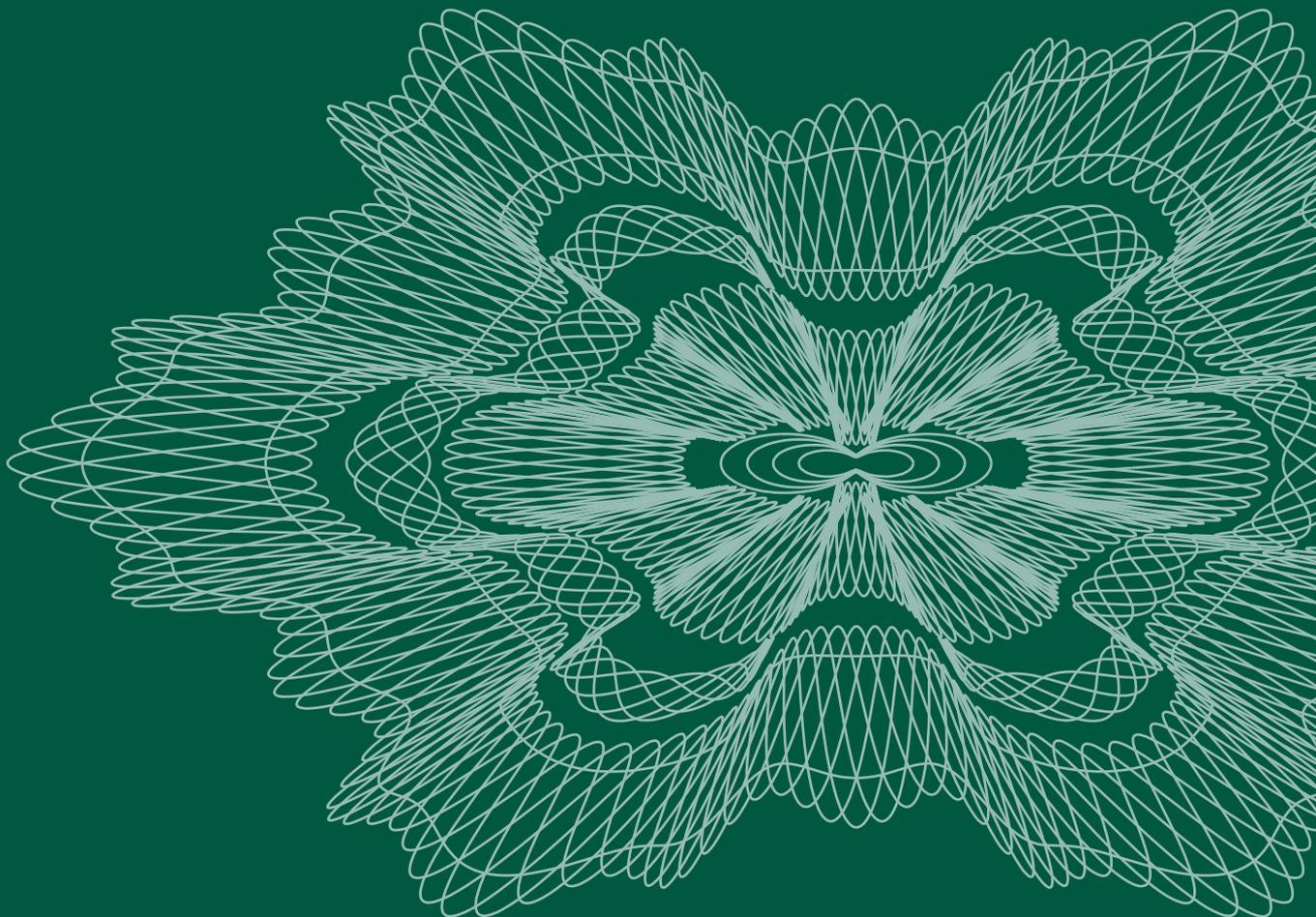




Economic Bulletin

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Economic perspectives

Address by Governor Svein Gjedrem at the meeting of the Supervisory Council of Norges Bank on Thursday, 17 February 2005

Introduction

This year, Norway is commemorating the centenary of the dissolution of the union with Sweden. Historically, an important part of nation-building has been the establishment of a monetary system and a central bank. In Norway, the stage was set for the introduction of a national currency in autumn 1814. With the prospect of a union with Sweden, a clause was included in the Constitution stipulating that Norway should maintain its own bank and its own monetary system. The monetary unit was the specie daler.

In 1875, the Storting (Norwegian parliament) decided to join the currency union that Denmark and Sweden had established two years earlier. The specie daler was then replaced by the krone. One Norwegian krone was worth 0.40323 grams of fine gold.

In the latter part of the 1800s, Norway benefited from free trade and free capital movements and became a relatively prosperous country. The standard of living in Norway did not lag behind that of Sweden (Chart 1).

The currency union was maintained after the political union with Sweden was dissolved. The agreement lost its practical significance after the gold standard was suspended in 1914. The agreement was not formally terminated until 1972.

From an economic viewpoint, the dissolution of the union in 1905 was a painless process. Former Central Bank Governor Nicolai Rygg¹ wrote: *“For 1905, (Norges Bank) points to the bright aspects of developments over the year, i.e. rising exports,..., but it takes*

time for confidence and the enterprising spirit to grow sufficiently to generate greater vitality and activity”. Norges Bank’s role was primarily to secure confidence in the monetary system. There were fairly large cash withdrawals from banks. Many sought to safeguard their wealth by investing in foreign bonds. Banks had to resort to loans from Norges Bank. The Board of Norges Bank nevertheless chose to leave the interest rate unchanged at 5 per cent. In Rygg’s words, this would not contribute to undermining the confidence-inspiring calm that marked major historical events.

Economic developments were favourable up to World War I.

International real interest rates have fallen

The interest rate level is lower today than in 1905. In fact, Norges Bank has not allowed the key rate to be this low since the Bank was established in 1816. This partly reflects international conditions.

In many countries interest rates were reduced considerably when the economic situation deteriorated early in 2000. Interest rates adjusted for inflation, i.e. real interest rates, are now also low.

The first decades following World War II were marked by stable nominal interest rates, moderate inflation and low, but positive real interest rates. In subsequent periods, real interest rates have fluctuated (Chart 2).

In the 1970s inflation surged. Nominal interest rates rose, but to a lesser extent than the inflation rate, and

Chart 1. Developments in GDP and interest rates 1900-1914

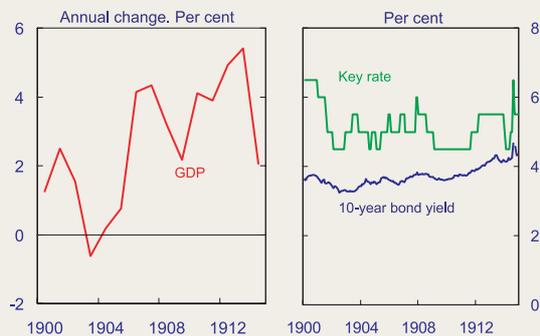
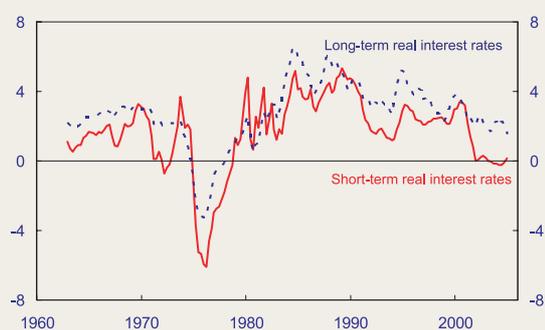
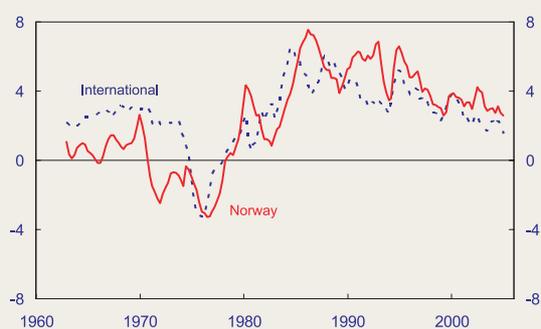


Chart 2. International real interest rates Per cent



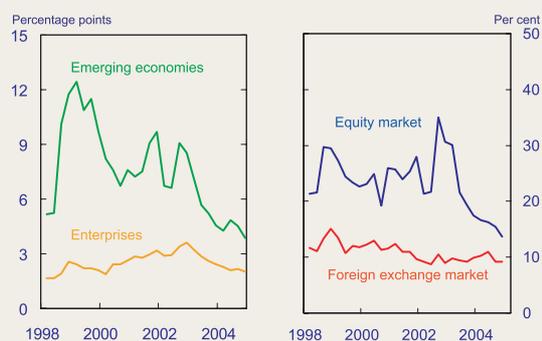
¹ N. Rygg (1954): Norges Bank’s history, Norges Bank

Chart 3. Long-term real interest rates
Per cent



Sources: Norges Bank, OECD, Statistics Norway

Chart 4. Risk premium



Source: EcoWin

real interest rates turned negative. Early in the 1980s, monetary policy was tightened considerably in many countries. Real interest rates moved up. Inflation gradually fell and stabilised again at a low level. This paved the way for a decrease in real interest rates in the 1990s before they fell further after the economic turnaround in 2001.

Low real interest rates may be ascribed to several factors:

Inflation has been low for such a long period that savers require a low premium as a hedge against unexpected inflation in the future.

In order to prevent an appreciation against the dollar many Asian central banks have been buying US government bonds, exerting downward pressure on yields.

Low short-term interest rates in the US, Japan and euro area countries are inducing investors to shift into more long-term securities, with an attendant fall in long-term interest rates.

The US and some other countries have increased their key rates, but expectations of the rate of increase ahead have been dampened. The fall in long-term interest rates may be attributable to new assessments of the growth outlook for the world economy.

In Norway, the real interest rate may deviate from external real interest rates when growth prospects diverge. This will also lead to a change in the real krone exchange rate, so that the expected return on investments in Norway and abroad become about the same. However, over time long-term real interest rates have largely followed international rates, and in line with international developments long-term interest rates in Norway have also fallen markedly (Chart 3).

Low risk?

Real interest rates abroad are unusually low, and the risk premium is also low. Savers and investors are offered a wide range of investment options. Risk and expected

returns are assessed when choosing among the alternatives. The premium that investors require to take risk has fallen considerably in recent months and is now generally low.

For example, there is little difference between government bond yields and yields on bonds issued by private enterprises. The extra premium that emerging economies have to pay on loans is also small. Moreover, premiums paid to hedge against future fluctuations in foreign exchange and equity markets are small (Chart 4).

The low risk premiums may reflect fairly solid growth in the world economy and a strengthening of corporate profits and financial positions. It seems that credit risks are fairly well diversified in securities markets and international banks appear to be solid. Fewer major negative events have shaken the markets in recent periods.

But another explanation may be that low interest rates have prompted investors to take more risk, thereby pushing down risk premiums. In that case, lower premiums reflect an expansionary monetary policy rather than low real risk.

Imbalances in the world economy

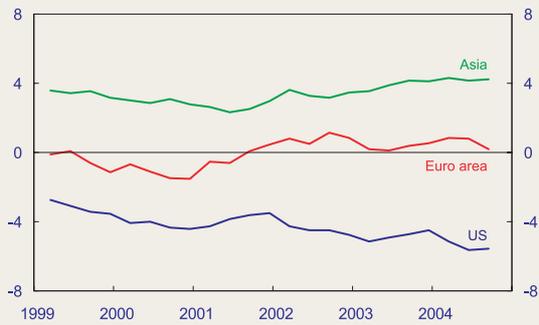
Low interest rates and risk premiums stand in stark contrast to the considerable imbalances in the world economy.

There are particularly large imbalances both with regard to the US trade and current account balance. This partly reflects the US federal budget deficit. Moreover, US households have a high level of consumption and a low level of saving. Strong demand in the US has sustained growth in the world economy. The deficit in the US is matched by surpluses in Europe and Asia (Chart 5).

A persistent deficit has pushed up US foreign debt to a high level (Chart 6).

The US population is growing faster than that of other OECD countries. This may suggest that saving in the US is somewhat lower and investment somewhat higher, but

Chart 5. Current account balance
Per cent of GDP



Sources: EcoWin / National statistics

Chart 6. US net foreign debt
Per cent of GDP



Sources: Federal Reserve Board and US Department of Commerce

the impact is now considerably greater than implied by demographic factors alone.

The imbalances may continue for a period. International capital markets are deep and liquid with an ample supply of credit for US borrowers. If creditors begin to fear a fall in prices and withdraw, this may still trigger substantial corrections. This may lead to higher interest rates and perhaps also a fall in US equity markets that spills over to other countries' financial markets. In that case the dollar will also depreciate. The household debt burden in the US may be another source of instability if households abruptly reduce both demand for housing and consumption.

The Federal Reserve is now gradually increasing interest rates and the first measures aimed at reducing the US budget deficit have been announced. This may curb growth in domestic demand and imports of goods and services. However, the US authorities will probably not go as far as to bring economic growth to a halt, with an accompanying increase in unemployment.

The US issues the world's most important settlement and reserve currency. States and agencies in the US have access to dollar-denominated loans in major international capital markets. The exchange rate risk lies with foreign creditors. The US may have a long-term interest in maintaining a stable dollar that is used in international payments. But this may be weighed against short-term interests: If the dollar depreciates, the US trade deficit will be reduced with a limited impact on domestic production.

The US is not the only source of trade imbalances. They also reflect very low growth in continental Europe and the largely export-based growth in Asian countries. Countries other than the US must therefore also contribute in order to prevent growth in the global economy from faltering.

With limited domestic growth capacity and high unemployment, many industrial countries are poorly equipped to cope with a weaker dollar and lower US

demand. The challenges are perhaps particularly demanding in Japan and some large European countries (Chart 7).

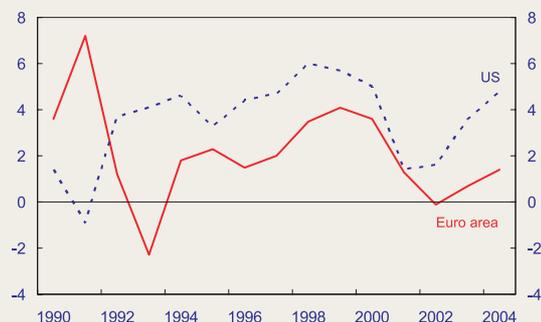
The situation is not negative across the board. There is solid growth in a number of European countries such as Spain, Ireland and the Nordic countries. In Germany, structural reforms are being implemented, particularly in the labour market, which could promote growth. It is possible that low long-term interest rates will boost investment. Nevertheless, there is uncertainty as to future economic developments, which is not fully reflected in prices, interest rates and premiums.

There is also a risk that large imbalances in world trade and low employment in Europe will trigger protectionism, which could reduce growth capacity even further.

Low interest rates in Norway

Norges Bank's key rate, the sight deposit rate, is at a historically low level. Real interest rates are also low. Between December 2002 and March 2004, the key rate was reduced by a total of 5.25 percentage points. The

Chart 7. Private domestic demand
Annual growth. Per cent



Source: OECD

Chart 8. Interest rates and inflation
Per cent

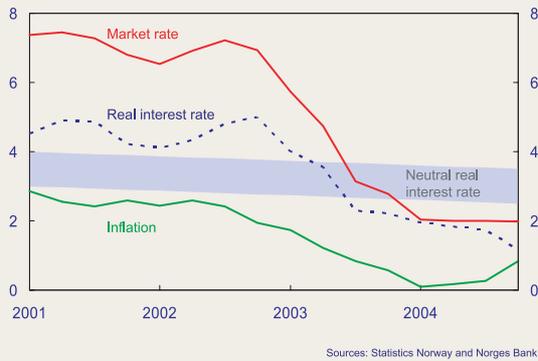
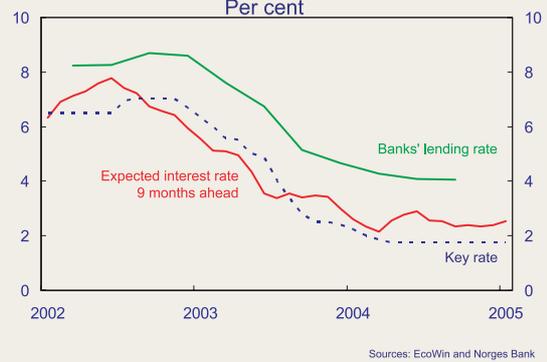


Chart 9. Key rate, lending rate and expected interest rate
Per cent



interest rate decline can be ascribed to a number of factors (Chart 8).

In late autumn 2002, inflation started to fall. The inflation projections were also revised down. Gradually new information about the outlook for other countries and the Norwegian economy indicated that inflation might be very low. Short-term interest rates fell by close to 4 percentage points.

It would seem that it is not only changes in the real interest rate that have an influence, but also the level of real interest rates. Between December 2002 and March 2004, the interest rate has moved from a high to a low level.

The real interest rate is now lower than a neutral interest rate. A real interest rate that is lower than the neutral rate will stimulate activity even after the effects of the interest rate fall itself have been exhausted. This was pointed out by the Swedish economist Knut Wicksell in 1907²: "...the upward movement of prices, whether great or small in the first instance, can never cease so long as the rate of interest is kept lower than its normal rate".

Calculations seem to indicate that the neutral real interest rate for Norway is between 2½ and 3½ per cent and it has probably fallen somewhat in recent years.

Monetary policy is functioning

It takes time for an interest rate reduction to have an impact on inflation. We are now seeing the effects of monetary policy decisions some of which were taken two years ago.

The interest rate has affected inflation via the krone exchange rate and via demand for goods and services. In particular, the rise in prices for domestically produced goods and services has picked up. In addition, the reduction in the interest rate has probably contributed to holding up expectations of future inflation even when inflation is low.

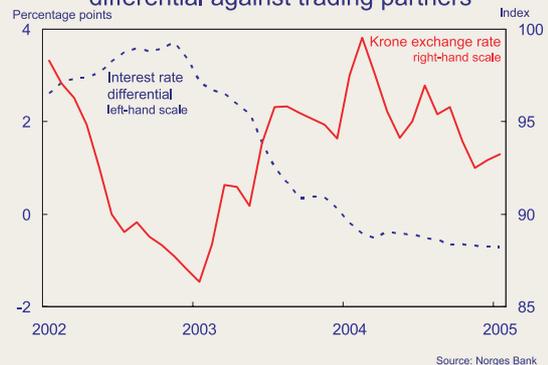
Norges Bank's key rate is an overnight rate. The inter-

est rate on deposits and loans with longer maturities will reflect expectations as to future interest rate decisions. As the key rate was gradually reduced, expectations also fell, and banks reduced their lending rates. Monetary policy has had a greater impact because market participants expected the low interest rate to persist over a period (Chart 9).

The first signs of the effects of the interest rate cuts appeared in the foreign exchange market. The interest rate differential against other countries narrowed (Chart 10). It became more attractive to borrow and less profitable to invest in the Norwegian krone. The movement in the krone exchange rate was reversed and it depreciated through 2003 and into 2004. However, the impact on the krone exchange rate has been considerably dampened because external interest rates have remained low. High prices for oil and gas and other export goods also contributed to an appreciation of the krone last year.

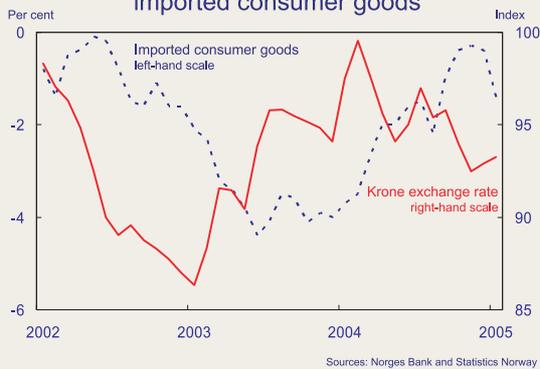
The depreciation of the krone in 2003 contributed to restraining the fall in prices for imported goods (Chart 11). The effect occurred gradually. Companies and importers may have preferred to observe changes in the

The exchange rate channel
Chart 10. Krone exchange rate and interest rate differential against trading partners

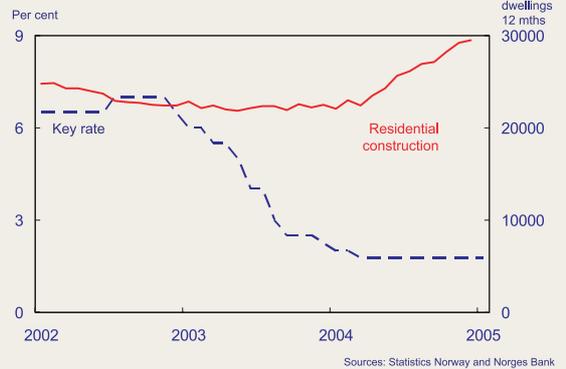


² Knut Wicksell (1907): "The Influence of the Rate of Interest on Prices", *Economic Journal*, XVII (1907), pages 213-220.

The exchange rate channel
Chart 11. Krone exchange rate and rise in prices for imported consumer goods



The demand channel
Chart 13. Key rate and residential construction



exchange rate over time before changing their selling prices.

After several expensive wage settlements and a short period of a strong krone had weakened profitability in the Norwegian business sector, the depreciation of the krone contributed to curbing the decline in activity and employment.

There is nevertheless uncertainty as to the magnitude of the impact of short-term exchange rate fluctuations because companies engage in currency hedging.

There are different ways to hedge against currency fluctuations. Some enterprises buy intermediate goods in the same currency in which they sell their products. Other companies raise a loan in the same currency as that of the company's assets. In addition, companies can hedge against currency swings in the forward exchange market and options market. The large volume of international trade in currency derivatives, which is dominated by banks reduces, premiums and costs for other business sectors and thereby promote cross-border trade in goods and services. It is not a good idea to throw a spanner into the works.

The impact on household consumption and housing investment has been substantial. Business investment is now picking up.

In Norway, household debt is higher than household deposits. The decline in interest rates has thereby freed up funds. Households reacted relatively rapidly, and growth in consumption picked up.

The fall in interest rates pushed up house prices (Chart 12). Turnover in the housing market has been high. Higher housing wealth provides increased borrowing opportunities and thereby also boosts demand for consumer durables. Household debt has risen by around 11 per cent over the past year.

High resale home prices have made it more profitable to build new homes, and residential construction is rising (Chart 13).

The fall in interest rates has also contributed to sustaining the market value of office premises and commercial property even with a high vacancy rate. With the prospect of higher occupancy rates, prices are now rising.

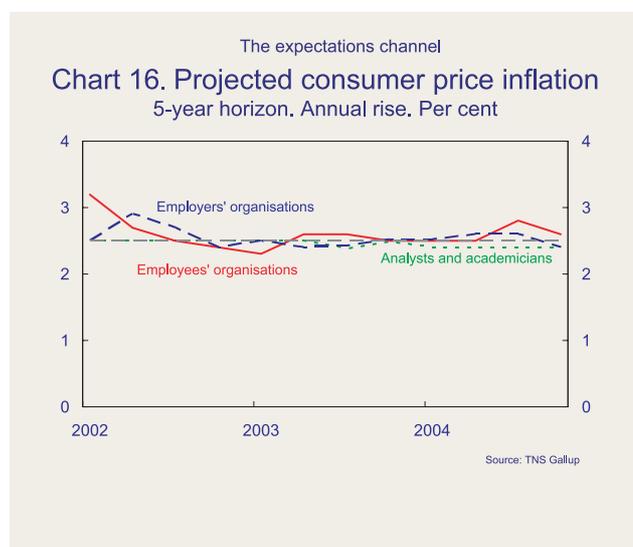
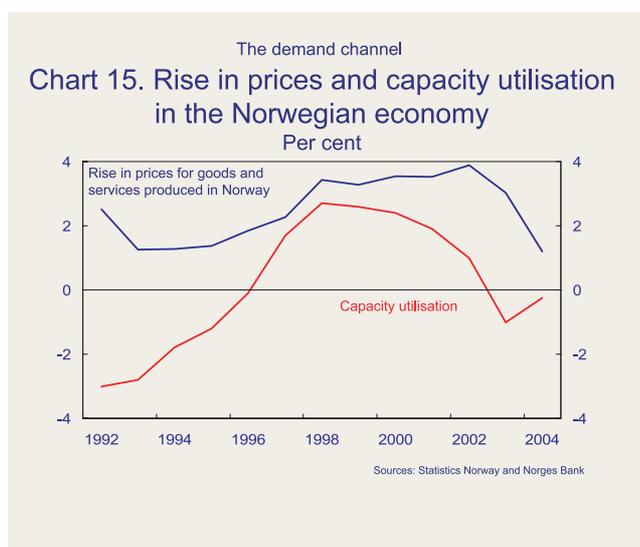
Owing to higher productivity and a drop in sickness absence, it may have taken time for the effects to

The demand channel
Chart 12. Key rate and house prices
 Annual rise. Per cent



The demand channel
Chart 14. Number employed
 In thousands





become visible in the labour market. However, higher demand for labour and falling unemployment is gradually leading to a tighter labour market (Chart 14).

High interest rates in 2002 and fiscal discipline contributed to a deceleration in wage growth to a more sustainable level.

Higher demand for companies' goods provides scope for increasing prices. Experience shows that inflation is directly influenced by the level of capacity utilisation in the Norwegian economy. Some of the rise in prices for domestically produced goods and services can be attributed to higher margins in the business sector (Chart 15).

If there is confidence in monetary policy, economic agents will expect inflation to be close to target over time. This will provide a basis for company budgets. This will then contribute to stabilising inflation. Many companies change their prices only once or twice a year. When they change prices, they probably take into account the expected rise in other prices.

It has been important to prevent inflation expectations from falling and becoming entrenched at a low level. Surveys of inflation expectations nevertheless indicate that expectations are well anchored around the inflation target in the long term (Chart 16).

The interest rate is a powerful instrument. The effects come through growth in private consumption, higher house prices, increased residential construction, higher investment in various business sectors, business start-ups, improved corporate profitability, higher employment and wage growth, higher profit margins and higher imported inflation.

