

Transparency and predictability in monetary policy¹

by Tom Bernhardsen and Arne Kloster, Monetary Policy Department

By being open about its policy response pattern, the central bank allows economic agents to understand the implementation of monetary policy. They will then be able to anticipate the central bank's interest rate decisions to a fairly large extent. Transparency and predictability can contribute to strengthening monetary policy credibility and enhance its effectiveness. This article assesses the predictability of Norges Bank's interest rate setting since 1999, and includes a comparison with a number of other countries. Changes in money market rates after the monetary policy meetings are used as an indication of whether the decisions surprised market participants. The study indicates that interest rate decisions in Norway have surprised market participants somewhat more than in other countries, particularly in 2001. This may be because the economic situation has been fairly different in Norway compared with other countries. In addition, the inflation target was introduced relatively recently in Norway. Over time, however, it is the actual inflation developments that are decisive for monetary policy credibility. Long-term indicators show that inflation expectations in Norway are close to the inflation target.

1 Introduction

Whereas monetary policy was previously formulated without any particular emphasis on public disclosure, most central banks now attach considerable importance to transparency and predictability. This is partly because monetary policy has been revised in many countries from rule-based regimes linked to the exchange rate or other intermediate targets to direct inflation targeting. Under a fixed exchange rate regime, for example, it is fairly clear what the central bank takes into account when setting interest rates, and the policy effect on the target variable can be rapidly observed. Direct inflation targeting may also imply a type of rule in that the inflation outlook will be the reference for interest rate setting. Nevertheless, operational implementation requires considerable discretion.

A high degree of discretion implies freedom of manoeuvre for the central bank. At the same time, the basis for the central bank's interest rate decisions may be less obvious for the public. Even though the central bank's mandate is formulated clearly and publicly known, it is not necessarily easy to discern how the central bank will proceed in practice to attain its objective. The central bank can diminish the source of uncertainty by being open about its judgement, which may in turn increase the predictability of monetary policy.

This article looks at the predictability of Norges Bank's interest rate setting over the past few years, and includes a comparison with a selection of other countries. Section 2 discusses in further detail why transparency and predictability are important. Section 3 describes how changes in money market rates may reflect the degree of predictability. In Section 4, we use money market rates to analyse the predictability of interest rate

setting in Norway since the beginning of 1999. In section 5, we do the same for a selection of other countries and compare the results with those of Norway. Section 6 discusses indicators of monetary policy credibility in Norway, and Section 7 provides a summary.

2 Why should central banks be concerned about transparency and predictability?

Norges Bank's task is to secure low and stable inflation over time. The inflation target is 2½%. This is what Norges Bank must be measured against. Why then are transparency and predictability of importance?²

Before we discuss this further, it may be useful to clarify four concepts:

By *transparency in monetary policy* we mean that the central bank communicates with clarity its policy response pattern and view of economic developments and the functioning of the economy to the public.³ Transparency also implies that the objective of monetary policy is understood.

Monetary policy is predictable if the central bank's decisions are generally expected by economic agents.

Monetary policy credibility means that economic agents believe that inflation will over time be in line with the inflation target.

Effectiveness in monetary policy implies that:

- inflation expectations are stable, equal to the inflation target. If inflation expectations vary widely, marked changes in nominal interest rates may be necessary to

¹ We are grateful to Farooq Akram, Kristin Gulbrandsen, Steinar Holden, Arild Lund, Øistein Røisland, Ingvild Svendsen and Pål Winje for their useful comments.

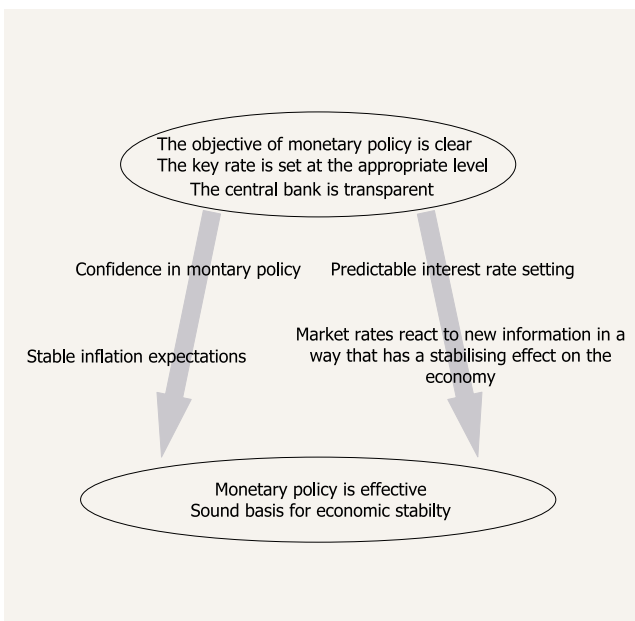
² See Blinder, Goodhart, Hildebrand, Lipton and Wyplosz (2001) for a more thorough discussion on this issue.

³ Transparency can be discussed in relation to a number of factors, such as the central bank's target function, response function, analyses, view of how interest rates influence inflation and its assessment of the inflation outlook and the balance of risks. See Gjedrem (2001) for a discussion of Norges Bank's communication in the light of these factors and a comparison with other countries.

attain the desired level of real interest rates. This reduces the effectiveness of monetary policy.

- market participants' expectations about future changes in the key rate are based on a correct understanding of the central bank's policy response pattern. Monetary policy has an effect on the economy via market interest rates. This means that monetary policy to a large extent operates through expectations. If expectations tend to be markedly different from the outcome, the effectiveness of monetary policy is limited.

On this basis, we can argue that transparency is important because it can contribute to enhancing the credibility and effectiveness of monetary policy. The chart below provides an illustration of these relationships. However, the relationships are based on the preconditions that the objective of monetary policy is understood and the central bank sets the interest rate at the appropriate level to reach its target. These two criteria are more important than transparency per se. When these two criteria are satisfied, transparency may have the effects described below.



The arrow to the left in the chart illustrates that transparency can contribute to strengthening monetary policy credibility. When the central bank is open about its policy response pattern, and perceived as acting logically in relation to its objective, the confidence of economic agents in low and stable inflation over time is strengthened. This provides the economy with a solid nominal anchor. The inflation expectations that are used as a basis for wage and price determination are the same as the central bank's inflation target. In a situation where the economy is exposed to a shock that causes inflation to deviate from the target, the costs of bringing inflation back to target are lower if inflation expectations remain stable.

The necessary adjustment of the nominal interest rate level is smaller when the impact on real interest rates is substantial. A high degree of confidence thereby enhances monetary policy effectiveness.

The arrow to the right in the chart illustrates the relationship between transparency, predictability and effectiveness in monetary policy. For monetary policy to have an impact on inflation, changes in Norges Bank's key rate, the deposit rate, must first have an effect on interest rates on corporate and household assets and liabilities. The deposit rate and market rates are largely linked through market expectations. Money market rates are influenced by expectations about future developments in Norges Bank's key rate. Market participants' understanding of the central bank's policy response pattern is an important basis for these expectations.

When market participants understand the central bank's policy response pattern, the foundation is then laid for predictable interest rate setting.⁴ Market rates can then react with a stabilising effect to new information about economic developments. Signs of growing pressures in the economy will generate expectations of higher key rates, with an attendant increase in market rates. Signs of receding pressures have the opposite effect. Such reactions in market rates normally occur rapidly. If market rates do not react, or reactions have a destabilising effect, more frequent and greater changes in the key rate could be necessary to attain the objective of low and stable inflation. In addition, uncertainty surrounding the policy response pattern would be a source of wider fluctuations in interest rates and other financial prices. Such fluctuations would also make it more demanding for the central bank to attain its inflation target.

