Evaluation of Norges Bank's projections for 2004

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The assessments of capacity utilisation in the Norwegian economy in 2004, measured by estimates of the output gap, changed only moderately through 2003 and 2004. For the past year, Norges Bank has projected that the Norwegian economy was approaching normal capacity utilisation towards the end of 2004. In the *Inflation Reports* in 2003, the rise in the consumer price index adjusted for tax changes and excluding energy products (CPI-ATE) was projected to move up by 2 per cent cent in 2004. The projection was revised downwards to ½ per cent in the March 2004 *Inflation Report*. Price inflation in 2004 was substantially lower than projected in 2002–2003, but the projections in the 2004 were close to the mark in relation to actual developments.

1. Introduction

This article provides an evaluation of the projections for inflation and economic developments in 2004 that have been made since the last *Inflation Report* in 2002.

There may be many reasons why projections deviate from actual developments. These reasons can be grouped into four main categories:

Random disturbances
- The economy is subjected to unexpected events or shocks that it is not possible to take account of in advance.

Description of the current situation
- There is uncertainty surrounding the actual state of the economy at the time the projections are made. This is because it takes time for the statistics to be published, and because the statistics are often extensively revised subsequently. An incorrect starting point for the assessment of developments in the period ahead may cause deviations between projections and actual developments.

Assumptions
- The projections in the *Inflation Reports* in 2002–2004 were based on technical assumptions about interest and exchange rates. The projections in *Inflation Report* 3/02 and 1/03 are based on the assumption of an unchanged interest and exchange rate through the projection period. As the interest rate declined to a lower level, the assumptions regarding the interest and exchange rate changed. Two sets of projections were presented in *Inflation Report* 2/03. One was based on unchanged interest rate and exchange rate through the projection period. The other was based on an assumption that the interest rate and exchange rate would shadow market forward interest and exchange rates. The projections in *Inflation Report* 3/03 and thereafter have been based on similar assumptions. One important reason for the change was that projections based on a clearly unreasonable interest rate assumption would be of limited value as a basis for decision-making.[2] Nor would there be any point in evaluating projections based on unrealistic assumptions. In the shorter term, monetary policy assumptions normally have a more limited influence on the projections.
- The projections are also based on assumptions concerning international economic developments, oil prices, public expenditure and direct and indirect taxes. These are factors that influence economic developments, but which monetary policy cannot influence. If developments differ from the assumptions concerning these variables, the projections will not be accurate. How closely in line these assumptions are with actual developments depends partly on the quality of Norges Bank's analyses, but will also be influenced by various random disturbances.

The operational objective of monetary policy is low and stable inflation, with annual consumer price inflation of approximately 2.5 per cent over time. Norges Bank operates a flexible inflation targeting regime, so that weight is given to both variability in inflation and variability in output and employment. Monetary policy is forward-looking. Projections for price inflation and economic developments therefore form an important basis for monetary policy decisions. Norges Bank works continuously to improve the basis for its projections. Analysing the difference between actual developments and projections forms part of this work. The analyses can contribute to a better understanding of the functioning of the economy, and thereby contribute to more accurate projections in the future. The evaluation of the projections also forms an important basis for the evaluation of monetary policy. A more detailed account of monetary policy is provided in Norges Bank's Annual Report for 2004 (published in April 2005).

[1] I should like to thank Anne Berit Christiansen and Kåre Hagelund for valuable contributions and comments. Thanks also to other colleagues at Norges Bank.

[2] In autumn 2003 Norges Bank's key rate had come down to 2.5 per cent.

Structural changes and understanding of the functioning of the economy

- Economic relationships may change over time. This may be partly due to changes in framework conditions, such as market deregulation, which results in stronger competition.
- It is uncertain how monetary policy influences both the real economy and prices. The analytical apparatus that is used may provide an inaccurate or inadequate description of actual economic relationships. Over time, these relationships will also be influenced by structural changes.

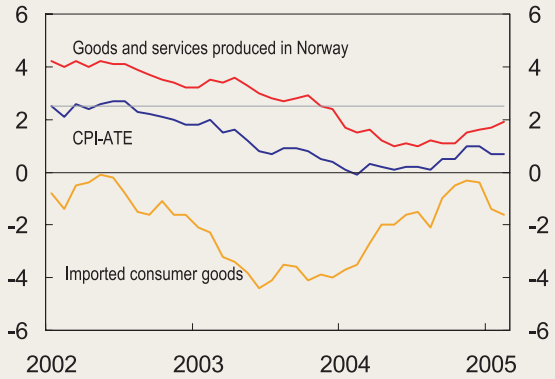
2. Developments in inflation and output in 2004

Consumer price inflation fell markedly from summer 2003 and continued to fall up to spring 2004. Consumer price inflation adjusted for taxes and excluding energy products (CPI-ATE) was 0.3 per cent in 2004. Inflation was very low in the first half of 2004, but gathered pace through the autumn and reached 1.0 per cent in November and December and 0.7 per cent in January and February 2005. The rise in prices for domestically produced goods and services moved up to about 1½ per cent at the end of 2004. Prices for imported consumer goods were more unstable. At the end of the year, these prices were about ½ per cent lower than at end-2003 (see Chart 1). After adjusting the CPI-ATE for the introduction of maximum rates for day-care places, which has a one-off effect on inflation, and the direct effect of interest rates on house rents, underlying inflation was about ¾ per cent in 2004.[3] Alternative measures of underlying inflation also show that inflation was low in 2004 (see Chart 2). Generally, the indicators show an underlying annual rise in consumer prices in the order of ½-1½ per cent .[4]

While inflation was primarily pushed down by the fall in imported consumer goods in 2003, the more subdued rise in house rents and the fall in prices for services with important price components other than wages made a strong contribution in 2004 (Chart 3).

After a relatively moderate recession in the first half of 2003, growth in the Norwegian economy picked up markedly in 2004. Cost inflation fell to a more sustainable level after a short period with a tight monetary policy. Monetary policy easing through 2003 and into 2004 contributed to a sharp rise in private consumption and housing investment. Activity in service industries and the construction sector rose sharply. Conditions for manufacturing improved as a result of high petroleum investment, the global economic recovery and a weaker krone. Profitability improved for mainland enterprises. Investment began to increase in a number of industries. Export growth picked up markedly.

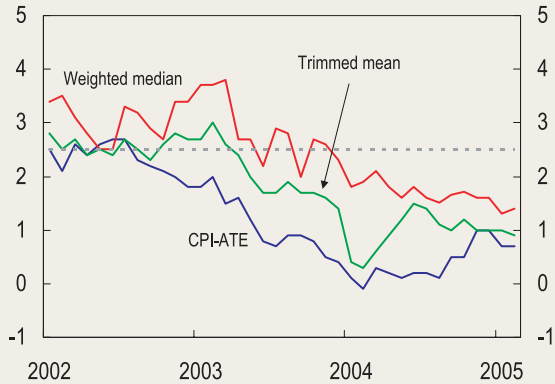
Chart 1 CPI-ATE[1]. Total and by supplier sector[2]. 12-month rise. Per cent. January 2002 - February 2005



[1] CPI-ATE: CPI adjusted for tax changes and excluding energy products
[2] Norges Bank's estimates

Sources: Statistics Norway and Norges Bank

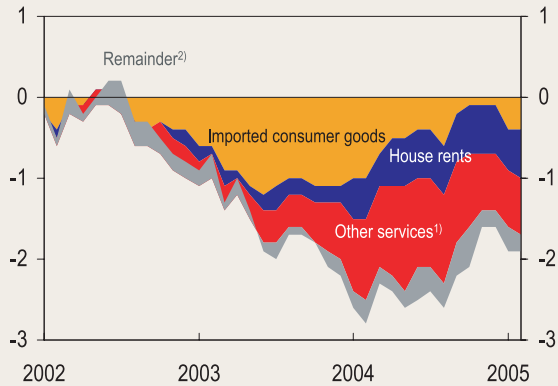
Chart 2 Three indicators of underlying inflation[1],[2]. 12-month rise. Per cent. January 2002 - February 2005



[1] A *trimmed mean* is calculated by omitting the largest and smallest price movements when measuring inflation. Price changes accounting for 20 per cent of the weighting base are eliminated
[2] A *weighted median* is obtained by ranking changes in prices for some goods and services by rising value. The median is the middle value obtained when the CPI weights are taken into account.