The effects of the interest rate decline on demand, output and employment have been pronounced. It has taken time for inflation to pick up. This partly reflects low external interest rates and high oil prices, which have moderated the impact on the krone exchange rate. Higher imports from low-cost countries, competition and improved efficiency in Norwegian production have also kept inflation at a low level.

As a result of low inflation, we have kept interest rates low for a longer period. The impact on output and employment is therefore more pronounced.

We cannot expect the interest rate to have the same impact from one period to the next. The economy is also exposed to unexpected disturbances. As a result, we cannot fine-tune economic developments using the interest rate, but avoid the largest effects when the economy is exposed to disturbances. Experience seems to indicate that inflation expectations remain stable even if inflation varies somewhat as long as the interest rate is used actively to curb effects. Given our highly open economy, we may have to accept somewhat wider variations in inflation than some other countries.

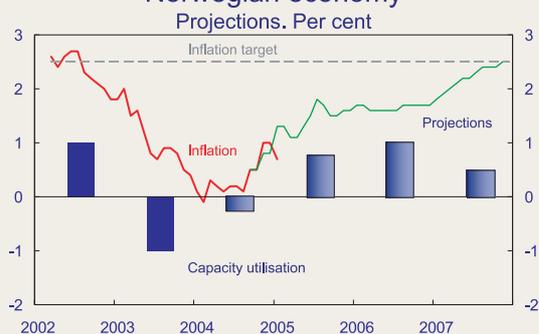
The interest rate level can influence the timing of household and business investment. With the current low interest rate level, many have found it advantageous to move forward purchases of property and other investments which they would otherwise have delayed.

Housing demand 10 to 15 years ahead will depend on future income levels, population growth and living patterns. The current level of interest rates has limited implications for housing demand in the longer term. A high level of residential construction today will be followed by a lower level at a later stage. The same may apply to commercial property investment.

There are examples showing that a period of higher-than-normal house prices can have an impact over a very long period. At the end of the 1800s, house prices in Kristiania (now Oslo) rose sharply. Some areas of Oslo are still marked by the massive volume of residential construction prompted by the rise in prices. The housing market collapsed at that time. The demand for new dwellings was saturated. It was not until the mid-1980s that real house prices returned to the level in 1899.

Household debt is now more than one and a half times as high as disposable income. The accumulation of debt partly reflects structural adaptation over time to a

Chart 17. Inflation and capacity utilisation in the Norwegian economy



Sources: Statistics Norway and Norges Bank

deregulated credit market and partly to low interest rates. The higher debt burden has made households more vulnerable. A period will come when households prefer to stabilise debt and reduce consumption.

The fall in interest rates has sustained activity in Norway after a period of weak economic developments abroad and high domestic wage and cost inflation. But an aggressive use of the interest rate as an instrument may itself be a source of new fluctuations in the economy because it influences the time profile for saving and investment. It is therefore important that growth is self-driven when the interest rate has to return to a more normal level after a period.

The effect of Norway's interest rate also depends on external interest rates. Many countries have raised their key rates during this cyclical upturn, also in several steps. Most recently, the Federal Reserve increased its key rate by 0.25 percentage point, and it has also announced further interest rate hikes. With the prospect of low inflation, Norway has lagged behind other countries in adjusting interest rates to a more normal level.

Two years after we started to lower interest rates it would appear that inflation is moving up, albeit slowly. Inflation is low, but the indices are also influenced by temporary and erratic disturbances. It will still take time before we will have seen the full impact of low interest rates. It may appear that growth in the Norwegian economy has become more self-driven. Capacity utilisation is close to normal and rising. After a period, the interest rate can then gradually be raised to a more normal level (Chart 17).

Economic policy tasks

The various components of economic policy have varying effects. This is why they have different functions:

- Monetary policy steers inflation in the medium and long term and can also contribute to smoothing swings in output and employment.

- The central government budget – growth in public expenditure – influences the krone and the size of the internationally exposed business sector in the medium term. Government expenditure and revenues must be in balance in the long term.
- Wage formation, the structure of the economy and incentives determine how efficiently we utilise our labour resources and other economic resources.

There is also an interaction:

- In its budget resolutions, the government authorities will attach importance to the effects of the budget on the Norwegian economy and will therefore take account of interest rate effects. In this way, they avoid a situation where growth in public expenditure and the interest rate push the economy in different directions.
- With a known monetary policy response pattern, the parties to the centralised income settlements can take into account interest rate effects when wage increases are agreed.
- Moreover, the parties to public sector negotiations can take into account that the higher the pay increases are, the fewer there are that can be remunerated over government budgets. The interaction here came into clear evidence when employment in the general government sector fell after the expensive wage settlement in 2002.

The authorities can achieve better economic policy results if they can commit in advance to a set of credible policy rules. Households, enterprises and capital markets are forward-looking in their decision-making. It is therefore important that the authorities do not sow doubt, but on the contrary act in a long-term and predictable manner. There must be consistency between plans and actions.

Monetary policy's role is to ensure low and stable inflation. Experience shows that we cannot reduce unemployment over time by simply accepting somewhat higher inflation. In many countries, also in Norway, confidence that inflation will be held at bay has increased because interest rate setting has been delegated to the central bank.

Budget norms are not new. The norm during the first 25 post-war years – and it was adhered to – was that the annual budgets should show a surplus. The surplus was sufficient to finance an increase in loans to state banks.

At the beginning of the oil age in Norway, in the early 1970s, the norm had to be assessed. The relationship between the use of petroleum revenues and changes in industry structure was highlighted.

Report no. 25 to the Storting from 1973-1974, *"The role of petroleum activities in Norwegian society"* stated: "A transfer of production and employees between enterprises and industries can occur as a result

Chart 18. Central government spending and GDP

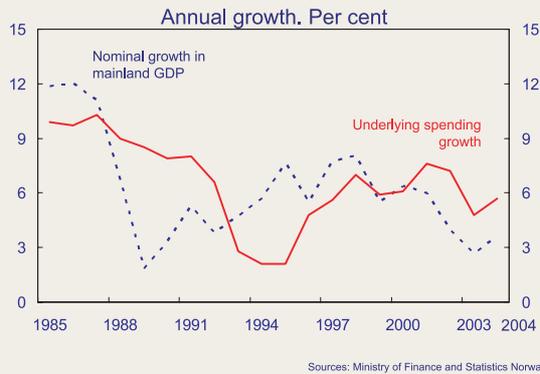
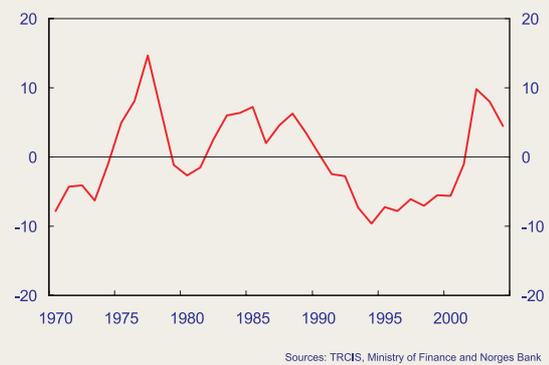


Chart 19. Competitiveness
Deviation from average. Per cent



of higher domestic cost pressures” ... and further ... “Inflationary pressures will depend in particular on the extent to which the Norwegian business sector is involved in petroleum activities and the share of revenues that are used domestically”. The implications for economic policy were also clarified: “The risk of excessive inflationary pressures must be given considerable weight when decisions are to be taken here”. The government budget was at that time used to steer the activity level in the economy. The interest rate was to be low – and kept unchanged. Today, with an inflation target, inflationary pressures will be steered using the interest rate, while the value of the krone will fluctuate. Today, this sentence would have to read: “The risk of an exchange rate that is too strong must be given considerable weight when decisions are to be taken here”.

We are now in a period where petroleum wealth is being invested in foreign financial assets via the Government Petroleum Fund. The government is to gradually phase in petroleum revenues into the domestic economy by using approximately the expected real return on the Fund.

The fiscal rule was established in 2001. Growth in public expenditure started to accelerate in 1997 after having been low in the mid-1990s. Spending growth has also been fairly strong in recent years, but perhaps somewhat slower than earlier. Since 2000, spending growth has averaged 6.3 per cent, while GDP growth in value terms has been 4.5 per cent (Chart 18). We have limited overall knowledge about real growth in public service production. Reliable measures of productivity and price developments have not been developed.

The fiscal rule for the budget implies that the government can use 4 per cent of the Fund over time. This year, a little more than 6 per cent is being used. The deviation partly reflects an unexpected shortfall in tax revenues in recent years. The government budget deficit is the difference between total revenues and total expenditure. They each account for about half of total GDP in

Norway. Even small deviations from expenditure and revenue projections can have a major impact on the deficit. Exchange rate changes will also lead to fluctuations in the value of the Petroleum Fund. For these reasons alone, the use of petroleum revenues may in periods deviate from the 4 per cent rule. Spending was also increased in response to the economic downturn. We can therefore safely affirm that the fiscal rule has been normative for fiscal policy.

In the years following 1997, with strong growth in public expenditure, the fiscal rule pointed to a continued increase in the use of petroleum revenues. We had to expect this growth in spending to lead to deteriorating competitiveness in Norwegian manufacturing, either through higher wages or an appreciation of the krone. With stronger wage growth in Norway than abroad, the competitiveness of Norway’s manufacturing industry has weakened by about 15 per cent since the mid-1990s (Chart 19). Competitiveness is about 5 per cent weaker than the average for the past 30 years. The krone exchange rate has been influenced by high oil and gas prices and prices for other Norwegian export goods. Monetary policy has also influenced the path for Norway’s relative costs, but the nominal value of the krone is about the same as 10 years ago. Strong growth in public expenditure and expectations of moderately higher growth in the use of petroleum revenues now seem to have been factored into the cost level.

Over the past 30 years manufacturing has been scaled back in waves. The last wave occurred around the turn of the millennium, but a substantial decline also occurred in the period 1977 to 1984 and from 1987 to 1992. Prior to these periods, the manufacturing sector’s competitiveness deteriorated (Chart 20).

The usefulness of a fiscal rule is that it gives weight to long-term considerations when addressing day-to-day economic policy challenges. The fiscal rule stabilises enterprises’ expectations concerning competitiveness and the krone exchange rate. This can prevent abrupt

Chart 20. Employment in manufacturing
In thousands



Sources: Statistics Norway and Norges Bank

and pronounced swings in the structure of the economy. If the government authorities disregard the rule, enterprises will lose an important reference. A policy rule can make matters worse if economic agents have drawn up long-term plans on a faulty basis.³

Both short-term and long-term considerations imply that the use of petroleum revenues as a share of the Petroleum Fund should be curbed ahead.

The Norwegian economy is growing at a brisk pace.

The public sector has invested heavily in the care of the elderly, which should cover the needs of a generation that was born just after World War I. The need for growth in public expenditure will be more moderate in the coming years and marked by the small cohorts of the 1930s and war years, who are now joining the ranks of the elderly. Moreover, the National Insurance Scheme, introduced in 1967, is nearing maturity. In addition, a few years remain before the large post-war cohorts retire and add to the demand for health services.

Hence, the conditions are now conducive to returning to the use of 4 per cent of the Petroleum Fund.

The current cost level in the Norwegian business sec-

tor is adapted to an expansion of the petroleum sector and a steady phasing-in of petroleum revenues into the mainland economy. Costs rose sharply from the mid-1960s to the mid-1970s and reached a very high level. In subsequent years, costs have varied around this level. After a period, we will be able to cover a smaller share of our imports using current petroleum revenues and drawings on the Petroleum Fund. Competitiveness must then have to be improved. It may have to be brought back to around the level prevailing at the end of the 1960s prior to Norway's emergence as an oil nation.⁴

The labour market

In the long run, wage growth must be consistent with labour productivity. When real wage growth is higher than productivity growth, profitability in the business sector deteriorates and the business sector will then recruit fewer employees and reduce their workforces. Likewise, employment in public entities will decline if labour costs rise more than revenues. When the social partners engage in centralised and local negotiations, they will therefore weigh employment against the usefulness of taking out higher pay.

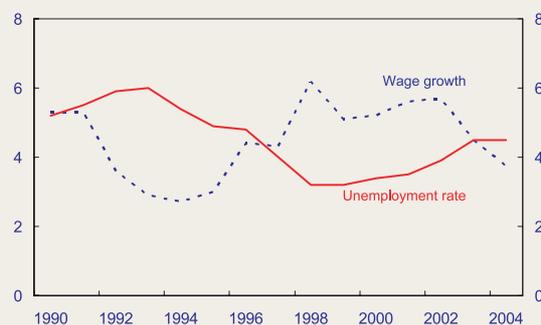
Compared with other European countries, income formation in Norway has been fairly flexible. Wage growth has rapidly declined when unemployment has risen. This is why unemployment has not taken hold at a high level (Chart 21).

The favourable results partly reflect the considerations underlying the wage settlements at a centralised level. But perhaps it has been equally important that it has been possible to adjust workforces and wage growth at a local level.

First, companies can adapt the use of labour to production by using overtime, part-time positions or contract labour.

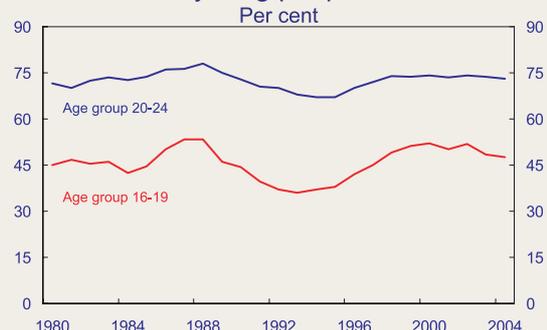
Moreover, the supply of labour is highly flexible. When demand rises, the number of job-seekers increases. Those

Chart 21. Wage growth and unemployment
Per cent



Source: Statistics Norway, TRCIS

Chart 22. Labour force participation among young people
Per cent

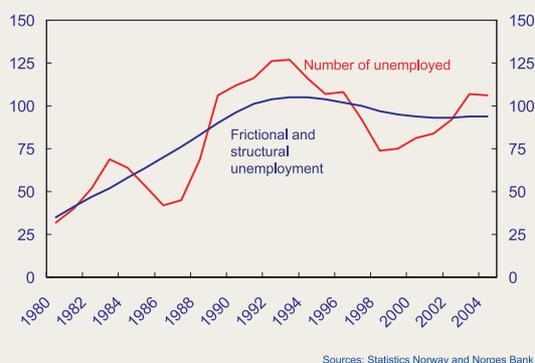


Source: Statistics Norway

³ See Kydland, F.E. and E.C. Prescott (1977): "Rules rather than discretion: The inconsistency of optimal plan", *Journal of Political Economy* 85, pages 473-490.

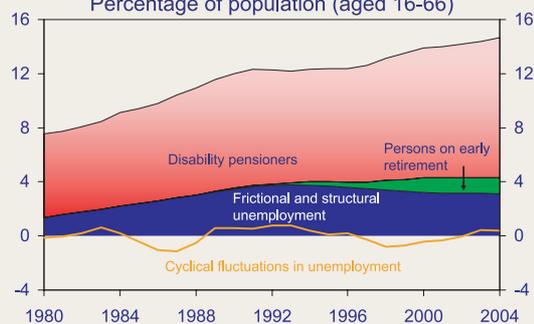
⁴ See Akram, Farooq Q. (2003): "Reell likevektsvalutakurs for Norge" (Real equilibrium exchange rate for Norway), *Norsk Økonomisk Tidsskrift* 118, pages 89-112.

Chart 23. Number of unemployed
In thousands



Sources: Statistics Norway and Norges Bank

Chart 24. Persons on early retirement, disability pensioners and unemployed persons
Percentage of population (aged 16-66)



Sources: Statistics Norway, National Insurance Administration and Norges Bank

who are already employed work more. During an upturn, we have in particular observed an increase in labour force participation among young people. Along the same lines, the number of persons in education tends to rise when unemployment is rising (Chart 22).

When labour demand increases, we see an influx of job-seekers from our neighbouring countries. In addition, close to 30 000 persons had some form of employment in Norway throughout or during parts of 2001, but resided in Sweden. With the enlargement of the EU Norway has become part of a larger labour market. Enlargement also provides scope for increased trade in services. This increases the production capacity of the Norwegian economy. For example, it seems that capacity in the construction industry has increased. The activity level is now very high, and there are still no signs of rising wage growth. Hence, labour mobility can eliminate bottlenecks in the labour market.

Employment is also strengthened by local wage negotiations. Some of the newer industries apply performance-related pay to a greater extent, allowing firms to reduce costs more easily while retaining employees when earnings decline. There also seems to be wage flexibility in more traditional industries. Differences in productivity growth and wage growth across Norwegian manufacturing enterprises show that workers tend to accept lower pay increases in enterprises with low productivity growth.⁵ This can provide companies with more time to adapt and curb the impact on unemployment.

Unemployment will vary over the business cycle, but there will always be job-seekers who are temporarily without work. Fluctuations around the trend level of unemployment can be an expression of the level of frictional and structural unemployment (Chart 23). If restructuring and job changes become more common, the number of unemployed will also increase as a result of job changes. If economic activity is high, most job-seekers will rapidly find a new position. Job-seekers

with skills for which there is less demand must seek employment for a longer period. In periods of major structural changes in the economy, this group may increase. When there are few unemployed of this type, wage growth tends to be high.

Even if Norway fares favourably in relation to many other countries, the Norwegian labour market also has its weaknesses. Wage growth now probably accelerates at a higher level of unemployment than it would have ten and twenty years ago. Many are also channelled from unemployment to social security benefits, and benefits may be an obstacle to returning to the labour force. Sickness absence also rose for a long period, but has decline markedly over the past six months, partly reflecting tighter requirements concerning individual follow-up.

Over time, cyclical fluctuations in unemployment have been small in relation to the increase in structural and frictional unemployment and growth in the number of disability pensioners and persons on early retirement (Chart 24).

It is important to preserve and perhaps improve our flexible system of wage formation. Pension schemes and the application of social security rules should also be changed to provide better incentives and opportunities to seek employment. Legislation and rules governing the labour market can also be better designed to promote production and employment.

Conclusion

Before I conclude, let us return to the period surrounding the dissolution of the union with Sweden in 1905.

As mentioned, the dissolution did not have any implications for monetary policy in Norway. However, a Swedish economist of that period is in some ways present in today's monetary policy – in both Norway and Sweden.

Knut Wicksell was professor of economics at the

⁵ Source: Kjell Gunnar Salvanes: "Omstilling og strukturelle endringer i det norske arbeidsmarkedet" (Adaptation and structural changes in the Norwegian labour market). Lecture at a conference arranged by the Norwegian School of Economics and Business Administration, the Norwegian Shipowners' Association and the Foundation for Research in Economics and Business Administration in Oslo on 8 October 2004.

University of Lund. When the Scandinavian currency union lost its significance in 1914, he proposed the establishment of a Scandinavian central bank. Its objective would be price stability.

Once inflation targeting became the framework for monetary policy in many countries, Wicksell's works experienced a renaissance. Not only did he point to the importance of maintaining price stability, but he also gave the interest rate responsibility for doing so. When we today refer to a normal or neutral rate of interest, Wicksell is an obvious reference.

In 1907, he wrote the following about the relationship between the interest rate and inflation:

"... the problem of keeping the value of money steady, the average level of money prices at a constant height, which evidently is to be regarded as the fundamental problem of monetary science, would be solvable (...) by a proper manipulation of general bank rates, lowering them when prices are getting low, and raising them when prices are getting high".⁶

Wicksell's proposal to establish a Scandinavian central bank was never realised. Wicksell himself entered into a union with a Norwegian woman, Anna Bugge. As the story goes, she strongly urged him to complete his academic works, rather than devoting his time to writing for newspapers and popular oratory. She was active in the peace and women's movement and was Sweden's first female diplomat. The union between the two did not consist of a formal marriage as Wicksell refused to enter into a contract which at that time would have made him her guardian. It was a contractual form of cohabitation based on mutual trust and respect, perhaps not unlike the cohabitation that Norway and Sweden have enjoyed on the Scandinavian peninsula over the past 100 years.

But that is another story.

⁶ Knut Wicksell (1907): "The Influence of the Rate of Interest on Prices", *Economic Journal*, XVII (1907), pages 213-220.

Evaluation of Norges Bank's projections for 2004

Per Espen Lilleås, economist in the Economics Department¹

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 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

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).

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.

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

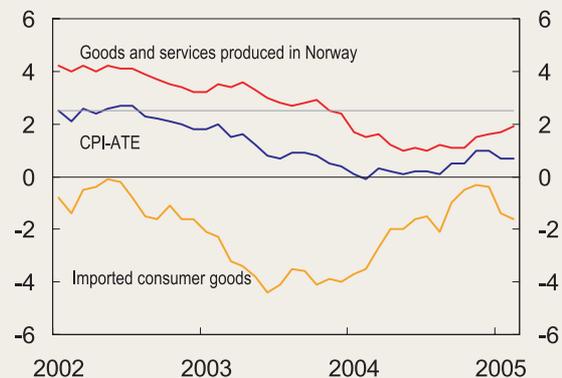
While inflation was primarily pushed down by the fall in imported consumer goods in 2003, the more subdued rise in house rents and the fall in prices for services with important price components other than wages made a strong contribution in 2004 (Chart 3).

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.

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.

Chart 1 CPI-ATE¹⁾. Total and by supplier sector²⁾. 12-month rise. Per cent. January 2002 - February 2005

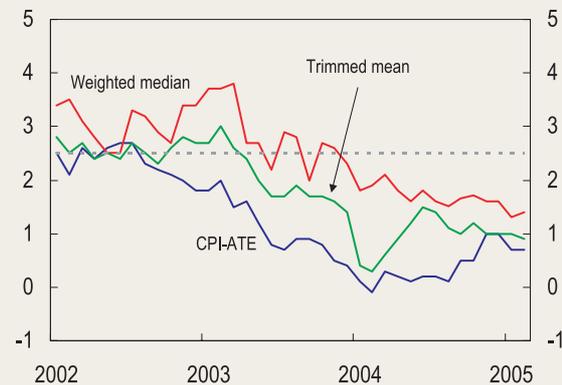


¹⁾ CPI-ATE: CPI adjusted for tax changes and excluding energy products

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

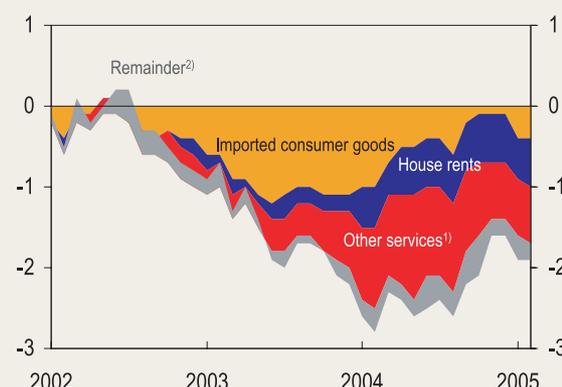


¹ A *trimmed mean* is calculated by omitting the largest and smallest price movements when measuring inflation. Price changes accounting for 20 per cent of the weighting base are eliminated

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

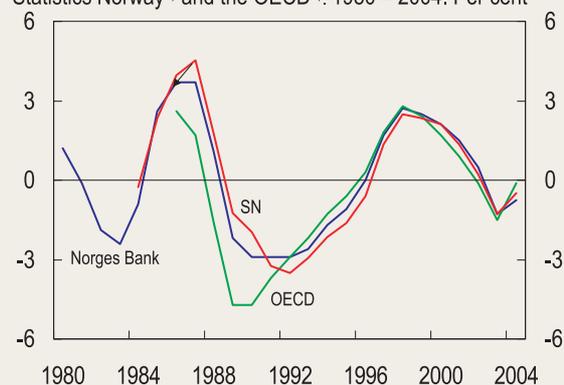
Output gap

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 gap¹⁾ from Norges Bank²⁾, Statistics Norway³⁾ and the OECD⁴⁾, 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.

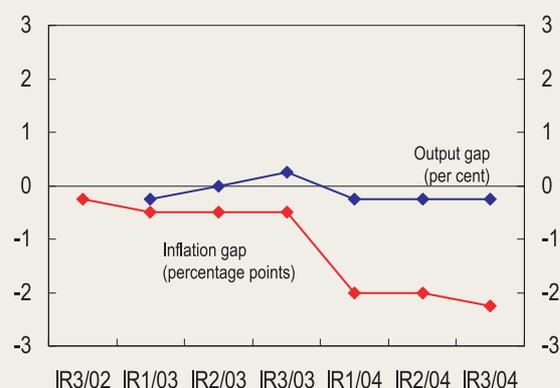
	Projections IR 3/02 ¹	Projections IR 1/03 ¹	Projections IR 2/03 ²	Projections IR 3/03 ²	Projections IR 1/04 ²	Projections IR 2/04 ²	Projections IR 3/04 ²	Faktisk
Interest rate (per cent)	7	5.5	3.4	3.0	1.8	2.0	1.8	1.8
Exchange rate (index, I-44)	89.0	88.3	94.7	95.7	99.3	96.1	95.6	95.6
GDP trading partners	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

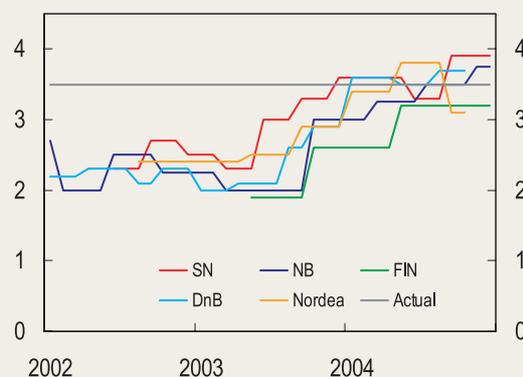
Sources: Statistics Norway, Technical Reporting Committee on Income Settlements and Norges Bank

Chart 5 Developments in projections for the output and inflation gap in 2004¹⁾



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 increase 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...

