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Why Central Bankers Should Disclose Interest Rate Forecast*

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Abstract
This paper deals with theoretical and empirical dimension of publishing interest rates projections by central banks. Its first goal is to review arguments in favor of and against this decision and to illustrate the debate using experience of four central banks which publish or used to publish interest rates forecast. The second objective is to evaluate the Czech National Bank's capability to efficiently use publishing of its interest rates forecasts to increase further its transparency, accountability and credibility. We argue that (i) the CNB meets all requirements needed for making its interest rate forecast public; (ii) more specifically, we do not find any evidence of significantly worse CNB's performance in interest rates forecasting compared to other institutions; (iii) it is not clear whether the risk assessment in combination with verbal description of interest rate forecast currently used has always been sufficiently precise guidance for the market participants; (iv) after the CNB starts publishing interest rates forecasts in 2008, market expectations will probably move closer to the CNB's view which should in turn enhance accountability and credibility of the CNB's forecasts and improve the efficiency of its monetary policy conduct at all.

1. Introduction

From the beginning of 2008 the Czech National Bank (hereafter the CNB) will publish the trajectory of interest rates (in the form of a fan-chart) consistent with its quarterly macroeconomic forecast. This decision of the bank board taken in March 2007 will mean a further step towards greater transparency of the CNB's monetary policy which has been conducted within the inflation targeting regime since 1998.[1]

It is well documented that the inflation-targeting regime has brought the transparency of central banks into special focus. For instance Goodhart (2001) and Archer (2005), using the example of the U.K. and New Zealand respectively, show that inflation-targeting central banks are particularly highly dependent on the market perception of their policy decisions and their communication. This is the case due to the fact that longer-term interest rates given inter alia by market expectations of fu-

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[1] Also starting in 2008, the number of monetary policy meetings of the board will be reduced to eight from the current number of twelve. Moreover, the CNB will publish the votes cast by the board members on interest rate decisions by name as of 2008. Simultaneously, the new inflation target for y-o-y CPI inflation at the level of 2 % was announced to be effective from 2010.

ture monetary policy are the very factor playing a role in the actual decision-making of economic agents. And, accordingly, these longer-term rates (rather than the short--term ones under direct control of a central bank) co-determine the ultimate macroeconomic outcomes the central bank aims to influence. In this respect, the transparent communication of a central bank assessment of the current state of the economy and its likely future development including implicit risks and monetary policy pressures thereof is a prerequisite for successfully conducting monetary policy in this regime.

At the same time, inflation-targeting central banks[2] have recognized the phenomenon of an undetermined level of inflation with that being anchored by the expectations of agents formed with direct relation to monetary policy regime, its objectives and track record. A central bank's decision to publish its own forecasts for the policy interest rate is a further step towards greater openness and clarity in com-munication. This decision does not affect the execution of monetary policy, but has certain consequences for the forecasting process at central banks. Furthermore, the currently applied inflation targeting approach is mainly based on the *"management of expectations"*, as formulated by Woodford (2005). He claims *"for not only do expectations about policy matter, but […] very little else matters"*.

To get a more realistic picture of the economy in this respect, inflation targeters have been gradually moving from constant interest rate assumptions underlying their macroeconomic forecasts (a conditional forecast) to a fully consistent framework where the agents' endogenous inflation and interest-rate expectations are an integral part of the whole macroeconomic forecast (an unconditional forecast).

Thus, the ability of the monetary authority to influence expectations in this manner[3] is directly related to the transparency and communication of an inflation-targeting central bank. In various aspects, this article addresses challenges an inflation--targeting central bank faces if it decides to publish the endogenous trajectory of interest rates underlying its macroeconomic forecast. In the perspective of that mentioned above, publishing endogenous interest rates could be considered as the best practice of central banking transparency and communication.

However, not only inflation targeters but also other central banks have been getting more and more transparent in the last decade, compared to what the standard in this business was fifteen or more years ago. From today's perspective it is almost impossible to imagine that prior to 1994, the Fed's FOMC decisions regarding the federal funds rate were assumed to be implicitly announced through the size and type of open market operations taking place the next day.

From a theoretical or more general point of view, transparency has become an integral part of the triangle of central banking principles comprising the accountability and credibility of central banks along with their aim to behave transparently. By applying these core principles many central banks deal with challenges stemming from the fact that they have become almost fully independent from governments (even being sometimes accused of getting out of democratic control). Following these three principles of central bank independence[4] is considered to be the best way to solve the potential problem of time- or dynamic inconsistency of monetary policy.

[2] In 2007, 24 central banks are conducting their monetary policy within the inflation targeting regime.

[3] That is to encourage economic agents to form their expectations according to systematic monetary policy behaviour.

Despite a generally-shared broad picture on what transparency basically means and what its benefits are, there are few common views on the details. Winkler (2000) for example provides a very nice and comprehensive discussion on various aspects and features of transparency including the mutual relationships and interdependence between the communication, transparency, independence, credibility, predictability and efficiency of monetary policy. Not surprisingly, he has found that the term transparency is vague and often contradictory in both academic literature and in the practitioners` thinking. As he stressed, transparency cannot simply be reduced to a central bank's openness and thus more information provided by the bank does not necessarily mean a higher level of mutual understanding between a central bank and the general public. As a result, he proposes his own broader definition of the term being referred to as *"common understanding"* that *"points to the need that both the sender and the receiver in the monetary policy game share a common mode of interpretation"* (p. 26).

In reality, there are a number of signs of central bank transparency to be seen in various aspects of their behaviour beyond those that have been mentioned for the case of inflation targeters. All central banks are now more or less transparent concerning their primary objectives including their willingness to reveal considerations and preferences regarding possible conflict (trade-off) between inflation and GDP fluctuations.

The increasing transparency of a central bank has been reflected in the better market perception of the bank and in its forecasting performance. In his paper, Swanson (2004) shows that the aforementioned Fed´s decision to start explicitly announcing changes in its federal fund rate target in 1994 and the previous and subsequent steps taken to increase the Fed`s transparency have led to generally better and more certain forecasts of the markets by private sector forecasters. Similarly, Bauer et al. (2006) find out that the private agents´ ability to predict future economic developments has increased to a certain extent since 1994 when the Fed started publishing its view of the economic outlook with the expectations of market participants being more closely in line each other.