Source: Statistics Norway

Chart 3 Contribution to the decline in CPI-ATE inflation since December 2001. Percentage points



[1] Services with important price components other than wages.
[2] Agricultural products, fish products, consumer goods produced in Norway, services with wages as dominant factor

Source: Norges Bank

[3] According to the Regulation on Monetary Policy, the direct effects on consumer prices resulting from changes in interest rates, taxes, excise duties and extraordinary temporary disturbances shall not be taken into account.

[4] The rise in the trimmed mean was 1%, and the rise measured as a weighted median was 1.7% in 2004.

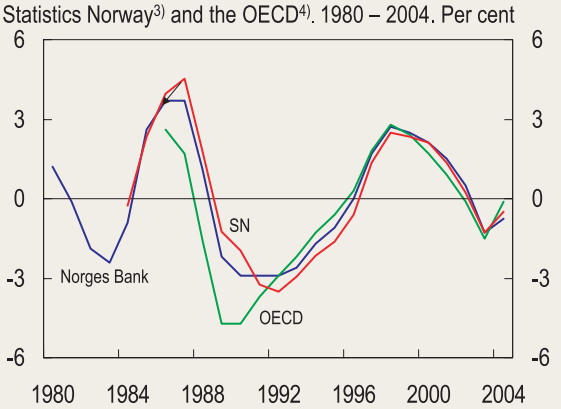
Output gap

Flexible inflation targeting means that when inflation expectations are anchored around the inflation target, the central bank will weigh price developments against developments in the real economy. The output gap is a comprehensive measure of capacity utilisation in the economy, and provides an expression of Norges Bank's assessment of developments in the real economy. The output gap is defined as the difference between the actual level of output in the economy and the output level that is consistent with stable inflation over time. There are various methods for estimating the output gap. Norges Bank's estimate of the output gap is based on an overall assessment based partly on technical estimates, partly on various indicators of capacity utilisation. The estimate of the output gap changes in the light of the revision of national accounts figures, and new information and new methods that are developed over time which provide a basis for revising our assessment of capacity utilisation in the economy.

The growth potential of the Norwegian economy seems to have increased more than normal in 2004. This is related to increased competition and a sharp decrease in sickness absence. It is likely that these developments will contribute to somewhat stronger growth in the Norwegian economy in the short term without the supply of labour or productive capital constraining growth. Nevertheless, the strong growth in 2004 implies that capacity utilisation has increased and has now probably reached its historical normal level.

The output gap, as estimated by Norges Bank, was slightly negative but closing in 2004. The recent downturn was nonetheless fairly mild compared with previous downturns in the Norwegian economy. Although the output gap estimates are highly uncertain, other institutions' output gap estimates present a similar picture (see Chart 4).

Chart 4 Estimates of the output gap[1] from Norges Bank[2], Statistics Norway[3] and the OECD[4]. 1980 – 2004. Per cent



[1] The output gap measures the difference between actual and trend mainland GDP. The methods of estimation used differ from one institution to the next.
[2] *Inflation Report* 1/05
[3] *EconomicSurvey* 1/05
[4] OECD *EconomicOutlook* No. 76

3. Deviations between projections and actual developments

Table 1 shows key assumptions and projections for 2004 in the *Inflation Report* published from autumn 2002 to end-2004. The last column shows actual developments. The box "Changes in the projections" at the end of this article provides a more detailed account of changes in the projections in the various inflation reports.

There has been relatively little change in the projections for capacity utilisation in the Norwegian economy in 2004. The output gap has been estimated at fairly close to zero through 2003 and 2004 (see Chart 5). Growth in the Norwegian economy in 2004 was higher than projected by either Norges Bank or other institutions (see Chart 6). Growth estimates for 2004 were gradually revised upwards through 2003 and in early 2004, which must be viewed in the light of the easing of monetary policy, among other things. The reason that Norges Bank has nonetheless left the estimate of the output gap in 2004 unchanged is that potential output in the Norwegian economy probably also increased more than

Table 1. Central assumptions and projections for some key macroeconomic variables for the Norwegian economy in 2004 and actual developments. Percentage change from previous year unless otherwise specified.

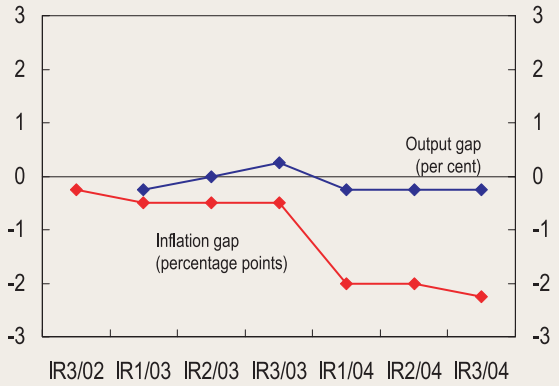
	Projections IR 3/02[1]	Projections IR 1/03[1]	Projections IR 2/03[2]	Projections IR 3/03[2]	Projections IR 1/04[2]	Projections IR 2/04[2]	Projections IR 3/04[2]	*Faktisk*
Interest rate (per cent)	7	5.5	3.4	3.0	1.8	2.0	1.8	1.8
Exchange rate (index, I-44)	89.0	88.3	94.7	95.7	99.3	96.1	95.6	95.6
GDP trading partners	2½	2¼	2¼	2¼	2½	2½	2¾	2.9
International prices	¾	¾	¼	0	-1½	-1	-½	-1
Mainland GDP	2¼	2	2½	3	3¼	3½	3¾	3½
Annual wages	5¼	4½	4½	4¼	3¾	3¾	3¾	3¾
CPI-ATE	**2¼**	**2**	**2**	**2**	**½**	**½**	**¼**	**0.3**
Output gap		**¼**	**0**	**¼**	**-¼**	**-¼**	**-¼**	**-¾**

[1] Based on the assumption of unchanged interest and exchange rates

[2] Based on forward interest and exchange rate

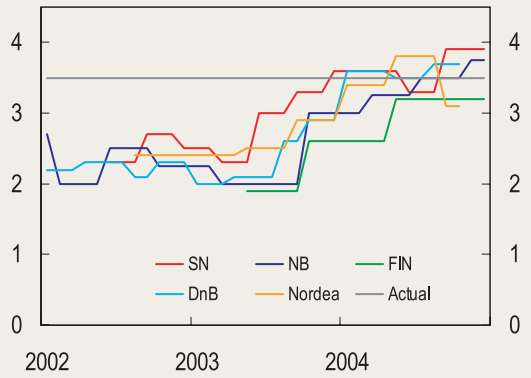
Sources: Statistics Norway, Technical Reporting Committee on Income Settlements and Norges Bank

Chart 5 Developments in projections for the output and inflation gap in 2004[1)]



[1)] The output gap measures the difference between actual and trend mainland GDP. The inflation gap measures the difference between actual inflation and the inflation target.
Source: Norges Bank

Chart 6 Mainland GDP. Projections for 2004 published at different times. Per cent



Sources: Norges Bank (NB), Statistics Norway (SN), the Ministry of Finance (Fin) and DnB NOR

normal in 2004, while capacity utilisation was somewhat lower in 2003 than previously assumed. However, national accounts figures published in December 2004 and March this year have provided a basis for a downward revision of the estimated output gap in 2004. The Norwegian economy is nevertheless assumed to have approached normal capacity utilisation towards the end of 2004.