Using our definition of the concepts, transparency is an "instrument" which the central bank can use to enhance the predictability and effectiveness of monetary policy. Moreover, transparency can increase the understanding of monetary policy, which can enhance credibility. The latter is probably of particular importance in a period when the central bank's mandate is new and it does not have a long and positive track record under the existing regime.

Transparency and predictability are not alone sufficient to secure monetary policy credibility. Over time, the central bank cannot secure credibility unless actual inflation is near target. Even if market participants react with some surprise to interest rate decisions, the implications will be relatively limited if the central bank sets the key rate at an appropriate level in relation to the inflation target. In the same vein, a predictable monetary policy is of little use if the results are unsatisfactory.

The degree of predictability in interest rate setting can still provide an indication of policy transparency and the effectiveness of communication. If market participants understand the central bank's policy response pattern, changes in the key rate will be widely expected and already priced into the market before the actual change in the key rate takes place.

⁴ Transparency does not guarantee predictability in interest rate setting. A study by Wadhvani (2001) indicates that the Bank of England's interest rate setting in the period 3 June 1997 - 18 April 2001 came as a greater surprise to the market than the interest rate changes made in continental Europe and the US in the same period. At the same time, one can argue that the Bank of England is a very open central bank, as it presents assessments of the economic outlook in its Inflation Report four times a year and publishes the minutes of its Monetary Policy Committee meetings fairly shortly after they take place. Wadhvani's study, however, indicated that the element of surprise diminished during the period studied.

3 Predictability and changes in money market rates

Money market rates reflect market participants' expectations about developments in Norges Bank's deposit rate (see box on interest rate expectations). If the central bank's policy response pattern is communicated with clarity, changes in money market rates should generally come as a reaction to new information about economic developments, for example when new economic data are published, and to a lesser degree when interest rate decisions are made. If there is a general tendency for market rates to react strongly in the wake of an interest rate decision, this indicates that market participants are often surprised by the central bank's decisions. This may be because they have not fully understood the central bank's policy response pattern. Alternatively, the central bank and market participants may have divergent perceptions of economic developments.

If market participants do not expect any changes in the key rate in the period to maturity of the money market interest rate, the money market rate will normally be somewhat higher than the key rate. The difference is due to premia that compensate for the differences in the loans' maturities and credit risk. If the market expects a cut in the key rate, the tendency will be towards lower money market rates, and they may be lower than the key rate. If the market expects an increase in the key rate, money market rates will tend to be higher than the key rate plus premia.

The interest rate meetings of Norges Bank's Executive Board are held every sixth week. Directly prior to an interest rate meeting, the one-month rate will provide an indication of the outcome expected in the market. As an illustration, we can assume that the one-month rate is normally 25 basis points⁵ higher than the key rate if the market does not expect an interest rate change. We also assume that the key rate is 6% and that all market participants expected an interest rate cut of 50 basis points at the first interest rate meeting. The one-month rate will then be at about 5.75% immediately before the interest rate meeting.

If the outcome of the interest rate meeting is in line with expectations, i.e. that the key rate is reduced by 50 basis points, the one-month rate will not change when the interest rate decision is published. However, if the central bank's decision is different from expectations, this will have an immediate impact on the one-month rate after the decision is known. If Norges Bank keeps the key rate unchanged, for example, the one-month rate will increase immediately after the decision by 50 basis points to a level of around 6.25%. If Norges Bank reduces the key rate by 25 basis points, the one-month rate will rise to around 6%. Changes in the one-month rate thus provide an indication of market participants' interest rate expectations ahead of interest rate meetings.⁶

While today's one-month rate only reflects expectations about the outcome of the next interest rate meeting, the three-month rate reflects expectations about decisions over the next three months, i.e. a period with more than one interest rate meeting. If the three-month rate is lower than the key rate, we can assume that market participants expect an interest rate cut at (at least) one of the next two interest rate meetings. If the key rate is left unchanged at the first interest rate meeting, there is still a possibility of a cut at the next meeting.

Surprising interest rate decisions will therefore tend to have a smaller impact on the three-month rate than on the one-month rate. However, there may be situations where the opposite is the case, that surprising interest rate decisions have greater impact on the three-month rate than on the one-month rate. This may be the case if Norges Bank not only makes a surprising interest rate decision but issues surprising signals about future interest rate developments.

In the next section we look at the reaction of money market rates to interest rate meetings in Norway and a selection of other countries since the beginning of 1999. Norges Bank has held regular scheduled interest rate meetings since summer 1999. In particular thereafter, market participants have had the possibility of anticipating Norges Bank's interest rate decisions and pricing expected outcomes into market rates before the interest rate decision takes place. Central banks in a number of other countries introduced the system of regular scheduled interest rate meetings earlier than Norges Bank. For these countries, it is natural to look at a longer period. We have chosen to include all the interest rate meetings from the beginning of 1999 for all countries in the analysis. This means that the period of currency turbulence in autumn 1998, when it was probably particularly difficult for market participants to predict outcomes, is not included. Our starting point also means that we are including the four interest rate meetings that Norges Bank held in the first half of 1999, which were not announced in advance.

In the section below we have chosen to use the reactions in money market rates (NIBOR) with a one-month and three-month maturity as a basis for evaluating predictability. As discussed above, our choice of maturities makes it possible to distinguish between expectations linked to one meeting from expectations over a somewhat longer period.

4 Have Norges Bank's interest rate decisions surprised market participants?

In this section we take a closer look at the extent to which Norges Bank's interest rate decisions have surprised market participants. Norges Bank's interest rate decisions may differ from market expectations. However, Norges Bank cannot allow itself to be steered

⁵ 100 basis points is equal to 1 percentage point.

⁶ In practice, market participants tend to have varying interest rate expectations. In some situations, some participants may expect a 0.5 percentage point cut, while others expect unchanged interest rates. The one-month rate then reflects the average of market expectations.

Theories of interest rate expectations¹

According to the expectations theory, investments in securities with different maturities generate the same expected rate of return. This implies that interest rates with longer maturities are a geometric mean of expected future interest rates with shorter maturities. For example, the 10-year rate today may be written as a geometric mean of the current one-year rate and expected one-year rates nine years ahead. This means that

$$(1+i_{10})^{10} = \frac{(1+i_1) (1+i^e_{1,1}) (1+i^e_{2,1}) (1+i^e_{3,1})}{(1+i^e_{4,1}) \dots (1+i^e_{9,1})}$$

where i_{10} and i_1 are the spot 10-year rate and the spot one-year rate today respectively, and $i^e_{t,1}$ is the future expected one-year rate at time t . Similarly, money market rates may be written as a geometric mean of the current key rate and expected key rates over the period to maturity of the money market rates.²

Using two interest rates with different maturities, we can calculate the implied interest rates, often called the implied forward rates or forward rates for short. For example, the one-year forward rate in nine years is calculated so that the return on a nine-year investment, when reinvested for one more year at the forward rate, gives the same return as a 10-year investment. Mathematically, the calculations are based on the equation

$$(1+i_{10})^{10} = (1+i_9)^9 (1+i^e_{9,1})$$

which is a variant of expectations theory. This gives

$$i^e_{9,1} = (1+i_{10})^{10} / (1+i_9)^9 - 1 = f,$$

where f symbolises the long-term forward rate. Given the expectations theory, forward rates may be interpreted as the market's expected interest rate level for the corresponding future date.