In sum, a high level of central bank transparency is considered as positive. However, some economists claim that the transparency of central banks can go too far and can damage the efficiency of the monetary policy execution. Mishkin (2004) argued that increased transparency will complicate the communication process and weaken support for a central bank focus on long-run objectives.

The remainder of the article is organised as follows. The second chapter reviews arguments in favor of and against publishing the interest rate forecast as the top case of transparency. The third chapter then examines the experience of central banks that already publish interest rate forecasts or used to publish interest rate forecasts. The fourth chapter gives an overview of discussions on this topic taking place at the CNB and generally in the Czech environment with the fifth chapter concluding and summarizing.

2. The Clash of Arguments

There has been quite a lively dispute in literature as to whether or not central banks should publish the trajectory of interest rates consistent with their macroeconomic forecasts, i.e. the endogenous trajectory generated by a monetary policy

[4] Central bank independence may in general comprise several dimensions such as institutional independence, operational independence, personal independence and (last but not least) financial independence.

reaction function of the particular central bank. This chapter picks up arguments for both these options (to disclose or not to disclose the rates) as discussed in literature and among practitioners.

In their paper, Mayes and Tarkka (1999) were among the first to address issues of making public statements on a central bank's views of the future. Even if the forecasts are imprecise, Mayes and Tarkka find several potential reasons for doing so, such as (i) it helps reduce uncertainty for other decision-makers increasing the allocative efficiency of the economy; (ii) it enhances the credibility of the monetary policy pursuit of price stability and reduces the costs of the disinflationary policy; (iii) it improves the co-ordination of macroeconomic policies; (iv) it provides a sort of democratic accountability of a central bank, and finally (v) it helps a central bank to follow a consistent strategy with the possibility to learn from its experience.

As for the forecast of interest rates in particular, Mayes and Tarkka depart from the idea that monetary policy, within the inflation targeting regime, aims at the achievement of the inflation target rather than on merely reaching or maintaining the required level of interest rates (frequently being kept constant for forecasting purposes as was the traditional idea until recently). Then, if a central bank shows a projection not hitting its target under such a constant interest rate assumption it must add how the *"*true*"* future interest rate settings will differ from the assumption. And simultaneously, what this will mean for the future outcome and its deviation from the original forecast, so that *"the private sector can be convinced both that the bank has not changed the goals of policy and that they can be achieved with the instruments at hand"* (Mayes, Tarkka, 1999, p. 13). Thus, the central bank needs to clearly outline its own upcoming behavior with policy makers knowing and following the strategy when setting monetary policy in the future. Based on their analysis, the authors conclude that the particular trajectory generated by the model and/or shown in the projection cannot be considered as a commitment to future actions. This should rather be taken as an illustration of how monetary policy could evolve, under the assumptions taken in the projection, to reach inflation close to the target.

A serious argument against disclosing interest rates builds on the recognition of the double-edged nature of public information used for policy-making. In this context, publishing the future interest rate path may be too effective in influencing the actions of economic agents, as suggested by Amato, Morris and Shin (2002). Then, as the authors claim, the agents may overreact to public information and, since central bankers do not have a monopoly on wisdom, a central bank's faulty judgment on the future interest rates will cause damage to the market participants. And at the same time, the private information of individual agents is not used optimally with channels through which the market mechanism aggregates and disseminates information on the economic fundamentals being disrupted. According to the authors, this is especially the case if the acquisition of private information is costly for the individual agents. Amato, Morris and Shin then conclude that the ex-ante value of private information will be devalued together with an incentive to gain such information.

Svensson (2006), however, using the same model as Amato, Morris and Shin (2002) challenges their results that more public information can be bad for social welfare. Svensson elaborates more on the model used and finds out that for empirically plausible parameters of the model social welfare increases with growing trans-

parency. And moreover, even under a conservative assumption of the equal accuracy of the public and private information, one can expect higher social welfare with public information than without.[5]

As stated in (Mishkin, 2004), there are in general numerous reasons for a central bank to publish its macroeconomic forecast as such. It helps the public and the markets understand actions taken by the bank and to assess whether the bank really seeks to hit its inflation target. Simultaneously, the credibility of monetary policy could increase in the eyes of the general public if it has the possibility to evaluate the central bank's forecast performance and to see that the forecast is prepared using the best practice, which in turn makes an incentive for the bank to prepare good, accurate, internally consistent forecasts.[6] Despite this, Mishkin claims that *"announcing the policy path is highly problematic"* (2004, p. 54). According to him, one objection to publishing an interest rate forecast is that it would complicate the process of decision-making for the central bank board or committee that only makes decisions about the current setting of the interest rate in currently prevailing practice among central banks. Then, the projection of the rate path to be announced would clearly require the board or committee to come to an agreement on it, which would likely be a real problem in particular for the more distant future and the process as such could be impaired.[7]

The second problem with publishing the interest rate forecast according to Mishkin is that it can complicate the central bank's communication with the public. There is a severe danger that the public will understand this trajectory as an unconditional commitment of the bank to set the rates just in line with the announced trajectory. When a change to the path is made by the bank in the next forecast after newly available information is assessed, the public may blame the bank for making a mistake and giving out its previously announced policy. This could in turn undermine the central bank's credibility and might weaken support for the bank and its independence.[8]

More recently, Rudebusch and Williams (2006) examined the macroeconomic effects of a central bank's direct revelation of its expectations about the future path of the policy rate. They made use of New Keynesian model with asymmetric information to show that, in an economy where private agents have imperfect information about the determination of monetary policy, a central bank's communication of interest rate projections can help shape financial market expectations and may improve overall macroeconomic performance.

[5] Morris, Shin and Tong extended this subtle discussion further in (Morris, Shin, Tong, 2006).

[6] Naturally, preparing such a reliable macroeconomic forecast imposes significant costs on a central bank. This, however, could conversely promote the signaling effect of publishing it as the markets can see that the monetary policy strategy of the bank is credibly applied and the bank cannot be accused of doing *"cheap talk"*, as described in (Mayes, Tarkka, 1999).

