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Economic perspectives

Address by Governor Svein Gjedrem at the meeting of the Supervisory Council of Norges Bank on Thursday, 15 February 2007

1 Introduction

The poet Rolf Jacobsen would have been 100 years old this year. He was particularly interested in geography. In an interview with Telemark Arbeiderblad in 1971, he stated that the Bible was a work of substantial importance, but that the same could be said about the comprehensive guide to public transport in Norway.[1] In one of his geography poems, he writes:

"When the sun is shining on China
the stars are twinkling here.
And the reverse. Asia is vast.
Half the earth's land mass
[...]».[2]

Yes, Asia is vast. The rapid expansion in China and other Asian countries is of growing importance to Norway. These countries are a major source of cheap consumer goods and services and demand for our raw materials.

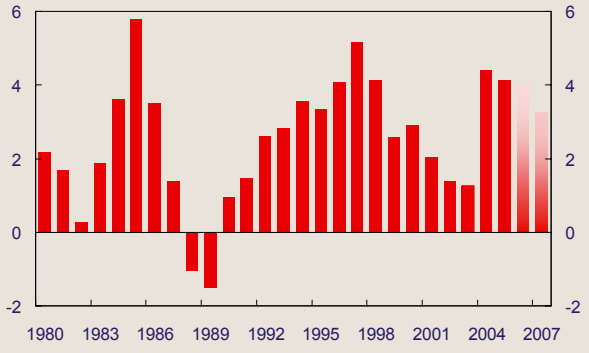
2 Interest rates, inflation and the business cycle

The Norwegian economy is now booming following the pronounced upswing since summer 2003 (Chart 1). The upturn followed a period of slower growth as from 1998 and a mild recession in 2002 and into 2003. Even though there have been cyclical changes, growth has been very high over the past 15 years.

Norway is one of the nations that has gained most from trade liberalisation and increased cross-border flows of capital, technology and labour. Norway has experienced the benefits of shifts in the division of labour across countries and regions.

First, Norway's terms of trade have improved markedly (Chart 2). We can buy one and a half to two times the volume of imports for the price paid for our exports than was the case only 5–6 years ago. Prices for oil and gas, shipping, fish, industrial commodities and engineering products have increased considerably.

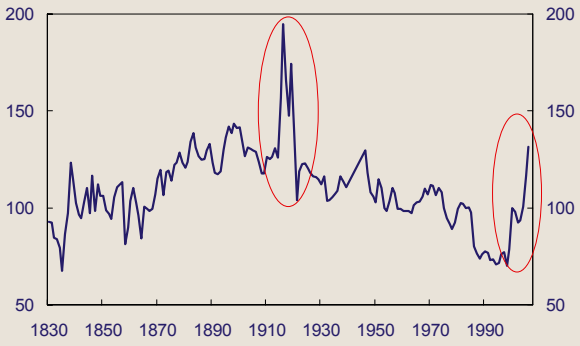
Chart 1 Mainland GDP. Annual growth. Per cent



Sources: Statistics Norway and Norges Bank

The chart shows annual growth in Mainland GDP from 1980 to 2007. Annual figures. Figures for 2006 and 2007 are projections from Inflation Report 3/06.

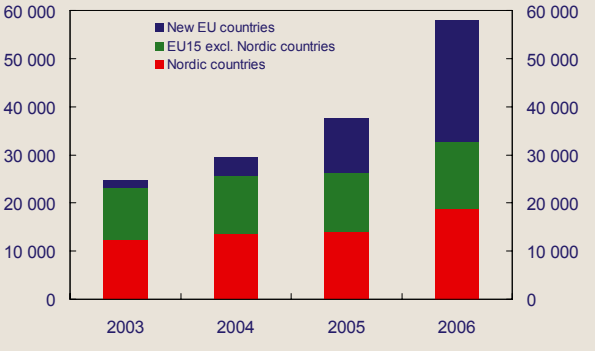
Chart 2 Terms of trade. Index. 2000=100



Sources: Statistics Norway and Norges Bank

The chart shows the terms of trade of Norway, from 1830 to 2006. Annual figures. There is a break in the time series between 1940 and 1945. Figure for 2006 is an estimate based on the first three quarters. Source of the historical data is Norges Bank's project "Historical Monetary Statistics for Norway". The terms of trade are calculated as the export price index relative to the import price index.

Chart 3 Foreign workers on assignments in Norway



Source: Central Office - Foreign Tax Affairs

The chart shows the number of registered foreign workers for the years 2003 to 2006. "New EU countries" include Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia. "EU15 excluding the Nordic countries" include EU member states until the enlargement in 2004, excluding Sweden, Denmark and Finland. "Nordic countries" include Denmark, Finland and Sweden. Annual figures.