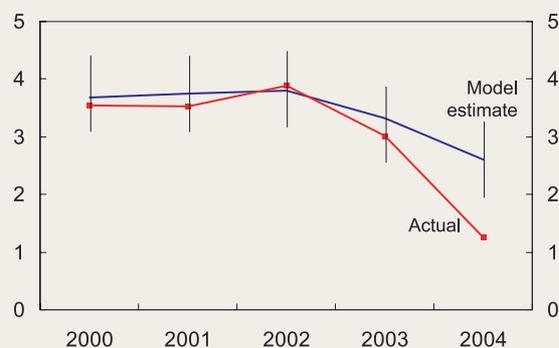
Normally, a downturn is accompanied by increased pressures on prices and margins as a result of lower demand. It was thus expected that enterprises would be exposed to increased competition as demand in the Norwegian economy slowed in 2002 and 2004, and that this would lead to somewhat lower inflation.

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).

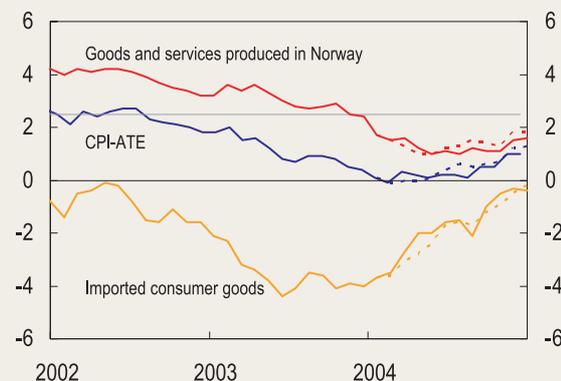
In *Inflation Report 1/04*, the projections were based on the assumption that increased competition would keep the rise in prices for domestically produced goods and services at a low level through 2004. The rise in prices for domestically produced goods and services moved in line with the projections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

Chart 7 Changes in prices for goods and services produced in Norway. Actual developments and model estimate¹⁾



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 impulses⁵ 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 ½ 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.

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-

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
<i>Decomposition of difference</i>		
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.

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.

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

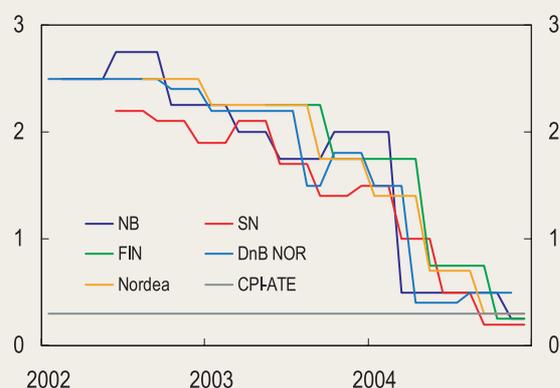
One criterion for evaluating whether Norges Bank's projections have been accurate is a comparison of our projections with those of other institutions. Chart 9 shows the projections of Norges Bank and some other institutions for the rise in the CPI-ATE in 2004, made at different times. Through 2003, no 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 "naïve" 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.

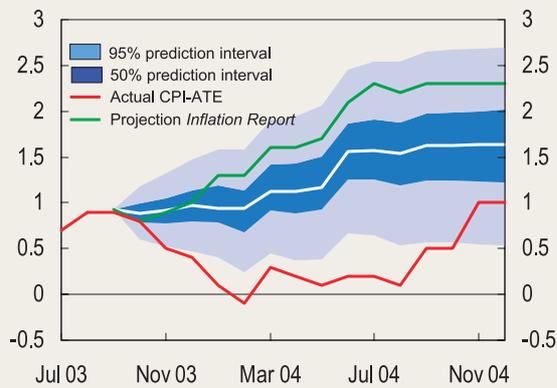
Chart 10 shows predictions for the rise in the CPI-ATE using an ARIMA model for the period October 2003 to December 2004, along with the projections in *Inflation Report 3/03* and actual price movements. The predictions based on the ARIMA model are closer to actual

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



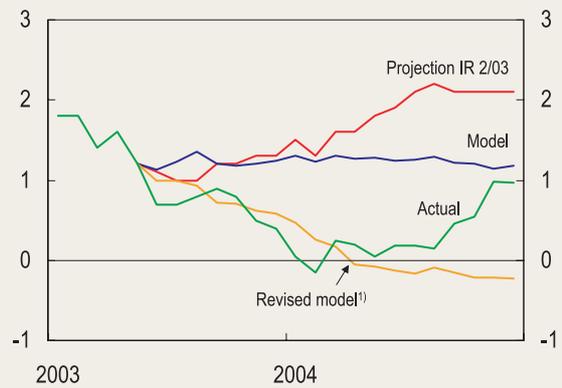
Sources: Norges Bank, Statistics Norway (SN), the Ministry of Finance (Fin), DnB NOR and Nordea

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 overridden 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.

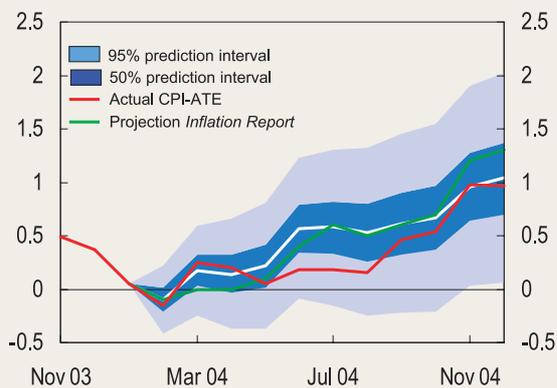
In Chart 11, Norges Bank's projections in *Inflation Report 1/04* for the CPI-ATE in the period February to December 2004 is compared with ARIMA predictions for the same period. During this period there were only minor differences between our projections and the ARIMA predictions.

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 based 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.

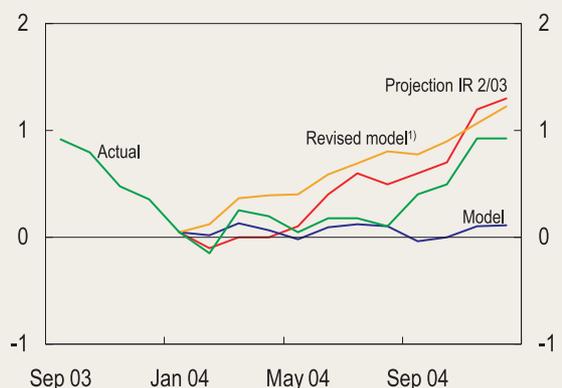
Although this "rule" for the treatment of previous forecast errors may enhance the accuracy of projections in some periods, this method may yield poor results in other periods. If the same method had been used for projections early in 2004, it would have predicted inflation of around zero through 2004 (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 overridden 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 “over-riding” 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 uncer-

tain, 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
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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 $\frac{3}{4}$ 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 $2\frac{1}{2}$ 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 $1\frac{1}{4}$ per cent, i.e. $\frac{1}{2}$ percentage point lower than projected in autumn 2002. Weaker developments also entailed a downward adjustment of $\frac{1}{4}$ percentage point for growth in 2004, in spite of a $1\frac{1}{2}$ percentage point reduction in interest rates since the previous report. The output gap was estimated at zero in 2003 and $\frac{1}{4}$ 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 $1\frac{3}{4}$ per cent in 2003 and 2 per cent in 2004, i.e. $\frac{1}{4}$ 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 $\frac{1}{4}$ 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 $\frac{1}{4}$ 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 $\frac{1}{4}$ 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 $5\frac{3}{4}$ per cent in 2002 to $4\frac{1}{2}$ per cent in 2003, or $\frac{1}{2}$ percentage point lower than projected in the previous report.

In the period February to May 2003, CPI-ATE inflation fell by $\frac{1}{2}$ 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 $-\frac{1}{4}$ per cent.

In the period June to September 2003, CPI-ATE inflation fell by $\frac{1}{4}$ 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 $2\frac{1}{4}$ per cent in the October report in 2003 to $2\frac{1}{2}$ 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 $\frac{1}{4}$ 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 $-\frac{1}{4}$ per cent.

However, inflation developments were not in line with expectations. In January 2004, CPI-ATE inflation was about $1\frac{1}{4}$ 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 $1\frac{1}{4}$ 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 $\frac{1}{4}$ 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 $\frac{1}{4}$ 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 $\frac{1}{4}$ 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 $\frac{1}{4}$ 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.

Statistics Norway Ministry of Finance Norges Bank Actual growth

■ ■ ■ —■—

Chart 14 Mainland GDP

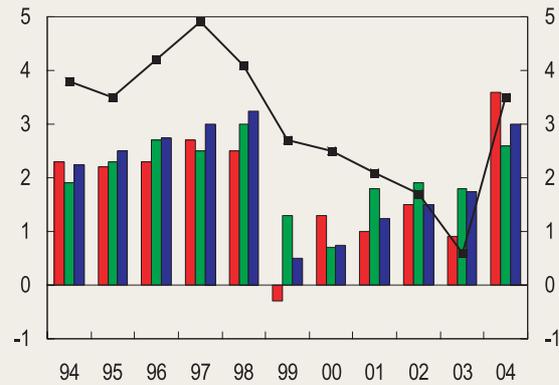
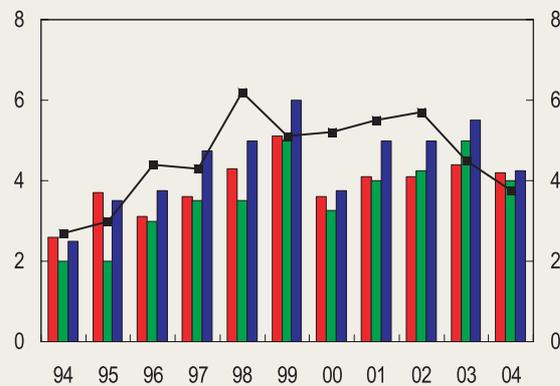
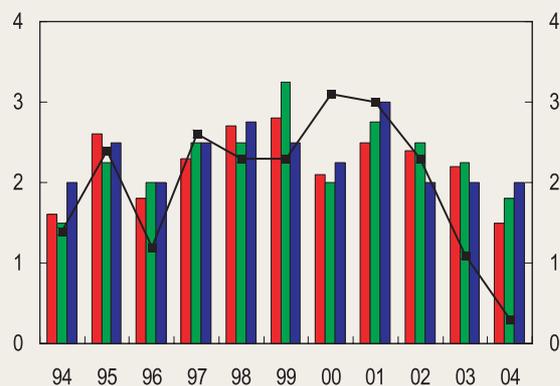


Chart 15 Annual wage growth¹⁾



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

Chart 16 Consumer price inflation¹⁾



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 (AAE⁷) and the relative root mean square error (RRMSE⁸). 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 $(1/N) \sum_{n=1}^N |y_n - \hat{y}_n|$ 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

$\sqrt{1/N \sum_{n=1}^N \left((y_n - \hat{y}_n) / y_n \right)^2}$ 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:

$$\Delta p_t^d = 0.20 + 0.53 \Delta p_{t-1}^d + 0.34 \Delta(w-z)_t - 0.04(p^d - (w-z))_{t-1} + 1.18 d86$$

(0.07) (0.043) (0.059) (0.014) (0.504)

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).

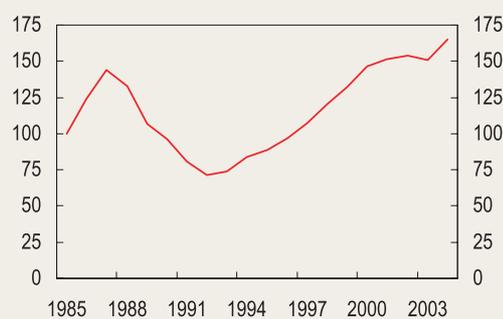
Chart 1 House prices deflated by total wage income and household disposable income. Index, 1985=100. Annual figures. 1985-2004¹⁾



¹⁾ Projections for 2004

Sources: Statistics Norway, Norwegian Association of Real Estate Agents (NEF), Association of Real Estate Agency Firms (EFF), FINN.no, ECON and Norges Bank

Chart 2 House prices deflated by the house rent index in the CPI. Index, 1985=100. Annual figures. 1985-2004¹⁾



¹⁾ Projections for 2004

Sources: Statistics Norway, NEF, EFF, FINN.no, ECON and Norges Bank

reflect changes in fundamentals. In particular, it is likely that the fall in interest rates since the end of 2002 has contributed to the rise in prices. The current low interest rate level is unlikely to continue, however. If interest rates have a strong impact on house prices, we would therefore expect house price inflation to be relatively subdued when interest rates gradually normalise. As long as interest rates increase gradually, there is nevertheless reason to believe that price adjustments will be fairly slow. Nor will house prices necessarily fall when interest rates gradually increase, since the interest rate increases may reflect rapid growth in wages and employment.

It follows that indicators and models that measure whether house prices are overvalued in relation to fundamentals, or whether the fundamentals have been responsible for the high house prices, may be useful when monitoring financial stability. Understanding how and to what extent house prices depend on various fundamentals is also important for projecting house price developments.

The ratio of house prices to income and the ratio of house prices to house rents is commonly used to measure whether house prices are overvalued in relation to long-term fundamental values (see, for example, *The Economist* (2003) and a box in *Financial Stability* 1/03). Such measures may indicate that house prices in Norway are high in relation to fundamentals (see Charts 1 and 2). These measures are incomplete, however, since they do not measure whether house prices are high (in relation to income or house rents) due to a bubble or due to developments in fundamentals. An alternative approach is to estimate an econometric model of house prices using fundamental variables as explanatory factors. Then, under certain conditions, one can use the deviation between actual and fitted house prices as a measure of whether or not house prices are overvalued in relation to fundamental explanatory factors. IMF (2004), Foley

(2004) and McCarthy and Peach (2004) have used such an approach.

In this article, we try to answer the following questions:

- What are the most important fundamental explanatory factors for house prices?
- How quickly and strongly do house prices react to changes in these factors?
- Is there a price bubble in the housing market?
- What has driven developments in house prices in recent years?
- What will happen to house prices if interest rates and the Norwegian economy develop in line with the analyses in *Inflation Report* 3/04?

We estimate a model of house prices on quarterly data for the last 14 years. The analysis indicates that interest rates, housing construction, unemployment and household income are the most important explanatory factors for house prices. We find that house prices react quickly and strongly to changes in interest rates. Thus, a considerable portion of house price inflation since May 2003 may be explained by the fall in interest rates in the last two years. 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 compared with a fundamental value determined by interest rates, income, unemployment and housing construction.

In the next section, we discuss factors that may affect house prices. We then investigate the relevance of these factors by estimating a model of house prices (section 3). In sections 3 and 4, we use the model to discuss the questions raised above. The model was presented in *Financial Stability* 1/04.

2. What can affect house prices?

House prices are determined by housing supply and housing demand. Housing supply, measured by the housing stock, is fairly stable in the short term, since building new dwellings takes time and housing construction per year is low in relation to the total housing stock. In the short term, therefore, house prices will generally fluctuate with changes in demand. The housing stock will adapt to demand over time, however. A long-term model of house prices should therefore contain explanatory factors for developments in the housing stock, such as construction and building site costs and prices for new dwellings. Here, we restrict the analysis to explain house price movements for a given housing stock.

Housing demand consists of two components: household demand for owner-occupied dwellings and demand for dwellings as a pure investment instrument. It is reasonable to assume that the first component is clearly larger than the second. We will therefore place greatest emphasis on the demand for owner-occupied dwellings.

Households may consume housing services either by owning or renting a dwelling. In this analysis, we consider the demand for housing services from owner-occupied dwellings (including flats in housing cooperatives). We also assume that this demand is proportional to housing demand. The analysis is based on the following aggregate demand function:

$$(1) \quad H^D = f\left(\frac{V}{P}, \frac{V}{HL}, Y, X\right), \quad f_1 < 0, \quad f_2 < 0, \quad f_3 > 0,$$

where

H^D = housing demand

V = total housing costs for a typical owner

P = index of prices for goods and services other than housing

HL = total housing costs for a typical tenant (rent)

Y = households' real disposable income

X = a vector of other fundamentals that affect housing demand

f_i = the derivative of $f(\bullet)$ with respect to argument i

Equation (1) says that the demand for owner-occupied dwellings increases if income increases and decreases if housing costs in connection with ownership increase in relation to house rents or prices for other goods and services. The vector X contains observable variables which capture effects of demographic conditions, banks' lend-

ing policies and household expectations concerning future income and housing costs. Expectations concerning future income and housing costs are important because (a) housing is a consumer durable (b) the purchase of a dwelling is the most substantial purchase for most households during their lifetime and (c) most households debt-finance a substantial portion of the purchase when buying their first home or when trading up in the housing market. The content of X is discussed in more detail below.

The housing cost for an owner-occupier measures the value of goods which the owner-occupier relinquishes by owning and occupying a dwelling for a period. Somewhat simplified², the real housing costs for owners may be defined as:

$$(2) \quad \frac{V}{P} \equiv \frac{PH}{P} BK = \frac{PH}{P} \left[i(1-\tau) - E\pi - (E\pi^{PH} - E\pi) \right],$$

where

BK = housing cost per real krone (NOK) invested in a dwelling

PH = price for an average dwelling (in NOK)

i = nominal interest rate

τ = marginal tax rate on capital income and expenses

$E\pi$ = expected inflation (expected rise in P and HL , measured as a rate)

$E\pi^{PH}$ = expected rise in PH (measured as a rate)

The expression $[i(1-\tau) - E\pi]$ is the real after-tax interest rate. It measures the real interest costs associated with a housing loan and the real interest income lost by investing in a house. Higher interest rates mean increased interest costs and higher return when money is deposited in the bank. Thus, housing costs increase. The expression $[E\pi^{PH} - E\pi]$ is the expected real rise in house prices. Expected housing wealth increases if $[E\pi^{PH} - E\pi]$ increases. This means that the real housing costs for owners fall. Thus, it becomes relatively more advantageous to own a dwelling than to rent, and demand for owner-occupied dwellings rises.

Equation (2) may be simplified to:

$$(2') \quad \frac{V}{P} \equiv \frac{PH}{P} BK = \frac{PH}{P} \left[i(1-\tau) - E\pi^{PH} \right].$$

The variable BK is now the nominal after-tax interest rate minus the expected increase in nominal house prices.

Equations (1) and (2) describe the demand for owner-occupied housing. The variables in (1) and (2) will also affect the demand for housing as an investment instrument. It is reasonable to assume that this demand, like other demand, increases as income rises. If house rents increase in relation to house prices, it becomes more advantageous to invest in a dwelling for rental purposes.

² We disregard maintenance costs and tax advantages of owning one's own home.

Then, housing demand increases. Similarly, lower interest rates and/or higher $E\pi^{PH}$ will make it relatively more advantageous to invest in housing rather than to place money in bank deposits. This results in higher demand for dwellings as an investment instrument.

As described above, the housing supply is relatively stable in the short term. The house price PH is the price that ensures that housing demand is equal to housing supply. We insert (2) in (1) and then solve the equation for PH . We also use a semi-logarithmic function:

$$(3) \quad \ln PH = \beta_1 \ln P + (1 - \beta_1) \ln HL + \beta_2 \ln Y + \beta_3 BK + \beta_4 \ln H + \beta_5 g(X),$$

where

H = total housing stock

We then define real disposable income by:

$$(4) \quad Y = \frac{YN}{P^{\alpha_1} HL^{\alpha_2} PH^{\alpha_3}},$$

$$\alpha_1 + \alpha_2 + \alpha_3 = 1, \quad \alpha_1 < \beta_1, \quad \alpha_2 < \beta_2.$$

where

YN = nominal disposable income

Equation (4) takes into account that higher house prices reduce purchasing power in the housing market for households as a whole.³

By solving (3) and (4) we get the following expression for PH :

$$(5) \quad \ln PH_t = \varphi_1 \ln P_t + \varphi_2 \ln HL_t + \varphi_3 \ln YN_t + \varphi_4 BK_t + \varphi_5 \ln H_t + \varphi_6 g(X_t) + \varepsilon_t,$$

where

$$\varphi_1 = (\beta_1 - \beta_2 \alpha_1) / \gamma$$

$$\varphi_2 = (1 - \beta_1 - \beta_2 \alpha_2) / \gamma$$

$$\varphi_3 = \beta_2 / \gamma$$

$$\varphi_4 = \beta_3 / \gamma$$

$$\varphi_5 = \beta_4 / \gamma$$

$$\varphi_6 = \beta_5 / \gamma$$

$$\gamma = (1 - \beta_2 \alpha_3)$$

Subscript t denotes the period and ε_t is a stochastic disturbance that captures the effects of omitted, non-fundamental factors. We see that $\ln P$ and $\ln HL$ fall out of equation (5) if $(\beta_1 - \beta_2 \alpha_1) = (1 - \beta_1 - \beta_2 \alpha_2) = 0$. This requires that the income elasticity β_2 in equation (3) is greater than 1.

The variable BK_t in equation (5) contains the expected change in real house prices from period t to period $t+1$. This is an unobservable variable. We assume that price expectations depend on the observable (fundamental)

variables on the right-hand side of equation (5), the real rise in prices in period $t-1$ and a disturbance v_t which captures effects of psychology and other non-fundamental factors that may influence price expectations. We can then formulate the following relationship for house prices:

$$(6) \quad \ln (PH)_t = h(\text{fundamentals})_t + \theta(\text{real rise in prices})_{t-1} + v_t + \varepsilon_t$$

$$= h(\text{fundamentals})_t + (\text{deviation from fundamental value})_t$$

$$= (\text{fundamental value})_t + (\text{deviation from fundamental value})_t.$$

In equation (6), house prices may deviate from their fundamental value if $\theta \neq 0$ or if the disturbances v_t and ε_t deviate from zero. A positive and substantial deviation from the fundamental value is evidence of a price bubble in the housing market.⁴ Such a bubble may begin with a rise in house prices resulting from a change in fundamentals or a positive shift in price expectations ($v_t > 0$). If $\theta > 0$, which is plausible, an increase in real house prices will give rise to expectations of a continued increase in prices. It will then be relatively more advantageous to own a dwelling (see above). This increases housing demand and house prices today. Consequently, price expectations increase further and prices are pushed up further. This process may drive house prices far above their fundamental value if θ is large enough.⁵ It is reasonable to assume that $\theta < 1$, however, implying that the process dies out over time.

Note that house prices may also fluctuate substantially if interest rates or other fundamentals vary considerably. The fluctuations may be amplified by supply side factors. As described above, increased demand will only affect house prices (not the housing stock) in the short term. However, higher house prices will lead to the construction of more dwellings. This will put downward pressure on house prices over time, and the effect will be strengthened if demand has declined when the new dwellings are completed. Household expectations may also contribute to fluctuations in house prices. An interest rate reduction will normally result in expectations of a (more rapid) rise in real house prices. Consequently, it may pay to expedite planned house purchases. This may lead to a fairly substantial rise in house prices in the short term, with a fall in prices later on.

We argued above that housing demand depends on household expectations concerning their own income. Since expected house price inflation also affects household behaviour, households will also place emphasis on expected income growth for other households. Developments in the labour market are important for household expectations concerning their own and others' future income. Increased unemployment results in

³ Higher house prices reduce the purchasing power of first-time buyers and increase the purchasing power of those leaving the housing market (the effect is zero for other households as a whole). Those who leave the housing market, however, will not use this increased purchasing power to purchase a dwelling. Therefore, total purchasing power in the housing market falls when house prices rise.

⁴ The term "bubble" is defined in different ways in the literature. The above definition is used by IMF (2003, note 3), among others.

⁵ See Case and Shiller (2003, pages 299–300 and 337–338) for a more detailed discussion.

expectations of lower wage growth and increased uncertainty concerning future income and ability to repay debt (both one's own and that of others). This reduces the willingness to pay for owner-occupied dwellings. Therefore, we will test for effects of unemployment in the empirical analysis.

Since most households raise loans to purchase dwellings, banks' lending policies may be important for developments in house prices. Lending policies depend on banks' profitability, government regulations, customers' (expected) ability to repay debt and the collateral values of customers' dwellings.⁶

$$(7) L^s = h\left(O, REG, Y, U, \frac{PH}{P}\right),$$

$$h_1 > 0, \quad h_2 < 0, \quad h_3 > 0, \quad h_4 < 0 \quad h_5 > 0,$$

where

- L^s = banks' supply of credit to households
 O = banks' profitability
 REG = measure of government regulation of bank lending
 U = unemployment rate
 h_i = the derivative of $h(\bullet)$ with respect to argument i

Equation (7) says that the supply of credit is reduced if banks' profitability declines, if the government regulates (more strictly) the supply of credit, if customers' (expected) income declines or if collateral values fall. As explained above, increased unemployment will result in expectations of lower wage growth and increased uncertainty about future ability to repay debt. This will reduce the supply of credit to households.

We will test for effects of banks' lending policies by including household debt as an explanatory variable for house prices. The coefficient of this variable is, however, only identifiable if the supply of credit is limited by banks' profitability (O) or by government regulations (REG); the other variables in equation (7) are also included directly in the determination of house prices. The results in Jacobsen and Naug (2004) indicate that credit to households was limited by banks' profitability during the banking crisis at the beginning of the 1990s. They do not find evidence that credit to households has been limited by banks' profitability after 1993, however. It would appear, therefore, that the supply of credit has less independent effect on house prices now than before and during the deregulation of the credit market

in the mid-1980s and during the banking crisis that followed. If we do not find that household debt has a significant effect on house prices, this indicates that lending was not limited by government regulations or banks' profitability in the estimation period. Household debt has a significant positive effect in models of Norwegian house prices that are estimated on data from the 1980s and 1990s (see Eitrheim (1994) and Boug et al. (2002, Chapter 5.5)).⁷

Total housing demand will also depend on the size of the population and the number of individuals in the start-up phase.⁸ Housing demand in different parts of the country will depend on population movements. In Norway, net migration to central areas has been positive in recent years. This has affected regional house prices in various ways, but may also have changed average house prices for Norway as a whole.