[7] A similarly complicated process of seeking for a common perspective on the future interest rate trajectory may evolve during the discussion between the central bank staff responsible for the forecast and the decision makers.

[8] Such an illusion of an unconditional commitment can be reduced to a great extent or even eliminated by a central bank having an open discussion on the assumptions, risks and uncertainties of its forecast. The bank can also present the interest rate projection in the form of a fan chart with uncertainty intervals around the forecasts to illustrate the uncertainty with several different sensitivity analyses shown to outline alternative interest rate paths if the economic developments deviate from the baseline scenario, as it is the case of the Norges Bank – see e.g. (Bergo, 2007).

Given the limited practical experience with publishing an interest rate forecast, the empirical studies on its effects are rather scarce. Archer (2005) finds a very limited effect of unexpected changes in the reserve Bank of New Zealand interest rate forecast on the market yield curve. He interprets this evidence as support for the idea that financial markets in New Zealand have understood the conditional nature of the projections.

Ferrero a Secchi (2007) use panel data from Norway, New Zealand, the U.S. and the euro area to show that the communication of future policy intentions, either quantitative or qualitative, improves the ability of market operators to predict monetary policy decisions. They particularly focused on the case of the Reserve Bank of New Zealand, and showed that the publication of the interest rate forecast has had a significant impact on market expectations. Also, they find that the change in market interest rates in the period included between two publications of the interest rate forecast is similar to the revision of the forecast. This supports the idea that market participants well understand the conditionality of the interest rate forecasts.

Kahn (2007) reviews the topic by providing standard arguments on the benefits and drawbacks of publishing interest rates. Taking these into account from both a theoretical and practical point of view, Kahn concludes that it might be difficult for monetary policy decision-making bodies to find a consensus on the final interest rate trajectory. The different views on the objectives, models and forecasts among the bank board members can, however, have a positive value as such and can compensate for the lack of common views on the interest rate path.

Besides those more or less general or theoretical arguments, there are a few pros and cons that can be raised from the practical point of view by people who are directly involved in forecasting and policy process in central banks. Namely, an argument in favor may be that publishing interest rate forecasts would enable monetary policy decision makers to openly express their potential distance from the whole macroeconomic forecast by a possible deviation of the actual interest rate setting from the projected trajectory of rates. In fact, this is the only relevant way of doing so in an environment of unconditional forecasts with an endogenous interest rate path.

An argument against publishing from a similar perspective might be the following. Having the rates undisclosed may prevent the staff from producing the forecast due to intentional fine-tuning or even manipulating the endogenous rate trajectory during the forecasting process to get the final path in line to what the board or markets expect. This threat, however, can be to a certain extent reduced by letting the staff be an owner of the forecast and by announcing this ownership.

Moreover, central banks are nowadays quite often able to successfully influence market expectations on future interest rate paths without an explicit announcement of the interest rate forecasts. Under these conditions, the probable and rather naturally arising deviations of interest rate forecasts from reality may then lower this influence of monetary policy on interest rates of longer maturities which in turn may undermine the efficiency of monetary policy execution. But this particular risk does not have to be very serious in reality and may be offset by the numerous other positives of publishing interest rates. The following chapters of the article deal with that in more detail.

In the special case of a central bank conducting its monetary policy within ERM II participation, publishing the interest rate forecast may discover the mutual inconsistency of policy targets. This might be the case under certain conditions when, for example, a need to fight against inflation using interest rate hikes to meet the Maastricht criterion for price stability could cause the criteria defined for long-term interest rates to be missed.

In summary, the balance between the pros and cons of making an endogenous interest rate path public is far from being skewed to either side dominantly. In our view, however, the positives of doing so are somewhat more reasonable than the negatives especially if the latter can be considerably reduced by efficient central bank communications and other measures taken.

3. Experience of Pioneering Central Banks

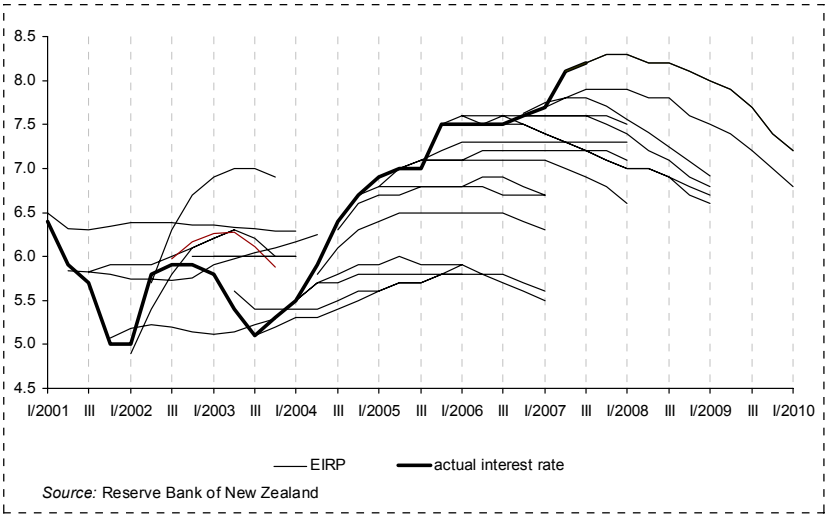
As suggested in sections 1 and 2 of this article, many central banks and monetary authorities publish their macroeconomic projections for the economy and the future values of key variables such as inflation or GDP. Nevertheless, there are currently only a few central banks around the world which have practical experience in publishing macroeconomic projections based on endogenous interest rate projections (EIRPs). The Reserve Bank of New Zealand (since June 1997), Norges Bank (since November 2005) and Sveriges Riksbank (since February 2007) currently publish endogenous interest rate forecasts. Banco de la República Colombia used to publish such a forecast (from December 2003 to June 2004). EIRP has recently started to be published in the Central Bank of Iceland (March 2007) and the Bank of Israel (July 2007).

