectations in inflation-targeting economies may be somewhat better anchored than in non-inflation-targeting economies. Since the adoption of an inflation objective was often accompanied by starting to publish a forecast (within a few years), we might similarly conclude that the effects of forecast publishing may be limited, and that how much better anchored expectations are as a result of releasing a forecast is very difficult to identify.

Given that the evidence on the effects of publishing a forecast is limited, it is not surprising that we also cannot discern substantial differences in economic outcomes and banks’ ability to communicate despite the fairly wide range of practice described above. Although a number of researchers have pressed central banks to publish more information about their forecasts, others argue that central banks should only publish the most important information to focus their

³³ Muller and Zelmer (1999) present evidence for Canada. Haldane and Read (2000) present evidence for the United Kingdom and the United States. Poole, Rasche and Thornton (2002) present evidence that FOMC statements have made future moves more predictable in the United States. Ehrmann and Fratscher (2005) find that ECB interest rate moves are about as predictable as those of the Federal Reserve, and more predictable than those of the BoE.

³⁴ Leeper (2003) provides a qualitative review of the inflation reports of several central banks.

³⁵ Chortareas et al. (2002) is one example of a paper that finds that more “transparency” in published forecasts is associated with lower average inflation outcomes, but not lower inflation volatility. They define full transparency as: publishing a forecast, publishing forward looking analysis, discussing forecast errors, and discussing the risks to the forecast. As Carpenter (2004) notes, Chortareas et al. do not identify a causal relationship: central banks that pursue sound monetary policies may also wish to publish more information.

CLASS II FOMC — RESTRICTED (FR)

communication. For example, the RBNZ reduced some of the detail of its forecast that it publishes. In addition, the Bank of England is regarded to have been successful in its use of forecasts to enhance communication, although compared to the other central banks studied it releases less detail about its forecast. While the Bank publishes the entire distribution of its forecast in its fan charts, it releases the statistics behind the charts only with a lag and provides neither output gap forecasts nor its own view of future interest rate developments.³⁶ However, even the Bank of England has increased the amount of detail it provides in its forecasts, including the introduction of fan charts, a GDP forecast, and a forecast conditioned on market expectations of interest rates.

The extent of detail provided in the published forecast may depend on the intent of the central bank. The forecast can be used to communicate information about the central bank's assessment of the economic outlook, or the central bank's preferences, or both. To stay with our example of the Bank of England, the Bank states that it uses the *Inflation Report* to convey information about the outlook, but not its goals, perhaps because the Bank has already been given explicit goals by the government. This may explain why the BoE publishes the level of information that it does.

What assessments have been made of forecast track records?

Many central banks periodically evaluate their forecasting track records in speeches, inflation reports and other central bank work (such as bulletin articles), evaluating the performance of the forecast relative to those of other forecasters and alternative models, as well as testing for biases and forecast rationality. These assessments find that, while far from perfect, central bank forecasts compare relatively favorably. For example, Turner (2006) in the RBNZ Quarterly Bulletin noted that the root mean squared errors (RMSE) of the Bank's forecasts for most variables were at least comparable to those from Consensus Forecasts, and for inflation and interest rates they were somewhat better. In addition to annual assessments of the past three years' forecasts³⁷, Riksbank economists have compared the official forecasts to those from two structural models (an identified Bayesian vector autoregression and a dynamic general equilibrium model).³⁸ Official forecasts have lower RMSEs for forecast horizons of one year or less, but the model-based forecasts perform better at longer horizons. Other central banks, including the Norges Bank and the Bank of England, also regularly provide assessments of past forecasts.

³⁶ One might argue that by not providing an explicit mode at the time of publication, the Bank of England is being more transparent, because it is being more upfront about the low likelihood that its modal forecast will be realized.

³⁷ The Riksbank, in its first *Inflation Report* each year, provides comparisons of the previous three years' forecasts with those of outside forecasters and with actual outcomes. These comparisons also provide a basis for the annual parliamentary assessment of the Riksbank's monetary policy.

³⁸ Adolfson et al. (2006).

CLASS II FOMC — RESTRICTED (FR)

In addition, some central banks have invited outside observers to evaluate their forecasting ability and publish reports of their findings. For example, the Bank of England invited Adrian Pagan (2003) to review its forecast models and performance, and a review of the RBNZ's forecasting model was included in a more general report by Lars Svensson (2001). Both of these reviews of past performance were quite positive. Svensson said that RBNZ forecasting was "best practice." Pagan noted that two issues raised in previous Bank of England analyses and in outside commentary—the bias in the forecasts and the persistence of forecast errors—were minor but suggested that the Bank might pay some more attention to the joint distribution of errors (errors were largest when inflation and GDP growth were negatively related). He also suggested that greater attention be paid to auxiliary models.