According to the Fisher equation, the nominal interest rate is equal to the real interest rate plus expected inflation. This means that

$$i = r + \pi^e,$$

where i , r and π^e are the nominal interest rate, the real

interest rate and expected inflation respectively. The Fisher equation implies that the nominal interest rate is equal to the sum of the real interest rate and expected inflation. Similarly, the long-term forward rate is the sum of the long-term real interest rate and long-term inflation expectations. An estimate of the long-term real interest rate will then give an estimate of long-term inflation expectations. Long-term inflation expectations provide an indication of confidence in monetary policy.

According to the Fisher equation, the interest rate differential against other countries reflects different real interest rates and/or inflation expectations:

$$i - i^* = (r - r^*) + (\pi^e - \pi^{e*}),$$

where $*$ indicates the variables for some other country. Countries may have different real interest rates and thereby different nominal interest rates for given inflation expectations, depending on the general economic situation. Therefore, we can observe differences in international real interest rates in the short and medium term. In the long term, however, there is reason to believe that real interest rates are the same in different countries because capital will flow to the countries where the real interest rate is highest. The long-term forward rate differential will then reflect the difference in long-term inflation expectations:

$$f - f^* = \pi^e - \pi^{e*}$$

Given that the long-term real interest rate is the same in different countries and has been adjusted for any differences in the inflation target, the long-term forward rate differential provides a relative measure of confidence in monetary policy.

The derivations above assume that there are no risk premia. In practice, there will be maturity and liquidity premia and as a result the equations above will not hold completely. Consequently, the statement concerning confidence in monetary policy based on forward rates must be interpreted with caution. Following developments in forward rates over time may nevertheless provide information about confidence in monetary policy.

¹ For more information about the theories discussed in this box, refer to de Grauwe (1996) and Brooke et al. (2000).

² Even with unchanged interest rate expectations, money market rates are normally somewhat higher than key rates due to maturity and credit risk premia, cf. discussion in section 3. Simplifying, we disregard this when we consider how expectations about changes in the key rate affect money market rates.

by these expectations, and must at any time set the key rate at the level the Bank considers to be appropriate given the economic situation. See box for further discussion.

We have looked at the reaction of money market rates after interest rate meetings. Charts 1a and 1b show the

change in the key rate and the reaction of money market rates after the interest rate meetings that have been held since January 1999. The charts show the change in the one-month rate and the three-month rate between the day prior to the meeting and the day after the interest

Chart 1a. Norway: Change in 1-month rate following interest rate meetings

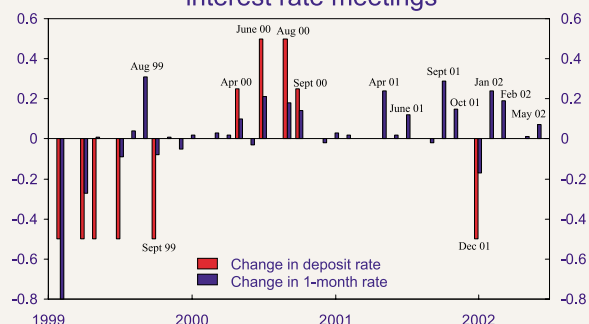
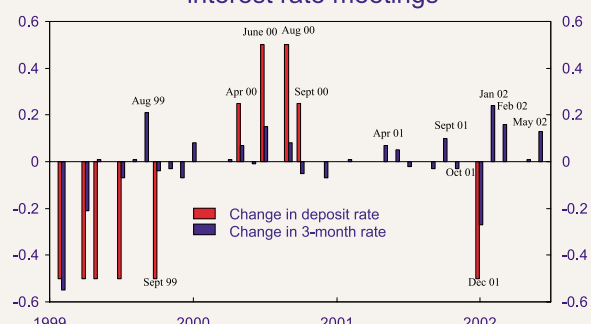


Chart 1b. Norway: Change in 3-month rate following interest rate meetings



rate decision was announced.⁷ At the meetings where the key rate was left unchanged, only the change in money market rates is shown. An increase in market rates after the interest rate decision indicates that the market expected a lower key rate than the outcome. A fall in market rates after the decision indicates that the market expected a higher key rate than the outcome.

In 1999, the key rate was reduced from 8% to 5.5%. The first four interest rate cuts of 50 basis points were made at unscheduled interest rate meetings. The interest rate cut on 27 January 1999 had a full impact on money market rates.⁸ At the next interest rate meeting on 3 March 1999, the impact was smaller, and at the interest rate meeting in April and June 1999, the interest rate

cuts were widely expected and had already been priced into money market rates. Market participants were gradually less surprised by the interest rate cuts in the first half of 1999, most probably because Norges Bank signalled in this period that interest rates would be lowered.⁹

Since June 1999 the dates of the interest rate meetings of Norges Bank's Executive Board have been announced in advance. After the scheduled meeting on 25 August 1999, money market rates rose by 20-30 basis points. This indicates that the market expected an interest rate cut. When the key rate was reduced by 50 basis points one month later, the impact on money market rates was marginal.

In 2000, the sight deposit rate was raised from 5.5% to 7%. Money market rates edged up after most meetings held in 2000. Following the interest rate meeting in June 2000, money market rates increased by about 20 basis points. After the three other interest rate meetings where the key rate was increased, the rise in money market rates was somewhat smaller. The impact on money market rates was small after the interest rate meetings where the key rate was left unchanged. This may indicate that there was greater uncertainty as to the magnitude of a change than whether a change would take place.

The impact on money market rates after the interest rate meeting on 21 September 2000 was somewhat different from the others. At that meeting the key rate was raised by 25 basis points. At the same time, the central bank's upside bias was changed to a neutral bias, i.e. with the same probability of an interest rate increase as an interest rate cut.¹⁰ The one-month rate increased by 14 basis points, which indicates that the market had priced in some chance of an unchanged key interest at that meeting. The three-month rate fell, however. This was the only case in the date sample where the three-month rate moved in the opposite direction of the key rate. This may suggest that market participants had envisaged a further increase in interest rates later in the autumn, and were therefore surprised when Norges Bank shifted to a neutral bias with the same probability of an interest rate increase as an interest rate cut.¹¹ This interpretation is supported by the movements in FRA rates. FRA rates maturing in March, June and September 2001, which can be interpreted as the market's expected three-month rates at these three times, fell by more than 20 basis points after the interest rate decision on 21 September 2000.

In 2001, the key rate was kept unchanged at 7% up to the interest rate meeting in December. After the interest rate meeting in April 2001, the one-month rate rose by 25 basis

⁷ This is a fairly rough measure and may capture other information that may also have influenced interest rate expectations. On the other hand, the relatively broad time interval ensures that market participants also receive information about the basis for the interest rate decision, which is provided at the press conference in the afternoon. It can be argued that by only looking at the impact immediately after the interest rate meeting, we exclude other information that central banks may provide at other times, for example in connection with speeches and editorials. If the central bank announces an unexpected interest rate change between interest rate meetings, the impact will occur at that time, and not when the central bank officially decides to change the key rate. In our analysis, it then appears as though interest rate decisions are predictable, while the central bank has in reality merely moved the element of surprise ahead in time.

⁸ After the interest rate meeting on 27 January 1999, the one-month rate fell from 8.5% to 7.75% so that the impact was considerably greater than the change in the key rate. A few days later, the one-month rate stabilised at a level just below 8%.

⁹ See Norges Bank website: publications from the first half of 1999.

¹⁰ From the interest rate meeting of 16 February 2000 to the meeting of 16 May 2001, the Bank expressed its "bias" by referring to whether the probability of an interest rate reduction was greater than the probability of an interest rate increase. As from the interest rate meeting of 20 June 2001, the Bank started to refer to the probability of attaining the inflation target with an unchanged interest rate (see leader in the June 2001 Inflation Report).

¹¹ In a survey conducted by Reuters among 12 economists in the Norwegian financial community, 8 expected unchanged interest rates, while 4 expected an interest rate increase of 25 basis points. All the economists surveyed expected a further increase in the key rate within the remaining period of 2001.