In this part we focus on describing the main experiences – where available – in publishing EIRPs and on comparing the historical development of interest rate forecasts with the subsequent outcomes. Evaluating the trajectories of endogenous interest rate forecasts is relatively complicated. For example Archer (2005, p. 8) argues that *"it is exceedingly difficult to formally evaluate the practice of publishing interest rate projections, given the absence of a counterfactual, and the existence of a myriad of other influences on monetary policy that makes cross-country comparisons fraught"*. This difficulty also stems from the fact that only in the case of New Zealand and Norway we do have such a history.

3.1 The Reserve Bank of New Zealand

Until November 2005 the Reserve Bank of New Zealand (RBNZ) was the only central bank preparing and publishing macroeconomic projections based on EIRPs. RBNZ emphasised the uncertainties of EIRPs from the very beginning. Its Monetary Policy Statement (June 1997, p. 8) communicated EIRPs in the following way: *"The projected path […], it should also be stressed, is very dependent on the assumptions made and on the economic information available at the time of preparing the projections. As new information becomes available, and as assumptions are modified, the outlook for inflation pressures will change, and this will alter the projected track […]"* McCaw and Ranchhod (2002, p. 7) claim that *"[…] monetary policy response is conditional on all other variables evolving exactly as projected, which is of course not considered particularly likely. […] We constantly stress the conditionality of the projections to discourage readers from misinterpreting our forecasts as a strongly-held view on future economic developments."*

FIGURE 1 The Reserve Bank Interest Rate Forecasts

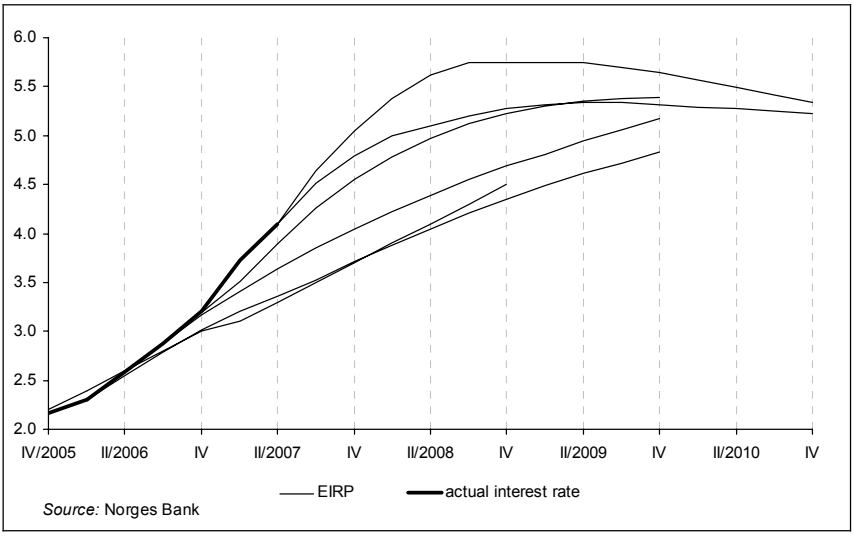


RBNZ publishes EIRP in a form of line-chart, in contrast to the Norges Bank and Sveriges Riksbank, which use fan-charts, i.e. the probability bands of projection outcomes over time. RBNZ regularly publishes a graph with its current and last prediction of the EIRP together with an Excel spreadsheet containing the exact numbers rounded to one decimal place. *Figure 1* shows the development of the 90-day interest rate and the RBNZ's EIRP forecast from the beginning of 2001. From this figure it is clear that: (i) EIRPs were mostly lower than the actual outcomes from the beginning of 2004 to now, (ii) EIRPs were much more volatile before the end of 2003 than subsequently. An assessment of the RBNZ's forecast against the Consensus Forecasts covering the period 2003–2005 can be found in (Turner, 2005).

Generally, RBNZ evaluates its experience with the publication of EIRPs positively. For example, Archer (2005) concludes that *"[...] most of the time markets understand the conditionality of projections, a handful of counter-examples notwithstanding [...]"* (p. 3). Furthermore, (p. 8) he claims: *"It turns out that many of the presumed problems have not caused great difficulty in New Zealand, while some are yet to be tested."* RBNZ also feels that there are particular benefits with regard to higher transparency. RBNZ [9] claims that *"while acknowledging the risks to credibility given the inherent inaccuracy of forecasts, we think that they can be overcome with an appropriate balance between the use of projections as a prediction of future outcomes, and as an expository device that illustrates the key policy issues."* The self-evaluation of RNBZ with EIRPs is formulated as follows: *"Over recent years, we have perhaps presented projections in more detail than is warranted for the role that they play, and have tied the discussion of the policy decision too mechanically to the projections. These thoughts encourage us to move Monetary Policy Statements further in the direction of downplaying the detail associated with the central projection path,*

[9] see Publication of projections (http://www.rbnz.govt.nz/monpol/review/0095532.html).

FIGURE 2 Norges Bank Interest Rate Forecasts



increasing the emphasis on the policy issues revealed, and more clearly outlining the uncertainties that are part and parcel of the art of setting monetary policy."

3.2 The Norges Bank

The Norges Bank's move to publish EIRPs was gradual. Until the end of 2002 its forecasts were based on a constant interest rate assumption. Qvigstad (2006a) confirms that the preliminary step was taken at the beginning of 2003, when the Executive board started to publish its own four-month forecast interval.[10] In November 2005, the Norges Bank took this process one step further and decided to publish its EIRPs three years ahead. This made the Norges Bank the second central bank in the world to start publishing EIRPs and the first one to do so by means of a fan chart. Its Inflation Report (November 2005, p. 5) says *"Our interest rate projections further out are somewhat higher than forward rates in the financial market…The Executive Board has endorsed the analysis and the projection for future interest rate developments in this Report."* On page 54 it states: *"The projections in this Report are based on interest rate developments that in the Executive Board's assessment provide a reasonable path for the Norwegian economy and a reasonable balance between the objectives of monetary policy."* The current Monetary Policy Report (formerly Inflation Report) contains a fan chart prediction for inflation, the output gap and the key policy rate for the next three-year period. The central bank publishes 90 %, 70 %, 50 % and 30 % upper and lower bands around the baseline scenario (the EIRP) as well as charts indicating how the projections would be different under specific alternative scenarios. *Figure 2* describes the six EIRPs for the repo rate. The first four of them show a lower EIRP than the subsequent outcome.