In 2004, inflation measured by the CPI-ATE was substantially lower than projected by Norges Bank in 2002 and 2003. In the *Inflation Report* published from autumn 2002 to autumn 2003, the rise in the CPI-ATE was projected at about 1¾ percentage points higher than the actual rise of 0.3 per cent in 2004. Since *Inflation Report* 1/04, inflation in 2004 has been closely in line with Norges Bank's projections.

The difference between actual and projected developments in output and prices must be viewed in the light of developments in the various assumptions underlying the projections.

Normal capacity utilisation towards the end of 2004 in line with previous assessments

Capacity utilisation lower than projected in 2003

Our assessment is now that capacity utilisation in the Norwegian economy was lower in 2003 than projected in the *Inflation Report* in 2003. The output gap is now estimated at -1¼ per cent, whereas in *Inflation Report* 1/03 it was estimated at zero. The downward adjustment reflects weaker-than-projected developments in output and the labour market, at the same time as domestic inflation was lower than expected. National accounts figures published in December last year also show that growth in the Norwegian economy was lower in 2002-2003 than projected through 2004. This indicates that there were probably more available resources in the economy in 2003 and at the beginning of 2004 than previously assumed.

…higher-than-projected growth in the Norwegian economy in 2004

More expansionary monetary policy led to higher growth in the Norwegian economy

Pressures in the Norwegian economy diminished rapidly towards the end of 2002. In response to slower economic growth and lower inflation in Norway, Norges Bank lowered the interest rate. Norges Bank's key rate was cut from 7 per cent in December 2002 to 1.75 per cent in March 2004, and the krone exchange rate gradually weakened through 2003. In the *Inflation Report* in 2003, the monetary policy assumptions underlying the projections were gradually adjusted downwards, implying a lower interest rate and weaker exchange rate. This contributed to higher projected growth, particularly in the most interest-rate sensitive sectors of the economy.

International conditions…

After growing at a slower-than-expected pace in 2002 and early 2003, the global economy subsequently shifted into an upturn that was stronger and more broadly based than both Norges Bank and other forecasters had projected. In 2004, growth in the world economy was stronger than witnessed in several decades. Both in the US and the euro area, growth was underpinned by low interest rates. To a large extent, the global upswing reflected buoyant growth in China and India. High demand growth in China and India pushed up prices for oil and other commodities. Higher commodity prices, in conjunction with a weaker krone exchange rate and lower wage growth, led to a marked improvement in profitability in Norwegian manufacturing. Growth in traditional goods exports was appreciably stronger than previously assumed.

…and higher petroleum investment also fuelled growth
At the beginning of 2003, there were prospects that petroleum investment would peak in 2003 and level off at a relatively high level in 2004. However, as high global demand growth pointed to persistently high oil prices, the estimates for petroleum investment were also revised upwards. Higher petroleum investment has also led to higher-than-expected imports, but has generated considerable impulses to production in Norway. This is confirmed by reports from our regional network, which point to the positive spillover effects of growth in petroleum on other industries in Norway.

....and higher potential output in 2004
In the *Inflation Reports* in 2004, Norges Bank assumed that potential output increased somewhat more than normally in 2004. Information from our regional network indicates that intensified competition in many industries limited enterprises' scope for passing on higher costs to prices. Many enterprises reported that they had implemented extensive cost-reduction and efficiency-enhancing measures. Production could thus be increased to a fairly considerable extent without a substantial increase in employment. In the first half of 2004, preliminary national accounts figures indicated high growth in labour productivity, which supported our projection of higher-than-normal growth in potential output in the first two *Inflation Reports* in 2004.

The number of person-hours worked has since increased and labour productivity appears to have shown more normal growth later in 2004. The increase in person-hours worked must, however, be seen in connection with the sharp fall in sickness absence through 2004. The fall in sickness absence increase the supply of labour and reduced the need for new employees. A sustained reduction in sickness absence results in a sustained increased in available person-hours. Combined with increased competition and rationalisation in many sectors, this probably contributed to a higher-than-normal increase in potential output in 2004. As a result, the economy was probably able to expand at a fairly rapid pace in 2004 without the emergence of constraints on growth in the form of a shortage of labour or productive capital. The higher rate of growth in 2004 nevertheless implies an increase in capacity utilisation in the Norwegian economy through 2004.

National accounts figures published in December 2004 and March 2005 indicate that growth in the Norwegian economy was somewhat lower in 2002-2004 than projected in *Inflation Report* 3/04. Average capacity utilisation in the Norwegian economy in 2004 is therefore estimated to be somewhat lower than previously at present. However, our estimations indicate that the output gap was close to zero at the end of 2004, in line with previous projections.

Inflation was lower in 2004 than projected in 2003, but no major surprises through 2004

Lower wage growth…
Pressures in the Norwegian economy diminished faster-than-expected towards the end of 2002 and through 2003. Following several years of high wage growth, the cost level had become high in many enterprises and public entities. Public sector budgets could not sustain employment after several years of high pay increases. Nominal expenditure growth in the public sector increased in relation to nominal GDP growth. In manufacturing, unemployment increased as a result of the preceding deterioration in competitiveness. The effects of high wage growth in the period 1998-2002 were probably underestimated in our projections. Unemployment increased at a fast pace and unemployment fell more than expected. Combined with weaker developments in the international and domestic economy through 2003, this resulted in lower-than-projected wage growth in 2003 and 2004.

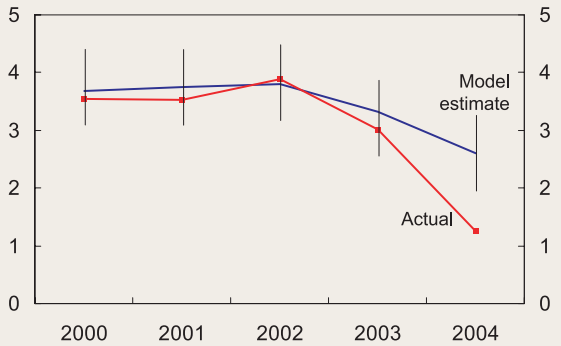
…structural changes in some industries…
Normally, a downturn is accompanied by increased pressures on prices and margins as a result of lower demand. It was thus expected that enterprises would be exposed to increased competition as demand in the Norwegian economy slowed in 2002 and 2004, and that this would lead to somewhat lower inflation.

The effects of intensified competition on inflation towards the end of 2003 and into 2004 were appreciably stronger than there were grounds to anticipate. This partly reflected structural changes and new entrants in some industries. For example, there were new operators in the airline industry and in the grocery trade. This triggered sharp price cuts towards the end of 2003 and in winter 2004. Prices for services and price components other than wages fell markedly (see Chart 2). Consumer price inflation was very low at the beginning of 2004.

Normally, the rise in prices for domestically produced goods and services follow developments in labour costs and productivity. In Appendix 2 to this article, this relationship is illustrated using a simple econometric model. The model provides a good explanation of the rise in prices for domestically produced goods and services in recent years, but in 2004 the rise in prices was considerably lower than normally implied by developments in labour costs and productivity (see Chart 7).

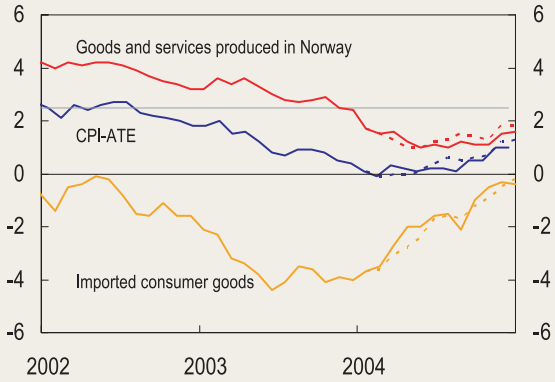
In *Inflation Report* 1/04, the projections were based on the assumption that increased competition would keep the rise in prices for domestically produces goods and services at a low level through 2004. The rise in prices for domestically produced goods and services moved in line with the projections through 2004 (see Chart 8).