Despite relatively favorable assessments both by central banks and by outside assessors, published central bank forecasts are not without their critics. Sims (2002) criticizes central banks for not using more Bayesian techniques when forecasting, which he believes could improve forecasts that are already of "high quality." Faust and Wright (2006) find some evidence that the Bank of England's forecast is not efficient (information known at the time the forecast was made is correlated with the forecast error) when the conditioning assumption for interest rates is taken into account.

How have central banks handled obvious forecast errors?

Central banks have used their forecast reports to address obvious past forecast errors. Other central bank communication, including speeches and testimonies, have also sometimes been devoted to explaining why the economy evolved significantly differently from the baseline projection and to underscore that forecasts are uncertain. For example, Swedish inflation was below target and below the Riksbank forecasts during 2004 and 2005. According to the *Inflation Report* for the first quarter of 2006, experiments with its macroeconomic model suggested that the Riksbank's overprediction of inflation likely occurred because of higher productivity growth and lower import prices than it had expected. The Riksbank also compared its forecast performance with outside forecasts, pointing out that at times the Riksbank forecast was closer to outcomes than the average of outside forecasts.³⁹ Another example is that Canadian inflation turned out to be much higher than forecast in late 2002 and early 2003. The twelve-month rate rose above 4 percent, significantly above the Bank of Canada's 1-to-3-percent target range for inflation. In its April 2003 Monetary Policy Report, the Bank suggested that the reasons for the forecast error were higher-than-expected prices of oil and natural gas, an unforeseen sharp rise in insurance premiums, and an economy that was operating closer to its capacity limits than had

³⁹ One complication in evaluating forecasts was that the Riksbank used the conditioning assumption of a constant policy interest rate during part of the period studied.

CLASS II FOMC — RESTRICTED (FR)

been anticipated. The rest of the report went on to outline the reasons that inflation would decline in coming months.

What has been the public/market response to the publication of forecasts?

Some attention has been devoted to the effects of releasing forecasts on financial markets or on public expectations. For example, Andersson et al. (2006) examine the immediate effects on the term structure of Swedish interest rates of the release of the Riksbank's *Inflation Report*, as well as central bank speeches, minutes, and the unexpected component of changes in the repo rate and in data releases. They find that the information in the publication of the *Inflation Report*, which they measure as the difference between the inflation forecast and the inflation target, has a significant effect on interest rates with a maturity of one year or less. They find a much larger effect on the yield curve of a surprise change in the policy rate, and they caution that interpreting the effect of releasing the forecast is difficult because its publication coincides with some of the policy interest rate announcements. Clare and Courtenay (2001) also find some evidence that financial variables react to the release of the Bank of England's *Inflation Report*.

What problems have central banks had with using forecasts to communicate?

In general, central banks that publish forecasts have not had any serious problems using their forecasts to communicate, though they have faced some challenges. Some of these we have already pointed out above, for example the resistance of labor unions to the Riksbank's decision to condition its forecasts on market interest rates and the RBNZ experience publishing an MCI forecast.

CLASS II FOMC — RESTRICTED (FR)

References

Andersson, Malin, Hans Dillén, and Peter Sellin (2006), “Monetary Policy Signaling and Movements in the Term Structure of Interest Rates,” *Journal of Monetary Economics*, 53, 1815-1855.

Archer, David (2005), “Central Bank Communication and the Publication of Interest Rate Projections,” Bank of International Settlements, June.

Berg, Claes (2005), “Experience of Inflation-Targeting in 20 Countries,” *Sveriges Riksbank Economic Review*, 1.

Blinder, Alan, Charles Goodhart, Philipp Hildebrand, David Lipton, and Charles Wyplosz (2001), “How Do Central Banks Talk?” Geneva Reports on the World Economy, 3, Geneva: International Center for Monetary and Banking Studies.

Carpenter, Seth (2004), “Transparency and Monetary Policy: What Does the Academic Literature Tell Policymakers?” Board of Governors of the Federal Reserve System, April.

Chortareas, Georgios, David Stasavage, and Gabriel Sterne (2002), “Does It Pay To Be Transparent? International Evidence from Central Bank Forecasts,” *Federal Reserve Bank of St. Louis Review*, July/August, 99-117.

Doyle, Brian, Jon Faust, Linda Kole, Mike Leahy and Paul Wood (2005), “The Foreign Experience with Explicit Numerical Price Objectives,” a background paper prepared for the January 2005 FOMC meeting.

Doyle, Brian (2006), “Update on the Explicit Numerical Price Objective Project,” a background paper prepared for the October 2006 FOMC Meeting.