[10] From the June 2004 publication of interest rate bands for the subsequent 4 months (although the target was not necessarily at the centre of this interval); publication after this 4 month horizon from November 2002 to June 2004.

Norway's experience with EIRPs shows that MPC needs to have criteria that define an *"appropriate interest rate path"* (Qvigstad, 2006b). Norges Bank is at present using six criteria for what constitutes an appropriate interest rate path.[11] Each issue of the Norges Bank Inflation Report contains a box formulating the criteria that the Bank follows. This notwithstanding, Qvigstad (2006a) stresses that *"[...] establishing these criteria is an ongoing process, and should not be interpreted as 'commandments' that are carved in stone"*.

3.3 The Sveriges Riksbank and The Banco de la República Colombia

Both The Sveriges Riksbank and The Banco de la República Colombia have, or used to have, a very short experience with the publication of EIRPs. Up to autumn 2005, the Riksbank used a conditional forecast on the assumption of a constant repo rate within the forecast period. On the one hand, the advantage of this conditional forecast was officially formulated as easier communication when the new monetary regime was established and before the new inflation target built up its credibility. On the other hand, it was not possible to create a realistic forecast of the key macroeconomic variables under this approach. The Riksbank tries to resolve these problems by producing forecasts based on market expectations, as reflected in implied forward rates. It is obvious that market expectations provide a much more realistic path for the future development of the repo rate than the assumption of a constant repo rate. Nevertheless, with the use of market expectations the Riksbank cannot clearly explain the consistent development of interest rates to the general public and the financial markets together with its explanation of monetary policy decisions. A further step towards greater transparency and clarity was made in February 2007 with the Riksbank's decision to publish its unconditional forecast, i.e. its own EIRP (repo rate). A more detailed description of the Riksbank's forecasts and their communication is provided in (Apel, Vredin, 2007). They also evaluate the Riksbanks experience with publishing its first two EIRPs (February and June 2007) and describe some difficulties in selling these EIRPs to the market participants. These difficulties are also mentioned in Svensson (2007, p. 3): *"Many market agents considered that the interest rate forecast in February was too low. However, in connection with the June forecast some agents were surprised at how much we had adjusted the forecast upwards."* Even though the EIRPs surprised the market, the Riksbank's forecasts have been at least partially built in the spot market rates, as Apel and Vredin (2007) show.

Banco de la República Colombia published its EIRPs only three times, between December 2003 and June 2004. The Bank showed two scenarios in its Inflation Report *"[...] a) the basic scenario that maintains the policy rule active and therefore offers a path of interest rates that is compatible with the long-term inflation targets; and b) an alternative scenario that presents the inflation results under the assumption that CDT (Certificate of Deposit) rates are constant for two consecutive years."* (December Inflation Report, p. 12). The Bank published the values of the EIRP forecast in a table for a term of 2 years, with the exact numbers rounded to one – and later to two – decimal places. The December 2003 Inflation Report formulates the EIRPs in the following way *"[...] forecasts are consistent with a rise of 100 bp in 90-day CDT rates in*

[11] See Qvigstad (2006b).

2004 and an additional 90 bp in 2005. This increase would be partly due to the rise in external interest rates. The current 90-day CDT rate is around 8.0 %." (December Inflation Report, p. 13). The balance of risks was only discussed verbally by the Bank. The Bank only used the fan chart approach for inflation, i.e. not for the other predicted variables, including interest rates. From unofficial consultations we received two reasons for why the Bank stopped publishing EIRPs. The first one was that emerging markets are very sensitive to external shocks, which in the case of Columbia is evident from strong fluctuations of the nominal exchange rate. The second one was a technical one. The Banco de la República admitted that it had not had a sufficiently accurate and sensitive macroeconomic model.[12] Both of these factors resulted in communication problems which eventually culminated in a decision to stop publishing EIRPs.

4. The CNB Dilemma

The CNB monetary policy is, similarly to the monetary policy of the above-mentioned central banks, conducted within the inflation targeting framework. In this framework, the primary objective of the central bank is maintaining price stability. To fulfil this objective, the central bank changes interest rates in order to keep inflation near the inflation target. Accordingly and due to a certain time lag between an actual interest rate move and a consequent response of macroeconomic and inflation developments, a prominent role in this framework is given to the forecast of future economic developments.

The CNB forecast is built up using its core structural model QPM (Quarterly Projection Model). One of the QPM's equations stylistically describes the central bank behaviour in setting the interest rates. In addition to the inflation forecast's deviation from the inflation target, interest rate smoothing and perspectives on the real side of the economy come into the central bank's consideration as captured in the QPM reaction function.[13]

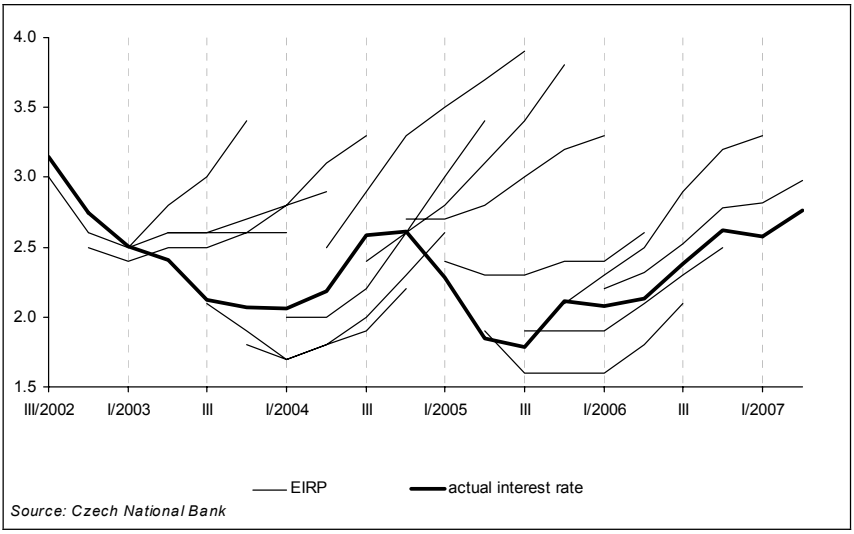
Since July 2002, when the first unconditional forecast based on the QPM was released, the CNB has not disclosed the numerical values of the interest rate forecast. Instead, it has started to publish a verbal description of the interest rate forecast, which gives the reader a hint as to the direction of future monetary policy measures as predicted by the model, but not their size. The description usually consists of one sentence which has standard and rather technical wording like *"Consistent with the macroeconomic forecast and its assumptions is growth in nominal interest rates."* (the October 2007, Inflation Report, p. 11).