Chart 7 Changes in prices for goods and services produced in Norway. Actual developments and model estimate[1)]



[1)] The model estimates are based on a simple equation discussed in more detail in Appendix 2 to this article. The estimates are dynamic and based on actual wage and productivity developments. The vertical columns indicate the uncertainty associated with the estimates

Chart 8 CPI-ATE. Total and by supplier sector. Historical developments and projections in *Inflation Report* 1/04. 12-month rise. Per cent. January 2002 - December 2004



Sources: Statistics Norway and Norges Bank

…and changes in trading patterns and intensified competition for internationally traded goods resulted in lower inflation

China and other low-cost countries account for a steadily growing share of Norway's imported consumer goods. At the same time, China's mounting importance in world trade has led to stronger competition in certain industries and lower prices for certain goods. Moreover, high productivity growth in the production of certain goods, particularly audiovisual equipment, has resulted in a persistent fall in prices. Our projections for price developments for imported consumer goods in the *Inflation Report* in 2002 and 2003 underestimated the reduction in price impulses to the Norwegian economy that these structural changes would engender. As a result, the projected rise in prices for consumer goods was too high.

Until 2004, Norges Bank used producer prices among our trading partners as an indicator of external price impulses to the Norwegian economy. In *Inflation Report* 1/04, Norges Bank introduced a new indicator of external price impulses[5] that provided a better and broader measure of these prices than producer prices among our trading partners. This indicator measures price developments for the consumer goods that Norway imports more directly. The indicator captures the effects of the trade shift toward China and other low-cost countries, and the particularly high productivity growth for the production of audiovisual equipment. In 2003 and 2004, external price impulses, measured in this way, fell by 1¾ per cent and 1 per cent, respectively.

The effects of changes in the krone exchange rate came later than assumed earlier

The new indicator showed that external price impulses to consumer prices in Norway had been weaker throughout the 1990s than previously assumed. New econometric calculations that take this into account indicated that the krone exchange rate has a somewhat weaker effect on prices, and that movements in the krone exchange rate affect consumer prices with a longer lag than previously assumed.[6]

In early 2004, the projection for the rise in prices for imported consumer goods in 2004 was revised down considerably in relation to previous projections. The projected rise in prices for imported consumer goods as a result of the krone depreciation in 2003 was assumed to occur at a later stage. On the whole, the projections for the rise in prices for imported consumer goods in 2004 have been close to the mark (see Chart 8), in spite of fairly large deviations in some months. These deviations primarily reflect wide seasonal variations in prices for clothing and footwear. Prices for clothing and footwear have exhibited a pronounced falling trend which is difficult to explain in full, and which may be related to problems in measuring price developments.

Other factors

In 2004, the rise in house rents was markedly lower than the norm in previous years. Interest rate setting through 2003 pushed down the rise in house rents and probably pushed down overall consumer price inflation by about _ percentage point in 2004. Lower day-care rates as a result of the introduction of maximum rates also pushed down inflation in 2004. Norges Bank has not taken these factors into account when making its projections.

Summary:

Minor changes were made in the projections from the beginning of 2004. The inflation projections in *Inflation Report* 1/04 seem to have been closely in line with actual developments in 2004. The projections may have been more accurate than earlier because of an improvement in the projections for external prices impulses to Norway and because the pass-through from the krone exchange rate to imported consumer goods has been in

[5] See Røstøen (2004)

[6] See box in *Inflation Report* 1/04: " The pass-through from the krone exchange rate to prices for imported consumer goods"

line with our projections. It also appears that we correctly assumed that increased competition would contribute to keeping down the rise in prices for domestically produced goods and services through 2004. Nor was the Norwegian economy exposed to new, unexpected disturbances in 2004.

The main factors behind markedly lower-than-projected inflation at the end of 2003 are:

- Intensified competition in many industries. Stronger competition in retail trade, the airline industry and other services resulted in a pronounced fall in prices for certain goods and services in these industries.
- The pass-through from the exchange rate came later than projected. The krone depreciation through 2003 exerted less upward pressure on inflation in 2004 than expected.
- External price impulses were weaker than expected, primarily due to shifts in trading patterns, low international inflation and high productivity and strong competition in the production of some internationally traded consumer goods.
- Wage growth was lower than projected. The low level of wage growth may be due to the very low rate of inflation at the beginning of the year.

Table 2 decomposes the deviation between actual and projected inflation for 2004, which was published in the last *Inflation Report* in 2003 and the first report in 2004. A decomposition for the two first reports in 2003 would not have resulted in a significantly different picture.

Norges Bank's analytical tools do not provide for a precise estimation of the effects on inflation stemming from intensified competition and structural changes in certain industries. The effects are estimated by comparing the actual rise in prices for some goods and services that may be influenced by these factors with an estimated "normal" price rise of 2½ per cent for these goods and services. The difference is assumed to be the effect of change in competition on prices.

Table 2. Decomposition of the difference between actual and projected inflation in 2004 published in *Inflation Report* 3/03 and 1/04.

	IR 3/03	IR 1/04
Difference between actual and projected rise in CPI-ATE. Percentage points	-1¾	-¼
Decomposition of difference		
Contribution from exchange rate	-¼	0
External price impulses	-(¼–0)	0
Lower wage growth	-¼	0
Stronger competition	-¾	0
Not explained/other factors[1]	-(½–¼)	-(½–¼)

[1] Other factors that may explain the difference are the introduction of a maximum rate for day-care places and direct effects of interest rate reductions in the form of lower house rents. These factors may explain an estimated 0.3-0.4 percentage point of the difference between actual and projected inflation. These are temporary disturbances that Norges Bank does not take into account when setting interest rates.

4. Should Norges Bank have foreseen already in 2002 and 2003 that inflation would be as low as it was in 2004?

Consumer price inflation in 2004 was substantially lower than the projections published in the *Inflation Reports* in 2002 and 2003. The reasons for the deviations between the projections and actual developments were initially grouped into four: random disturbances, description of the current situation, assumptions and structural changes and the understanding of the functioning of the economy.

The decomposition in Table 2 indicates that the forecast error for inflation for 2004 in *Inflation Report* 3/03 can be largely attributed to structural changes, such as increased competition in Norway and changes in trading patterns. These factors can explain directly about 1 percentage point of the difference between the projections and actual developments. The resulting lower-than-projected inflation probably also contributed to lower wage growth and hence a further fall in inflation. This type of structural change is difficult to foresee before it actually occurs. Using traditional macroeconomic models, it is also very difficult to project how they will influence developments in the future.

An alternative measure of the effect of structural changes and increased competition on inflation in 2004 is the projection error in the equation for the rise in prices for goods and services produced in Norway discussed in section 3. The actual rise in domestically produced prices for goods and services was 1.4 percentage points lower than the projection generated using this equation, given actual wage and productivity developments in 2004. This provides support for the assumption that the difference between actual and projected inflation largely reflects factors that it was not possible to take account of using ordinary macroeconomic models.

The main purpose of the projections in the *Inflation Report* is to provide a sound basis for interest rates decisions. The discussion of the various risk factors that may lead to deviations between actual developments and projections also forms part of this decision-making basis. In the assessment of the projections it is therefore also necessary to ask whether relevant factors were included in the risk picture, and accordingly also taken into account when interest rate decision were made.

In *Inflation Report* 2/03 (p. 37), intensified competition was highlighted as a factor that could potentially contribute to lower inflation ahead:

"A steady improvement in the framework conditions for cross-border trade is also exerting downward pres-

sure on the rise in prices for internationally traded goods and services. Another effect of the price gap is that a rising number of foreign operators with lower operating costs have discovered the profit potential in Norway. For example, international low-fare airlines and low-price food chains have established activities in Norway. In the long run, free competition will contribute to narrowing the price gap."