Faust, Jon and Dale Henderson (2004), “Is Inflation Targeting Best Practice Monetary Policy?” *Federal Reserve Bank of St. Louis Review*, 86, 4, July/August.

Faust, Jon and Eric Leeper (2005), “Forecasts and Inflation Reports: An Evaluation,” Federal Reserve Board, photocopy, December.

Fracasso, Andrea, Hans Genberg, and Charles Wyplosz (2003), “How Do Central Banks Write? An Evaluation of Inflation Targeting Central Banks,” *Geneva Reports on the World Economy Special Report*, 2, Geneva: International Center for Monetary and Banking Studies.

Geraats, Petra (2002), “Central Bank Transparency,” *Economic Journal*, 112, November, 532-565.

Geraats, Petra (2005), “Transparency and Reputation: The Publication of Central Bank Forecasts,” *Topics in Macroeconomics*, Berkeley Electronic Press, 5, 1.

CLASS II FOMC — RESTRICTED (FR)

Mishkin, Frederic (2005), “Can Central Bank Transparency Go Too Far?” *Issues in Inflation Targeting*, proceedings of a conference held at the Bank of Canada, May.

Morris, Stephen and Hyun Song Shin (2002), “The Social Value of Public Information,” *American Economic Review*, 92, 1521-1534.

Kohn, Donald (2005), “Central Bank Communication,” speech to the American Economic Association, January 9.

Orphanides, Athanasios (2001), “Monetary Policy Rules Based on Real-Time Data,” *American Economic Review*, 91, 4, September, 964-85.

Orphanides, Athanasios and John Williams (2004), “Imperfect Knowledge, Inflation Expectations and Monetary Policy,” in Bernanke and Woodford (eds.) *The Inflation Targeting Debate*, University of Chicago Press.

Poole, William, Robert H. Rasche, and Daniel L. Thornton (2002), “Market Anticipations of Monetary Policy Actions,” *Federal Reserve Bank of St. Louis Review*, July/August, 65-93.

Reifschneider, David, Robert Tetlow, and Peter Tulip (2004), “Background Information on Greenbook Projection Confidence Intervals,” Memorandum to the Federal Open Markets Committee, March 11.

Rudebusch, Glenn, and John Williams (2006), “Revealing the Secrets of the Temple: The Value of Publishing Central Bank Interest Rate Projections,” Federal Reserve Bank of San Francisco, Working Paper 31, October.

Sims, Christopher (2002), “The Role of Models and Probabilities in the Monetary Policy Process,” *Brookings Paper of Economic Activity*, 2, 1-40.

Svensson, Lars (1997), “Inflation Forecast Targeting: Implementing and Monitoring Inflation Targets,” *European Economic Review*, 41, 6, 1111–1146.

Svensson, Lars (2002), “Monetary Policy and Real Stabilization,” in *Rethinking Stabilization Policy*, Federal Reserve Bank of Kansas City, 261-312.

Svensson, Lars (2005), “Monetary Policy with Judgment: Forecast Targeting,” *International Journal of Central Banking*, 1, 1-54.

Svensson, Lars (2005), “Social Value of Public Information: Morris and Shin (2002) Is Actually Pro Transparency, Not Con,” *American Economic Review*, forthcoming.

Svensson, Lars and Michael Woodford (2005), “Implementing Optimal Policy through Inflation-Forecast Targeting,” in Bernanke and Woodford (eds.) *Inflation Targeting*, University of Chicago Press, 19-83.

CLASS II FOMC — RESTRICTED (FR)

Svensson, Lars and Robert Tetlow (2005), “Optimal Policy Projections,” *International Journal of Central Banking*, 1(3) 177-207.

Svensson, Lars (2006), “The Instrument-Rate Projection under Inflation Targeting: The Norwegian Example,” working paper.

Wood, Paul (2003), “International Experience with Central Bank Communication,” a background paper prepared for the June 2003 FOMC meeting.

Woodford (2005), “Central Bank Communication and Policy Effectiveness,” NBER Working Paper 11898. (Presented at the Federal Reserve Bank of Kansas City Symposium in Jackson Hole.)

New Zealand

Brash, Donald (2001), “Making monetary policy: a look behind the curtains,” a speech to the Canterbury Employers’ Chamber of Commerce, Christchurch on January 26.

Lienert, Ashley (1988), “Reserve Bank Econometric Model Forecasts,” *Reserve Bank Bulletin*, June, 102-106.

Reserve Bank of New Zealand (various issues), *Monetary Policy Statement*.

Svensson, Lars (2001), “Independent Review of the Operation of Monetary Policy in New Zealand: Executive Summary,” *Reserve Bank of New Zealand Bulletin*, 64, 1, 4-11.