In addition to this sentence, outsiders can get some clue of the CNB interest rate forecast from the description of the financial analysts' interest rate expectations. In chapter IV.4 of the Inflation Report, these expectations are verbally compared with the CNB forecast. Looking again into the October 2007 Inflation Report we find a sentence at the bottom of p. 42: *"The interest rate path consistent with the aforementioned CNB forecast was slightly above the expectations of financial market analysts for the near future. At the longer horizon, it was higher."* This comparison allows the market to make a relatively contrived guess as to what the CNB interest rate forecast looks like.

[12] For more information on the model of the Columbian economy see the (Inflation Report, 2003), Banco de la República, June, and (Gómez, Vargas, Uribe, 2002).

[13] See (Coats, Laxton, Rose, 2003) for more details on the Czech QPM.

FIGURE 3 CNB Interest Rate Forecasts



Source: Czech National Bank

As time passed, intentions to publish a forecast-consistent interest rate path in numerical form emerged. The motivation behind these deliberations was the further improvement of monetary policy transparency, as previous measures towards greater openness have been perceived positively by the public. Based on the detailed discussion of potential pros and cons of publishing interest rates, the Bank Board decided, in March 2007, to reveal the numerical values of the interest rate forecast effective from 2008.

In addition to the theoretical arguments, as described in section 2, and the practical experience of central banks that already publish interest rate forecasts (the RBNZ, Bank of Norway, Sveriges Riksbank) or used to publish interest rate forecasts (Banco de la República Colombia), as described in section 3 of this paper, several Czech country-specific arguments have been raised. In the rest of this section we review some of these specific arguments.

We analyze the possible impact of publishing interest rate forecasts on the private forecasts and discuss the role of asymmetric risk assessment in the desired impact of the forecast on private expectations.

4.1 Accuracy of the CNB Forecasts

The CNB interest rate forecasts do not seem very accurate at first sight. If we look at historical interest rates forecasts on the background of the actually realized interest rate path, as depicted in *Figure 3*, we can see significant errors in the CNB interest rate forecasts. Related to this, the consequent forecasts mutually differ to a significant extent.

However, the inaccuracy in the CNB interest rate forecasts must be seen on the background of relatively high interest rates volatility stemming from the structural characteristics of the Czech economy. Being characterized as a small, converging and very open economy, any external shock (especially a shock in the exchange

TABLE 1 Accuracy of the CNB and Other Institutions Forecasts

		Forecast horizon	
		1-month	1-year
ČNB	Mean error	0.02	0.54
	RMSE	0.15	0.87
Financial analysts	Mean error	-0.05	0.45
	RMSE	0.17	0.83
Market	Mean error	0.03	0.41
	RMSE	0.14	0.76

Notes: ME – mean forecast error, ME = $\frac{\sum(E(x)-x)}{n}$; RMSE – root mean squared forecast error,

RMSE – root mean squared forecast error, RMSE = $\sqrt{\frac{\sum(E(x)-x)^2}{n}}$

Source: authors' calculation based on Czech National Bank data

rate) has a substantial effect on the interest rate forecast. Temporary shocks have major impacts on the interest rate forecast in the short run (less than 3 quarters), the longer-run pattern of the forecasts is determined mainly by the assumed convergence of the interest rates to their "policy neutral" level.[14] So far, the initial setting of the interest rate in all forecasts has been below the neutral level, and thus interest rate forecasts have been upward sloping. The short-end of the forecasts is downward sloping in periods with disinflationary shock (July and October 2002, July and October 2003, January and April 2005), but in a majority of the forecasts the interest rates were projected to rise in the short run.

If we compare the CNB forecast with forecasts of other institutions, we do not find significant differences with regard to their accuracy in light of the relatively high historical volatility of interest rates. *Table 1* reports the mean forecast error (ME) and root-mean-squared forecast error (RMSE) for the CNB forecast 1 month[15] and 1 year ahead with the financial market analysts' forecast[16] and market's forecast[17]. The ME statistic indicates the degree of bias in forecasts, i.e. it shows whether there is any over- or under-predicting over time. The RMSE is the complement statistic, which provides a measure of forecast accuracy. It measures how far away forecasts were from actual out-turns. All the CNB's forecasts tend to overestimate the actual interest rates, especially on the 1-year horizon. The CNB forecast is more accurate on the nearer horizon while on the 1-year horizon it is less accurate than other forecasts. However, differences in the mean errors are, given the historical volatility of interest rates, negligible. Even smaller differences are in forecasting errors as measured by RMSE.[18] These fin-

[14] This level is set as the equilibrium real interest rate plus model consistent inflation forecast. The equilibrium real interest rate is then derived in line with trends in the real version of uncovered interest rate parity evolving in the background of the cyclical part of the CNB`s core model.

[15] Because the CNB forecast is prepared on a quarterly basis, we approximate the 1-month forecast by the forecast for the actual quarter.

[16] As collected by the CNB in the Financial Market Inflation Expectations survey.

[17] As captured by money market interest rates and forward rate agreements (FRA).

[18] We tested the hypotheses of equal mean errors and squared errors using equality tests (*t*-tests). The results of the tests do not reject the null hypothesis of equal mean errors and squared errors at any conventional level of significance (1–10 %).