Weaker price impulses to the Norwegian economy as a result of structural changes in international trade were also regarded as a risk factor in early 2003 (*Inflation Report* 1/03, p. 28):

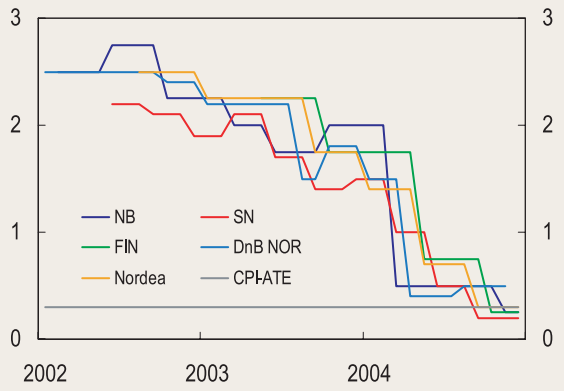
"Producer prices among our 25 largest trading partners are expected to rise by around ½ per cent a year. The rise in import prices in Norway may be lower, however. In the past few years, the rise in prices for imported consumer goods has slowed as trade has shifted away from Western countries with high price levels towards low-cost countries. At the same time, there has been a considerable improvement in the framework conditions for imports from low-cost countries."

However, Norges Bank did not take this into account in its projections, partly because it was difficult to find clear indications that future inflation would be influenced by such factors. Estimating the effect on consumer price inflation of structural changes in international trade is complicated. In comparison with other institutions that make economic projections, Norges Bank was among the first to develop an indicator of external price impulses that took account of such factors.

The krone exchange rate was somewhat weaker at the beginning of 2004 than the forward exchange rate in *Inflation Report* 3/03 would imply, but the exchange rate gradually strengthened, with the result that the krone exchange rate has not been substantially different from our assumption. The deviation in the exchange rate in Table 2 is therefore due to an overestimation of the pass-through from the exchange rate to prices and an underestimation of the lag. This deviation must therefore be attributed more to a change in the understanding of the functioning of the economy than to the projections being based on assumptions that were not in line with actual developments.

Lower-than-projected wage growth in 2003 and 2004 can be partly ascribed to economic developments in 2003 being weaker than assumed in analyses of the current situation in the *Inflation Report* in 2003. However, it must also be seen against the backdrop of structural changes and random disturbances that led to markedly lower-than-projected inflation.

Chart 9 CPI-ATE. Projections for 2004 published at different times. Per cent



Sources: Norges Bank, Statistics Norway (SN), the Ministry of Finance (Fin), DnB NOR and Nordea

A comparison of Norges Bank's and other institutions' projections

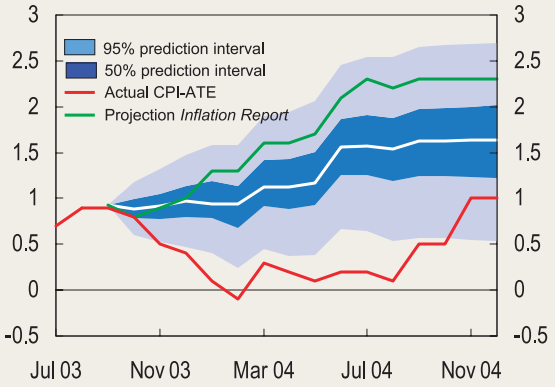
One criterion for evaluating whether Norges Bank's projections have been accurate is a comparison of our projections with those of other institutions. Chart 9 shows the projections of Norges Bank and some other institutions for the rise in the CPI-ATE in 2004, made at different times. Through 2003, no institution predicted that price inflation would be as low as 0.3 per cent in 2004. All the institutions projected substantially higher inflation. However, Norges Bank was among the first to revise down markedly its projection after inflation fell in January 2004. The projections for inflation in 2004 published in the *Inflation Reports* in 2004 have been relatively close to the mark.

Comparison of Norges Bank's projections with "naïve" forecasts

The results of "naive" projection methods are also assessed when inflation projections are made. Predictions using a simple statistical time series model that captures the trend rise and seasonal fluctuations in the CPI-ATE have often proved to be fairly accurate in the short term. However, the model does not contain information about the forces driving inflation. As a result, models of this type are occasionally fairly far off the mark in the short term, and do not normally predict developments accurately in the longer term. It is also possible to estimate confidence intervals around the projections. These intervals provide an indication of the uncertainty surrounding the projections based on the historical variation in the time series.

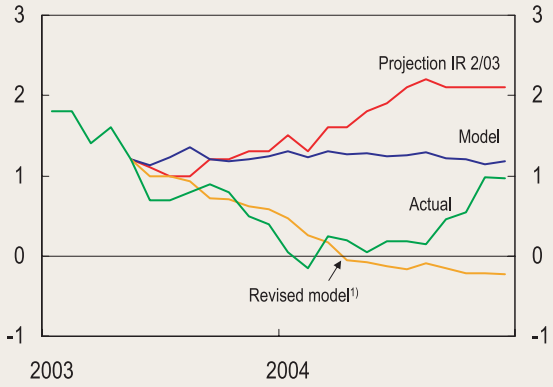
Chart 10 shows predictions for the rise in the CPI-ATE using an ARIMA model for the period October 2003 to December 2004, along with the projections in *Inflation Report* 3/03 and actual price movements. The predictions based on the ARIMA model are closer to actual

Chart 10 CPI-ATE. Projection IR 3/03, X12 projection and actual inflation. 12-month rise. Per cent



Sources: Statistics Norway and Norges Bank

Chart 12 CPI-ATE. IR 2/03. Projection and actual inflation. 12-month rise. Per cent



[1)] The model has been overriden by a rule whereby the projection is revised downward by half of the forecast error for the previous period.

Sources: Statistics Norway and Norges Bank

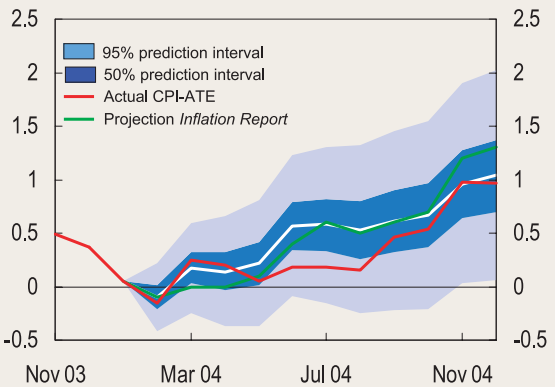
price developments than Norges Bank's projections, but the ARIMA model also predicts markedly higher inflation than proved to be the case. Inflation moves outside the 95 per cent confidence interval surrounding the predictions as early as in November 2003, and remains outside this interval until November the following year.

In Chart 11, Norges Bank's projections in *Inflation Report* 1/04 for the CPI-ATE in the period February to December 2004 is compared with ARIMA predictions for the same period. During this period there were only minor differences between our projections and the ARIMA predictions.

The projections using another econometric model with earlier developments in the CPI-ATE as the only explanatory variable for the CPI-ATE, were also closer to the mark than our projections for 2004 published in the *Inflation Report* in 2003. In Chart 12, the projections in *Inflation Report* 2/03 are compared with the projections based on this model. If it had also been assumed in the model that half of the forecast error for the previous period represented news about inflation in the period ahead, and the projection had been revised downwards accordingly, the projections would have been even more accurate in the initial phase. Thus, it was possible already in early 2003 to make forecasts which, assessed retrospectively, would have accurately predicted actual inflation through 2003 and the first part of 2004. However, these projections are base on the assumption that the factors that explain previous overpredictions of inflation will function in the same way in the future. This is an assessment that it is considerably easier to make in retrospect than at the time when the projections are made.