[1] Ole Karlsen (editor) (1993): "Frøkorn av ild (Seeds of Fire). Om Rolf Jacobsens forfatterskap", Landslaget for norskundervisning, Cappelen Fakta.

[2] Source: From the poem "Når solen skinner på kinesere" (When the sun is shining on China) in Rolf Jacobsen's collection of poems "Nattåpent". Gyldendal Norsk Forlag A/S 1985.

Moreover, Norwegian importers have gained access to new markets in central Europe and Asia which offer considerably cheaper consumer goods. A similar situation has not been seen since World War I, when earnings in the shipping industry and other export industries were exceptionally high for a period.[3]

Second, the supply of foreign labour has increased markedly after EU enlargement in 2004 (Chart 3). Over the past two years, these labour inflows have accounted for more than 30 per cent of growth in our labour force. Norwegian companies have also been able to be considerably bolder in undertaking new assignments and investments knowing that they can procure labour throughout Europe. In addition to increased labour inflows from Poland, Lithuania and other central European countries, we have long benefited from inflows of labour from Sweden. Many workers are on temporary assignment and their consumption is primarily concentrated in their home country. The Norwegian economy has seen a net capacity increase.

Third, the Norwegian business sector has been quick to integrate information technology. This applies both to companies competing on international markets (Chart 4) and those supplying goods and services to the domestic market. In comparison with other countries, it is particularly productivity gains in banks and other service sectors that stand out. Examples are automated processes and swifter payments in the financial industry and improved inventory and management systems in commerce and transport.

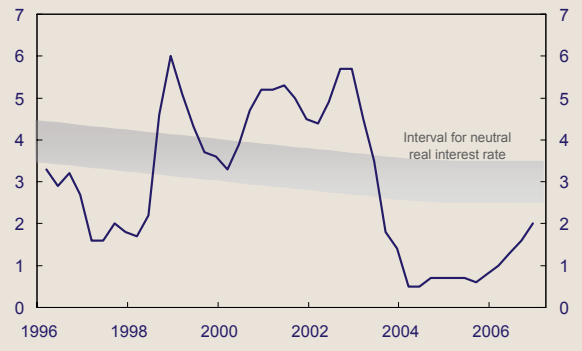
In Norway, monetary policy is oriented towards low and stable inflation. The operational target is consumer price inflation of close to 2.5 per cent over time. We operate a flexible inflation targeting regime. Both variability in output and inflation are given weight in interest-rate setting.

A decline in import prices, ample supply of labour and high productivity growth have boosted the growth potential of the Norwegian economy and led to very low inflation. Against this background, it has been appropriate to stimulate demand for goods and services. We consider a normal real interest rate to be in the order 2½ to 3½ per cent (Chart 5). We have kept the interest rate markedly lower than that level since autumn 2003.

Since the economic recovery started, it has gradually broadened. Capacity utilisation is now at a very high level (Chart 6). There are reports of limited capacity in most industries and regions and labour shortages in almost every occupational category. There are shortages of drivers, pre-school teachers, supervisors, engineers, carpenters, architects, auditors, accountants, IT personnel and health workers. It has probably not been since the 1970s that we find such widespread reports of purely physical production constraints, for example now in the form of shortages of rigs and other equipment in the petroleum industry or shortages of plank, concrete and insulation in the construction industry.

When we reduced the interest rate in 2003, demand and output rapidly picked up. However, it took a long

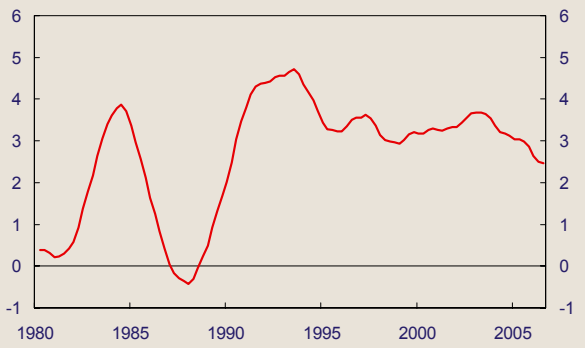
Chart 5 Short-term real interest rate. Per cent



Source: Norges Bank

The chart shows 3-month money market rate deflated by the 12-quarter moving average (centred) of inflation measured by the CPI, from 1996 Q1 to 2006 Q4. Projections for the CPI from Inflation Report 3/06 form the basis for this estimate. Quarterly figures