TABLE 2 Credibility of the CNB Forecast for CPI Inflation

$\Delta E_{analysts}(CPI_{t+1}) = C(1) + C(2)*[E_{CNB}(CPI_{t+1}) - E_{analysts}(CPI_{t+1})]$				
	Coefficient	**Std. Error**	***t*-Statistic**	**Prob.**
C(1)	0.02	0.04	0.52	0.61
C(2)	0.29	0.14	1.98	0.06
R-squared	0.30	Sum squared resid		1.38
S.E. of regression	0.25	Durbin-Watson stat		2.12

Note:Least Squares, Newey-West Standard Errors, 24 observations between April 2001 and January 2007
Source: authors calculation based on the Czech National Bank data

dings indicate the existence of a common, probably structural, source of uncertainty in all the forecasts. The similarity in the statistics might also stem from the mutual dependency of the forecasts, namely from the influence which the central bank forecast has on the market and analysts' expectations. We address this issue in more detail below.

4.2 Credibility of the CNB Forecast

The financial market pays eminent attention to the central bank forecast. Mandel and Tomšík (2004) identified four relative advantages of a central bank forecast. First, the central bank has the power to set short-term interest rates; hence it can fulfill this part of the forecast. Second, the central bank forecast is made by the numerous and qualified staff, so it usually sets a benchmark for the forecasts of market analysts and other think-tanks.[19] Third, the central bank is politically independent and has no incentives to make misguiding forecasts. Last, but not least, the central bank forecast is free of charge.

If the central bank forecast is published and if it gains credibility among the public, it can have a significant impact on private expectations. To test the credibility of the CNB forecasts we analyzed the effect of the CNB forecast for CPI inflation, which is disclosed in numerical values, on the financial analysts' expectations. In this simple model, the financial analysts' expectations should come closer to the CNB forecast after its disclosure if the CNB forecast is credible. To test this hypothesis we regress the change in the analysts' inflation expectations one year ahead $\Delta E_{analysts}(CPI_{t+1})$ on the difference between the CNB forecast for the same time horizon $E_{CNB}(CPI_{t+1})$ and the analysts' inflation expectations before the release of the CNB forecast $E_{analysts}(CPI_{t+1})$. The regression results shown in *Table 2* do not reject our hypothesis and suggest that the analysts build 30% of the difference between the CNB forecast and their previous estimates into their expectations.[20]

Surprisingly, we get similar results if we test the credibility of the CNB forecast for interest rates one year ahead, even though the CNB does not yet disclose nu

[19] The fact that the CNB provides other central banks with technical assistance on a regular and ongoing basis, primarily in the field of model building, demonstrates the high level of the CNB staff's expertise.

[20] The inflation and interest rate expectations of financial analysts are surveyed each month, therefore we regress the change in their expectations between the month before the release of the forecast and the month when the forecast is released. Even within this relatively short period of time, however, the change in expectations must have also been influenced by other new relevant information available beyond the effect of the CNB's new forecast release. It is therefore necessary to interpret the results cautiously and as indicative and we see it as the subject of possible future research in this field.

TABLE 3 Credibility of the CNB Forecast for Interest Rates

$\Delta E_{analysts}(ir_{t+1}) = C(1) + C(2) * [E_{CNB}(ir_{t+1}) - E_{analysts}(ir_{t+1})]$				
	Coefficient	**Std. Error**	***t*-Statistic**	**Prob.**
C(1)	-0.07	0.05	-1.44	0.17
C(2)	0.28	0.08	3.73	0.00
R-squared	0.57	Sum squared resid		0.50
S.E. of regression	0.17	Durbin-Watson stat		1.36

Note:Least Squares, Newey-West Standard Errors, 19 observations between July 2002 and January 2007
Source: authors calculation based on the Czech National Bank data

merical values for interest rate forecasts (see *Table 3*). In this case we regress the change in the analysts' interest rate expectations one year ahead $\Delta E_{analysts}(ir_{t+1})$ on the difference between the CNB forecast for the same time horizon $E_{CNB}(ir_{t+1})$ and the analysts' interest rate expectations before the release of the CNB forecast $E_{analysts}(ir_{t+1})$. The results of the regression suggest that the market participant can guess the CNB's interest rate forecast, probably from the CNB's forecasts of other variables and using the knowledge of CNB's view on the transmission mechanism, namely the reaction function.[21] The estimation results of this equation are, however, affected by the autocorrelation of residuals, probably stemming from a low number of observations. Despite this problem we can conclude that the CNB forecast is at least partially credible and that financial analysts adjust their forecasts towards the CNB forecast.

It is reasonable to expect that the effect of the CNB forecast on the interest rate expectations would be more pronounced if the CNB released the numerical values of the interest rate forecast and if the interest rate forecast was properly communicated. For the CNB this would mean the better control of long-term interest rates, which would make the transmission of short-term interest rates into the rest of the economy more efficient. As a result, the CNB would get a better grip on the economy, including the possibility of improving an inflation-output variability trade-off.

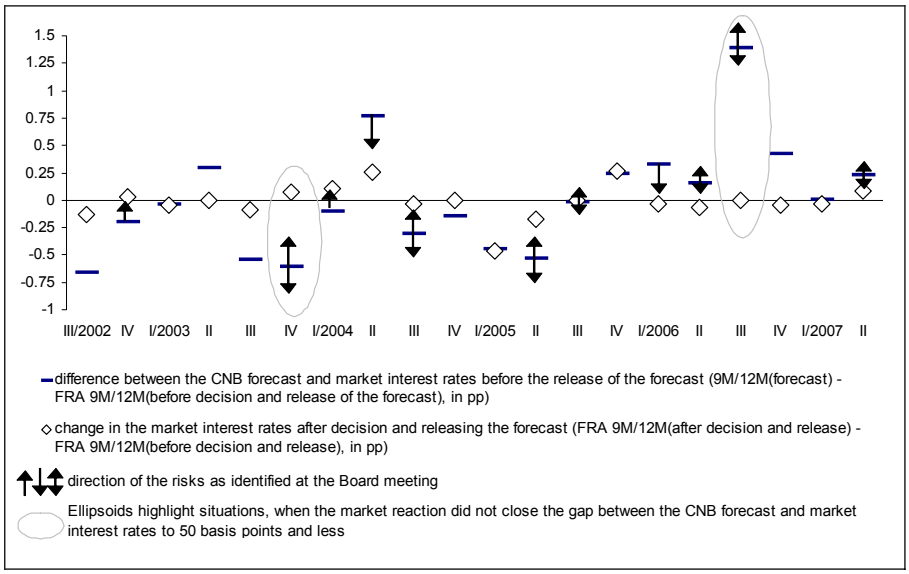
However, there are also the costs of publishing the interest rate forecast. First, the interest rates would probably be more volatile on the days when the new forecast is released. Also, there is a potential threat that expectations will stick too much to the CNB forecast despite the arrival of new data, which would otherwise change them. These arguments, together with other theoretical arguments as described in section 2, should be taken into account when deciding whether to publish interest rate forecasts or not.