3. An empirical model of house prices

We model a price index for resale homes as a whole. The price index used is published monthly by the Norwegian Association of Real Estate Agents and the Association of Real Estate Agency Firms. The statistics are prepared by the Norwegian research institute Econ Analyse and financed by the internet marketplace FINN.no. The index measures the average house price per square metre, adjusted for effects of size, type and location (see ECON 2004). The monthly figures only go back to January 1997, but annual figures have been estimated for the period 1985-2004 and quarterly figures for the period 1990-1996. The model below is estimated on quarterly data from 1990 to the first quarter of 2004 (the last observation that was available when the model was constructed).⁹

We tested for effects of the following variables:

- households' total (nominal) wage income¹⁰
- indices for house rent paid and total house rent in the consumer price index (CPI)
- other parts of the CPI adjusted for tax changes and excluding energy products (CPI-ATE)¹¹
- various measures of the real after-tax interest rate
- the housing stock (as measured in the national accounts)
- the unemployment rate (registered unemployment)
- backdated rise in house prices
- household debt

⁶ See Stiglitz (1992, Sections 6.2–6.3) for a theoretical discussion.

⁷ IMF (2004) reports positive effects of credit growth in a house price equation for 18 OECD countries estimated on annual data from 1971 to 2003. Similar effects have been found in studies of British and Swedish house prices (see Hendry (1984), Meen (1990), Pain and Westaway (1997), Muellbauer and Murphy (1997), Holly and Jones (1997) and Barot and Yang (2002)). In all of these studies, credit was regulated in large parts of the estimation period.

⁸ IMF (2004) finds positive effects of total population (for given income) in a house price equation for 18 OECD countries (see note 7). Muellbauer and Murphy (1997) report such effects for the UK, and Barot and Yang (2002) find population effects in equations for Swedish and British house prices. The house price equations in Holly and Jones (1997), Pain and Westaway (1997) and Foley (2004) contain effects of the population's age mix.

⁹ We have estimated quarterly figures from 1997 by taking the average of the monthly figures in each quarter.

¹⁰ Tax-motivated fluctuations in share dividends have had a considerable effect on measured developments in household disposable income in recent years. These fluctuations in share dividends have probably had little impact on household demand for dwellings. We therefore use wage income instead of disposable income as an explanatory variable.

¹¹ Housing demand is unlikely to be appreciably affected by short-term fluctuations in inflation that are due to tax changes or fluctuations in energy prices.

- the total population
- the shares of the population aged 20-24 and 25-39
- various measures of relocation/centralisation
- TNS Gallup's indicator of households' expectations concerning their own financial situation and the Norwegian economy (the consumer confidence indicator)

The list of explanatory factors is long compared with the number of observations during the sample period. In addition, we included both current and lagged variables to take account of possible lags in household behaviour. As a result, it was not feasible to include all the explanatory factors in one house price equation (with a meaningful result). We therefore estimated a number of models in which we included only some of the variables. Then we simplified these models by imposing restrictions that were not rejected by the data and that simplified the interpretation of the dynamics.

House rents and other consumer prices generally had coefficients and *t*-values close to zero. In addition, models with a nominal interest rate showed a better fit than models with a real interest rate; inflation had coefficients and *t*-values close to zero in models in which we included the nominal interest rate and inflation as separate explanatory variables, and the coefficient of inflation had the wrong sign in most models. The model in this section therefore expresses a relationship between nominal house prices, nominal income, nominal interest rates and other variables.¹² In Table 2 of the Appendix, we show a model in which the real house price depends on real income, real interest rates and other variables in the long term.¹³

The insignificant effects of house rents may reflect the fact that rents in housing cooperatives accounted for an important share of house rent indices in the CPI during most of the estimation period. This, coupled with the fact that many house rents have been strongly regulated, suggests that caution should be exercised in using time series of the relationship between house prices and house rents in the CPI to assess whether house prices are high or low in relation to market rents.¹⁴ We do not have long time series for market rents.

The discussion in Section 2 showed that both actual and expected interest rates are important to housing demand. We therefore tested for effects of banks' lending rates and various market rates: the three-month,

twelve-month, three-year and five-year rates. Banks' lending rates had a strongly significant effect in all models, whereas the effects of market rates were (clearly) insignificant in models in which banks' lending rates were also included. This may indicate that both house prices and the difference between market rates and banks' lending rates depend positively on the economic outlook: the estimated effect of market rates may (to some extent) capture effects of a changed economic outlook. It is therefore likely that the effect of interest rate expectations is undervalued in the estimated equations. The insignificant effects of market rates may also reflect the fact that the interest rate was used to stabilise short-term developments in the krone exchange rate during much of the 1990s. Households may then (to a greater extent than now) have used observed interest rates as an estimate of future interest rates. This also implies that it is difficult to identify effects of interest rate expectations on house prices.

We did not find significant effects of household debt on house prices, either when we included the debt variable throughout the estimation period or when we included only a debt effect for the period 1990-1993. In isolation, this indicates that credit for household purchases of dwellings was not limited by banks' profitability during the estimation period. As discussed in Section 2, it is nevertheless likely that other loans to households were limited by banks' profitability in the period 1990-1993.

We find no evidence that population movements or demographic factors have a strong direct impact on house prices as a whole. However, demographic changes will influence house prices by influencing wage income in the economy, which forms a part of the preferred model. As demographic factors change slowly over time, it may be difficult to identify effects of such factors over a relatively short estimation period.

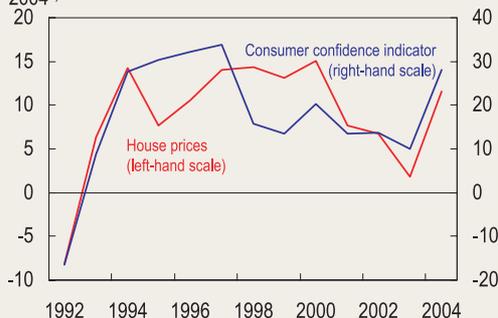
We attempted to capture effects of expectations by including TNS Gallup's indicator of households' expectations concerning their own financial situation and the Norwegian economy. This indicator is strongly correlated with developments in house prices (see Chart 3). However, it is also strongly correlated with the interest rate level and the unemployment rate, which are specified as separate explanatory variables. We therefore chose to adjust TNS Gallup's consumer confidence indicator for effects of the interest rate and unemployment.

¹² It is usual to use nominal interest rates instead of real interest rates in empirical house price models (see for example Meen (1990), Hall, Psaradakis and Sola (1997) and the model in IMF (2004) (mentioned in notes 7 and 8 above)). However, most studies in the literature estimate relationships between real house prices and real income.

¹³ In principle, one would not expect the level of inflation to influence real prices and other real economic variables. However, the model in this section implies that higher inflation results in a change in real house prices if wage growth and the nominal after-tax interest rate increase as much as the inflation rate. The long-term income elasticity is greater than 1, so that increased consumer prices result in higher real house prices if wages increase as much as consumer prices. This model property (and the results that have produced it) may be related to the fact that house prices are excluded from the CPI, but at the same time have a bearing on households' purchasing power in the housing market (see discussion of equation (4)). The model is estimated over a period where inflation (adjusted for tax changes and excluding energy products) was between 1 and 3 per cent for all years except 1990. It may be reasonable to assume that during this period households expected inflation of about 2½ per cent over time, and that their behaviour in the housing market was based on this assumption. The estimated inflation effect on real house prices therefore does not necessarily influence the forecasting properties of the model. The model in the Appendix implies that real house prices are independent of consumer prices in the long term (as long as the full effect of changed consumer prices is reflected in wages).

¹⁴ It may be reasonable to assume that the relationship between house prices and market rents is stable in the long term. If house prices increase in relation to a long-term equilibrium value between house prices and house rents, it will be relatively more profitable to rent than to own. At the same time, the return on buying dwellings for rental purposes will decline. Both factors will contribute to pushing house rents up and house prices down. See Leamer (2002), Krainier (2003), The Economist (2003), McCarthy and Peach (2004) and a box in Financial Stability 1/03 for a more detailed discussion of the relationship between house prices and house rents. An econometric analysis in Inflation Report 3/03 indicates that the house rent index in the CPI depends positively on house prices.

Chart 3 Developments in house prices and an indicator of households' expectations of their own financial situation and the Norwegian economy¹⁾. Per cent, Annual figures, 1992 - 2004²⁾

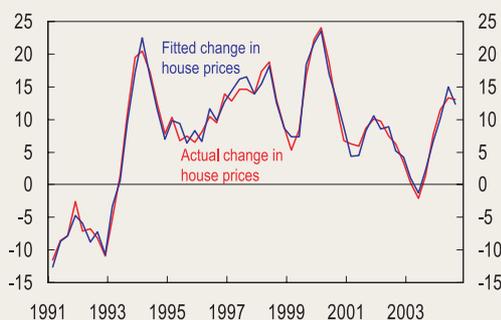


¹⁾ Provides an indication of the share with a positive assessment of the current situation and outlook for the future less the share with a negative assessment.

²⁾ Projections for 2004

Sources: TNS Gallup, NEF, EFF, finn.no, ECON and Norges Bank

Chart 4 Actual and fitted house prices. Percentage change over 4 quarters



Sources: NEF, EFF, finn.no, ECON and Norges Bank

First, we estimated a model of the consumer confidence indicator with the interest rate and unemployment as explanatory variables (see Table 3 in the Appendix). Then we calculated the difference between the actual and fitted value of the consumer confidence indicator for each period. This difference measures a shift in expectations that is due to factors other than changes in the observed values of the interest rate and the unemployment rate. Shifts of this nature may, for example, occur as a result of a change in political conditions, a change in the outlook for the Norwegian economy or negative shocks such as war, terror and a fall in stock markets.

The preferred model is shown in Table 1. The model is an error correction model of the logarithm of house prices. It contains effects of total wage income, the housing stock, the unemployment rate, banks' after-tax lending rate and the adjusted consumer confidence indicator. The expression in square brackets measures the deviation from an estimated long-term relationship between house prices, interest rates, unemployment, income and the housing stock. The coefficient of -0.12 indicates that house prices rise (fall) by 0.12 per cent in quarter t if house prices are 1 per cent lower (higher) than the estimated long-term relationship in quarter $t - 1$ (all else being equal).

Chart 4 shows that the model fits well over the estimation period 1990 Q2 – 2004 Q1. It also succeeds reasonably well in predicting four-quarter growth in 2004 Q2 and Q3.¹⁵ The model in Table 1 fits somewhat bet-

ter than the model for real house prices in the Appendix.

The model implies that house prices will increase by $\frac{1}{2}$ per cent in the first year and by $1\frac{3}{4}$ per cent in the long term if wage income increases permanently by 1 per cent and the other explanatory factors remain unchanged.¹⁶ However, a rise in house prices will result in increased housing construction and housing stock over time. According to the model, house prices will decline by $1\frac{3}{4}$ per cent in the long term if the housing stock, as measured in the national accounts, increases by 1 per cent.¹⁷ In the period 1999-2003, the housing stock and wage income increased on average by 2 per cent and 5 per cent per year respectively. If the housing stock and wage income grow at the pace prevailing for the last five years, house prices will increase by about 5 per cent per year for given values of the interest rate, the unemployment rate and the (adjusted) consumer confidence indicator. Since these variables are stationary, this means that house prices will rise in pace with wage income in the long term. This is confirmed if we exclude the housing stock from the model. The estimated income elasticity then falls to 1.22. This estimate is not significantly different from 1 at the 10 per cent level.¹⁸

According to the model, house prices will fall by $2\frac{1}{4}$ per cent in the first quarter and by $3\frac{1}{4}$ per cent in the long term if banks' lending rates increase by 1 percentage point and the other explanatory factors remain unchanged.¹⁹ The effect after 2-4 quarters is $\frac{1}{4}$ per cent stronger than the long-term effect (see Chart 5). This may indicate that interest rate changes have a strong

¹⁵ The values for interest rates and income for 2004 Q3 are based on projections from *Inflation Report* 3/04.

¹⁶ The house price equation in the Appendix has a long-term income elasticity of $2\frac{1}{4}$. It is usual to find income elasticities of between $1\frac{1}{2}$ and $3\frac{1}{2}$ in house price models that contain effects of the housing stock (see for example Hendry (1984), Meen (1990), Muelbauer and Murphy (1997), Pain and Westaway (1997), McCarthy and Peach (2004) and Foley (2004)).

¹⁷ The housing stock and wage income are strongly correlated when adjustment is made for seasonal variation. The effects of the housing stock and wage income are therefore very imprecisely estimated if we allow the variables to be included with separate coefficients. However, we cannot reject a hypothesis that the two variables have the same coefficient with opposite signs (the test has a p-value of 0.27). We have therefore chosen to impose a condition that income and the housing stock shall have the same long-term effect with opposite signs. In the model in the Appendix, we have imposed a condition that the coefficient of the housing stock shall be $\frac{3}{4}$ of the coefficient of wage income (with the opposite sign). The housing stock will then have approximately the same long-term coefficient in the two models.

¹⁸ It is usual to find income elasticities of around 1 in house price models that do not include effects of the housing stock or other supply side factors (see for example Holly and Jones (1997) and the equation for 18 OECD countries in IMF (2004)).

¹⁹ The model in Table 1 has approximately the same interest rate effects as the house price equation in the Appendix. IMF (2004) finds that, on average, real house prices in 18 OECD countries will fall by $3\frac{1}{2}$ per cent in the long term if the nominal interest rate increases by 1 percentage point and other explanatory factors remain unchanged.

Table 1 A model of house prices

$$\begin{aligned} \Delta houseprice_t = & 0.12 \Delta income_t - 3.16 \Delta (INTEREST \cdot (1-\tau))_t - 1.47 \Delta (INTEREST \cdot (1-\tau))_{t-1} + 0.04 EXPEC_t \\ & (1.94) \qquad (7.04) \qquad (3.27) \qquad (3.09) \\ & - 0.12 [houseprice_{t-1} + 4.47 (INTEREST \cdot (1-\tau))_{t-1} + 0.45 unemployment_t - 1.66 (income - housingstock)_{t-1}]. \\ & (5.69) \qquad (2.54) \qquad (3.48) \qquad (8.63) \\ & + 0.56 + 0.04 S1 + 0.02 S2 + 0.01 S3. \\ & (3.42) \quad (3.35) \quad (1.80) \quad (0.73) \end{aligned}$$

$R^2 = 0.8773$, $\sigma = 0.014166$, $DW = 2.57$.

Estimation period: 1990 Q2 – 2004 Q1.

Estimation method: Least squares method

Absolute t -values are given in brackets under the estimates.

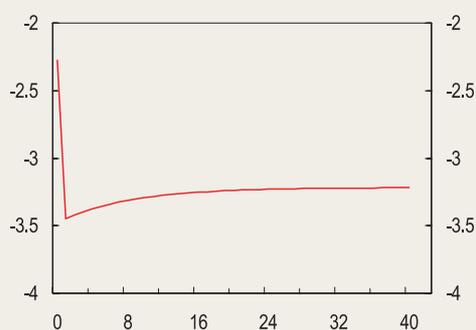
Δ is a difference operator: $\Delta X_t = (X_t - X_{t-1})$.

The variables are defined as (small letters indicate that variables are measured on a logarithmic scale):

<i>houseprice</i>	= Price index for resale homes. Sources: NEF, EFF, finn.no and ECON
<i>INTEREST</i>	= Banks' average lending rate. Source: Norges Bank
τ	= Marginal tax rate on capital income and expenses (0.28 since 1992)
<i>EXPEC</i>	= $(E-F) + 100 \cdot (E-F)^3$
<i>E</i>	= Indicator of household expectations concerning their own financial situation and the Norwegian economy. Measured as rate, total over two quarters. Source: TNS Gallup
<i>F</i>	= Value of <i>E</i> that may be explained by developments in the interest rate and unemployment. Calculated from an estimated model of TNS Gallup's consumer confidence indicator (see Table 3)
<i>unemployment</i>	= Unemployment rate. Source: The Directorate of Labour
<i>income</i>	= Total wage income in the economy. Source: Statistics Norway
<i>housingstock</i>	= Housing stock at constant prices. Source: Statistics Norway
<i>S_i</i>	= Variable which is equal to 1 in quarter <i>i</i> , otherwise zero.
R^2	= Share of the variation in the left-side variable that is explained by the model
σ	= Standard deviation of regression residuals
<i>DW</i>	= Durbin Watson test statistic

The expression in square brackets measures the deviation between the house price in the last quarter and an estimated long-term relationship between house prices, the interest rate, the unemployment rate, wage income and the housing stock. The data from TNS Gallup extend back to 1992 Q3. The variable *EXPEC* is therefore equal to zero from 1990 Q2 to 1992 Q3.

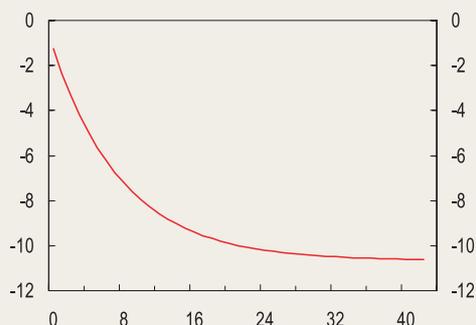
Chart 5 Change in house prices when banks' lending rate rises permanently by one percentage point. Percentage change in the first 40 quarters after the rise



Source: Norges Bank

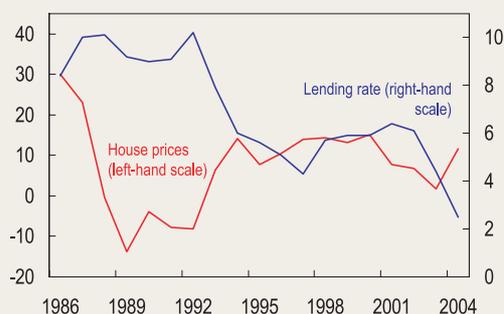
impact on household expectations in the short term (see the expectations model in the Appendix). In isolation, a higher interest rate leads to expectations that house prices will fall. Households wishing to enter the housing market or trade up may then choose to postpone their purchase. This may lead to house prices falling more in the short term than in the long term when interest rates rise. Similarly, a fall in interest rates will lead to expectations of rising house prices. It will then be relatively more favourable to buy a dwelling immediately rather than later. This may lead to prices rising more in the short term than in the long term. Interest rates are measured at the end of each quarter. The strong short-term effect may therefore indicate that housing demand reacts

Chart 6 Change in house prices when unemployment rises permanently from 4 to 5 per cent. Percentage change in the first 40 quarters after the rise



Source: Norges Bank

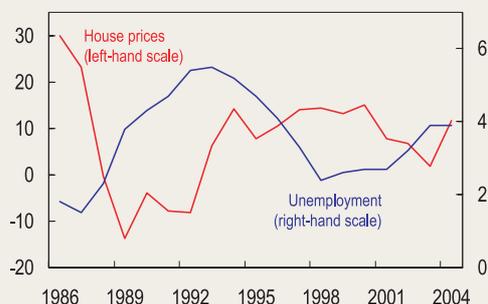
Chart 7 Developments in house prices and the level of banks' lending rate after tax. Per cent. Annual figures. 1986-2004¹⁾



¹⁾ Projections for 2004

Sources: NEF, EFF, finn.no, ECON and Norges Bank

Chart 8 Developments in house prices and the unemployment rate. Per cent. Annual figures. 1986-2004¹⁾



¹⁾ Projections for 2004

Sources: NEF, EFF, finn.no, ECON and Norges Bank

to changes in market rates before lending rates are changed.

The model in Table 1 implies that house prices will fall by about 11 per cent over time if the unemployment rate should increase permanently from 4 to 5 per cent.²⁰ The adjustment is relatively slow (see Chart 6). This may be because unemployment changes relatively slowly: it can take time for households to realise that unemployment has settled at a higher level. However, the expectations model in the Appendix indicates that changed unemployment is rapidly reflected in households' overall expectations concerning their own financial situation and the Norwegian economy. In isolation, this implies that house prices should react rapidly to changes in unemployment. A more detailed analysis (not shown) indicates that a change in unemployment is reflected more rapidly in households' expectations regarding the Norwegian economy than regarding their own financial situation. The developments in Chart 6 may therefore indicate that households place greater emphasis on the outlook for their own financial situation than on the outlook for the Norwegian economy when there is a change in unemployment.

The model in Table 1 contains a positive effect from the calculated expectations variable. The effect implies that house prices react primarily to large shocks to expectations. Small changes in the expectations variable may reflect noise in the data, since the variable is based on a model that is estimated on data from a sample survey. The expectations variable may capture effects due to changed expectations regarding unemployment. A changed labour market outlook may therefore have a more rapid impact on house prices than the estimated unemployment effects would imply.

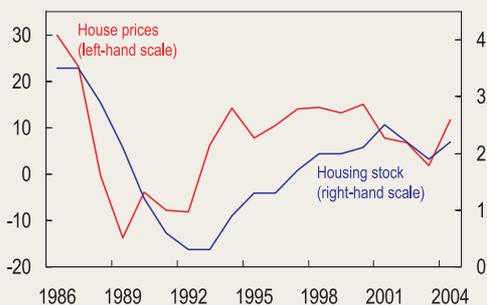
4. What drives house prices?

Chart 4 above shows that the model in Table 1 fits well. In this section, we first use the model to discuss what has driven developments in house prices in recent years. Then we use the model to discuss whether house prices are overvalued in relation to fundamental explanatory factors. Finally, we use the model to estimate how house prices will develop in the period ahead if developments in the interest rate and the Norwegian economy are in line with the analyses in *Inflation Report 3/04*.

The analysis in Section 3 indicates that house prices will rise approximately in pace with household (wage) income in the long term. However, Chart 1 above showed that the ratio of house prices to income has increased substantially since the trough in 1992. The house price model and Charts 7-9 indicate that this reflects developments in interest rates, unemployment and the housing stock. Charts 7 and 8 show that the price fall in the early 1990s was accompanied by high interest rates and high unemployment. The price fall also result-

²⁰ The effect of unemployment is weaker in the house price model in the Appendix than in the model in Table 1. This reflects the fact that unemployment increased in the early 1990s and that inflation and house prices fell at the same time. In the model in the Appendix we have imposed the condition that inflation and the nominal after-tax interest rate shall have the same coefficient with opposite signs. The coefficient of inflation has the wrong sign if the coefficients of the interest rate and of inflation are estimated freely. The model in the Appendix therefore implies that the fall in inflation in the early 1990s contributed more to reducing house prices than what follows from a "free" estimation and from the model in Table 1. Conversely, the estimated effect of unemployment is weaker in the model in the Appendix than in the model in Table 1.

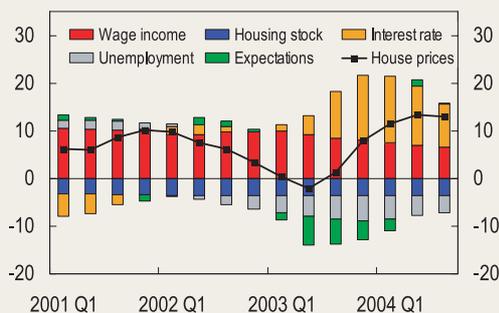
Chart 9 House prices and housing stock. Percentage rise. Annual figures. 1986-2004¹⁾



¹⁾ Projections for 2004

Sources: Statistics Norway, NEF, EFF, finn.no, ECON and Norges Bank

Chart 10 House prices and estimated contributions from wage income, housing stock, unemployment, interest rate and expectations variable. Contribution in percentage points to 4-quarter growth



Sources: NEF, EFF, finn.no, ECON and Norges Bank

ed in a very low level of housing construction in the first half of the 1990s (see Chart 9). The interest rate and the unemployment rate fell markedly from 1992 to 1997/1998. As a result, house prices rose far more than income. The low level of housing construction also contributed to the growth in house prices.

Chart 10 decomposes the rise in house prices in the period 2001 Q1 - 2004 Q3. The decomposition is based on the estimated model and developments in the explanatory variables.²¹ The calculations show that housing construction pushed down the four-quarter rise by 3-4 percentage points in the period 2001 to 2004 Q3. Growth in wage income pushed up the four-quarter rise by 9-10 percentage points in the first two years of the period. In the last two years, increased unemployment and lower growth in wage income have dampened developments in house prices. In 2003, developments in house prices were further dampened by a negative shock to household expectations in the first half of 2003. This was probably attributable to unexpectedly weak developments internationally, fear of terror, war in Iraq, the spread of SARS, the strong krone exchange rate in early 2002 and poorer prospects for the Norwegian economy.²² The interest rate reductions since December 2002 have pushed up house price inflation by reducing interest expenses, boosting optimism and generating expectations of higher house prices. However, the contribution to the four-quarter rise declined strongly from 2004 Q1 to 2004 Q3.

The above analysis indicates that developments in house prices in recent years can be largely attributed to changes in fundamentals. The expectations variable used can capture effects of non-fundamental factors, but we find no evidence that shocks to expectations have

contributed to pushing house prices up appreciably in the last two years (the contribution from the variable for 2003 is negative (see Chart 10)). Nor do we find significant effects due to lagged changes in house prices. This indicates that households only to a limited extent use the observed rise in house prices as an indicator of future house price inflation.²³ This reduces the risk of house prices becoming overvalued in relation to fundamentals (see discussion in Section 2). However, the model implies that house prices will rise more in the short term than in the long term if interest rates fall. This overshooting does not represent a house price bubble (as we have defined the concept 'bubble'), but it may have negative effects on the economy. However, the estimates imply that the overshooting is relatively moderate even if interest rates fall to the same extent as in recent years.

The analysis so far does not provide evidence that house prices are overvalued compared with fundamentals. However, we have attempted to construct a model that provides the best possible explanation for house price inflation using fundamental variables. If some of the price rise of the past year and a half had reflected a bubble in the housing market, this could (to some extent) have been captured by the interest rate and other explanatory variables in the model.²⁴ One would then have expected the coefficients in the model to be unstable, however. In particular, one would have expected the model to underpredict house price inflation over the past year and a half if it was estimated over a shorter period and simulated forward. Chart 11 shows the results of such an experiment. Here we have estimated the model with data up to and including 2000 Q3, and simulated the model up to and including 2004 Q3.²⁵ Chart 12 shows that the model predicts both the price

²¹ The decomposition method is described in Jacobsen and Naug (2004).