Norges Bank sets the interest rate independently of market participants' interest rate expectations

Norges Bank's analyses of economic developments as they are presented in the Inflation Report provide the basis for the Bank's interest rate setting. Developments in interest rates are important for market participants' decisions in the financial markets. Anticipating future interest rate changes and positioning a portfolio accordingly can result in large gains. On the basis of expectations concerning economic developments and analyses and statements from Norges Bank, the market forms expectations concerning future interest rates. These expectations are reflected in forward rate agreements (FRAs) and other future interest rates (see separate box on interest rate expectations).

Norges Bank monitors developments in market participants' interest rate expectations which provide information about how market participants interpret the Bank's policy response pattern. These developments are also important to evaluating the market's confidence in monetary policy. However, Norges Bank's interest rate setting cannot be ruled in any way by market participants' interest rate expectations. Norges Bank sets the interest rate at any given time in accordance with what the Bank considers to be appropriate given the economic situation. This point was clarified by the central bank governor in the leader to the Inflation Report 2/99.

"Norges Bank seeks to avoid undue uncertainty concerning interest rate determination by presenting its evaluations and projections in the Inflation Report and other documents. The Bank's analysis is based on assumptions concerning the exchange rate, fiscal policy, international developments, oil prices and a number of other variables. Any significant deviations from these assumptions will lead to developments that differ from our current projections. The same may apply if it should become clear that the historical relationships underlying the analysis have changed. In its conduct of monetary policy, Norges Bank must take into account the effects of any deviations from the assumptions. This may in turn lead to interest rate developments that are not in line with market expectations.

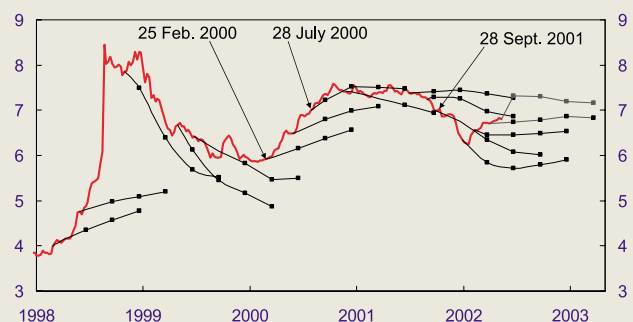
Market participants' expectations form the basis for their activity in money and foreign exchange markets. Norges Bank cannot be bound by market expectations, but must base monetary policy measures on its professional assessment of the outlook for the economy. In its analyses and statements, the Bank will seek to explain the background for its decisions."

The chart below shows a sample of the actual development in the three-month rate (red line) and a number of FRA rates observed at various points in time (black lines) since 1998. An example may help to explain the chart. On 25 February 2000, the three-month rate was a little less than 6.0 percent as indicated by an arrow. At the same time, market participants expected a rise in the three-month rate. The rates on FRAs maturing in June, September and December 2000, which may be interpreted as market participants' expected three-month rates at these times, were 6.15, 6.4 and 6.6 percent respectively. Norges Bank increased the key rate in 2000 and the three-month rate rose considerably more than market participants expected in February 2000.

The chart shows that actual interest rate developments may deviate considerably from the market's interest rate expectations. This may be because economic developments differ from expectations. At end July 2000, the market's interest rate expectations were closely in line with actual interest rate developments. Considering the period 1998-2000 as a whole, however, market participants have tended to expect interest rates to be lower than was the case. Market expectations prior to the terrorist attacks in the US in September 2001 represent an exception. Following these events, three-month rates fell substantially below the level expected by market participants one month earlier.

It should be said, however, that it is of course easier to have an opinion about what interest rate is appropriate today than about what will be appropriate one year ahead. Therefore, the chart should not be seen as criticism of market participants' interest rate analyses, but rather a reminder of how difficult it is to predict future interest rates.

Three-month interest rates and FRA rates



Source: Norges Bank

points, while the three-month rate reacted relatively mildly. The increase in the one-month rate was particularly strong after the interest rate meeting on 19 September 2001, a few days after the terrorist attacks in the US. The key rate was not changed at that meeting, and the central bank maintained its neutral bias, i.e. that the probability

that inflation two years ahead would be higher than 2.5% was the same as the probability that it would lower.

At the interest rate meeting on 31 October 2001, the key rate was left unchanged, but the Bank stated that it was more probable that inflation two years ahead with unchanged interest rates would be lower than 2.5% than

that it would be higher. The one-month rate increased by a little less than 20 basis points, while the three-month rate remained virtually unchanged. At the interest rate meeting in December 2001, the key rate was cut by 50 basis points at the same time that the Bank maintained its downside bias for inflation. The one-month rate fell by close to 20 basis points, while the three-month rate fell by around 25 basis points.

At the interest rate meeting in January 2002, the key rate was left unchanged, and the Bank maintained its downside bias for inflation. Money market rates increased by about 20 basis points. At the interest rate meeting in February 2002, the Bank also kept the key rate unchanged, but switched to a neutral inflation bias, i.e. the probability that inflation two years ahead would be higher than 2.5% was the same as the probability that it would be lower. Money market rates moved up by a little less than 20 basis points. At the interest rate meeting in April 2002, the key rate was left unchanged, with little change in money market rates.

At the interest rate meeting in May 2002, the key rate was also left unchanged. The balance of risks to inflation was changed to an upside risk, i.e. the probability that inflation two years ahead would be higher than 2.5% was greater than the probability that it would be lower. According to a Reuter's survey among 15 financial analysts, all 15 expected the key rate to be left unchanged. Thirteen of the analysts expected the Bank to maintain a neutral bias, while three expected a shift to an upside risk to inflation. The three-month rate increased by 13 basis points, while the impact on the one-month rate was small.¹²

The impact on money market rates after the interest rate meetings in 2001 were on occasion fairly substantial, which indicated that the market was surprised by some of the interest rate decisions. After April 2001, the impact was largely positive, which indicated that many market participants had expected interest rate cuts through 2001. The reason may be that market participants had a different view of the economic outlook than Norges Bank. The world economy was marked by a slowdown and rate cuts. However, the Norwegian economy was experiencing labour shortages and pressures on economic resources. Wage growth had been markedly higher in Norway than in other countries for several years. Domestic developments underlined the need for maintaining interest rates at a relatively high level.¹³ At the same time, it was uncertain how weak global growth would affect the Norwegian economy. The market may have assessed the impact of international developments on the Norwegian economy to be greater than that implied by Norges Bank's projections.

¹² At quotation close the day before the interest rate meeting, the three-month rate was 6.82%. During the next day up to the announcement of the interest rate decision at 2 pm, it rose to 6.88%. Between 2 pm and 3 pm, it rose to 6.90%. At 10 am on the day after the interest rate meeting, the three-month rate had risen to 6.95%, or to about the same level as at quotation close that day. FRA rates with maturity in September and December 2002 rose by a little more than 10 basis points in the hours following the announcement of the interest rate decision. In the morning hours of 23 May, these rates had risen by a further 10 basis points.

¹³ The justification for keeping the key rate unchanged up to December 2001 is provided in Norges Bank's press releases (introduction to press conference) on the Bank's website: www.norges-bank.no.

Analysts' interest rate expectations

Money market rates reflect the average expectations of traders in the market. These may deviate from the expectations of analysts in banks and brokerage firms. Since April 2000, Reuters has conducted a survey among analysts before each interest rate meeting at Norges Bank. The analysts are asked, among other things, about their interest rate expectations prior to the interest rate meeting at Norges Bank.