4.3 Asymmetric Risk Assessment

In some situations, the impact of the forecast on the expectations might be distorted intentionally by the central bank. If the board of a central bank foresees the forecast's risks, it might communicate these risks via a "risk assessment" (alternatively called bias). The risk assessment can be either symmetric or asymmetric. If the assessment is asymmetric, it sends a clear signal to the market and to financial

[21] The CNB reaction function including the coefficients´ values has been published in (Coats, Laxton, Rose, 2003).

FIGURE 4 Immediate Response of the Future Short-Term Interest Rates after the CNB Forecast is Released



Source: Czech National Bank

analysts not to fully obey the message of the forecast. In these cases, the deviation of the private expectations from the central bank forecast is desirable. *Figure 4* shows the difference between the CNB forecast of the future short-term interest rates and the market expectation of the future short-term interest rates, as captured in FRA contracts (the black lines), the change in the market expectations after releasing the forecast (the white diamonds) together with the risk assessment marked by arrows.

Several findings are obvious from this chart. First, arrow marks are displayed only for eleven forecasts out of twenty; there are no arrows for the forecasts whose risk assessment, as written in the minutes of the Bank Board [22] or in the presentation of the decision at the press conference,[23] was missing or unclear. Out of eleven clear signals of risk assessments, four pushed the private expectations in the right direction. The signalling in October 2003 and July 2006 (in ellipsoids), when the market expectations remained different by more than 50 basis points from the forecast, was the least efficient. Given this ambiguity in the results it is not clear whether the risk assessment in combination with a verbal description of the interest rate forecast has been a useful guide for the market participants.

The second observation is that in most cases the red dots lie close to the horizontal axes, whereas the blue lines spread into much more positive or negative values. This means that even though the forecast usually assumes a significant move

[22] The CNB minutes are released with an 8-day delay; hence they are not publicly availably at the time when the forecast is published, i.e. on the day of board meeting. However we assume that the same risk assessment as later published in the minutes is conveyed at the press conference held immediately after the decision.

[23] The CNB press conference is held immediately after each monetary policy meeting.

in the future short-term interest rates, the immediate market reaction to the forecast has been modest. The only exceptions were the January 2005 forecast, where expected future short-term interest rates shifted down by 50 basis points, and the October 2005 forecast, with a 25 basis-point move in the opposite direction. However, in the majority of forecasts, the immediate shift in expectation, though small, has been in the right direction from the forecast perspective.

A high degree of persistence in the market expectations as appears in *Figure 4* reflects not only uncertainty connected with the real future interest path, but also uncertainty connected with the interpretation of the verbal description of the CNB interest rate forecast. It seems reasonable to assume that the immediate market reaction will probably be stronger when the CNB starts publishing the numerical values of the forecast. In the case of a symmetric risk assessment, market expectations will probably be closer to the CNB forecast. In the opposite case of an asymmetric risk assessment, the market expectations will probably still differ from the CNB forecast in a desirable direction.

5. Conclusion

In the final part of the article we summarize our findings and make concluding remarks:

First, a high level of monetary policy transparency is generally perceived to be positive among both theoretical economists and practitioners from central banks. Steps taken by many central banks in this field have substantionally increased the common uderstanding between monetary authorities and the general public and market participants in the past decade. Inflation-targeting central banks have been most active in this opening process, recognising a crucial role played by market expectations in the transmission mechanism of monetary policy. Macroeconomic forecasts, as the key input into the decision-making process of the inflation-targeting central banks, have been gradually moved to make use of the fully consistent framework with an endogenous interest rate trajectory.

Second, there are a number of serious theoretical and practical arguments for both publishing and not publishing interest rate forecasts, with the final balance of them not pointing to either side definitively. As we see it, however, the pros of disclosing the interest rate path are of a somewhat bigger relevance than the cons, though practical arrangements in a particular central bank play a major role. The track record of central banks that publish or used to publish endogenous interest rate trajectories suggests that this is really a high-level standard (or even state-of-the-art) for monetary policy transparency and that only a few very experienced inflation targeters have been doing it succesfully. A well-functioning forecasting and policy analysis system, efficient monetary policy communication and an overall high level of central bank credibility are among the necessary preconditons that have to be met to start publishing an interest rate forecast.

Third, we tend to believe that the CNB belongs to the group of central banks that have significantly contributed to developing an inflation targeting regime. As such, the CNB meets all those general requirements mentioned above, in our view. As for interest rate forecasts in particular, we do not find any evidence of significant differences in forecasting performance between the CNB on one hand and financial analysts and market participants on the other hand.

Fourth, the current way of communicating the likely future development of interest rates has proven to be efficient in influencing, to a certain extent, the market expectations of future monetary policy. As the empiric data shows, however, it is not clear whether the (asymmetric) risk assessment in combination with the verbal description of the interest rate forecast has always been a sufficiently precise guide for the market participants.

Fifth, after the CNB starts publishing the numerical values of its interest rate forecasts in 2008, the alignment of market expectations with the view of the CNB will probably increase. In the case of a symmetric risk assessment, market expectations will likely move closer to the CNB forecast. In the case of an asymmetric risk assessment, the market expectations will obviously still differ from the CNB forecast in a desirable direction. Overall, publishing the interest rate forecast should enhance the accountability and credibility of the CNB forecasts and improve the efficiency of its monetary policy execution.

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