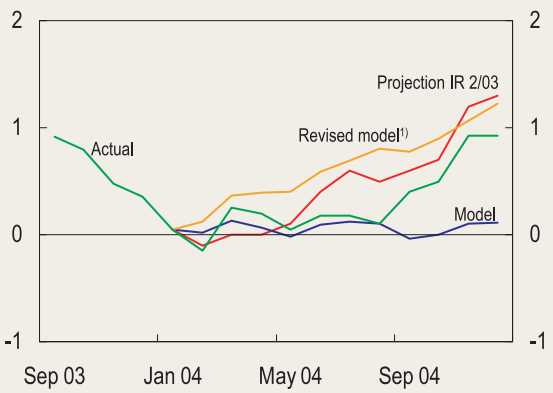
Although this "rule" for the treatment of previous forecast errors may enhance the accuracy of projections in some periods, this method may yield poor results in other periods. If the same method had been used for projections early in 2004, it would have predicted inflation of around zero through 2004 (see Chart 13). If a rule had been introduced in the same simple model to the effect

Chart 11 CPI-ATE. Projection IR 1/04, X12 projection and actual inflation. 12-month rise. Per cent



Sources: Statistics Norway and Norges Bank

Chart 13 CPI-ATE. IR 1/04. Projection and actual inflation. 12-month rise. Per cent



[1)] The model has been overriden by a rule that inflation reverts to a historical average

Sources: Statistics Norway and Norges Bank

Table 3. Difference between actual and forecast inflation for a selection of inflation-targeting central banks

	Average difference from forecasts up to 2003[1]		Difference from forecast for 2004	
	Forecast one year ahead	Two years ahead	One year ahead	Two years ahead[1]
Australia	1.2	1.0	0.2	0.2
Euro area	0.3	0.5	0.4	0.6
New Zealand	0.7	1.0	0.5	0.4
UK	0.2	0.4	0.4	0.2
Sweden	0.7	0.8	0.6	1.7
Norway	0.5	0.8	1.7	1.9

1) The average has been calculated for the period 1998 – 2003. For the euro area and Norway, the period is 2001-2003

Sources: The inflation reports of: Reserve Bank of Australia, Norges Bank, Sveriges Riksbank, Reserve Bank of New Zealand, Bank of England, European Central Bank

that inflation would gradually revert to a historical average, the projections would have been fairly accurate through 2004. The timing of a change from one "overriding" rule to another in a simple model of this type is contingent on knowledge of developments in the forces that influence inflation.

How closely in line are the inflation forecasts of other central banks with inflation targets?

Table 3 shows the differences between actual inflation and the forecasts of six inflation-targeting central banks. The forecasts used are those published in the last inflation report in each year. The figures for average differences between projected and actual inflation from the years prior to 2004 indicate that Norges Bank's projections have been just as accurate as other inflation-targeting central banks. However, the difference between inflation in 2004 and the projections in Norges Bank's *Inflation Report* 3/03 are far larger than the differences for the other central banks. This must be viewed in the light of the large and unexpected fall in prices for some goods and services in late 2003 and early 2004 (see above).

5. Conclusion

One important reason for evaluating projections is to achieve a better understanding of economic relationships and price formation with a view to improving Norges Bank's forecasting work.

In early 2004, a new indicator of external price impulses was introduced. At the same time, the pass-through from the exchange rate to prices for imported consumer goods was revised somewhat. It was assumed that the pass-through from changes in the exchange rate to prices for imported consumer goods was somewhat smaller, and would occur with a longer lag than previously assumed. Estimates of the pass-through are uncertain, and relationships may change over time. However, the experience of 2004 indicates that it was correct to make these changes. Generally, the projections for prices for imported consumer goods made in 2004 were fairly closely in line with actual developments.

Weak economic growth, a decline in demand in 2003 and structural changes in some markets led to contributed to more intense competition in many sectors. The effect on prices of changes in competitive conditions may be substantial, but is difficult to quantify. We use our regional network actively in an attempt to capture changes in competitive pressures and the effects they may have on prices in the different sectors.

Norges Bank works continuously to improve the basis for its projections, and the resources employed in analysing and understanding developments in the Norwegian economy have been increased.

References:

de Brouwer, Gordon & Neil R. Ericsson (1998): «Modeling Inflation in Australia», *Journal of Business & Economic Statistics*, American Statistical Association, 16(4), pp. 433–449

Kolsrud, D. & R. Nymoen (1998): "Unemployment and the Open Economy Wage-Price Spiral", *Journal of Economic Studies*, 25, pp. 450–467

Røstøen, Johan Øverseth (2004): "External price impulses to imported consumer goods", *Economic Bulletin* 3/2004, pp. 96–102.

Changes in projections

Inflation Report 1/03

During winter and the early part of 2003, developments in the international economy proved to be weaker than assumed in the last report in 2002. Growth was weak and the economic situation was vulnerable to new shocks. The situation in Iraq had not been clarified and generated uncertainty. Both equity prices and interest rate expectations continued to fall. The growth projections for our trading partners in 2003 were lowered by ¾ percentage point in relation to the projections published in autumn the preceding year. In spite of weaker-than-expected developments, the projection for growth among our trading partners in 2004 was left unchanged at 2½ per cent in 2004, primarily as a result of stronger monetary policy stimulus. Many central banks reduced their key rates to a considerable extent.

In Norway, labour market developments were weaker in the months around the turn of the year 2002/2003 than projected in *Inflation Report* 3/02. Employment declined to a further extent than anticipated and unemployment rose. Combined with weaker developments in the international economy, a continued strong krone and a weaker domestic labour market, the projection for growth in the Norwegian economy in 2003 was adjusted downward to 1¼ per cent, i.e. ½ percentage point lower than projected in autumn 2002. Weaker developments also entailed a downward adjustment of ¼ percentage point for growth in 2004, in spite of a 1½ percentage point reduction in interest rates since the previous report. The output gap was estimated at zero in 2003 and ¼ per cent in 2004.

In line with expectations, CPI-ATE inflation fell in the period up to January 2003. The krone exchange rate remained at a strong level and the effects of a strong exchange rate were expected to bring inflation further down in 2003. Owing to weaker labour market developments and the prospect of lower growth, the projections for wage growth in 2003 and 2004 were revised down. CPI-ATE inflation was projected at 1¾ per cent in 2003 and 2 per cent in 2004, i.e. ¼ percentage point lower than projected in the *Inflation Report* published in autumn 2002.

Inflation Report 2/03

Developments in the international economy continued to be surprisingly weak. Interest rates were reduced in the euro area, Denmark and Sweden. There were expectations of further interest rate cuts in many countries. Growth forecasts for Norway's trading partners in 2003 were revised downwards by a further ¼ percentage point. In the Norwegian economy, mainland investment and exports seemed to be falling at a faster pace than assumed earlier. At the same time, the projections for growth in household consumption were adjusted up as a result of lower interest rates. Nevertheless, the projections for mainland GDP growth in 2003 were revised down by ¼ percentage point. New revised national accounts figures showed stronger growth than earlier in the Norwegian economy in 2000-2001. As a result of this, the output gap was estimated to be somewhat more positive in 2002, but with weaker growth in 2003, the output gap was still put at zero in 2003.

Labour market conditions remained weaker than expected. The projections for registered unemployment in 2003 were adjusted up by ¼ percentage point, and employment fell more than projected. The results of the wage negotiations in spring 2003 pointed to a fall in annual wage growth from 5¾ per cent in 2002 to 4½ per cent in 2003, or ½ percentage point lower than projected in the previous report.

In the period February to May 2003, CPI-ATE inflation fell by ½ percentage point more than projected in *Inflation Report* 1/03. In particular, prices for imported consumer goods fell more than projected. The krone exchange rate had depreciated by 5.5 per cent since *Inflation Report* 1/03. In isolation, this pushed up the inflation projections towards the end of 2003 and in 2004. At the same time, wage growth had slowed faster than projected earlier. This contributed to lower projections for the rise in prices for domestically produced goods and services.