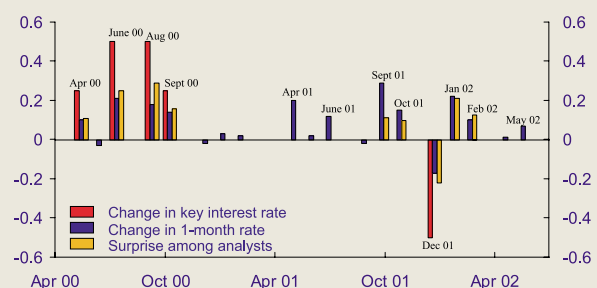
The chart below is an extension of Chart 1a and shows the change in the key rate (red) and the one-month rate (blue) after the interest rate meetings. The yellow bars show the degree of surprise among analysts and may be compared with the change in the one-month rate.¹ If the yellow bars are higher than the blue, the analysts on average were more surprised by the interest rate decision than the traders in the market.

In connection with the four interest rate increases in 2000, the degree of surprise among analysts was in line with the degree of surprise among operators trading in the market. The analysts appear to have been somewhat more surprised by the interest rate increase in August 2000.

After the interest rate increase in September 2000, the interest rate was left unchanged until the interest rate meeting in December 2001. In this period, it appears that the analysts were largely able to predict Norges Bank's interest rate decisions, although on average the analysts expected an increase of about 10 basis points at the meetings in both September and October 2001. Traders in the market expected a more substantial decrease in interest rates, so that the gap between their expectations and Norges Bank's interest rate decisions was wider than for the analysts.

The degree of surprise was roughly the same for the two groups in connection with the interest rate meetings in December 2001 and at the meetings in January, February, April and May 2002.

Degree of surprise among analysts and traders in the market



¹ The analysts' expected interest rate change at a given meeting is calculated as the empirical average in the survey. The degree of surprise is calculated as the change in the key rate minus the expected change in the key rate. Assume, for example, that the analysts expect on average an interest rate increase of 30 basis points. If the key rate rises by 50 basis points, the degree of surprise is 20 basis points. If the key rate is left unchanged, the degree of surprise is -30 basis points. This method of calculation makes it easier to compare the degree of surprise among analysts and traders in the market. For both groups the figures represent averages. Some analysts may of course have anticipated Norges Bank's interest rate decision even if analysts on average missed the mark.

After the interest rate meeting on 12 December 2001, when the key rate was reduced by 50 basis points, the impact on the three-month rate was particularly strong. According to a survey conducted by Reuters among 15 macroeconomists in the Norwegian financial community, all 15 expected an interest rate cut at that meeting, but none expected an interest rate cut of 50 basis points with a continued downside bias for inflation.¹⁴ On 13 December 2001, in the daily financial newspaper *Finansavisen*, some market participants claimed they were surprised by this interest rate decision, and that it did not contribute to Norges Bank's predictability. They pointed to the fact that Norges Bank did not cut the key rate or change its bias after the terrorist attacks in the US on 11 September. Nor did the Bank find it necessary to cut the key rate when interest rates were reduced internationally and substantial interest rate cuts were priced into the Norwegian FRA market. A possible interpretation of this is that market participants were surprised by the interest rate decision on 12 December because it was not perceived as being consistent with the policy response pattern through the autumn of 2001.

In addition, the significance of Norges Bank's assessment of the balance of risks to inflation may have been unclear to the market. In the October 2001 Inflation Report, published on 31 October, inflation was projected at 2.5% two years ahead. This may have been interpreted to mean that there was little need for an interest rate cut. However, at the same time the Bank stated that the probability that inflation would lower than 2.5% was greater than the probability that it would be higher. In a speech in Gausdal on 25 January 2002, the Deputy Governor of Norges Bank provided clarification: "Norges Bank's inflation projection is our judgement of the most probable outcome for the rise in the CPI two years ahead. In setting the interest rate, however, we also place emphasis on the probability distribution - or the balance of risks - surrounding the projection. In order to reduce the possibility of substantial deviations from the inflation target, Norges Bank takes the balance of risks into account when assessing the interest rate."¹⁵

The market reaction in December 2001 may indicate that some market participants had not understood this. Forsbak writes in *Dagens Næringsliv* of 27 December 2001: "To say that the projection was 2.5%, but expectations lower, was not clear information."¹⁶ Dørum (2002) discusses the lack of clarity in the interpretation of the probability distribution for inflation that Norges Bank presents in its Inflation Report. In particular, he underlines the "duality in communication"¹⁷ when the

expected level of inflation is different from the most probable outcome.

Around the first two interest rate meetings in 2002, there were again considerable reactions in money market rates, particularly in January. In *Dagens Næringsliv* of 17 January 2002, market analysts discuss the implications for interest rate setting when Norges Bank assesses the balance of risks to the inflation projection of 2.5% as asymmetrical. The discussion focuses on whether the key rate will be changed at the next meeting when the Bank has an asymmetrical probability distribution around the inflation projection. One analyst "interprets a downward bias as a signal of what they do at the next meeting."¹⁸ The analyst concerned justified his expectations of an interest rate cut in January on this basis. Since Norges Bank maintained the asymmetrical balance of risks at the meeting in January, this may also have influenced market expectations about the decision at the interest rate meeting in February. However, Norges Bank had also presented an asymmetrical balance of risks earlier without changing the key rate at the next interest rate meeting.¹⁹

Money market rates reflect the expectations of operators that trade in a market. An alternative is to compare the Bank's interest rate decisions with the expectations of central bank watchers in the Norwegian financial community (see box).

5 Comparison with other countries

In this section, we will consider how changes in key rates have affected money market rates in other countries and compare these findings with the results in Norway.²⁰ Economic developments in the US have a substantial impact on developments in a number of other countries. At its meeting in May 1999, the Federal Open Market Committee of the central bank in the US (the Fed) did not change the interest rate but expressed concern about imbalances in the economy that could lead to inflationary pressures. From June 1999 to May 2000, the interest rate was increased six times, from 4.75 to 6.5%. In this period, changes in money market rates were generally small after the FOMC meetings (see Charts 2a and 2b).

After the interest rate increases in the first half of 2000, the FOMC continued to express concern about inflationary pressures in the economy up to and including the interest rate meeting in November 2000.²¹ However, the interest rate remained unchanged, with little impact on money market rates.

¹⁴ See *Dagens Næringsliv* 10 December and *Finansavisen* 13 December 2001.

¹⁵ See Norges Bank's website, www.norges-bank.no.

¹⁶ Quote from *Dagens Næringsliv*, page 3, 27 January 2001

¹⁷ Quote from *Dagens Næringsliv*, page 33, 31 January 2002

¹⁸ Quote from *Dagens Næringsliv* page 32, 17 January 2002

¹⁹ At the interest rate meeting on 12 April 2000, Norges Bank indicated that it was more probable that the next interest rate change would be an increase than a decrease. The Bank kept the key rate unchanged at the next interest rate meeting on 10 May 2000.

²⁰ Data has been gathered from EcoWin for all countries.

²¹ A standard formulation from the FOMC's press releases is "...the Committee believes the risks continue to be weighted mainly toward conditions that may generate heightened inflation pressure in the foreseeable future".