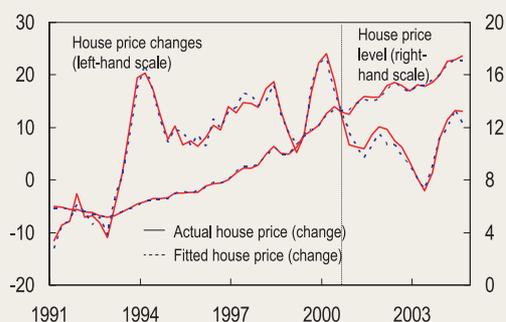
²² Norges Bank adjusted its projection for the unemployment rate (registered unemployed) for 2004 from 3½ per cent in Inflation Report 3/02 to 4½ per cent in *Inflation Report* 2/03.

²³ The IMF (2004) house price equation for 18 OECD countries contains strong, positive effects of the lagged rise in real house prices (the rise in prices the previous year).

²⁴ It is reasonable to assume that there was no price bubble in the housing market in May/June 2003. House prices had then fallen for more than nine months, and the decline was related (according to our analyses) to a negative shock to household expectations.

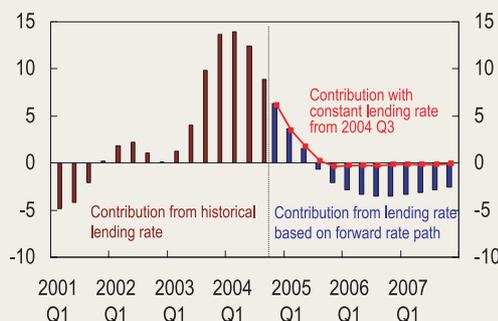
²⁵ We use the actual values of the explanatory factors (but the simulated values of house prices) in the forecast period.

Chart 11 Actual and fitted house price (NOK 1000/sq.m.). Level and percentage change over 4 quarters



Sources: NEF, EFF, finn.no, ECON and Norges Bank

Chart 12 Estimated contribution from banks' lending rate to house prices. Contribution in percentage points to 4-quarter change based on history, constant interest rate from 2004 Q3 and the forward rate path in *Inflation Report 3/04*



Source: Norges Bank

level and house price inflation reasonably well. This indicates that house prices are not overvalued in relation to the fundamental explanatory variables in the model.

House prices may nevertheless move slowly in the period ahead as a result of developments in fundamentals. First, housing investment has increased recently. This will exert downward pressure on house prices in the period ahead. Second, house prices may move slowly when interest rates gradually normalise. Our model implies that the fall in interest rates since December 2002 will only generate moderate impulses to house price inflation in 2005 (see Chart 12). The chart also shows the isolated effect on house prices in the period ahead if the interest rate increases in line with the interest rate path in *Inflation Report 3/04*. In isolation, such a development could lead to a fall in house prices of 3-3½ per cent per year in 2006 and 2007. However, this interest rate path reflects expectations of a decline in unemployment and 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 unemployment, wage income and housing investment also move in line with the analyses in *Inflation Report 3/04*.²⁶ Wage income is estimated to increase by more than 4 per cent in each of the years 2005-2007. The ratio of house prices to wage income will therefore decline without a fall in house prices.

5. Conclusion

House prices have more than tripled since 1992. After falling 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 have analysed factors behind the rise in house prices, using an econometric 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, the fall in interest rates in recent years can explain a substantial portion of house price inflation since May 2003. We find no evidence that house prices are overvalued compared with a fundamental value determined by interest rates, income, unemployment and housing construction.

Our estimates indicate that the fall in interest rates will only make a moderate contribution to house price inflation in 2005. An interest rate increase in line with the interest rate path in *Inflation Report 3/04* may 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 wage income growth. The model implies that house prices will increase by 2-4 per cent per year in the period 2005-2007 if developments in interest rates, unemployment, income and housing construction are in line with the analyses in *Inflation Report 3/04*. If unemployment and/or income should move on a weaker trend than projected in the *Inflation Report*, the rise in interest rates may be less pronounced. The switch to inflation targeting has reduced the possibility that households will be exposed to a double shock in the form of both higher unemployment and higher interest rates, such as they experienced in the early 1990s.

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²⁶ The same result is obtained if we use the alternative house price model in the Appendix.

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Appendix

Table 2 An alternative model of house prices

$$\begin{aligned} \Delta houseprice_t = & 0.22 \Delta income_t - 3.10 \Delta (INTEREST \cdot (1-\tau))_t - 1.38 \Delta (INTEREST \cdot (1-\tau))_{t-1} + 0.05 EXPEC_t \\ & (3.37) \quad (6.84) \quad (2.91) \quad (3.46) \\ & - 0.17 [realhouseprice_{t-1} + 4.19 REALINTEREST_{t-1} + 0.23 unemployment_t - 2.26 (realincome - 0.75 housingstock)_{t-1}] \\ & (7.43) \quad (3.31) \quad (2.49) \quad (12.01) \\ & - 0.21 + 0.02 SI + 0.01 S2 + 0.01 S3. \\ & (5.67) \quad (2.10) \quad (1.35) \quad (1.15) \end{aligned}$$

$$R^2 = 0.87334, \sigma = 0.0143945, DW = 2.47.$$

Estimation period: 1990 Q2 – 2004 Q1.

Estimation method: Least squares method

Absolute *t*-values are given in brackets under the estimates.

The variables are defined in Table 1 (small letters indicate that variables are measured on a logarithmic scale), with the following exceptions:

realhouseprice = *houseprice* - *consumerprice*

consumerprice = Consumer price index adjusted for tax changes and excluding energy products.

Source: Statistics Norway

REALINTEREST = *INTEREST*(1- τ) less the average four-quarter change in *consumerprice* over three years

realincome = *income* - *consumerprice*

Table 3 A model of households' expectations concerning their own financial situation and the Norwegian economy

$$\begin{aligned} \Delta E_t = & - 0.07 - 12.96 \Delta (INTEREST \cdot (1-\tau))_t - 0.43 \Delta unemployment_t - 0.11 E_{t-1} \\ & (0.39) \quad (6.68) \quad (2.47) \quad (1.06) \\ & - 0.40 INTEREST \cdot (1-\tau)_{t-1} - 0.03 unemployment_{t-1} + 0.21 SI + 0.10 S2 + 0.22 S3. \\ & (0.42) \quad (0.82) \quad (4.57) \quad (4.49) \quad (5.61) \end{aligned}$$

$$R^2 = 0.80, \sigma = 0.049, DW = 2.03.$$

Estimation period: 1992 Q4 – 2004 Q1.

Estimation method: Least squares method

Absolute *t*-values are given in brackets under the estimates.

Variables and test statistics are defined in Table 1.

Monetary policy and the trade-off between inflation and output variability

Sharon McCaw, senior economist in the Economics Department and Kjersti Haare Morka, senior economist in the Monetary Policy Department¹

This article explores the consequences of various approaches to the conduct of monetary policy. A small, calibrated model of the Norwegian economy is used, which highlights the short-run trade-off between stabilising inflation and stabilising output. Some approaches to policy can be shown to be unambiguously better than others. However, when policy is efficient, the central bank must decide how much output variability it is willing to tolerate in order to attain more stable inflation.

1. Introduction

Since the beginning of the 1990s, several countries have adopted an inflation targeting framework for monetary policy. Since 2001, the operational target of monetary policy in Norway has been annual consumer price inflation of 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.

Within this type of framework there is considerable leeway regarding how policy is conducted. Subject to maintaining the inflation target in the long-run, the central bank has to decide how closely it will attempt to stabilise inflation around the target, at a cost of higher variability in output. This trade-off is particularly stark in the case of a shock that causes inflation and output to move in different directions (a cost-push or supply shock). The central bank's chosen course of action will depend on the perceived costs of variability in output and inflation respectively.

The aim of this article is to illustrate the consequences of various approaches to the conduct of monetary policy, using a small model for the Norwegian economy. We model different approaches to monetary policy by altering the interest rate response to different signals from the economy and examine the resulting variability in inflation and output. Some of the accepted “stylised facts” regarding inflation targeting monetary policy are illustrated. It is not the goal of this analysis to reach conclusions regarding what objectives the central bank should have, or what manner of conducting monetary policy might be optimal for Norges Bank. Two main points are illustrated:

- A move from flexible towards stricter inflation targeting implies accepting higher variability in output in order to keep inflation closer to the target on average. Stricter inflation targeting is illustrated in three different ways: i) responding relatively more strongly to

inflation than to the output gap, ii) responding to near-term inflation forecasts, and iii) overall stronger policy responses.

- Some approaches to the conduct of policy are unambiguously more *efficient* than others, that is, they attain the desirable result of lower variability in both output and inflation. For example, the central bank can generally achieve better outcomes by being forward-looking in its behaviour.

Section 2 presents the model used in the analysis, while Section 3 discusses the concept of an efficient policy frontier (EPF). Section 4 examines the implications of varying the coefficients in a simple policy rule. Section 5 concludes.

2. The model

This section describes the small, calibrated macroeconomic model that is used in the analysis. We give only a broad overview here; for a more detailed description of the model and its calibration see Husebø, McCaw, Olsen and Røisland (2004).²

2.1 A general overview

The model is highly aggregated, and provides a stylised representation of the key mechanisms in the economy, with a particular emphasis on the transmission mechanisms of monetary policy. It can be viewed as the smallest model necessary to explain the interaction of output, interest rates, exchange rates and inflation, under an inflation-targeting framework.³ Although very simple and highly aggregated, the model has a considerable theoretical content. Starting with the classic small-scale open-economy model by Dornbusch (1976), many similar models have been developed both in the academic literature and in central banks around the world. The quarterly model is calibrated to match salient features of

¹ Thanks to colleagues in Norges Bank for useful comments, and to Douglas Laxton (IMF) for sharing useful Dynare code. All views expressed here are those of the authors and do not necessarily represent the views of Norges Bank.

² The model used for the analysis here is not exactly the same as that described in Husebø et al. (2004). We model the real rather than nominal exchange rate, and the inflation target does not appear explicitly in expectations formation in the Phillips Curve. The differences are not material for the very general points we illustrate in this article.

³ A distinguishing feature of this model is its fairly simple specification of price-setting behaviour, where inflation is assumed to be proportional to an excess demand (output gap) term, as well as its own lag, reflecting nominal rigidities. Wages are not modelled explicitly. More sophisticated price- and wage-setting specifications for closed economies can be found in Taylor (1980) and Fuhrer and Moore (1995); the more recent of these models also allow for inflation persistence. More recent simple open-economy models in the same class include Svensson (1998), Ball (1999), Batini and Haldane (1999) and Leitimo and Røisland (2002).

the Norwegian economy, drawing on theory and a wide range of empirical estimates to choose parameter values for the model that result in appropriate aggregate properties.

Expectations play an explicit role in the model. First, expectations of future inflation are of importance as they will affect price- and wage-setting behaviour today. Second, expectations of future interest rate developments affect today's exchange rate. Finally, expectations of future economic cycles will affect today's spending decisions.

The model aims to explain how deviations from equilibrium develop and dissipate over the medium to long term.⁴ There is a clear role for monetary policy in the model: to provide the economy with a nominal anchor, that is, to prevent actual and expected inflation from drifting away from the target. When the central bank fulfils its role, the economy converges to a well-defined equilibrium. The model is designed such that the monetary authorities cannot boost output above its supply-determined level⁵ in the long run. In other words, in the long-run, monetary policy is neutral and there is no trade-off between the levels of output and inflation.

The model consists of just four key equations:

1) *An aggregate demand (IS) equation* for an open economy that expresses the dynamic relationship between the output gap (i.e. output relative to its sustainable or trend level), the real interest rate, the real exchange rate and world output;

2) *An inflation-adjustment equation (Phillips Curve)* characterising the dynamic response of inflation to inflation expectations, the output gap and the real exchange rate;

3) *An uncovered interest parity (UIP) equation* expressing the dynamic relationship between the exchange rate and the spread between domestic and foreign interest rates;⁶

4) *A monetary policy rule* describing how the central bank sets interest rates in order to balance the short-run trade-off between stabilising inflation around target and stabilising developments in the real economy. We discuss a simple rule specification in more detail later.

Each of these equations has a shock term that represents effects on the dependent variable from all sources other than the dynamics of the other variables appearing in the equation. These shocks will be important in our analysis. A demand shock could for example represent changes in tastes and preferences or the effects of fiscal policy. A shock to the Phillips curve could represent the growing importance of cheaper imports from China or stronger competition in the product market. A shock to

the UIP equation could represent a change in the risk premium associated with Norwegian financial assets. Finally, there is also the possibility of adding exogenous shocks to the monetary policy rule, representing interest rate responses to changes in variables that are not included in the monetary policy rule.

Even though the model is simple, its strength is the focus on the role of monetary policy, a property that makes it well suited for the analysis carried out in this paper. Monetary policy affects inflation and the real economy through three main channels in the model.

First, there is a traditional *demand channel*. An increase in the nominal interest rate also increases the real interest rate, due to nominal rigidities. This discourages expenditure. Less demand pressure, in turn, results in lower inflation through both lower wage inflation and profit margins (not modelled explicitly).

Second, there is an *exchange rate channel*. Higher domestic nominal interest rates relative to those abroad cause the currency to appreciate, all else equal. Imported goods become cheaper and inflation falls. However, a stronger currency also has a negative effect on demand and output, via both an expenditure switching effect towards imports, and reduced competitiveness for industries that compete with firms internationally. Lower demand and output reduce inflation, as above.

Finally, there is the *expectations channel*. Expectations concerning future inflation and economic growth play an important role in price and wage setting. If monetary policy is credible, inflation will be expected to be equal to or close to the inflation target. This in itself contributes to stabilising inflation around the target. If the inflation-targeting framework lacks credibility, on the other hand, stabilising inflation is correspondingly more difficult.

2.2 A rule for monetary policy

We now discuss the monetary policy rule in more detail, since it is at the heart of the analysis in this paper. In the small macro model described above, monetary policy is the key factor that brings the economy back to equilibrium. There are no self-regulating mechanisms that will bring inflation back to target if policy does not adequately respond to disturbances in the economy.

We assume that the central bank sets the interest rate directly, and that monetary policy is oriented towards keeping inflation close to a specified inflation target on average over time. Monetary policy is represented by a simple rule that specifies how the central bank sets the interest rate in response to inflation and the output gap. In practice, no inflation-targeting central bank follows such a simple rule literally, due to the complex and ever-changing nature of the economy. For example, the central bank will typically take into account the entire path of inflation and output when setting the interest rate.

⁴ "Equilibrium" here is a theoretical situation with inflation at target, an output gap of zero, and no shocks hitting the economy.

⁵ Various referred to, with subtleties of meaning we need not concern ourselves with here, as "potential," "natural," "trend," "sustainable" or "equilibrium" output.

⁶ Given only weak evidence that UIP holds in practice, we use a dampened version where exchange rate expectations have both a forward-looking and a backward-looking component.

However, the simple rule captures key features of contemporary central bank policy and is therefore useful for our current model exercise.

Our policy rule takes the form:

$$i_t = \alpha i_{t-1} + (1 - \alpha)[r^* + \pi^* + \theta(\beta(\pi_{t+k} - \pi^*) + (1 - \beta)(y_t - y^*))] \quad (2.1)$$

$0 \leq \alpha < 1, \quad 0 \leq \beta \leq 1, \quad \theta > 1$

where i_t is the nominal short-term interest rate in period t , r^* is the equilibrium real interest rate, π^* is the inflation target and π_t is inflation in period t . The equilibrium nominal interest rate, i^* , is defined by $i^* = r^* + \pi^*$. $(y_t - y^*)$ is the output gap in period t , that is, a deviation of output y_t from its trend or potential level y^* .

The coefficient α represents *interest rate smoothing*, i.e. making the interest rate response to shocks more gradual by including a weight on the previous quarter's interest rate. Interest rate smoothing reflects the fact that central banks are faced with uncertainty, for example regarding the effects of interest rate changes and difficulties in identifying the amplitude and timing of shocks. In practice most central banks prefer to avoid policy reversals and therefore tend to adjust interest rates gradually.

The coefficient θ indicates the overall vigour of the central bank's interest rate responses to deviations in output and inflation from their equilibrium values. We will refer to this as the *aggressiveness* coefficient.

The coefficient β is the *weight on inflation*, i.e. how much the central bank responds to deviations of inflation from its target, with the remaining $(1 - \beta)$ response being placed on the output gap.⁷ It is worth noting that this coefficient is a description of how interest rates respond to the two variables, and does not in itself represent the central bank's preferences between stabilising them. However, as we will see, the two are closely related.

The index k represents the *response horizon* with respect to inflation, that is, whether the interest rate is moved in response to today's observed inflation ($k = 0$) or in response to a forecast of future inflation at time $t + k$. It is useful to clarify the concept of "horizon", as it is used in two different ways in the literature. The response horizon, which is what we examine here, refers to the forecast of inflation, e.g. 4 or 8 quarters ahead, to which monetary policy mechanically responds in a simple rule. The term "policy horizon" is often used to refer to how long it typically takes for monetary policy to bring inflation back to target. The policy horizon will depend not only on the response horizon, but on *all* coefficients in the policy rule, on the entire model of the economy and on the nature of the shocks.

We will change the parameters α , β and θ and the

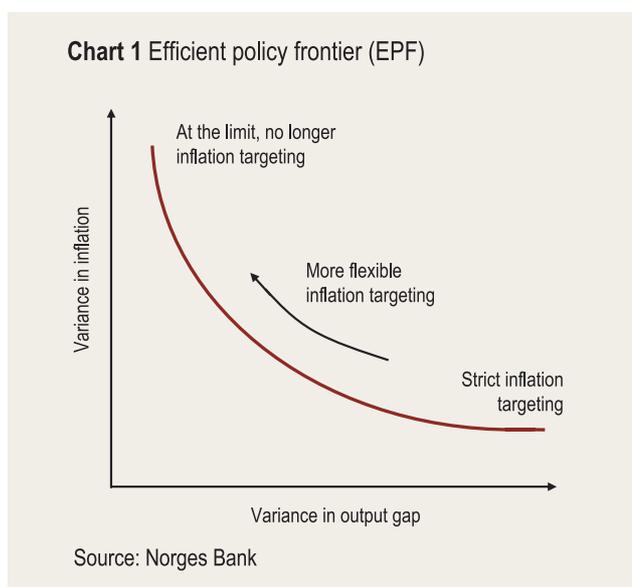
index k in order to illustrate different policy approaches by the central bank and their implications for output and inflation variability. The results will be presented within the framework of efficient policy frontiers (EPFs). The next section discusses the concept of EPFs.

3. Efficient monetary policy frontiers

3.1 The concept of an efficient monetary policy frontier

In theory, the central bank could follow any of an infinite number of possible monetary policy rules. Each rule results in a certain combination of inflation and output variability, which can be plotted in terms of the variance of the two variables. It is standard to assume that the central bank dislikes variability in both output and inflation, which means that points that are nearest the origin are preferable. The *efficient policy frontier* (EPF) (Chart 1) is the series of points where it is not possible to attain lower inflation variability without increasing variability in output.⁸ Any policy rule that results in an inflation-output variability outcome above the frontier is not "efficient"; unambiguously better outcomes are theoretically possible with a different rule.⁹ For example, we will show that some rules that ignore information about future inflation are outperformed by rules that make use of this information. However, it is not possible to say which of the efficient rules on the frontier is best without making explicit assumptions about the central bank's preferences regarding stabilising the two variables.

The EPF is downward sloping. Thus, when policy is efficient, reducing variability in inflation will be at the cost of higher variability in output.¹⁰ The standard channels through which monetary policy operates, outlined in Section 2, work primarily via output movements. For



⁷ For simplicity, we disregard the possibility of the central bank reacting to forecasts of the output gap.

⁸ The central bank may also wish to stabilise other variables in the short-run, such as interest rates and the exchange rate. However, for the purposes of this simple analysis we assume that the central bank is interested in the variability of these variables only to the extent that they affect the variability of output and inflation.

⁹ The position and the slope of the EPF will depend heavily on the model, the strength and nature of the shocks and on the structure of the monetary policy rule. Results regarding which rules are the most efficient must be interpreted with these caveats in mind.

¹⁰ This is not to say that there is a long-run trade-off between the *levels* of output and inflation. As discussed in Section 2, monetary policy is assumed neutral in the long-run.

example, raising interest rates reduces both output and inflation. Therefore, if a shock affects these two variables differently, the short-term trade-off is particularly evident. The more the central bank aims to stabilise inflation, the more output will vary.

Under standard assumptions about how the economy works, the EPF is convex to the origin. In linear models such as the one considered here, there is an increasing marginal cost of stabilising either inflation or output. For example, if the central bank already has a strong preference for keeping inflation close to the target, attempting even stricter inflation targeting would imply a large increase in output variability but only a small reduction, if any, in inflation variability.

The position and slope of the frontier represent the boundary of what monetary policy can achieve. This is determined by first, the constraints arising from the structure of the economy (and in particular the impact of monetary policy), and second, the nature of the shocks to which the economy is subjected. For example, if inflation is fairly sluggish and difficult to influence, the frontier will be further from the origin than if the monetary policy channels were fast-acting. If people give credence to the inflation target when forming their inflation expectations, then inflation shocks are much easier to counteract. Hence, the frontier will be closer to the origin.

Which of the points on the efficient policy frontier is preferable depends on objectives. As central banks can be assumed to dislike both deviations from the inflation target and large fluctuations in output, the central bank's objectives are usually described in the literature as minimising a loss function.¹¹ The bank sets the interest rate so as to minimise a weighted sum of the variability in the two variables (and potentially other variables as well, such as the interest rate). The greater the weight on output gap variability, λ , the more flexible the inflation targeting regime.¹² A central bank that has a low λ (*a strict inflation targeter*) will choose a rule that results in a point to the right on the EPF, tolerating high output variability in order to keep inflation as close as possible to the target at all times. On the other hand, a central bank that has a higher λ also wishes to take into account output variability, and will choose a rule more to the left on the EPF. This increasingly *flexible inflation targeting* becomes more and more expensive in terms of variability in inflation, until monetary policy can eventually no longer be characterised as inflation targeting.

3.2 An efficient policy frontier for Norway

To construct an EPF for the Norwegian economy, we use the model of the economy presented in Section 2. We must make assumptions about the average size and variability of the shocks to which the economy is subjected. We derive reasonable shocks from historical data, and assume for simplicity that the shocks to output,

prices and the exchange rate hit the economy independently of each other. Shocks to the interest rate are disregarded. We must also specify the monetary policy rules we wish to examine. For our simple rule (2.1) the coefficient ranges examined are specified in Table 1. We vary:

- 1) the aggressiveness of the overall monetary policy response: θ ;
- 2) the response to inflation deviations from target relative to the output gap: β ;
- 3) the response horizon, i.e. the central bank responds to projected inflation deviation k quarters ahead; and
- 4) the degree of interest rate smoothing, i.e. gradualism in policy: α .

Table 1. Coefficient ranges

Coefficient	Description	Lower Bound	Upper Bound	Step
θ	Policy aggression	1	40	1
β	Weight on inflation gap vs output gap	0.1	1	0.1
k	Response horizon	0 quarters	16 quarters	2 quarters
α	Interest rate smoothing	0.1	0.9	0.2

Each possible combination of the above coefficients defines one policy rule. For each rule, we calculate the average variance of output and inflation that results under the range of shocks we have specified. Thus, each rule gives one point on the chart.¹³ As described above, the EPF is then the series of points that results in the lowest inflation variability for a given output variability. Not all rules are efficient; most rules lie above the frontier.

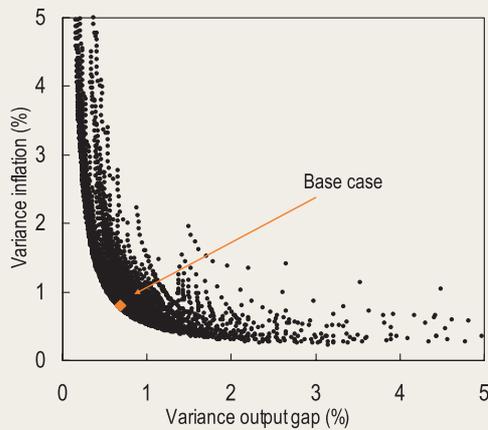
The above coefficient ranges result in about 16 500 different rules. However, some of the rules imply sharper moves in interest rates than tend to be observed in practice. Hence, when deriving the frontier we exclude the rules that result in quarterly interest rate movements of more than 2 percentage points more than 5 percent of the time (more than once every 5 years on average). Almost two thirds of the coefficient combinations are thereby excluded. The coefficients still vary over the full ranges described above. It is various *combinations* of coefficients, particularly of aggression and interest rate smoothing, that determine interest rate volatility. The outcomes from the remaining rules are shown in Chart 2. Imposing such a constraint is fairly standard practice, but it is not important for our qualitative illustrations. If the constraint is not imposed, the frontier has the same shape but lies slightly nearer the origin.

¹¹ See for example Svensson (1998).

¹² Note again that λ , the preference weight on output gap variability in the loss function, is distinct from β , the response weight on the level of the output gap in the policy rule.

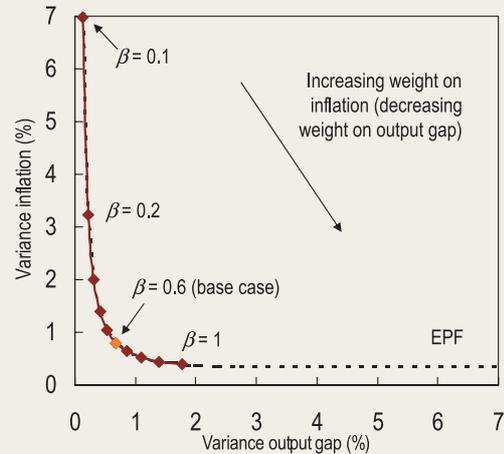
¹³ Simulations were run in Dynare. For more information, see <http://www.cepremap.cnrs.fr/~michel/dynare/>

Chart 2 An efficient policy frontier: a simple model for Norway



Source: Norges Bank

Chart 3 Increasing the relative weight on inflation deviations. Varying β from 0.1 to 1, step 0.1
 $\alpha = 0.3, k = 4, \theta = 6$



Source: Norges Bank

4 Exploring the consequences of different monetary policy approaches

4.1 A base case

We will now explore the consequences of different monetary policy approaches by examining the impact of altering the parameters in the policy rule. To facilitate comparisons between different policy approaches, we first choose a base case policy rule from which to vary the parameters one by one. This particular point on the EPF is not necessarily a better policy than other rules on the frontier. However, it represents a good starting point for our comparisons as it lies centrally on the EPF and does not contain any extreme coefficients (see Chart 2):

$$i_t = 0.3i_{t-1} + (1 - 0.3)[i_t^* + 6(0.6(\pi_{t+4} - \pi^*) + 0.4(y_t - y_t^*))] \quad (4.1)$$

In this rule, the central bank has a moderate degree of interest rate smoothing ($\alpha = 0.3$), responds slightly more to inflation than to the output gap ($\beta = 0.6$), responds to inflation one year ahead ($k = 4$), and responds with an overall aggression parameter of 6 ($\theta = 6$).