Inflation Report 3/03

The projections for growth among our trading partners were not changed between *Inflation Report* 2/03 and *Inflation Report* 3/03. Activity in the world economy started to pick up from a low level, led by higher growth in the US and some Asian countries. Developments in the euro area were weak, however.

In Norway, the key rate had been lowered by 1.5 percentage points since Inflation Report 2/03, which was published in June, and the krone exchange rate had depreciated by 1.4 per cent. With stronger monetary policy stimulus, mainland GDP growth was projected to be considerably higher in 2004. The upward revision of mainland GDP growth primarily reflected a marked increase in household consumption, with private consumption projected at 5 per cent in 2004. However, the projection for growth in mainland GDP in 2003 was lowered somewhat and the output gap in 2003 was estimated at -¼ per cent.

In the period June to September 2003, CPI-ATE inflation fell by ¼ percentage point more than projected in *Inflation Report* 2/03. This primarily reflected a stronger-than-expected fall in prices for imported consumer goods, but the strong krone also contributed to a fall in prices for domestically produced goods and services, with for example a marked fall in charter tour prices. CPI-ATE inflation as projected at 2 per cent in 2004. The depreciation of the krone through 2003 was expected to lead to a rapid rise in prices for imported consumer goods.

Inflation Report 1/04

The projections for growth among Norway's trading partners in 2004 were revised up from 2¼ per cent in the October report in 2003 to 2½ per cent in the first report in 2004. The recovery in the world economy came into clearer evidence, and was primarily concentrated around the US, Asia and eastern Europe.

In Norway, the key rate had been further reduced since autumn 2003. The krone had continued to depreciate. Demand in the Norwegian economy picked up, particularly in the household sector. Both consumption and housing investment rose. Prospects of higher growth in the world economy and a weaker krone paved the way for higher growth in the export sector. GDP growth was projected to be ¼ percentage point higher than in the previous report. On the basis of an overall assessment of developments in production, the labour market and domestic inflation, the projections for the output gap in 2002 and 2003 were revised down somewhat. Many enterprises had rationalised, which meant that many enterprises could increase production without a corresponding increase in employment. It was thus assumed that potential output would increase somewhat more than normally in 2004. The output gap in 2004 was estimated at -¼ per cent.

However, inflation developments were not in line with expectations. In January 2004, CPI-ATE inflation was about 1¼ per cent lower than projected in the report published in October the previous year. Prices for imported consumer goods did not pick up as expected, and the rise in prices for domestically produced goods and services fell rapidly, partly reflecting a marked fall in airfares and some foods prices. In January, the rate of increase in house rents also showed a marked decline.

In *Inflation Report* 1/04, inflation was projected to remain very low in the period to summer 2004, followed by a rise to about 1¼ per cent at the end of the year. The main reason behind the downward revision was a projected fall in prices for imported consumer goods, measured in foreign currency. At the same time, the feed-through from changes in the exchange rate to consumer prices was assumed to be somewhat smaller and to occur at a later stage than previously assumed. This implied that the projected rise in prices for imported consumer goods due to the weakening of the krone through 2003 would occur with a longer lag than expected earlier. Moreover, some of the shocks that had brought down the rise in prices for domestically produced goods and services around the turn of the year 2003/2004 would keep down inflation through the year.

Inflation Report 2/04

The global recovery continued and became more broad-based than previously. Growth was somewhat stronger than projected in *Inflation Report* 1/04. Stronger growth led to higher prices for oil and other commodities.

The projection for growth in the Norwegian economy was revised up by ¼ percentage point, primarily reflecting higher-than-expected growth in housing investment, while it also appeared that fiscal stimulus would be somewhat stronger than assumed earlier. Stronger global growth pointed to somewhat higher export growth.

The output gap was assessed to be ¼ percentage point lower in 2003 than projected in *Inflation Report* 1/04. The downward revision of the output gap in 2003 reflected high productivity growth in the latter half of 2003. It was assumed that this did not only reflect a normal cyclical increase in productivity.

Inflation moved up more than projected in March, but somewhat less than expected in April and May.

Inflation Report 3/04

After *Inflation Report* 2/04 was published in July, output growth in the Norwegian economy was broadly in line with projections, while growth in employment was somewhat lower. Inflation was lower than expected through the summer, but picked up in September. In September, the year-on-year rise in the CPI-ATE was approximately in line with the projections in *Inflation Report* 2/04.

The projection for the output gap in 2003 was revised down by a further ¼ percentage point. Somewhat weaker-than-expected growth in employment suggested that the level of excess capacity in the enterprise sector was somewhat higher than previously assumed. The low level of domestic inflation also indicated that there had been a somewhat higher degree of available resources in the Norwegian economy than had been assumed in the previous report.

At the same time, higher oil prices and stronger growth in housing investment provided a basis for revising up GDP growth projections by ¼ percentage point. With the downward revision of the output gap in 2003, the projection for 2004 was left unchanged.

Chart 14-16. Growth forecasts from statistics Norway, Ministry of Finance and Norges Bank, and actual growth. Last projections published previous year. Per cent. 1994 til 2004.

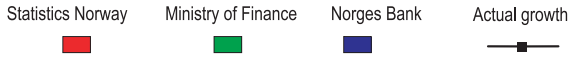


Chart 14 Mainland GDP

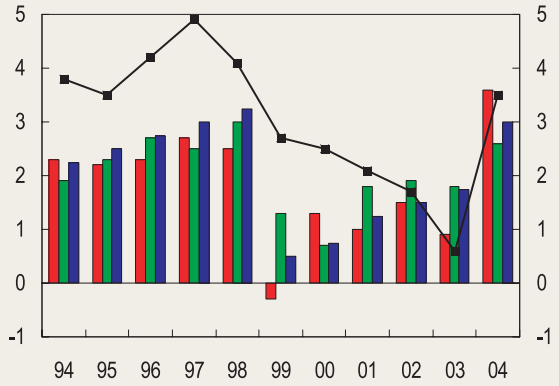
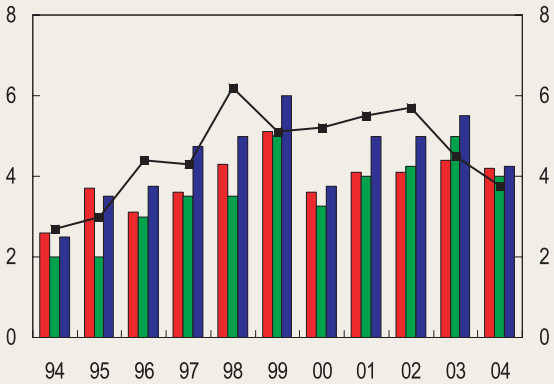
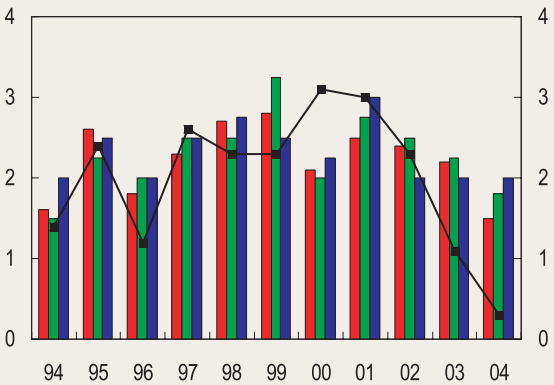


Chart 15 Annual wage growth[1)]



[1)] The figures for 2000 and 2001 include the costs of extra vacation days

Chart 16 Consumer price inflation[1)]



[1)] Projected and actual developments in the CPI to 2001. Projected and actual developments in the CPI-ATE from 2002

Appendix 1

Overview of projections from 1994 to 2004

In addition to studying the projections for a single year, it is important to consider whether we make systematic errors over time. Charts 14 to 16 provide a comparison of actual figures for the period 1994-2004 and projections from Statistics Norway, the Ministry of Finance and Norges Bank made at the end of the year preceding the projection year. All three institutions have tended to underestimate the period of expansion in the 1990s. Growth in GDP was higher than expected every year from 1994 to 2001. Wage growth has generally tended to be underestimated until the last few years.