Chart 2a. US: Change in 1-month rate following interest rate meetings

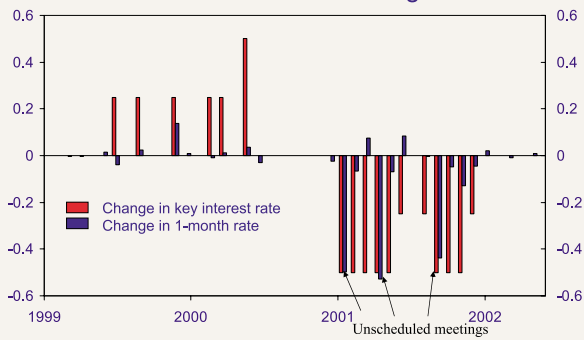


Chart 4a. UK: Change in 1-month rate following interest rate meetings

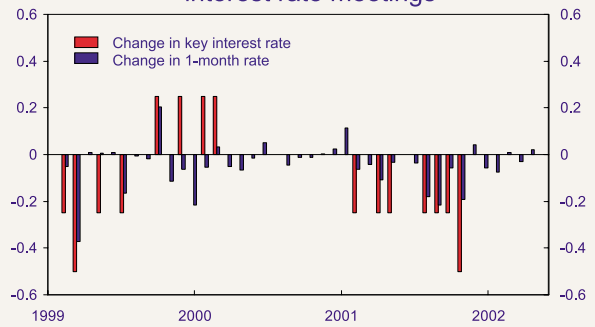


Chart 2b. US: Change in 3-month rate following interest rate meetings

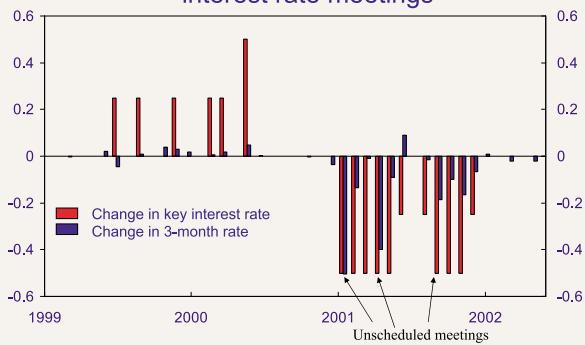


Chart 4b. UK: Change in 3-month rate following interest rate meetings

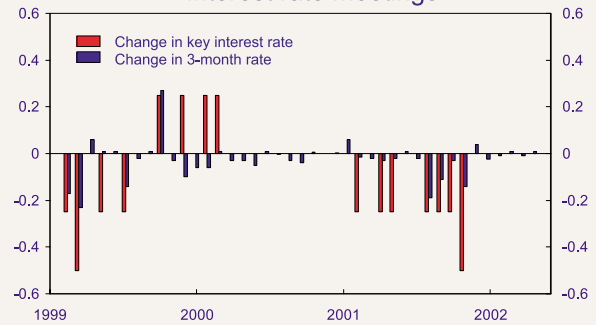


Chart 3a. ECB: Change in 1-month rate following interest rate meetings

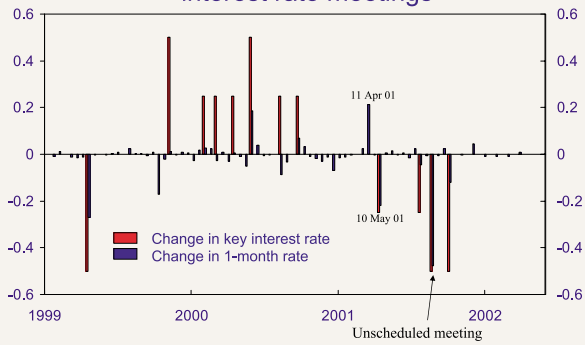


Chart 5a. Australia: Change in 1-month rate following interest rate meetings

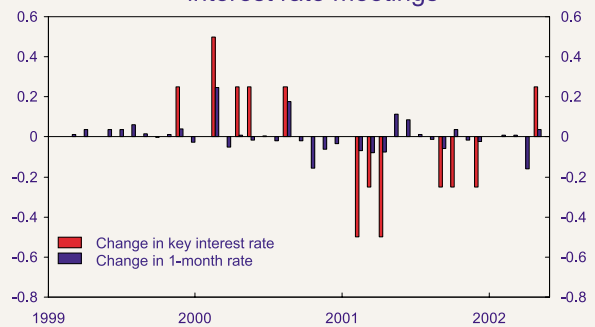


Chart 3b. ECB: Change in 3-month rate following interest rate meetings

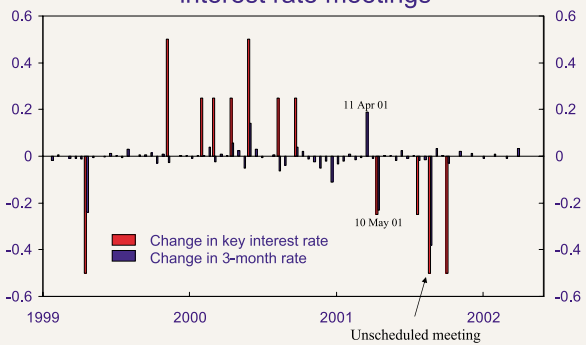


Chart 5b. Australia: Change in 3-month rate following interest rate meetings

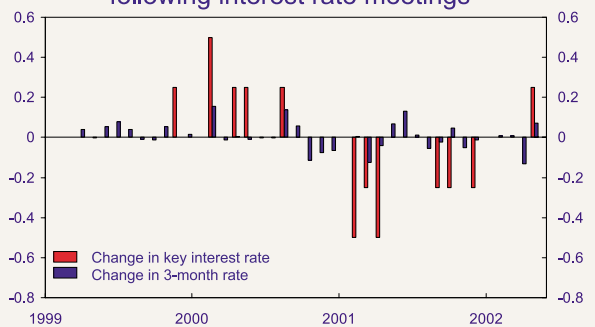


Chart 5a. Australia: Change in 1-month rate following interest rate meetings

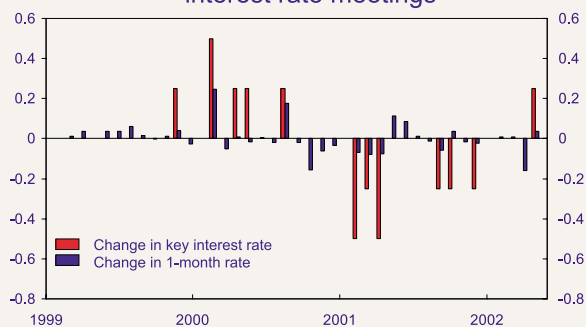


Chart 5b. Australia: Change in 3-month rate following interest rate meetings

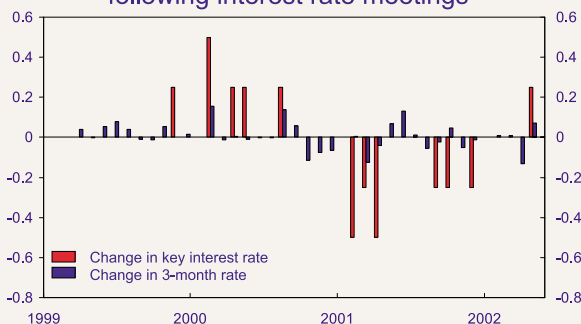


Chart 6a. New Zealand: Change in 1-month rate following interest rate meetings

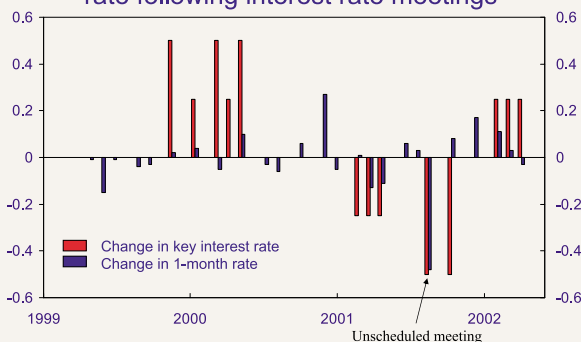
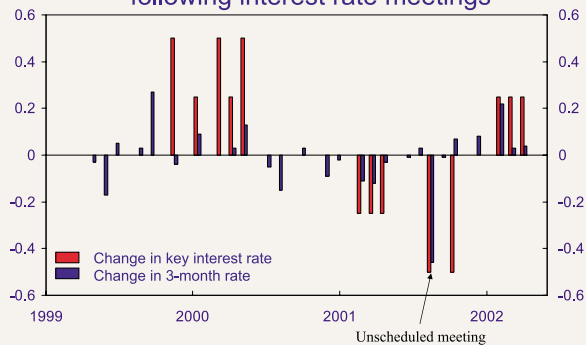