This is a fairly activist rule, as are all the rules on the EPF, with implied interest rate volatility close to the upper limit we imposed when deriving the EPF. However, this rule does not imply that if a shock were to raise the forecast of inflation one year ahead from 2.5 percent to 3.0 percent, interest rates would immediately be raised by $0.7 \times 6 \times 0.6 \times 0.5 = 125$ basis points, all else equal. An interest rate response would immediately act to reduce the inflation forecast, meaning that the actual interest rate increase implied by this rule would be less than 125 basis points. This illustrates that a monetary policy rule cannot be evaluated separately from the model in which it resides.

Sections 4.2 to 4.5 analyse the effects of varying, one by one, the coefficients in the monetary policy rule, starting from this base case. In the charts that follow, the EPF is drawn in as a thin dotted line.

4.2 Relative weight on inflation vs output gap deviations

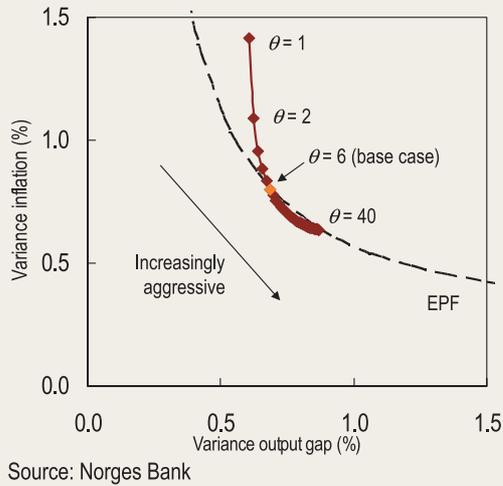
The β coefficient in the policy rule (2.1) characterises the extent to which the central bank responds to inflation deviations from target, relative to the output gap. Chart 3 shows the effect on the variability of inflation and output of increasing β from 0.1 to 1 by steps of 0.1. The parameter on smoothing (α), the aggression of the overall policy response (θ) and the response horizon (k) are fixed as in the base case (4.1).

As the weight on inflation (β) increases, the points shift down and to the right. This is consistent with a move towards stricter inflation targeting, as discussed in Section 3. That is, all else as in the base case rule, if the central bank reacts increasingly to inflation deviations from target and correspondingly less to the output gap when setting interest rates, the variability of inflation is reduced while output variability increases. We can also see the increasing marginal costs discussed in Section 3.1; for example when β is increased to a very high level, there is little gain in terms of reduced inflation variability, but a considerable cost in terms of increased output variability.

Although β is not a direct representation of the central bank's objectives (which are usually described by λ in a loss function), an increase in the response weight on either inflation or the output gap is consistent with a focus on stabilising that variable.¹⁴ This is also illustrated by the fact that if the other coefficients are held fixed as in

¹⁴ There may also be other factors, not captured in our model, that will influence the choice of how much weight to place on the two variables. For example, it is generally considered that the current output gap is very difficult to measure. This may be an argument for reducing the monetary policy response to this variable.

Chart 4 Increasingly aggressive monetary policy.
Varying θ from 1 to 40, step 1.
 $\alpha = 0.3, \beta = 0.6, k = 4$



the base case, changing β traces out the EPF. This implies that β is close to a pure “preference” coefficient in the policy rule, whereas we will see that the other coefficients also have clear implications for the *efficiency* of policy, i.e. whether outcomes lie on the EPF or not.

4.3 Overall policy aggression

We now vary θ , the coefficient determining the aggressiveness of the overall policy response. Chart 4 displays the average effects of increasing the overall aggressiveness of policy. The coefficient θ in equation (2.1) is increased from 1 to 40 in steps of 1. The other coefficients are as in the base case (4.1).

The chart shows that increasing the general aggressiveness of monetary policy responses moves the central bank towards stricter inflation targeting, tolerating greater variability in output in order to reduce inflation variability. As policy becomes more aggressive, there are at first large benefits in terms of reducing inflation variability at little cost in terms of output variability. However, the returns soon diminish. Note that rules with an aggression coefficient greater than 6, all other coefficients equal to the base case, have higher interest rate volatility than we allowed when constructing the EPF. This is why these rules are able to achieve outcomes below the EPF.

The chart shows that low values of θ are inefficient, as the outcomes lie well above the EPF. This finding is not contingent on the base case values for the other coefficients; all the rules on the EPF have aggressiveness of at least 5. This reflects that monetary policy has a clear role to play in stabilising the economy after shocks. It is also partly a result of the fact that we disregard uncertainty in our analysis. If the central bank knows exactly how the economy works and the nature of the shocks it

faces, then a fairly activist policy response will be efficient. In practice, very aggressive policy increases the possibility of making mistakes. In addition, our more general simulation experiments revealed that, even without uncertainty, extremely aggressive policy can be inefficient, destabilising both inflation and output. In our particular model this occurs only at very high levels of interest rate volatility.

4.4 Changing the response horizon for the inflation forecast

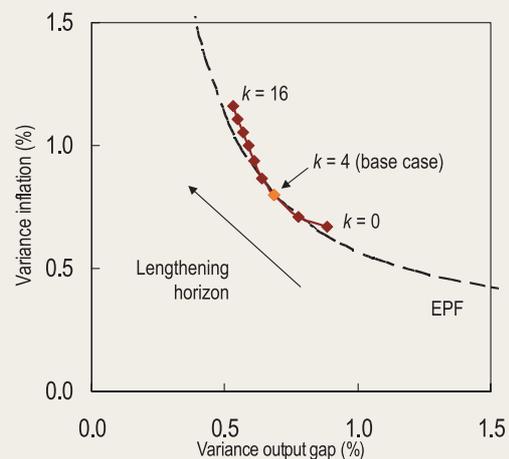
We now examine the implications of lengthening the response horizon, i.e. the implications of whether interest rates respond to what inflation is now, what it is expected to be in a year, or even further ahead.

The response horizon could be a single point in time or a moving average (for example five to eight quarters ahead). In the simple exercise here we take a single quarter horizon, k , which we vary between 0 and 16 with steps of 2 quarters. Chart 5 shows the results, with all other coefficients in the policy rule the same as in the base case rule (4.1).

A very short response horizon results in fairly high variability in output. Attempting to offset near-term movements in inflation may lead to very volatile monetary policy and destabilise the economy. Lengthening the response horizon in our base case rule reduces the variability in output at the cost of increasing the variability in inflation. It can therefore be interpreted as a move towards more flexible inflation targeting.

In the base case rule, the outcomes with very short and very long response horizons all lie above the EPF, i.e. they are not efficient. It can be shown that in the general case, where the other coefficients in the rule are allowed

Chart 5 Lengthening the response horizon.
Varying k from 0 to 16 quarters, step 2.
 $\alpha = 0.3, \beta = 0.6, \theta = 6$



Source: Norges Bank

to vary in their full scope, the vast majority of rules that lie on the EPF have a response horizon of 2 to 8 quarters. Hence, it is generally not efficient to have an extremely short ($k = 0$) or an extremely long response horizon.

As mentioned in Section 2, the *response horizon* should not be confused with the *policy horizon*, which can be considerably longer. For example, responding to current inflation ($k = 0$) does not imply that the central bank aims to return inflation to target immediately. At higher values of k , the response and policy horizons also need not be identical. For a given response horizon, increased interest rate smoothing, less aggressive policy responses or a higher weight on the output gap relative to inflation will all tend to lengthen the policy horizon. Hence, while a longer response horizon implies a longer policy horizon, all else equal, the efficient range for the response horizon does not correspond to a 1:1 prescription for how quickly the central bank should aim to return inflation to target.

A very short response horizon is inefficient because interest rate changes affect inflation with a long lag. With a longer response horizon, the central bank takes this into account and makes use of the information available about future inflation developments. In other words, they “look through” the near-term inflation effects of shocks if forecasts indicate that these will not be persistent. On the other hand, a very long response horizon allows shocks to play through the economy to a greater extent and therefore increases the risk that the inflation effects of shocks will become embedded in inflation expectations. As explained in Section 2, this makes the central bank’s job much harder.

Note also that in our simplified analysis the central bank recognises the shock immediately and knows

exactly what its effect on the economy and inflation will be. In practice, forecasts far ahead are increasingly unreliable. Looking too far ahead could therefore lead to monetary policy mistakes, with associated increased variability in both inflation and output.

4.5 Interest rate smoothing

Chart 6 shows the effect on the variance of inflation and output of increasing the degree of interest rate smoothing. The coefficient α in equation (2.1) is increased from 0.1 to 0.9 by steps of 0.2. The other coefficients are as in the base case rule (4.1).

Smoothing interest rates leads to increased variability in both inflation and output, i.e. unambiguously worse outcomes moving away from the EPF.¹⁵ It can be shown that this is a general result, true not just for the base-case rule, but for all values of the other coefficients. This result is not surprising. Given that we assume that the central bank knows exactly how the economy works and also the exact nature of the shock, delaying the policy response is inefficient. In practice, on the other hand, the central bank has to evaluate the cost of delaying the response versus the potential cost of making a policy mistake should the shock, or the economy’s response to it, turn out to be different than expected. Interest rate smoothing may therefore be quite reasonable in practice.

5 Conclusion

We have explored the implications of different approaches to monetary policy in a small model of the Norwegian economy and discussed the following general points.

First, central banks face a choice between stabilising inflation or output in the short-run. An efficient policy frontier maps out the limits of what monetary policy can achieve in terms of stabilising these two variables. These limits are contingent on the assumptions built into the model, such as the sluggishness of inflation and how monetary policy affects the economy.

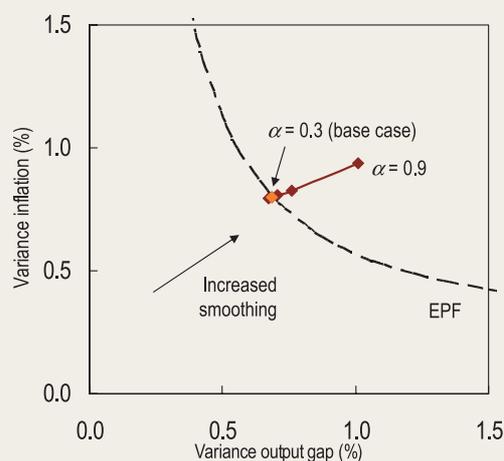
Second, this choice can be demonstrated by changing the coefficients in a simple policy rule for monetary policy. Starting from an efficient base case rule, i) increasing the overall aggression of policy, ii) increasing the weight on inflation relative to the output gap, or iii) responding to nearer-term inflation forecasts, all move policy towards stricter inflation targeting. That is, they imply lower variability in inflation at the cost of higher variability in output. Changing these coefficients in the opposite direction is a move towards more flexible inflation targeting, with lower variability in output at the cost of higher variability in inflation.

However, more general investigations reveal that some ways of conducting policy are more efficient than others, resulting in lower variability in both inflation and

Chart 6 Increasing interest rate smoothing.

Varying α from 0.1 to 0.9, step 0.2.

$\beta = 0.6$, $\theta = 6$, $k = 4$



Source: Norges Bank

¹⁵ Our base case rule with 0.3 smoothing nonetheless lies on the EPF because of the interest rate volatility constraint we imposed when deriving the frontier.

output. The following results, all standard in the literature, are found to hold in our small model:

- Neither very mild nor very aggressive policy is efficient. Monetary policy has a clear role to play in offsetting shocks, but can also destabilise the economy.
- Interest rate smoothing is never efficient. However, this finding is a result of the simplified nature of our analysis, which does not allow for monetary policy uncertainty or mistakes.
- Because of the lags with which monetary policy influences the economy, it is not optimal to respond only to current inflation. The central bank can do better by taking future inflation developments into account. On the other hand, responding to inflation more than 2 years ahead is usually not efficient in our model. Such a long response horizon increases the risk that inflation expectations may become entrenched away from the inflation target, which makes the central bank's job harder. However, this does not imply that the central bank should always aim to bring inflation back to target within 2 years. A given response horizon can be consistent with a wide range of policy horizons, depending on the specification of both the other coefficients in the monetary policy rule and the model itself.

It is important to bear in mind caveats to our results. The variability in output and inflation will be entirely contingent on the specification of the model and the shocks. Moreover, uncertainty is not taken into account in this exercise. We assume, for the sake of simplicity, that the central bank has perfect knowledge of the way the economy works (i.e. the model is correct) and of the distribution of shocks. The analysis of the implications of uncertainty for monetary policy is an important and complex field. We do not draw any conclusions here, but note that the efficient coefficient values are conditional on uncertainty assumptions. Our results are illustrative and intended to be interpreted qualitatively.

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Norges Bank publishes more detailed statistics on its website, www.norges-bank.no. The Bank's statistics calendar, which shows future publication dates, is only published on this website.

Financial institution balance sheets

Table 1. Norges Bank. Balance sheet. In millions of NOK

	31.12.2003	31.10.2004	30.11.2004	31.12.2004	31.01.2005
FINANCIAL ASSETS					
Foreign assets	250 975	252 022	268 568	268 399	284 663
International reserves	250 941	251 919	268 524	268 360	284 627
Other assets	33	103	44	39	35
Government Petroleum Fund investments	844 587	984 467	997 912	1 015 471	1 070 462
Domestic claims and other assets	39 195	53 177	26 609	3 995	4 320
Securities	23 281	22 953	23 109	0	0
Loans	12 552	27 490	506	494	497
Other claims	1 901	1 056	1 317	1 815	2 145
Fixed assets	1 461	1 391	1 389	1 395	1 387
Gold collection		287	287	291	291
Costs	174 151	39 436	42 378	0	34 344
TOTAL ASSETS	1 308 907	1 329 102	1 335 466	1 287 865	1 393 789
LIABILITIES AND CAPITAL					
Foreign liabilities	51 963	57 647	64 604	51 167	73 811
Deposits	256	1 014	1 257	309	620
Borrowing	49 776	54 607	61 428	48 993	71 316
Other liabilities	267	418	349	289	254
Counterpart of Special Drawing Rights allocation in IMF	1 664	1 608	1 571	1 575	1 620
Government Petroleum Fund deposits	844 587	984 467	997 912	1 015 471	1 070 462
Domestic liabilities	191 993	201 647	186 208	173 925	161 148
Notes and coins in circulation	46 249	43 232	43 902	47 595	45 175
Treasury	108 586	135 531	125 114	88 816	76 368
Other deposits	28 343	18 076	11 373	37 158	39 256
Borrowing	8 229	4 234	5 089	0	48
Other debt	586	575	731	356	301
Equity	46 213	43 483	43 483	47 302	47 302
Valuation adjustments	123 469	-15 926	-19 776	0	36 870
Income	50 682	57 785	63 035	0	4 196
TOTAL LIABILITIES AND CAPITAL	1 308 907	257 111	248 511	223 161	233 038
Commitments					
Allotted, unpaid shares in the BIS	275	275	275	258	258
International reserves					
Derivatives and forward exchange contracts sold	53 004	100 082	96 381	83 020	100 641
Derivatives and forward exchange contracts purchased	55 485	104 436	104 207	87 931	99 513
Government Petroleum Fund					
Derivatives and forward exchange contracts sold	236 920	438 583	502 930	534 611	607 293
Derivatives and forward exchange contracts purchased	248 582	445 943	525 038	526 161	573 522
Rights ¹⁾					
International reserves:					
Options sold	646	2 327	1 293	341	223
Options purchased	647	2 484	1 638	598	3 149
Government Petroleum Fund:					
Options sold	4 324	15 579	29 618	2 232	1 093
Options purchased	4 331	16 616	10 914	3 992	14 371

¹⁾ Options presented in terms of market value of underlying instruments as from December 2003.

Table 2. Norges Bank. Specification of international reserves. In millions of NOK

	31.12.2003	31.10.2004	30.11.2004	31.12.2004	31.01.2005
Gold	3 142	0	0	0	0
Special drawing rights in the IMF	2 237	1 929	1 909	2 181	1 962
Reserve position in the IMF	6 641	5 513	5 385	5 250	5 350
Loans to the IMF	703	566	547	535	539
Bank deposits abroad	92 681	73 818	79 456	77 923	77 087
Foreign Treasury bills	744	129	1 916	112	615
Foreign Treasury notes	107	0	0	0	95
Foreign certificates	1 315	755	1 037	928	949
Foreign bearer bonds ¹⁾	109 063	121 515	131 947	126 733	146 355
Foreign shares	33 566	52 217	52 915	54 500	56 154
Accrued interest	742	-4 523	-6 587	199	-4 479
Total	250 941	251 919	268 525	268 361	284 627

¹⁾ Includes bonds subject to repurchase agreements.

Source: Norges Bank

Table 3. State lending institutions. Balance sheet. In millions of NOK

	31.12.2003	31.03.2004	30.06.2004	30.09.2004	31.12.2004
Cash holdings and bank deposits	2 542	2 252	2 396	2 497	2 754
Total loans	191 220	189 541	189 393	189 623	189 572
Of which:					
To the general public ¹⁾	188 541	186 850	186 607	186 585	186 543
Claims on the central government and social security administration	-	-	-	-	-
Other assets	4 844	5 883	4 700	5 557	3 878
Total assets	198 606	197 676	196 489	197 677	196 204
Bearer bond issues	25	24	20	20	16
Of which:					
In Norwegian kroner	25	24	20	20	16
In foreign currency	-	-	-	-	-
Other loans	189 764	188 204	188 341	188 139	187 718
Of which:					
From the central government and social security administration	189 764	188 204	188 341	188 139	187 718
Other liabilities, etc.	5 455	6 081	5 064	5 736	4 767
Share capital, reserves	3 362	3 367	3 064	3 782	3 703
Total liabilities and capital	198 606	197 676	196 489	197 677	196 204

¹⁾ Includes local government administration, non-financial enterprises and households.

Sources: Statistics Norway and Norges Bank

Table 4. Banks.¹⁾ Balance sheet. In millions of NOK

	31.12.2003	31.03.2004	30.06.2004	30.09.2004	31.12.2004
Cash	4 980	4 157	4 633	4 390	4 649
Deposits with Norges Bank	26 784	27 772	18 046	29 768	37 017
Deposits with Norwegian banks	19 982	23 586	32 390	21 230	18 383
Deposits with foreign banks	56 636	43 252	54 376	25 867	27 174
Treasury bills	7 288	7 170	7 280	5 074	6 451
Other short-term paper	7 394	4 695	13 626	11 759	8 429
Government bonds etc. ²⁾	5 529	7 070	7 300	7 862	6 858
Other bearer bonds	105 734	108 253	117 961	118 235	125 075
Loans to foreign countries	51 186	52 883	61 235	52 597	51 570
Loans to the general public	1 186 014	1 212 904	1 245 327	1 277 267	1 303 674
Of which:					
In foreign currency	85 731	88 128	85 142	82 131	72 915
Loans to mortgage and finance companies, insurance etc. ³⁾	108 890	120 103	125 617	92 022	92 839
Loans to central government and social security admin.	139	546	706	713	636
Other assets ⁴⁾	143 072	162 244	145 233	149 879	126 727
Total assets	1 723 628	1 774 635	1 833 730	1 796 663	1 809 482
Deposits from the general public	786 055	798 519	834 449	813 423	844 790
Of which:					
In foreign currency	24 001	27 405	29 771	28 727	29 028
Deposits from Norwegian banks	21 756	27 284	32 924	21 254	18 927
Deposits from mortg. and fin. companies, and insurance etc. ³⁾	47 767	50 318	51 384	53 165	53 008
Deposits from central government, social security admin. and state lending institutions	10 090	8 423	8 305	8 008	6 198
Funds from CDs	70 673	71 972	73 819	77 116	77 938
Loans and deposits from Norges Bank	19 995	6 816	18 745	5 502	5 275
Loans and deposits from abroad	220 247	235 694	246 385	226 177	222 297
Other liabilities	435 033	463 035	451 220	471 127	455 286
Share capital/primary capital	28 530	31 276	31 708	31 714	31 767
Allocations, reserves etc.	76 999	77 682	77 857	78 125	79 526
Net income	6 483	3 616	6 934	11 052	14 470
Total liabilities and capital	1 723 628	1 774 635	1 833 730	1 796 663	1 809 482
Specifications:					
Foreign assets	193 506	186 196	206 172	175 553	156 612
Foreign debt	467 134	501 660	504 876	492 533	463 502

¹⁾ Includes commercial and savings banks.

²⁾ Includes government bonds and bonds issued by lending institutions.

³⁾ Includes mortgage companies, finance companies, life and non-life insurance companies and other financial institutions.

⁴⁾ Includes unspecified loss provisions (negative figures) and loans and other claims not specified above.

Sources: Statistics Norway and Norges Bank

Table 5. Banks.¹⁾ Loans and deposits by sector²⁾. In millions of NOK

	31.12.2003	31.03.2004	30.06.2004	30.09.2004	31.12.2004
Loans to:					
Local government (incl. municipal enterprises)	8 095	9 304	9 234	8 913	7 873
Non-financial enterprises ³⁾	356 382	358 150	360 523	363 014	357 567
Households ⁴⁾	821 537	845 450	875 570	905 340	938 233
Total loans to the general public	1 186 014	1 212 904	1 245 327	1 277 267	1 303 674
Deposits from:					
Local government (incl. municipal enterprises)	38 484	41 849	43 031	37 093	41 169
Non-financial enterprises ³⁾	234 285	233 651	235 336	235 285	261 619
Households ⁴⁾	513 286	523 019	556 083	541 045	542 002
Total deposits from the general public	786 055	798 519	834 449	813 423	844 790

¹⁾ Includes commercial and savings banks.

²⁾ Includes local government administration, non-financial enterprises and households.

³⁾ Includes private enterprises with limited liability etc., and state enterprises.

⁴⁾ Includes sole proprietorships, unincorporated enterprises and wage earners, etc.

Sources: Statistics Norway and Norges Bank

Table 6. Mortgage companies. Balance sheet. In millions of NOK

	31.12.2003	31.03.2004	30.06.2004	30.09.2004	31.12.2004
Cash and bank deposits	2 926	3 519	3 084	4 699	2 265
Notes and certificates	970	852	2 166	3 366	4 288
Government bonds ¹⁾	1 296	680	1 122	1 606	137
Other bearer bonds	53 979	58 051	60 538	59 585	53 788
Loans to:					
Financial enterprises	36 617	41 048	41 311	43 542	47 222
The general public ²⁾	210 435	216 425	222 139	225 171	236 800
Other sectors	9 195	9 224	9 443	9 115	9 188
Others assets ³⁾	6 180	9 462	7 623	5 090	6 475
Total assets	321 598	339 261	347 426	352 174	360 163
Notes and certificates	32 440	32 757	26 303	26 755	7 123
Bearer bonds issues in NOK ⁴⁾	57 544	56 761	53 665	53 468	55 764
Bearer bond issues in foreign currency ⁴⁾	110 490	122 970	135 009	136 285	159 559
Other funding	103 000	108 981	115 930	117 646	119 498
Equity capital	12 273	12 571	12 889	13 141	13 058
Other liabilities	5 851	5 221	3 630	4 879	5 161
Total liabilities and capital	321 598	339 261	347 426	352 174	360 163

¹⁾ Includes government bonds and bonds issued by state lending institutions.

²⁾ Includes local government administration, non-financial enterprises and households.

³⁾ Foreign exchange differences in connection with swaps are entered net in this item. This may result in negative figures for some periods.

⁴⁾ Purchase of own bearer bonds deducted.

Sources: Statistics Norway and Norges Bank

Table 7. Finance companies. Balance sheet. In millions of NOK

	31.12.2003	31.03.2004	30.06.2004	30.09.2004	31.12.2004
Cash and bank deposits	1 951	2 380	2 365	2 166	2 364
Notes and certificates	103	141	129	134	0
Bearer bonds	0	0	0	0	44
Loans ¹⁾ (gross) to:	92 956	98 070	102 425	99 460	103 405
The general public ²⁾ (net)	89 039	93 313	96 524	94 650	98 264
Other sectors (net)	3 700	4 540	5 671	4 559	4 916
Other assets ³⁾	2 599	2 679	3 022	2 387	2 377
Total assets	97 609	103 270	107 941	104 147	108 190
Notes and certificates	0	0	0	0	0
Bearer bonds	533	533	533	657	657
Loans from non-banks	11 826	12 461	12 706	12 472	12 298
Loans from banks	70 994	74 688	78 033	74 981	79 243
Other liabilities	6 030	6 722	7 183	6 564	6 268
Capital, reserves	8 226	8 866	9 486	9 473	9 724
Total liabilities and capital	97 609	103 270	107 941	104 147	108 190

¹⁾ Includes subordinated loan capital and leasing finance.

²⁾ Includes local government administration, non-financial enterprises and households.

³⁾ Includes specified and unspecified loan loss provisions (negative figures).

Source: Norges Bank

Table 8. Life insurance companies. Main assets. In millions of NOK

	31.12.2003	31.03.2004	30.06.2004	30.09.2004	31.12.2004
Cash and bank deposits	21 557	21 252	20 000	23 191	27 693
Norwegian notes and certificates	29 484	16 743	22 731	20 078	28 418
Foreign Treasury bills and notes	7 473	5 872	2 555	2 761	5 509
Norwegian bearer bonds	140 295	146 591	147 247	146 334	141 636
Foreign bearer bonds	108 540	123 189	130 335	130 826	128 066
Norwegian shares, units, primary capital certificates and interests	47 853	55 122	50 139	61 116	66 196
Foreign shares, units, primary capital certificates and interests	50 052	54 704	61 237	60 724	66 013
Loans to the general public ¹⁾	20 628	20 263	19 737	18 379	18 241
Loans to other sectors	676	711	685	651	625
Other specified assets	53 731	54 719	52 958	59 749	52 591
Total assets	480 289	499 166	507 624	523 809	534 988

¹⁾ Includes local government administration, non-financial enterprises and households.