Turner, Jane (2006), “An Assessment of Recent Reserve Bank Forecasts,” *Reserve Bank of New Zealand Bulletin*, 3, 38-43.

Canada

Bank of Canada (various issues), *Monetary Policy Report*.

Bank of Canada (various issues), *Monetary Policy Report Update*.

Macklem, Tiff (2002), “Information and Analysis for Monetary Policy: Coming to a Decision,” *Bank of Canada Review*, Summer, 11-18. (With updated information on the Bank of Canada website: http://www.bankofcanada.ca/en/monetary/monetary_decision.html)

Muller, Phillippe and Mark Zelmer (1999), “Greater Transparency in Monetary Policy: Impact on Financial Markets,” Bank of Canada Technical Report 86, August.

United Kingdom

Bank of England (various issues), *Inflation Report*.

CLASS II FOMC — RESTRICTED (FR)

Bank of England (various issues), *Minutes of the Monetary Policy Committee meeting*.

Clare, Andrew and Roger Courtenay (2001), “Assessing the Impact of Macroeconomic News Announcements on Securities Prices Under Different Monetary Policy Regimes,” Bank of England Working Paper 125.

Elder, Rob, George Kapetanios, Tim Taylor and Tony Yates (2005), “Assessing the MPC’s Fan Charts,” *Quarterly Bulletin*, Autumn, 326-48.

Faust, Jon and Jonathan Wright (2006), “Efficient Forecast Tests for Conditional Policy Forecasts,” Federal Reserve Board, photocopy, July.

Haldane, Andrew and Vicky Read (2000), “Monetary policy surprises and the yield curve,” Bank of England.

Independent Bank of England Commission (2000), “Report,” April.

King, Mervyn (1997), “The Inflation Target Five Years On,” speech at the London School of Economics, October 29.

Kohn, Donald (2000), “Report to the Non-Executive Director or the Court of the Bank of England on Monetary Policy Processes and the Work of Monetary Analysis,” October 18.

Lamont, Norman (1992), Mansion House Speech, October 29.

Pagan, Adrian (2003), “Report on Modelling and Forecasting at the Bank of England,” Bank of England.

Sweden

Adolfson, Malin, Michael Andersson, Jesper Linde, Mattias Villani, Anders Vredin (2006), “Modern Forecasting Models in Action: Improving Macroeconomic Analysis at Central Banks,” *Sveriges Riksbank Working Paper* 188, June (revised).

Giavazzi, Francesco and Frederic Mishkin (2006), “An Evaluation of Swedish Monetary Policy between 1995 and 2005,” Report for the Swedish Rikstag’s Committee on Finance.

Leeper, Eric (2003), “An *Inflation Reports* Report,” *Sveriges Riksbank Economic Review* 3, 94-118.

Rosenberg, Irma (2006), “Monetary Policy in Sweden,” a speech given at the Swedibank, September 18.

Sveriges Riksbank (various issues), *Inflation Report*.

Australia

CLASS II FOMC — RESTRICTED (FR)

Reserve Bank of Australia (various issues), *Statement on Monetary Policy*.

Stevens, Glenn Robert (2001), “The Monetary Policy Process at the RBA,” a speech to the Economic Society of Australia’s (Victorian Branch) Forecasting Conference, Melbourne, October 10.

Norway

Bergo, Jarle (2006), “Projections, uncertainty and choice of interest rate assumption in monetary policy,” speech at the Foreign Exchange Seminar of the Association of Norwegian Economists at Sanderstølen, January 27.

Norges Bank (various issues), *Inflation Report*.

European Central Bank

ECB (various), ECB Staff Macroeconomic Projections.

ECB (various), Eurosystem Staff Macroeconomic Projections.

ECB (2001), “A Guide to Eurosystem Staff Macroeconomic Projection Exercises,” June.

Ehrmann, Michael and Marcel Fratzscher (2005), “Communication and Decision-making by Central Bank Committees: Different Strategies, Same Effectiveness?” ECB Working Paper 488, May.

Issing, Otmar (2001), “Monetary Policy and Financial Markets,” speech at ECB watchers conference, June.

Switzerland

Jordan, Thomas J. and Michel Peytrignet (2001), “La Prévision D’Inflation de la Banque National Suisse,” (The Inflation Forecast of the Swiss National Bank), *Swiss National Bank Bulletin*, 2, 54-61.

Swiss National Bank (various), *Monetary Policy Report*.

Japan

Bank of Japan (various), *Outlook for Economic Activity and Prices*.

Bank of Japan (various), *Minutes of the Monetary Policy Meeting*.

Fujiwara, Sakuya (2003), “Inside a Monetary Policy Meeting,” speech given at Toyo University, March 13.