Chart 6b. New Zealand: Change in 3-month rate following interest rate meetings



At the meeting in December 2000, the FOMC presented a picture that suggested weaker economic growth in the US.²² In 2001, the interest rate was reduced 11 times, from 6.0 to 1.75%. Three of the interest rate reductions were decided at unscheduled FOMC meetings: 3 January, 18 April and 17 September. Following the meetings in January and April, both one-month and three-month rates fell substantially. After the extraordinary FOMC meeting on 17 September, the one-month rate fell markedly, while the impact on the three-month rate was limited.

If we disregard the unscheduled FOMC meetings, the Fed's interest rate decisions have had little impact on money market rates. This was particularly true in the period 1999-2000, but the impact was also small in 2001. This suggests that the Fed has been predictable in its conduct of monetary policy, even in a period marked by substantial changes in the federal funds rate. Nevertheless, the Fed has felt compelled to arrange extraordinary meetings of the FOMC.

Charts 3a and 3b show the impact on money market rates in the euro area following interest rate meetings of the Governing Council of the European Central Bank, the ECB. On the whole, the effects are small. However, the ECB's interest rate decisions on 11 April and 10 May 2001 seem to have surprised the market. At the meeting on 11 April 2001, the ECB left the key rate unchanged. Money market rates rose by about 20 basis points, indicating that market participants expected a reduction in interest rates at this meeting. The key rate was reduced by 25 basis points a month later, and there was an almost equally large reaction in money market rates. This may indicate that market participants revised their perception of the ECB's policy response pattern after the meeting on 11 April and were surprised by the interest rate reduction on 10 May. The interest rate meeting on 17 September 2001 following the terrorist attacks in the US was unscheduled. The interest rate cut of 50 basis points led to an almost equally large change in money market rates.

In the UK, decisions taken at meetings of the Bank of England's Monetary Policy Committee (MPC) had a substantial effect on money market rates on several occasions, especially in 1999, but also in 2001 and in particular for one-month rates. On the other hand, in 2000, the MPC meetings had little impact on money market rates.

In Australia, New Zealand, Canada and Sweden (Charts 5-8, see box), changes in money market rates in connection with interest rate meetings are rather small if we disregard the unscheduled interest rate meetings held in September 2001. The impact is small, especially in Australia and Sweden. New Zealand experienced a considerable increase in the three-month rate in September 1999 and in the one-month rate in December 2000. New Zealand's key rate was left unchanged at both interest

²² The FOMC wrote in the press release "...the Committee consequently believes that the risks are weighted mainly toward conditions that may generate economic weakness in the foreseeable future".

Table 1 Impact on money market rates in connection with interest rate meetings after July 1999. Percentage points

| | Change in 1-month rates | Change in 3-month rates | 10 largest 1-month | 10 largest 3-month |
|-------------|-------------------------|-------------------------|--------------------|--------------------|
| Norway | 0.10 | 0.07 | 0.21 | 0.14 |
| Sweden | 0.04 | 0.04 | 0.09 | 0.08 |
| UK | 0.06 | 0.04 | 0.13 | 0.10 |
| Euro area | 0.03 | 0.03 | 0.12 | 0.10 |
| Australia | 0.06 | 0.05 | 0.11 | 0.10 |
| New Zealand | 0.06 | 0.07 | 0.11 | 0.13 |
| Canada | 0.06 | 0.07 | 0.08 | 0.09 |
| US | 0.08 | 0.08 | 0.17 | 0.17 |

rate meetings. In Canada, money market rates changed by about 20 basis points on some occasions.

In order to compare country results more systematically, we have calculated different measures of the impact of interest rate meetings on money market rates (see Table 1). We have used data from July 1999 when Norges Bank introduced regular, scheduled monetary policy meetings.

Unscheduled interest rate meetings after the terrorist attacks in the US in September 2001 are excluded for all countries.

The first two columns in Table 1 show the average absolute change in one-month and three-month rates respectively following all interest rate meetings since 1 July 1999. In Norway, the change in the one-month rate is 0.10 percentage point. This is somewhat larger than in other countries. The change in the US is 0.08 percentage point, while the change in the UK, Australia, New Zealand and Canada is 0.06 percentage point. The change in Sweden and the euro area is somewhat smaller, 0.03-0.04 percentage point. The change in the three-month rate is largest in the US, with 0.08 percentage point. The change in the three-month rate in Norway, 0.07 percentage point, is the same as in New Zealand and Canada. The change in Sweden, the euro area and the UK is smaller, 0.03-0.04 percentage point.

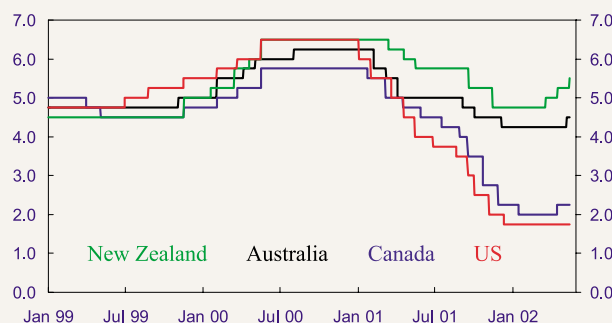
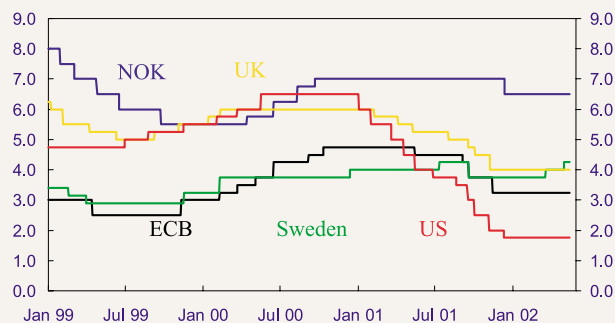
It appears, however, that the change in market rates tends to be smaller following meetings where the key rate was left unchanged. This may result in a lower average change in countries with frequent interest rate meetings, since there are relatively more meetings involving no change in the key rate. Therefore, columns three and four in Table 1 show the average of the ten largest changes in money market rates following interest rate meetings.

Measured in this way, the change in one-month rates is largest in Norway and the US, at 0.21 and 0.17 percentage point respectively. In the UK and the euro area, the changes are 0.13 and 0.12 percentage point respectively, while the change in Australia and New Zealand is somewhat smaller, at 0.11 percentage point. The change in Sweden is smallest, at 0.09 percentage point. The change in the three-month rate is largest in the US, at 0.17 percentage point, whereas in Norway it is somewhat smaller, at 0.14 percentage point. For the other

countries in the survey, the changes are less pronounced.

All in all, the results show that changes in money market rates in connection with interest rate meetings have been somewhat more substantial in Norway and the US than in other countries. One factor that may help explain this for Norway is that interest rate developments the last couple of years have differed from developments in other countries. It may be easier for market participants to foresee changes in the key rate if interest rate developments in the country concerned follow international developments.