Source: Statistics Norway

Table 9. Non-life insurance companies. Main assets. In millions of NOK

	31.12.2003	31.03.2004	30.06.2004	30.09.2004	31.12.2004
Cash and bank deposits	7 583	7 095	8 179	5 854	5 856
Norwegian notes and certificates	12 465	11 423	12 539	13 144	15 537
Foreign notes and certificates	1 072	654	1 260	2 097	4 292
Norwegian bearer bonds	16 764	19 776	18 730	20 320	20 024
Foreign bearer bonds	11 403	12 179	12 750	12 425	11 796
Norwegian shares, units, primary capital certificates, interests	7 863	8 653	8 734	9 182	9 584
Foreign shares, units, primary capital certificates, interests	6 471	7 104	7 757	8 063	6 168
Loans to the general public ¹⁾	1 285	1 308	1 287	1 338	1 396
Loans to other sectors	206	203	207	201	239
Other specified assets	41 615	47 425	43 495	40 167	41 348
Total assets	106 727	115 820	114 938	112 791	116 240

¹⁾ Includes local government administration, non-financial enterprises and households.

Source: Statistics Norway

Table 10a. Securities funds' assets. Market value. In millions of NOK

	30.09.2003	31.12.2003	31.03.2004	30.06.2004	30.09.2004
Bank deposits	4 602	5 992	6 312	7 132	7 059
Treasury bills, etc. ¹⁾	5 855	4 158	4 772	4 131	3 887
Other Norwegian short-term paper	22 491	25 185	21 817	21 218	19 464
Foreign short-term paper	469	614	232	236	245
Government bonds, etc. ²⁾	4 080	4 469	4 974	5 435	6 278
Other Norwegian bonds	25 806	26 715	28 824	30 379	34 073
Foreign bonds	5 180	6 752	6 859	6 950	7 232
Norwegian equities	23 326	28 871	32 242	32 627	33 617
Foreign equities	36 195	43 581	51 975	53 674	56 304
Other assets	3 394	3 718	4 038	4 157	4 334
Total assets	131 399	150 056	162 044	165 937	172 492

¹⁾ Comprises Treasury bills and other certificates issued by state lending institutions.

²⁾ Comprises government bonds and bonds issued by state lending institutions.

Sources: Norges Bank and Norwegian Central Securities Depository

Table 10b. Securities funds' assets under management by holding sector. Market value.
In millions of NOK

	30.09.2003	31.12.2003	31.03.2004	30.06.2004	30.09.2004
Central government and social security administration	704	726	982	1 169	1 173
Banks	1 645	1 844	684	676	625
Other financial enterprises	16 204	25 921	26 364	27 048	28 511
Local government admin. and municipal enterprises	10 775	12 944	11 998	12 413	12 899
Other enterprises	23 607	27 869	27 436	28 161	29 621
Households	70 372	72 793	83 969	85 247	87 328
Rest of the world	5 094	4 605	7 266	7 880	8 991
Total assets under management	128 402	146 702	158 699	162 593	169 147

Sources: Norges Bank and the Norwegian Central Securities Depository

Securities statistics

Table 11. Shareholdings registered with the Norwegian Central Securities Depository (VPS), by holding sector. Estimated market value. In millions of NOK

Holding sector	30.09.2003	31.12.2003	31.03.2004	30.06.2004	30.09.2004
Central government and social security administration	228 580	279 981	312 837	313 479	330 408
Norges Bank	2	3	3	3	3
State lending institutions	18	20	21	20	21
Banks		12 980	24 336	24 831	15 806
Savings banks	3 350				
Commercial banks	10 731				
Insurance companies	23 254	27 214	29 197	29 701	32 226
Mortgage companies	30	7	7	7	7
Finance companies	2	2	3	2	3
Mutual funds	26 280	31 769	34 870	35 122	36 659
Other financial enterprises	48 764	49 070	37 883	35 501	36 293
Local government administration and municipal enterprises	3 890	4 765	4 977	4 726	4 996
State enterprises	6 677	6 755	8 282	8 731	7 188
Other private enterprises	143 478	145 887	156 172	162 929	168 838
Wage-earning households	47 553	47 000	52 080	50 028	54 423
Other households	1 981	2 234	2 445	2 365	2 632
Rest of the world	209 647	228 064	250 851	271 278	316 727
Unspecified sector	720	543	526	502	496
Total	754 955	836 296	914 490	939 225	1 006 726

Sources: Norwegian Central Securities Depository and Norges Bank

Table 12. Share capital and primary capital certificates registered with the Norwegian Central Securities Depository, by issuing sector. Nominal value. In millions of NOK

	30.09.2003	31.12.2003	31.03.2004	30.06.2004	30.09.2004
Banks		27 512	29 983	30 146	30 140
Savings banks	11 511				
Commercial banks	15 845				
Insurance companies	2 528	2 530	2 700	1 584	1 584
Mortgage companies	2 194	2 194	2 194	2 244	2 244
Finance companies	5	5	5	5	5
Other financial enterprises	20 092	16 861	17 120	17 069	16 995
Local government administration and municipal enterprises	2	2	197	197	197
State enterprises	18 268	18 273	18 277	18 277	17 945
Other private enterprises	45 814	45 220	45 511	45 588	47 199
Rest of the world	5 422	5 224	6 296	7 206	7 250
Unspecified sector	4	0	0	0	0
Total	121 684	117 821	122 284	122 317	123 560

Sources: Norwegian Central Securities Depository and Norges Bank

Table 13. Net purchases and net sales (-) in the primary and secondary markets of shares registered with the Norwegian Central Securities Depository, by purchasing, selling and issuing sector¹⁾. Estimated market value. In millions of NOK

2004 Q3	Purchasing/ selling sector																
	Cent.gov't and social security	Norges Bank	State lending inst.	Banks	Insur. companies	Mort. companies	Fin. companies	Secur. funds	Other financ. enterpr.	Local gov't & munic. enterpr.	State enterpr.	Other private enterpr.	Wage-earning households	Other households	Rest of the world	Unsp. sector	Total ²⁾
Banks	2	0	0	147	-40	0	0	-141	74	-21	-1	-78	1	3	74	0	18
Insurance companies	0	0	0	0	-3	0	0	4	0	-11	0	5	4	0	1	0	0
Mortgage companies	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Finance companies	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other financial enterpr.	1 355	0	0	-971	-179	0	0	-1 134	556	-60	-1	-568	-760	-38	2 229	-6	422
Local gov't. admin. and municipal enterprises	0	0	0	1	5	0	0	13	0	-15	-1	-2	5	0	-8	1	0
State enterprises	-18 190	0	0	1 467	176	0	0	66	-309	-61	552	-339	-425	-58	16 958	-2	-164
Other private enterprises	5 394	0	-4	3 995	514	0	0	458	-1 779	-76	-181	-3 927	1 547	51	11 802	41	17 835
Rest of the world	-710	0	0	8 942	-788	0	0	-1 244	-937	-30	0	-385	-540	44	-1 952	-6	2 393
Unspecified sector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	-12 149	0	-4	13 581	-315	0	0	-1 977	-2 397	-274	368	-5 294	-167	1	29 103	27	20 504

¹⁾ Issues at issue price + purchases at market value – sales at market value – redemptions at redemption value.

²⁾ Total shows net issues in the primary market. Purchases and sales in the secondary market result in redistribution between owner sectors, but add up to 0.

Sources: Norwegian Central Securities Depository and Norges Bank

Table 14. Bondholdings in NOK registered with the Norwegian Central Securities Depository, by holding sector. Market value. In millions of NOK

	30.09.2003	31.12.2003	31.03.2004	30.06.2004	30.09.2004
Central government and social security administration	27 183	28 630	28 173	28 049	27 256
Norges Bank	8 275	6 549	8 884	7 571	7 963
State lending institutions	141	126	122	105	101
Banks		83 504	82 415	90 254	92 251
Savings banks	34 638				
Commercial banks	45 872				
Insurance companies	208 000	213 906	224 418	221 806	230 185
Mortgage companies	16 348	16 912	16 983	16 630	17 785
Finance companies	63	61	127	110	135
Mutual funds	30 387	30 897	34 734	37 329	41 894
Other financial enterprises	8 245	5 231	5 877	8 042	9 119
Local government administration and municipal enterprises	22 801	23 283	22 187	22 943	23 979
State enterprises	2 813	6 087	2 585	2 756	2 857
Other private enterprises	23 075	24 451	24 968	25 201	25 821
Wage-earning households	18 125	20 134	21 269	22 390	22 481
Other households	6 436	6 933	6 990	7 448	7 804
Rest of the world	74 887	78 992	78 628	77 176	72 241
Unspecified sector	270	216	213	228	216
Total	527 559	545 910	558 573	568 038	582 091

Sources: Norwegian Central Securities Depository and Norges Bank

Table 15. Bondholdings in NOK registered with the Norwegian Central Securities Depository, by issuing sector. Nominal value. In millions of NOK

	30.09.2003	31.12.2003	31.03.2004	30.06.2004	30.09.2004
Central government and social security administration	149 395	152 392	157 946	157 012	159 945
State lending institutions	169	148	144	123	119
Banks		159 244	163 638	174 496	180 675
Savings banks	88 407				
Commercial banks	70 132				
Insurance companies	317	317	252	252	252
Mortgage companies	62 856	62 854	62 996	58 968	60 651
Finance companies	500	500	500	500	625
Other financial enterprises	2 617	2 619	2 619	2 699	2 699
Local government administration and municipal enterprises	48 661	51 652	57 326	58 505	59 047
State enterprises	32 415	32 721	29 215	33 107	33 404
Other private enterprises	38 999	40 220	34 085	36 035	34 898
Households	196	213	213	213	99
Rest of the world	16 397	17 792	19 156	21 096	21 657
Unspecified sector	0	0	0	0	0
Total	511 059	520 673	528 090	543 006	554 072

Sources: Norwegian Central Securities Depository and Norges Bank

Table 16. Net purchases and net sales (-) in the primary and secondary markets for NOK-denominated bonds registered with the Norwegian Central Securities Depository, by purchasing, selling and issuing sector.¹⁾ Market value. In millions of NOK

2004 Q3	Purchasing/ selling sector															Unsp. sector	Total ²⁾
	Cent.gov't and social security	Norges Bank	State lending inst.	Banks	Insur. companies	Mort. companies	Fin. companies	Secur. funds	Other financ. enterpr.	Local gov't & munic. enterpr.	State enterpr.	Other private enterpr.	Wage-earning households	Other households	Rest of the world		
Central government and social security admin.	-2 021	1 351	0	3 491	6 527	302	-3	2 113	-83	-157	10	183	14	472	-4 586	2	7 614
State lending inst.	0	0	-25	-4	-1	0	0	0	0	0	0	0	0	0	0	0	-29
Banks	-285	0	0	2 849	8 971	1 085	41	5 975	1 622	578	86	198	1 505	394	-912	12	22 120
Insurance companies	0	0	0	-12	10	0	0	20	-25	0	0	12	0	0	-5	0	0
Mortgage companies	-121	0	0	1 023	-1 612	-493	1	13	-7	-200	-1	-356	-50	-20	233	-1	-1 593
Finance companies	0	0	0	80	-44	0	0	21	0	-12	0	0	10	0	69	0	125
Other financial enterprises	0	0	0	-203	-405	0	0	-34	1 057	-68	0	-1	5	-56	-26	0	269
Local gov't. admin. and municipal enterprises	356	0	0	743	-1 441	17	-6	553	576	508	8	-234	-13	-24	-27	1	1 017
State enterprises	460	0	0	1 856	1 667	51	0	254	203	-307	-3 194	35	17	101	-463	1	681
Other private enterprises	-311	0	0	-1 199	1 239	0	5	1 124	370	84	-52	1 322	64	-15	-543	-1	2 086
Households	0	0	0	0	-20	0	0	0	-26	0	0	-34	-6	-2	0	0	-88
Rest of the world	3	0	0	454	1 884	0	39	1 037	161	125	1	302	583	32	-761	5	3 866
Unspecified sector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	-1 920	1 351	-25	9 077	16 776	963	76	11 075	3 848	552	-3 143	1 427	2 128	883	-7 020	20	36 068

¹⁾ Issues at issue price + purchases at market value – sales at market value – redemptions at redemption value.

²⁾ Total shows net issues in the primary market. Purchases and sales in the secondary market result in redistribution between owner sectors, but add up to 0.

Sources: Norwegian Central Securities Depository and Norges Bank

Table 17. NOK-denominated short-term paper registered with the Norwegian Central Securities Depository by holding sector. Market value. In millions of NOK

	30.09.2003	31.12.2003	31.03.2004	30.06.2004	30.09.2004
Central government and social security administration	9 257	1 443	1 744	1 379	1 812
Norges Bank	10 288	7 471	6 689	10 232	10 117
State lending institutions	0	0	0	0	0
Banks		16 439	13 355	19 510	17 117
Savings banks	3 924				
Commercial banks	12 333				
Insurance companies	58 291	53 719	44 357	46 338	43 489
Mortgage companies	3 247	1 778	2 139	2 710	3 145
Finance companies	36	41	17	17	3
Mutual funds	28 802	29 881	26 993	25 364	23 781
Other financial enterprises	3 695	3 286	4 264	5 411	4 158
Local government administration and municipal enterprises	2 296	2 031	2 146	1 826	2 022
State enterprises	4 293	6 473	5 284	2 563	4 348
Other private enterprises	3 676	3 761	5 049	2 064	2 276
Wage-earning households	237	160	41	37	17
Other households	1 152	1 293	889	852	880
Rest of the world	9 249	10 423	10 058	9 192	6 533
Unspecified sector	0	0	0	0	0
Total	150 775	138 200	123 024	127 495	119 698

Sources: Norwegian Central Securities Depository and Norges Bank

Table 18. Outstanding short-term paper, by issuing sector.¹⁾ Nominal value. In millions of NOK

Issuing sector	31.12.2003	31.03.2004	30.06.2004	30.09.2004	31.12.2004
Central government and social security administration	68 013	62 332	66 426	61 051	66 000
Counties	404	574	694	694	554
Municipalities	5 468	5 531	5 251	5 257	4 601
State lending institutions	0	0	0	0	0
Banks	42 602	38 203	44 213	41 715	40 050
Commercial banks	7 713	.	.	.	.
Savings banks	34 889	.	.	.	.
Mortgage companies	5 843	3 260	1 317	997	3 322
Finance companies	0	0	0	0	0
Other financial enterprises	19	19	19	19	0
State enterprises	2 860	2 510	2 310	2 225	1 825
Municipal enterprises	6 276	6 326	5 681	6 066	6 987
Private enterprises	6 674	6 299	8 062	6 966	6 486
Rest of the world	3 493	3 723	2 000	2 600	2 700
Total	141 652	128 777	135 973	127 590	132 525

¹⁾ Comprises short-term paper issued in Norway in NOK by domestic sectors and foreigners and paper in foreign currency issued by domestic sectors.

Source: Norges Bank

Credit and liquidity trends

Table 19. Credit indicator and money supply

	Volume figures at end of period NOKbn			Percentage growth				
				Over past 12 months			Over past 3 months, annualised rate ⁴⁾	
	C2 ¹⁾	C3 ²⁾	M2 ³⁾	C2 ¹⁾	C3 ²⁾	M2 ³⁾	C2	M2
December 1995	936.0	1 081.5	530.3	4.9	4.9	6.0	5.4	1.3
December 1996	992.5	1 166.0	564.4	6.0	5.7	6.4	7.8	4.6
December 1997	1 099.1	1 309.6	578.5	10.2	10.4	1.8	10.2	3.0
December 1998	1 192.8	1 461.4	605.3	8.3	12.6	4.4	6.5	5.4
December 1999	1 295.0	1 620.9	670.1	8.4	8.6	10.5	10.0	8.4
December 2000	1 460.9	1 842.4	731.8	12.3	11.2	8.8	12.2	7.3
December 2001	1 608.2	2 010.3	795.4	9.7	7.8	9.3	9.3	10.5
December 2002	1 724.9	2 098.7	855.3	8.9	7.9	8.3	10.1	9.0
October 2003	1 828.7	2 236.9	868.9	7.6	6.5	2.8	7.4	2.6
November 2003	1 841.4	2 235.4	856.9	7.0	5.8	3.3	7.5	2.8
December 2003	1 846.5	2 230.7	873.1	6.8	5.5	1.9	7.3	1.5
January 2004	1 863.4	2 259.9	880.3	6.8	5.4	1.3	7.0	1.4
February 2004	1 874.2	2 274.2	877.2	7.0	5.5	2.0	7.1	2.0
March 2004	1 882.4	2 274.3	886.7	7.1	5.6	3.7	7.2	6.6
April 2004	1 894.4	2 296.1	883.8	7.2	5.6	4.6	7.7	10.5
May 2004	1 909.0	2 304.8	889.6	7.1	5.6	4.6	8.2	11.5
June 2004	1 930.3	2 332.9	919.3	7.5	5.7	5.6	8.6	8.0
July 2004	1 937.2	2 347.1	912.4	7.7	6.3	4.8	8.5	4.6
August 2004	1 947.1	2 339.9	897.6	7.7	5.7	3.7	8.5	3.1
September 2004	1 961.1	2 371.0	902.3	8.0	6.1	5.6	8.9	2.9
October 2004	1 976.0	2 381.5	906.3	8.3	6.2	4.6	9.8	9.6
November 2004	1 991.5	2 386.6	932.6	8.4	6.6	9.2	10.4	12.1
December 2004	2 004.5		936.5	8.8		7.6	10.1	14.5
January 2005	2 017.9		940.9	8.9		7.2		

¹⁾ C2 = Credit indicator. Credit from domestic sources; actual figures.

²⁾ C3 = Total credit from domestic and foreign sources; actual figures.

³⁾ M2 = Money supply (see note to Table 21).

⁴⁾ Seasonally adjusted figures.

Source: Norges Bank

**Table 20. Domestic credit supply to the general public¹⁾, by source. In millions of NOK.
12-month growth as a percentage**

	31.12.2002		31.12.2003		31.12.2004		31.01.2005	
	Amount	%	Amount	%	Amount	%	Amount	%
Private banks	1 097 144	8.2	1 185 722	7.8	1 303 640	10.0	1 315 166	10.1
State lending institutions	185 932	5.3	188 593	1.4	186 542	-1.1	189 213	0.3
Mortgage companies	182 006	10.9	210 326	15.3	236 799	13.0	238 534	13.0
Finance companies	83 234	9.9	89 257	7.0	98 263	14.9	94 907	13.1
Life insurance companies	23 124	-5.5	20 628	-10.8	18 241	-11.6	18 240	-11.1
Pension funds	3 936	5.2	3 295	-16.3	3 295	0.0	3 295	0.0
Non-life insurance companies	926	-0.9	1 285	38.8	1 396	8.6	1 400	8.5
Bond debt ²⁾	107 399	19.8	114 147	6.3	123 801	8.5	123 620	6.6
Notes and short-term paper	26 145	10.1	19 614	-25.0	20 067	2.3	21 114	-1.0
Other sources	15 036	33.1	13 646	-9.2	12 426	-8.9	12 460	-7.3
Total domestic credit (C2)³⁾	1 724 882	8.9	1 846 513	6.8	2 004 470	8.8	2 017 949	8.9

¹⁾ Comprises local government administration, non-financial enterprises and households

²⁾ Adjusted for non-residents' holdings of Norwegian private and municipal bonds in Norway.

³⁾ Corresponds to Norges Bank's credit indicator (C2).

Source: Norges Bank

Table 21. Composition of money supply. In millions of NOK

Actual figures at end of period	Notes and coins	Transaction account deposits	M1 ¹⁾	Other deposits ²⁾	CDs	M2 ³⁾	Change in M2 last 12 months, total
December 1995	42 069	178 653	217 727	296 799	15 731	530 257	28 952
December 1996	43 324	208 073	247 938	294 741	21 686	564 365	34 108
December 1997	46 014	227 382	269 597	278 741	30 200	578 538	14 173
December 1998	46 070	237 047	279 189	292 820	33 322	605 331	26 793
December 1999	48 020	300 128	343 494	295 820	30 802	670 116	64 785
December 2000	46 952	328 816	371 339	326 350	34 152	731 841	61 725
December 2001	46 633	344 110	386 148	370 171	39 048	795 367	63 526
December 2002	44 955	360 341	400 623	409 704	45 001	855 328	59 961
October 2003	40 816	384 107	421 197	416 966	30 757	868 920	24 249
November 2003	41 806	379 363	417 288	407 412	32 234	856 934	27 769
December 2003	46 249	387 309	428 996	407 337	36 806	873 139	17 811
January 2004	42 801	388 505	427 385	419 593	33 284	880 262	13 670
February 2004	42 224	393 706	432 244	415 276	29 726	877 246	18 479
March 2004	41 872	398 672	436 799	416 023	33 895	886 717	32 407
April 2004	42 057	391 151	429 453	428 562	25 775	883 790	39 269
May 2004	43 162	393 995	432 802	425 358	31 404	889 564	38 834
June 2004	43 704	428 193	467 793	419 011	32 459	919 263	48 235
July 2004	43 735	422 117	461 620	419 108	31 643	912 371	41 477
August 2004	43 191	406 141	445 281	421 549	30 792	897 622	30 452
September 2004	43 103	409 565	448 700	422 173	31 435	902 308	47 011
October 2004	43 232	414 667	453 881	419 012	33 377	906 270	37 350
November 2004	43 902	421 022	461 052	431 965	39 535	932 552	75 618
December 2004	47 595	430 092	473 432	423 193	39 902	936 527	63 388
January 2005	45 175	429 682	470 736	433 298	36 838	940 872	60 610

¹⁾ Narrow money, M1, comprises the money-holding sector's stock of Norwegian notes and coins plus the sector's transaction account deposits in Norges Bank, commercial banks and savings banks (in NOK and foreign currency).

²⁾ Excluding restricted bank deposits (BSU, IPA, withholding tax accounts, etc).

³⁾ Broad money, M2, comprises the sum of M1 and the money-holding sector's other bank deposits and CDs (in NOK and foreign currency) excluding restricted bank deposits (BSU, IPA, withholding tax accounts, etc).

Source: Norges Bank

Table 22. Household financial balance. Financial investments and holdings, by financial instrument. In billions of NOK

	Financial investments					Holdings				
	Year			Q3		Year			At 30 Sept.	
	2001	2002	2003	2003	2004	2001	2002	2003	2003	2004
Currency and deposits	34.5	48.3	25.5	-13.4	-15.4	481.4	529.9	556.8	551.9	582.1
Securities other than shares	6.7	1.9	2.8	0.4	0.3	21.6	23.0	27.9	25.7	30.0
Shares and other equity	3.6	20.4	41.0	11.3	11.5	150.1	148.7	163.5	161.3	176.9
Mutual funds shares	2.0	-2.1	4.1	1.8	-0.7	76.9	59.8	78.3	75.5	94.2
Insurance technical reserves	40.1	32.0	46.7	10.9	12.7	490.0	506.3	568.1	546.0	612.1
Loans and other assets ¹⁾	6.4	20.4	22.8	8.6	8.0	148.2	169.1	191.9	188.2	200.1
Total assets	93.2	120.8	143.1	19.7	16.3	1 368.1	1 436.9	1 586.5	1 548.5	1 695.4
Loans from banks (incl. Norges Bank)	67.3	72.0	92.2	27.9	25.9	660.4	727.8	822.1	792.0	905.8
Loans from state lending institutions	7.7	7.5	2.5	0.3	-0.3	148.5	156.0	158.5	159.1	158.0
Loans from private mortgage and finance companies	14.3	13.8	15.9	3.4	3.5	67.7	80.5	96.2	91.6	103.3
Loans from insurance companies	-0.6	0.4	-2.4	-0.1	-1.2	16.1	16.5	14.0	16.4	12.8
Other liabilities ²⁾	7.2	5.6	-1.0	-12.7	-6.7	118.7	123.2	122.2	115.2	119.6
Total liabilities	95.9	99.3	107.2	18.8	21.1	1 011.4	1 104.0	1 212.9	1 174.3	1 299.6
Net financial investments / assets	-2.7	21.4	35.9	0.9	-4.8	356.7	332.9	373.5	374.2	395.8

¹⁾ Loans, accrued interest, holiday pay claims and tax claims.

²⁾ Other loans, securities other than shares, tax liabilities and accrued interest.

Source: Norges Bank

Table 23. Money market liquidity. Liquidity effect from 1 January to end period. In millions of NOK

Supply+/withdrawal–	1.1 - 31.12		1.1 - 28.2	
	2003	2004	2004	2005
Central government and other public accounts (excl. paper issued by state lending institutions and government)	-13 408	-43 666	14 824	1 277
Paper issued by state lending institutions and government	-41 322	19 008	-6 306	-8 993
Purchase of foreign exchange for Government Petroleum Fund	14 620	46 870	0	0
Other foreign exchange transactions	0	75	0	0
Holdings of banknotes and coins ¹⁾ (estimate)	-1 337	-1 266	4 083	2 714
Overnight loans	0	0	0	0
Fixed-rate loans	12 000	0	0	0
Other central bank financing	18 716	-12 079	-12 056	283
Total reserves	-10 731	8 942	545	-4 719
Of which:				
Sight deposits with Norges Bank	-10 731	8 942	545	-4 719
Treasury bills	0	0	0	0
Other reserves (estimate)	0	0	0	0

¹⁾ The figures are mainly based on Norges Bank's accounts. Discrepancies may arise between the bank's own statements and banking statistics due to different accruals.