Table 4 shows the average forecast error, the average absolute error (AAE[7]) and the relative root mean square error (RRMSE[8]). These are measures of the accuracy of our projections for the entire period. AAE provides an indication of the average actual forecast error in percentage points over the years, without the forecast errors with opposite signs offsetting each other. RRMSE penalises large forecast errors more heavily than small errors, and indicates the magnitude of the errors in relation to actual growth. This makes it possible to compare the size of the forecast errors across different variables.

The table provides a summary of the information in the charts. There is little difference in forecast error between the three institutions.

Table 4. Average error, average absolute error (AAE) and relative root mean square error (RRMSE). Statistics Norway (SN), the Ministry of Finance (Fin) and Norges Bank (NB). 1994 to 2004

	SN	FD	NB
Growth in mainland GDP			
Average error	-1.25	-1.02	-1.02
AAE	1.43	1.38	1.33
RRMSE	0.49	0.62	0.62
Vekst i årslønn			
Average error	-0.69	-0.99	-0.12
AAE	0.9	1.12	0.73
RRMSE	0.07	0.08	0.05
Vekst i konsumpriser			
Average error	0.23	0.3	0.32
AAE	0.55	0.59	0.55
RRMSE	1.26	1.56	1.75

Sources: Ministry of Finance, Statistics Norway and Norges Bank

[7] AAE (average absolute error) is defined as $(1/N)\sum_{n=1}^{N}\left|y_n - \hat{y}_n\right|$ where y_n represents the actual growth rate and $\hat{y}_n$ is the projected growth rate.

[8] RRMSE (relative root mean square error) is defined as $\sqrt{1/N\sum_{n=1}^{N}\left(\left(y_n - \hat{y}_n\right)/y_n\right)^2}$ where y_n represents the actual growth rate and $\hat{y}_n$ is the projected growth rate.

Appendix 2

A model for movements in prices for goods and services produced in Norway

The model forming the basis for Chart 7 in this article can theoretically be interpreted in the light of inflation models of imperfect competition à la Brouwer & Ericsson (1998) and Kolsrud and Nymoen (1998). In the long term, prices for goods and services produced in Norway, p_t^d, reflect the level of total unit labour costs. In our model, these costs are expressed as $(w–z)_t$, where w_t and z_t represent total labour costs and productivity level, respectively, in period t. In the short term, inflation is determined by the rise in unit labour costs and by inflation in the previous period. Moreover, any deviation from the long-term equilibrium between price and unit cost will gradually be corrected by means of the equilibrium adjustment expression $(p^d - (w–z))_{t-1}$. All variables are expressed as logarithms, and Δ is a difference operator. The model is expressed by:

$$\Delta p_t^d = \underset{(0.07)}{0.20} + \underset{(0.043)}{0.53}\,\Delta p_{t-1}^d + \underset{(0.059)}{0.34}\,\Delta(w-z)_t - \underset{(0.014)}{0.04}(p^d-(w-z))_{t-1} + \underset{(0.504)}{1.18}\,d86$$

The final term in the equation, $d86$, is a dummy variable that captures effects of the devaluation of NOK in 1986. The figures in brackets are the standard deviations of the coefficients. All coefficients are statistically significant. The model has been tested for other possible explanatory variables, such as output gap, exchange rate and foreign prices. However, these variables have not been found to be statistically significant. There is nonetheless reason to believe that they have a certain (direct) effect on domestic prices. The model has been estimated using annual figures from 1982 to 2003. The model explains inflation well, but as usual the results should be interpreted with caution, particularly in view of the few observations covered by the analysis.

What drives house prices?

Dag Henning Jacobsen, economist in the Securities Markets Department, and Bjørn E. Naug, senior economist in the Economics Department [1]

House prices have more than tripled since 1992. After having fallen during the last part of 2002 and the beginning of 2003, house prices rose by more than 20 per cent from May 2003 to November 2004. We analyse factors underlying the pronounced rise in house prices using an empirical model. We find that interest rates, housing construction, unemployment and household income are the most important explanatory factors for house prices. The analysis indicates that house prices react quickly and strongly to changes in interest rates. Thus, a considerable portion of house price inflation since May 2003 can be explained by the fall in interest rates in the last two years. Conversely, the fall in interest rates will only make a modest contribution to house price inflation in 2005. An interest rate increase in line with the interest rate path in *Inflation Report* 3/04 can in isolation lead to a 3-3½ per cent fall in house prices per year in 2006 and 2007. However, this interest rate path reflects an expected decline in unemployment and an expected increase in the growth of wage income. The model implies that house prices will increase by 2-4 per cent per year in the period 2005-2007 if interest rates, unemployment, income and housing construction develop in line with the analyses in *Inflation Report* 3/04. We find no evidence that house prices are overvalued in relation to a fundamental value determined by interest rates, income, unemployment and housing construction.

Introduction

Developments in house prices may be important for activity in the Norwegian economy. First, house prices affect activity in the construction sector. New housing construction projects will be profitable if house prices increase in relation to building costs. This stimulates housing investment. Second, house prices affect household demand. Higher house prices mean an increase in wealth for homeowners and some owners will want to extract some of this gain to increase consumption. This effect is amplified by the fact that homeowners increasingly have the possibility of raising mortgage-secured loans when house prices rise – at interest rates that are often far lower than for other types of loans.

Developments in house prices also affect household borrowing for house purchases. An increase in house prices will fuel debt accumulation for a long period (see Jacobsen and Naug 2004), reflecting the fact that only a small portion of the housing stock changes hands each year. Even if house prices gradually level off, there will be a long period when selling prices are higher than the last time the dwelling changed hands.

Mortgage-secured loans account for more than 80 per cent of banks' lending to households. If house prices decline, collateral values can fall below the value of the housing loan for some households. Banks' loan losses will increase if these households are unable to service their debt. As a result, banks may become more reticent about providing loans to households and house prices may fall further. A fall in house prices will also reduce household wealth and the possibility of raising a mortgage-secured loan. This will curb private consumption and the level of activity in the Norwegian economy. Consumption may also become less interest rate sensitive than when households can borrow large amounts through mortgage-secured loans.

House prices have more than tripled since 1992. After having fallen during the last part of 2002 and the beginning of 2003, house prices rose by more than 20 per cent from May 2003 to November 2004. Developments in the housing market have contributed to a 10-11 per cent increase in household debt per year since 2000. The debt burden for low- and middle-income households is now close to 50 per cent higher than the last peak in 1987. The high accumulation of debt has made households more vulnerable to negative economic disturbances.

The sharp rise in house prices in the last year and a half may prompt the question of whether there is a bubble in the housing market, i.e. whether house prices are far higher than a fundamental value determined by interest rates, income and other fundamental explanatory factors for house prices. A house price bubble can arise if (i) many individuals want to purchase a dwelling today (putting an upward pressure on prices) because they expect house prices to rise in the period ahead and (ii) these expectations are not based on fundamentals. If there is a price bubble in the housing market, prices may fall sharply if price expectations change. Prices may show a particularly sharp decline if price expectations change as a result of a change in fundamentals. In this case, banks may experience that the value of the collateral falls below the value of the loan and that households increasingly have difficulty repaying (very high) debt. This can, as described above, lead to an economic downturn (see IMF (2003) and Borio and Lowe (2002)).

House price inflation since May 2003 may, however,

[1] We are grateful to Kjetil Olsen, Øistein Røisland, Kjersti-Gro Lindquist, Knut Sandal, Solveig Erlandsen, Kristin Solberg-Johansen and Hanne A. Gravningsmyhr for valuable comments. The analysis was carried out using PcGive 10.1 (Hendry and Doornik 2001).