Charts 9 and 10 show the key interest rates in different countries from the beginning of 1999. Chart 9 shows

Chart 9. Key interest rates in different countries**Chart 10.** Key interest rates in different countries

that key rates in Canada, Australia and New Zealand have largely followed interest rate developments in the US. Canada has closely followed interest rate developments in the US, while Australia and New Zealand cut their key rates somewhat less than the US in 2001. Chart 10 shows that developments in the key rates in the UK and the euro area are also similar to developments in the key rate in the US. The correlation is not as pronounced, but interest rates in both the UK and the euro area tend to move in the same direction as interest rates in the US.

However, interest rate developments in Norway have been different. This was most obvious in 2001, when interest rates were sharply reduced in the US and other countries, while in Norway they were left unchanged until December. Gradually, as the federal funds rate was reduced in the US, market participants may have expected interest rate cuts in Canada, Australia, New Zealand, the UK and the euro area as well. Market participants did not have a similar basis for interest rate expectations in Norway. There was considerable pressure in the Norwegian economy, and uncertainty about the impact of the international downturn on the domestic economy was probably greater in Norway than in many of the other countries. Therefore, it may have been more difficult to assess interest rate developments in Norway.

The same line of reasoning may also explain the relatively large changes in the US. Interest rates were reduced more and at an earlier stage in the US than in other countries in 2001. Therefore, it may have been more difficult for market participants to anticipate interest rate changes in the US than in countries that reduced interest rates at a later time.

Another explanation for the somewhat more pronounced changes in Norway may be that the monetary policy regime is relatively new. Inflation targeting was introduced in Norway in March 2001 and replaced a regime that focused on exchange rate stability. Although the new guidelines do not involve a significant change in the conduct of monetary policy, it may take time for market participants to gain insight into the Bank's policy response pattern and communication under the new regime.

6 Is there confidence in monetary policy in Norway?

Although some interest rate decisions seem to have surprised the market, this does not necessarily mean that the central bank has communicated its policy response pattern inadequately. There will always be some uncertainty as to the timing and magnitude of an interest rate change. The primary concern is that the Bank sets the key rate in such a way that inflation over time is close to the target.

The degree of predictability, as measured by the reaction of money market rates after the interest rate meetings, is by no means a perfect measure of monetary policy credi-

bility. Situations may arise where market participants have confidence in low and stable inflation expectations over time, even though they are not able to predict each interest rate decision. In the same vein, it is of little use to have a predictable monetary policy if the objective of low and stable inflation is not achieved.

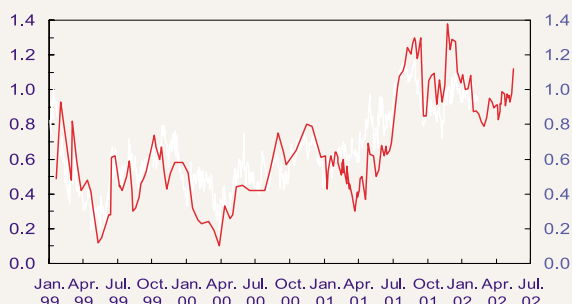
Monetary policy credibility can be measured in several ways. Chart 11 shows the development in the long-term implied forward rate for Norway from November 2000. This rate can be interpreted as the expected three-month rate 10 years ahead and should to a large extent be independent of cyclical fluctuations.²³ According to the Fisher equation, the long-term forward rate is the sum of the long-term real interest rate, inflation expectations and any risk premia (see box on interest rate expectations theories). The inflation target of 2.5% was introduced in March 2001. Since that time, the long-term forward rate has varied around a level of 6.5%. Both the long-term real interest rate and the risk premium are difficult to quantify and are shrouded with considerable uncertainty. Inflation expectations of 2.5% are consistent with a long-term real interest rate of 3.5% and a risk premium of 0.5%. These estimates may be reasonable.²⁴

Chart 12 shows the long-term forward interest rate differential against Germany. After the inflation target was introduced in March 2001, it widened and has subse-

**Chart 11. Long-term forward rates in Norway
November 2000 - May 2002**



Chart 12. Difference between Norwegian and German forward rates 10 years ahead



²³ See Kloster (2000) for a further description of how forward rates are estimated and interpreted.

²⁴ Although 3.5% may be a reasonable estimate of the long-term real interest rate, it is difficult to provide an exact quantification. Hammerstrøm and Lønning (2000) discuss the neutral real interest rate further. In addition, the risk premium is not directly observable and will probably vary over time.

quently varied around 1 percentage point. This difference is consistent with a risk premium of around 0.5 percentage point and a difference in the inflation target of a little more than 0.5 percentage point. Roughly speaking, forward rates do not indicate that inflation expectations deviate significantly from 2.5%. Forward rates are shrouded with uncertainty, however, both in terms of technical calculations and interpretation.

Another measure of inflation expectations can be found in Consensus Forecasts, a monthly survey conducted by Consensus Economics Inc. where analysts are asked about their inflation expectations. According to Consensus Forecasts for October 2001, the market expected the annual rate of inflation to be 2.4% up to 2005 and 2.5% in the period 2005-2011. In Consensus Forecasts for April 2002, the market maintained its expectations of an inflation rate of 2.5% up to 2012.²⁵

Even though the results may indicate that Norges Bank's interest rate decisions have to some extent surprised the market, we do not find any signs of a lack of confidence in monetary policy in Norway. Long-term forward rates, the forward rate differential against other countries and surveys among analysts in the financial market indicate that inflation expectations ahead in time are close to the inflation target.

7 Summary

Transparency can enhance the predictability of monetary policy so that the central bank's interest rate decisions are less surprising to the market. Predictability can enhance the effectiveness of monetary policy. When market participants understand the central bank's policy response pattern, there is a greater possibility that market rates react "correctly" to new information about economic developments. Through expectations, interest rate developments can thus contribute to stabilising economic developments.

Transparency can contribute to strengthening confidence in monetary policy. When monetary policy is credible, economic agents are confident that the central bank will attain the inflation target. Inflation expectations are thereby anchored in the inflation target. This establishes a nominal anchor for wage setting and price formation.

Transparency can be looked upon as an instrument available to the central bank for achieving a more predictable and effective monetary policy, which may enhance the long-term credibility of monetary policy. However, communication and predictability are not alone sufficient to achieve monetary policy credibility. Over time, the central bank cannot achieve credibility unless actual inflation is near the inflation target. Communication and a predictable monetary policy are of little use if the results are inadequate.

The reaction of money market rates to interest rate meetings can provide an indication of whether monetary policy is predictable. If the central bank's policy response pattern is understood, changes in money market rates should mainly come in response to new information about

economic developments and to a lesser extent in response to interest rate decisions. A tendency for money market rates systematically to react strongly after interest rate decisions indicates that the market is often surprised by the central bank's decisions.

Our findings indicate that interest rate decisions in Norway have surprised market participants somewhat more than in other countries. The explanation may be inadequacies in communication or that Norges Bank and market participants have had divergent assessments of economic developments. Interest rates have moved on a different path in Norway compared with other countries in recent years. In 2001, developments in the Norwegian economy and the outlook were particularly different from the situation prevailing in many trading partner countries. It may be easier for market participants to anticipate changes in the key rate if economic developments follow an international trend. Moreover, the current monetary policy regime was introduced relatively recently. It may take some time for market participants to gain insight into Norges Bank's policy response pattern and communication under the new regime.

Even though the results may indicate that Norges Bank's interest rate decisions have surprised the market to some extent, we do not find any signs of a lack of confidence in monetary policy in Norway. Long-term implied forward rates, the forward rate differential against other countries and surveys among analysts in the financial market indicate that inflation expectations are close to the inflation target.

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²⁵ Consensus Economics publishes long-term inflation expectations biannually in April and October.