Source: Norges Bank

Interest rate statistics

Table 24. Nominal interest rates for NOK. Averages. Per cent per annum

	1-month		3-month		12-month		Interest rate on banks' overnight loans in Norges Bank	Interest rate on banks' sight deposits with Norges Bank
	NIDR	NIBOR	NIDR	NIBOR	NIDR	NIBOR		
	October 2003	2.9	2.8	3.0	2.9	3.2			3.1	4.5	2.5
November 2003	2.9	2.8	3.1	2.9	3.2	3.1	4.5	2.5
December 2003	2.9	2.8	2.8	2.6	2.9	2.8	4.4	2.4
January 2004	2.5	2.3	2.4	2.3	2.5	2.3	4.2	2.2
February 2004	2.3	2.1	2.1	2.0	2.2	2.1	4.0	2.0
March 2004	2.1	1.9	2.0	1.8	2.1	1.9	3.8	1.8
April 2004	2.1	2.0	2.1	2.0	2.3	2.2	3.8	1.8
May 2004	2.1	2.0	2.1	2.0	2.4	2.3	3.8	1.8
June 2004	2.2	2.0	2.2	2.0	2.5	2.4	3.8	1.8
July 2004	2.1	2.0	2.1	2.0	2.3	2.2	3.8	1.8
August 2004	2.1	2.0	2.2	2.0	2.4	2.2	3.8	1.8
September 2004	2.1	2.0	2.1	2.0	2.2	2.1	3.8	1.8
October 2004	2.1	2.0	2.1	2.0	2.3	2.1	3.8	1.8
November 2004	2.1	2.0	2.1	2.0	2.3	2.1	3.8	1.8
December 2004	2.1	2.0	2.1	2.0	2.3	2.2	3.8	1.8
January 2005	2.0	1.9	2.1	2.0	2.3	2.2	3.8	1.8
February 2005	2.0	1.9	2.0	1.9	2.3	2.2	3.8	1.8

Note: NIDR = Norwegian Interbank Deposit Rate, a pure krone interest rate.

NIBOR = Norwegian Interbank Offered Rate, constructed on the basis of currency swaps.

Source: Norges Bank

**Table 25. Short-term interest rates¹⁾ for selected currencies in the Euro-market.
Per cent per annum**

	DKK	GBP	JPY	SEK	USD	Interest rate differential	
						EUR	NOK/EUR
October 2003	2.1	3.8	0.0	2.8	1.1	2.1	0.6
November 2003	2.2	3.9	-0.1	2.8	1.1	2.1	0.6
December 2003	2.2	4.0	0.0	2.8	1.1	2.1	0.4
January 2004	2.1	4.0	0.0	2.7	1.1	2.1	0.1
February 2004	2.1	4.1	0.0	2.5	1.1	2.1	-0.2
March 2004	2.1	4.3	0.0	2.3	1.1	2.0	-0.3
April 2004	2.1	4.3	0.0	2.1	1.1	2.0	-0.2
May 2004	2.2	4.5	0.0	2.1	1.2	2.1	-0.2
June 2004	2.2	4.7	0.0	2.1	1.5	2.1	-0.2
July 2004	2.2	4.8	0.0	2.1	1.6	2.1	-0.2
August 2004	2.1	4.9	0.0	2.1	1.7	2.1	-0.2
September 2004	2.1	4.9	0.0	2.1	1.9	2.1	-0.3
October 2004	2.1	4.8	0.0	2.1	2.1	2.1	-0.2
November 2004	2.1	4.8	0.0	2.1	2.3	2.2	-0.3
December 2004	2.1	4.8	0.0	2.1	2.5	2.2	-0.3
January 2005	2.1	4.8	0.0	2.0	2.6	2.1	-0.3
February 2005	2.1	4.8	0.0	2.0	2.8	2.1	-0.3

¹⁾ Three-month rates, monthly average of daily quotations.

Sources: OECD and Norges Bank

Table 26. Yields on government bonds¹⁾. Per cent per annum

	3-year	5-year	10-year
October 2003	3.9	4.4	4.9
November 2003	3.9	4.4	5.0
December 2003	3.5	4.1	4.8
January 2004	3.2	3.7	4.5
February 2004	2.8	3.4	4.3
March 2004	2.7	3.3	4.1
April 2004	3.1	3.9	4.7
May 2004	3.3	4.1	4.9
June 2004	3.3	4.1	4.7
July 2004	3.1	3.8	4.5
August 2004	3.0	3.6	4.3
September 2004	2.8	3.5	4.2
October 2004	2.8	3.5	4.2
November 2004	2.7	3.3	4.0
December 2004	2.7	3.2	3.9
January 2005	2.7	3.2	3.9
February 2005	2.7	3.2	3.8

¹⁾ Whole-year interest rate paid in arrears. Monthly average. As of 1 January 1993 based on interest rate on representative bonds weighted by residual maturity.

Source: Norges Bank

Table 27. Yields on government bonds¹⁾ in selected countries. Per cent per annum

	Germany	Sweden	France	UK	Japan	Interest rate differential	
						US	NOK/DEM ²⁾
October 2003	4.3	4.9	4.3	4.9	1.4	4.2	0.6
November 2003	4.5	5.0	4.4	5.0	1.3	4.3	0.5
December 2003	4.4	4.9	4.3	4.9	1.4	4.3	0.4
January 2004	4.3	4.7	4.2	4.8	1.3	4.1	0.3
February 2004	4.2	4.6	4.1	4.8	1.2	4.1	0.1
March 2004	4.0	4.4	4.0	4.7	1.4	3.8	0.1
April 2004	4.2	4.6	4.2	4.9	1.5	4.3	0.5
May 2004	4.3	4.7	4.3	5.1	1.5	4.7	0.6
June 2004	4.4	4.8	4.4	5.2	1.8	4.8	0.3
July 2004	4.3	4.6	4.3	5.1	1.8	4.5	0.2
August 2004	4.2	4.5	4.1	5.0	1.6	4.3	0.1
September 2004	4.1	4.4	4.1	4.9	1.5	4.2	0.1
October 2004	4.0	4.3	4.0	4.8	1.5	4.1	0.2
November 2004	3.9	4.2	3.9	4.7	1.5	4.2	0.2
December 2004	3.7	4.0	3.6	4.5	1.4	4.2	0.3
January 2005	3.6	3.9	3.6	4.6	1.4	4.3	0.3
February 2005	3.6	3.8	3.6	4.6	1.4	4.2	0.1

¹⁾ Government bonds with 10 years to maturity. Monthly average of daily quotations.

²⁾ Differential between yields on Norwegian and German government bonds with 10 years to maturity.

Sources: OECD and Norges Bank

Table 28. Banks. Average interest rates and commissions on utilised NOK loans to the general public at end of quarter. Per cent per annum

	Loans, excl. non-accrual loans								
	Total loans	Local government	Non-financial public enterprises	Non-financial private enterprises	Households	Credit lines		Repayment loans	
						Overdrafts and building loans	Housing loans	Other loans	
2003 Q4									
Commercial banks	4.48	4.41	3.50	4.59	4.44	6.51	4.20	4.51	
Savings banks	4.96	3.35	3.85	5.61	4.81	7.59	4.51	5.56	
All banks	4.73	3.89	3.64	4.99	4.65	7.03	4.37	4.96	
2004 Q1									
All banks	4.34	2.98	3.14	4.58	4.28	6.76	4.01	4.51	
2004 Q2									
All banks	4.13	2.84	2.88	4.34	4.08	6.63	3.82	4.27	
2004 Q3									
All banks	4.12	2.88	2.83	4.27	4.09	7.01	3.77	4.21	
2004 Q4									
All banks	4.04	2.88	2.78	4.13	4.02	6.87	3.69	4.11	

Source: Norges Bank

Table 29. Banks. Average interest rates on deposits in NOK from the general public at end of quarter. Per cent per annum

	Total deposits	Local government	Non-financial public enterprises	Non-financial private enterprises	Households	Deposits on transaction accounts	Other deposits
2003 Q4							
Commercial banks	1.81	2.48	2.16	1.81	1.77	1.63	2.03
Savings banks	1.87	2.53	2.37	1.91	1.80	1.32	2.17
All banks	1.84	2.51	2.25	1.84	1.79	1.50	2.12
2004 Q1							
All banks	1.42	1.92	1.66	1.37	1.40	1.13	1.67
2004 Q2							
All banks	1.25	1.81	1.73	1.25	1.20	1.00	1.49
2004 Q3							
All banks	1.28	1.82	1.70	1.28	1.24	1.02	1.52
2004 Q4							
All banks	1.27	1.78	1.71	1.26	1.22	1.04	1.48

Source: Norges Bank

Table 30. Life insurance companies. Average interest rates by type of loan at end of quarter. Per cent per annum

	Housing loans	Other loans	Total loans
31.12.2003	4.1	5.3	4.7
31.03.2004	3.7	5.2	4.5
30.06.2004	3.6	5.1	4.4
30.09.2004	3.6	5.1	4.4
31.12.2004	3.6	4.8	4.3

Source: Norges Bank

Table 31. Mortgage companies. Average interest rates, incl. commissions on loans to private sector at end of quarter. Per cent per annum

	Housing loans	Loans to private enterprises	Total loans
31.12.2003	5.5	5.7	5.2
31.03.2004	5.1	5.4	4.5
30.06.2004	4.8	4.9	4.1
30.09.2004	4.8	4.8	4.0
31.12.2004	4.7	4.7	3.9

Source: Norges Bank

Profit/loss and capital adequacy data

Table 32. Profit/loss and capital adequacy: all banks¹⁾.
Percentage of average total assets

	2002	2003	2004
Interest income	7.5	5.8	4.2
Interest expenses	5.4	3.9	2.4
Net interest income	2.1	1.9	1.8
Total other operating income	0.7	0.9	0.9
Other operating expenses	1.8	1.6	1.6
Operating profit before losses	1.0	1.2	1.1
Recorded losses on loans and guarantees	0.5	0.4	0.1
Ordinary operating profit before taxes	0.6	0.7	1.1
Capital adequacy ratio ²⁾	12.2	12.4	12.1
Of which:			
Core capital	9.6	9.7	9.7

¹⁾ Parent banks (excl. foreign branches) and foreign-owned branches / subsidiary banks.

²⁾ As a percentage of the basis of measurement for capital adequacy.

Source: Norges Bank

Table 33. Profit/loss and capital adequacy: finance companies¹⁾.
Percentage of average total assets

	2002	2003	2004
Interest income	9.7	8.5	6.4
Interest expenses	5.6	3.8	2.1
Net interest income	4.1	4.7	4.3
Total other operating income	2.5	2.3	1.4
Other operating expenses	4.1	4.0	3.1
Operating profit before losses	2.5	3.0	2.6
Recorded losses on loans and guarantees	0.6	1.0	0.6
Ordinary operating profit before taxes	1.9	2.0	2.0
Capital adequacy ratio ²⁾	10.9	10.9	11.3
Of which:			
Core capital	9.3	9.4	9.6

¹⁾ All Norwegian parent companies (excl. OBOS) and foreign-owned branches.

²⁾ As a percentage of the basis of measurement for capital adequacy.

Source: Norges Bank

Table 34. Profit/loss and capital adequacy: mortgage companies¹⁾.
Percentage of average total assets

	2002	2003	2004
Interest income	5.3	4.4	3.3
Interest expenses	4.7	3.8	2.7
Net interest income	0.7	0.7	0.5
Total other operating income	-0.0	0.0	0.0
Other operating expenses	0.2	0.1	0.1
Operating profit before losses	0.5	0.5	0.4
Recorded losses on loans and guarantees	0.0	0.0	0.0
Ordinary operating profit before taxes	0.5	0.5	0.4
Capital adequacy ²⁾	12.7	12.2	12.3
Of which:			
Core capital	10.4	9.6	9.3

¹⁾ All Norwegian parent companies.

²⁾ As a percentage of the basis of measurement for capital adequacy.

Source: Norges Bank

Exchange rates

Table 35. The international value of the krone and exchange rates against selected currencies. Monthly average of representative market rates

	Trade-weighted krone exchange rate ¹⁾	1 EUR	100 DKK	1 GBP	100 JPY	100 SEK	1 USD
October 2003	102.26	8.2278	110.74	11.80	6.42	91.32	7.04
November 2003	101.95	8.1969	110.22	11.83	6.41	91.14	7.01
December 2003	101.55	8.2414	110.74	11.74	6.22	91.34	6.71
January 2004	105.45	8.5925	115.36	12.42	6.41	94.04	6.81
February 2004	107.82	8.7752	117.77	12.96	6.51	95.63	6.94
March 2004	105.34	8.5407	114.65	12.72	6.42	92.49	6.97
April 2004	103.00	8.2938	111.42	12.46	6.43	90.47	6.92
May 2004	101.55	8.2006	110.21	12.21	6.10	89.83	6.83
June 2004	102.74	8.2856	111.45	12.47	6.24	90.62	6.83
July 2004	104.82	8.4751	113.98	12.73	6.32	92.16	6.91
August 2004	103.06	8.3315	112.04	12.45	6.19	90.70	6.84
September 2004	103.42	8.3604	112.40	12.27	6.22	91.96	6.84
October 2004	101.52	8.2349	110.71	11.91	6.06	90.87	6.60
November 2004	100.18	8.1412	109.55	11.65	5.98	90.48	6.27
December 2004	100.90	8.2181	110.55	11.83	5.91	91.52	6.13
January 2005	100.99	8.2125	110.38	11.76	6.06	90.77	6.26
February 2005	102.51	8.3199	111.79	12.06	6.09	91.58	6.39

¹⁾The nominal effective krone exchange rate is calculated on the basis of the NOK exchange rate against the currencies of Norway's 25 main trading partners, calculated as a chained index and trade-weighted using the OECD's weights. The weights, which are updated annually, are calculated on the basis of each country's competitive position in relation to Norwegian manufacturing. The index is set at 100 in 1990. A rising index value denotes a depreciating krone.

Further information can be found on Norges Bank's website (www.norges-bank.no).

Source: Norges Bank

Table 36. Exchange cross rates. Monthly average of representative exchange rates

	GBP/USD	EUR/GBP	USD/EUR	EUR/JPY	JPY/USD
October 2003	1.6760	0.6976	1.169	128.1083	109.57
November 2003	1.6888	0.6927	1.170	127.8064	109.25
December 2003	1.7496	0.7022	1.228	132.4419	107.81
January 2004	1.8223	0.6921	1.261	134.1105	106.34
February 2004	1.8683	0.6768	1.265	134.7664	106.57
March 2004	1.8268	0.6712	1.226	133.0724	108.53
April 2004	1.7999	0.6655	1.198	129.0620	107.75
May 2004	1.7872	0.6714	1.200	134.3959	112.00
June 2004	1.8272	0.6642	1.214	132.8262	109.44
July 2004	1.8422	0.6657	1.226	134.0781	109.32
August 2004	1.8188	0.6693	1.217	134.5203	110.50
September 2004	1.7932	0.6813	1.222	134.4870	110.08
October 2004	1.8059	0.6914	1.249	135.9705	108.89
November 2004	1.8593	0.6986	1.299	136.0822	104.77
December 2004	1.9291	0.6947	1.340	139.0986	103.79
January 2005	1.8777	0.6986	1.312	135.6150	103.38
February 2005	1.8866	0.6897	1.301	136.5290	104.93

Source: Norges Bank

Balance of payments

Table 37. Balance of payments. In millions of NOK

	2002	2003	2004
Goods balance	186 009	192 390	217 923
Service balance	21 524	19 426	21 031
Net interest and transfers	-13 641	-11 472	-7 738
Current account balance	193 892	200 344	231 216
Distributed among:			
Petroleum activities	255 813	277 264	322 860
Shipping	18 283	17 506	22 781
Other	-80 204	-94 426	-114 425
Net capital transfers etc. to other countries	1 463	-4 712	1 028
Net investment in financial assets \ Net capital outflow	192 429	205 056	230 188
Distributed among:			
Norwegian foreign investment	395 536	329 350	436 451
Foreign investment in Norway	271 860	190 807	259 982
Unallocated (incl. errors and omissions)	68 753	66 513	53 719
Distributed by purpose:			
Direct investment	28 722	2 445	10 210
Portfolio investment	189 775	41 987	193 483
Other investment in financial assets	-140 593	91 822	-64 028
International reserves	45 772	2 289	36 804
Unallocated (incl. errors and omissions)	68 753	66 513	53 719
Distributed by sector:			
Government administration ¹⁾	149 140	134 512	175 106
Norges Bank	30 460	13 319	28 630
Banks	-73 450	-29 140	-43 409
Insurance	56 178	24 556	55 810
Other financial enterprises	-29 177	-25 529	-57 338
Non-financial enterprises etc.	-9 475	20 826	17 669
Unallocated (incl. errors and omissions)	68 753	66 513	53 719

¹⁾ Including the Petroleum Fund.

Sources: Statistics Norway and Norges Bank

Table 38. Norway's foreign assets and debt. In billions of NOK

	31.12.2002			31.12.2003			30.09.2004		
	Assets	Debt	Net	Assets	Debt	Net	Assets	Debt	Net
Government administration ¹⁾	835	281	554	1 161	381	780	1 509	589	920
Norges Bank	234	63	171	262	62	201	305	84	222
Banks	126	391	-265	193	490	-297	176	515	-339
Insurance	190	29	161	219	25	193	253	29	224
Other financial enterprises	103	195	-92	131	245	-114	144	308	-164
Non-financial enterprises etc.									
- Public enterprises	120	141	-20	162	157	5	218	183	35
- Private enterprises	349	505	-156	337	523	-186	327	555	-227
- Households and non-profit organisations	73	11	62	84	12	72	91	12	80
Unallocated (incl. errors and omissions)	-3	-5	1	68	5	63	105	8	97
All sectors	2 028	1 612	415	2 617	1 900	716	3 129	2 282	847

¹⁾ Including the Petroleum Fund.

N.B. Changes have been made in the use of sources with effect from this publication. This has led to revision of the source data.

Sources: Statistics Norway and Norges Bank

International capital markets

Table 39. Changes in banks' international assets.¹⁾ In billions of USD

	2001	2002	2003	Q3		Outstanding
				2003	2004	At 30.09.04
Total	859.4	740.1	1 075.1	-110.0	236.1	17 706.8
Of which vis-à-vis:						
Non-banks	442.1	315.2	545.0	119.5	199.5	6 354.0
Banks (and undistributed)	417.3	425.0	530.1	-229.5	36.6	11 352.8

1) International assets (external positions) comprise
 – cross-border claims in all currencies
 – foreign currency loans to residents
 – equivalent assets, excluding lending.

Source: Bank for International Settlements

Table 40. Banks' international claims by currency. Percentage of total international assets

	December			Q3	
	2001	2002	2003	2003	2004
US dollar (USD)	45.2	41.9	39.4	40.2	39.2
Deutsche mark (DEM)	..	..	..	..	..
Swiss franc (CHF)	2.1	2.0	1.8	1.9	1.7
Japanese yen (JPY)	6.2	5.6	4.9	5.0	4.7
Pound sterling (GBP)	5.4	5.3	5.5	5.2	5.6
French franc (FRF)	..	..	..	..	..
Italian lira (ITL)	..	..	..	..	..
ECU/EURO ¹⁾	28.9	33.6	37.6	36.2	38.0
Undistributed ²⁾	12.2	11.6	10.8	11.5	10.8
Total in billions of USD	11 625.6	13 370.3	15 996.6	14 929.9	17 706.8

¹⁾ From January 1999.

²⁾ Including other currencies not shown in the table, and assets in banks in countries other than the home countries of the seven currencies specified.

Source: Bank for International Settlements

Foreign currency trading

Table 41. Foreign exchange banks. Foreign exchange purchased/sold forward with settlement in NOK.¹⁾ In billions of NOK at end of month

	Purchased net from:				Total	Purchased gross from:		Sold gross to:	
	Central gov't ²⁾	Other financial inst. ³⁾	Non-financial sector	Foreign sector		Non-financial sector	Foreign sector	Non-financial sector	Foreign sector
January 2004	0.0	-9.9	52.4	103.7	146.2	83.2	485.1	30.8	381.4
February 2004	0.0	-1.8	52.3	81.3	131.8	92.2	440.9	39.9	359.6
March 2004	0.0	10.8	47.1	133.4	191.3	87.9	475.5	40.8	342.1
April 2004	0.0	26.4	39.0	124.1	189.5	78.0	455.8	39.0	331.7
May 2004	0.0	20.3	39.3	130.7	190.3	78.6	452.1	39.3	321.4
June 2004	0.0	18.8	48.0	134.5	201.3	81.9	428.1	33.9	293.6
July 2004	0.0	15.6	49.8	116.2	181.6	81.6	359.5	31.8	243.3
August 2004	-0.2	11.0	45.4	118.1	174.3	77.0	360.1	31.6	242.0
September 2004	-0.4	15.2	42.9	131.7	189.4	74.5	388.2	31.6	256.5
October 2004	-0.3	25.0	32.9	123.5	181.1	68.4	329.7	35.5	206.2
November 2004	-0.6	26.1	35.4	130.6	191.5	75.9	346.4	40.5	215.8
December 2004	0.0	20.7	39.8	147.1	207.6	80.4	343.5	40.6	196.4
January 2005	0.0	13.2	41.2	147.4	201.8	78.9	294.8	37.7	147.4

¹⁾ Excl. exchange rate adjustments.

²⁾ Central government administration, social security administration and Norges Bank.

³⁾ Incl. possible discrepancies between forward assets and forward liabilities within the category of foreign exchange banks.

Source: Statements from commercial and savings banks (registered foreign exchange banks) to Norges Bank

Table 42. Foreign exchange banks. Overall foreign currency position. In millions of NOK

	31.12.2003	31.03.2004	30.06.2004	30.09.2004	31.12.2004
Foreign assets, spot	249 446	243 887	265 607	236 109	213 891
Foreign liabilities, spot	418 306	460 346	458 072	434 817	422 805
1. Spot balance, net	-168 860	-216 459	-192 465	-198 708	-208 914
2. Forward balance, net	124 179	201 952	193 924	196 350	202 197

Source: Norges Bank

Table 43. Norges Banks' foreign currency transactions with various sectors. In billions of NOK⁶⁾

	2002		2003		Week in 2004/2005									
	1-52	1-52	1-52	1-52	48	49	50	51	52	53	1	2	48-2	
1. Norwegian customers														
Net spot ¹⁾	14	11	11	11	-2.4	18.4	8.4	9.1	-1.4	5.7	15.0	1.4	54.2	
Net forward ¹⁾	-1	8	3	3	2.9	12.9	6.3	8.4	1.0	7.2	6.4	-2.1	43.1	
- Change in purchase contracts ²⁾	15	3	3	3	-5.3	5.5	2.0	0.7	-2.4	-1.5	8.5	3.5	11.1	
- Change in sales contracts ³⁾	-72	20	20	20	-0.5	-2.2	1.3	-0.5	2.9	-1.4	4.6	-3.9	0.3	
	-87	17	17	17	4.8	-7.8	-0.8	-1.2	5.4	0.2	-4.0	-7.4	-10.9	
2. Foreign sector														
Net spot ¹⁾	-45	-66	-66	-66	5.3	-22.1	-4.3	-2.8	-2.5	-9.8	-11.1	-2.2	-49.6	
Net forward ¹⁾	15	-33	-33	-33	-2.9	-10.1	9.0	-5.5	-12.4	-2.3	-8.3	5.7	-26.7	
- Change in purchase contracts ²⁾	-60	-33	-33	-33	8.2	-12.0	-13.3	2.7	9.8	-7.6	-2.8	-7.9	-22.9	
- Change in sales contracts ³⁾	-184	-215	-215	-215	9.1	-9.9	5.8	-27.6	36.6	-17.2	-45.8	-9.0	-58.0	
	-124	-182	-182	-182	0.9	2.1	19.1	-30.3	26.8	-9.6	-43.0	-1.2	-35.1	
3. Norges Bank														
Net spot ¹⁾	13	39	39	39	2.9	1.2	0.0	0.0	0.0	0.0	0.0	0.0	4.1	
Net forward ¹⁾	13	39	39	39	2.9	1.2	0.0	0.0	0.0	0.0	0.0	0.0	4.1	
- Change in purchase contracts ²⁾	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
- Change in sales contracts ³⁾	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
4. Other														
Increase in Norwegian customers' net currency claims on banks	-2	27	27	27	-2.5	4.0	-0.8	-1.8	1.8	-0.9	0.4	1.9	2.1	
Increase in banks' total positions	-1	1	1	1	-0.5	-1.4	-0.7	-1.6	0.9	3.2	-1.4	-0.4	-1.9	
Specification of foreign sector spot:														
Net NOK claims on banks ⁴⁾	35	-39	-39	-39	3.1	-17.6	10.3	-10.6	-11.9	-2.6	-9.3	4.8	-33.8	
VPS-registered shares ⁵⁾	-16	-18	-18	-18	-1.5	-2.1	1.2	1.0	-1.3	0.3	0.7	-0.3	-2.1	
VPS-registered bonds ⁵⁾	-5	12	12	12	-2.9	11.5	-1.7	-3.5	1.3	0.0	0.2	1.2	6.0	
VPS-registered notes and certificates ⁵⁾	2	12	12	12	-1.5	-1.8	-0.8	7.6	-0.5	0.0	0.1	0.0	3.1	
Foreign sector purchases of VPS-reg. securities, total	-	-	-	-	76.1	78.9	85.4	90.2	54.9	27.6	47.1	61.9	522.2	
Foreign sector sales of VPS-registered securities, total	-	-	-	-	70.1	86.4	84.2	95.3	54.4	27.9	48.1	62.8	529.2	

¹⁾ Positive figures denote that the sectors in question purchase foreign currency from Norwegian banks.

²⁾ Positive figures denote that the sectors in question increase their contracts for purchase of NOK, and negative figures denote a decline in purchase contracts.

³⁾ Positive figures denote that the sectors in question increase their sales contracts in NOK, and negative figures denote a decline in sales contracts.

⁴⁾ Positive figures denote a reduction of NOK deposits from the foreign sector in Norwegian banks.

⁵⁾ Positive figures denote net sales of VPS-registered securities by the foreign sector.

⁶⁾ Norges Bank has decided that these statistics are to be discontinued. Figures are available up to Week 2 in 2005.

Norges Bank is preparing to implement a new system for currency trading statistics.

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