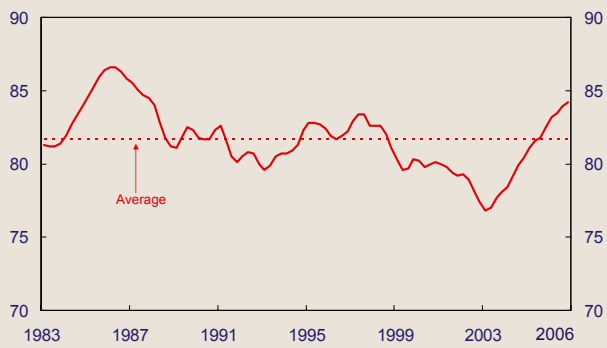
Chart 4 Productivity growth in the business sector. Per cent



Sources: Statistics Norway and Norges Bank

The chart shows trend productivity growth for mainland Norway excluding the public sector, export industry, non-oil energy sector and housing services in per cent, from 1980 Q2 to 2006 Q3. Quarterly figures.

Chart 6 Capacity utilisation in manufacturing. Per cent



Source: Statistics Norway

The chart shows the capacity utilisation trend in manufacturing, measured as a percentage, from 1983 Q1 to 2006 Q4, as it is measured in Statistics Norway's business tendency survey. The broken line indicates average capacity utilisation for the period. Quarterly figures.

[3] Tore Jørgen Hanisch, Espen Søilen, Gunhild Ecklund (1999): Norsk økonomisk politikk i det 20. århundre (Norwegian economic policy in the 20th century), HøyskoleForlaget, page 60.

time for employment to rise and the next phase from a pick-up in employment to a fall in unemployment was also long. But now the upturn has entered into a mature phase. As illustrated in Chart 7, capacity utilisation was higher than its normal level in 2006. Nevertheless, wage growth has thus far been moderate and inflation is clearly lower than the target of 2½ per cent.

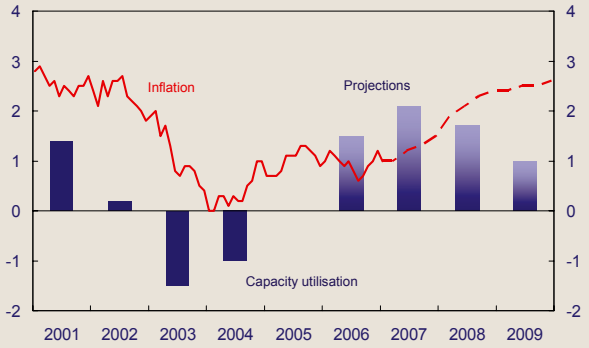
The decline in import prices, increased labour flows and higher productivity came into clear evidence when wage and price inflation fell markedly 3–4 years ago. A period of low real interest rates would nevertheless have been appropriate in order to realise the added growth potential. However, after several years of strong growth, resources are now in short supply. With the substantial number of businesses now facing capacity constraints, we can expect inflation to pick up. It is uncertain whether inflation will then rise quickly or only gradually near target.

Strong export growth, high oil investment and after a period higher growth in general government demand have contributed to the upswing in production and employment. But the low level of interest rates has also been a prominent driving force. This reflects the dynamics inherent in interest-rate setting. Low interest rates have stimulated demand and production and should lead to higher inflation, to which we are now reacting by raising interest rates.

Under inflation targeting, it is important to be mindful of the effects of higher interest rates on the krone exchange rate when inflation is low. Interest rate developments in other countries are thus of importance to interest rates in Norway.

Unemployment has declined sharply in recent quarters (Chart 8). The pace of decline and the level of unemployment are reminiscent of two earlier cyclical

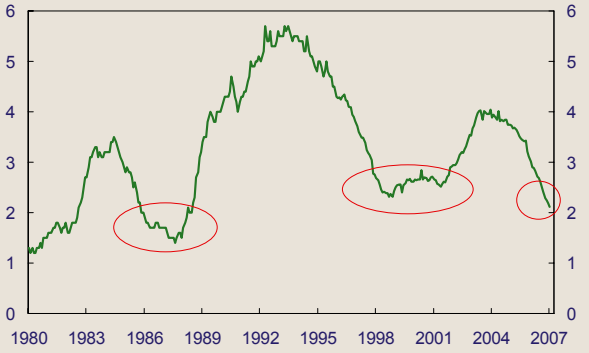
Chart 7 Inflation and capacity utilisation. Per cent



Sources: Statistics Norway and Norges Bank

The chart shows developments in inflation and capacity utilisation in the period 2001 to 2009. Capacity utilisation is measured as Norges Bank's estimate of the output gap. The output gap measures the difference between actual output and the output that is consistent with stable inflation (potential output). Annual figures. Figures for 2006 to 2009 are projections from Inflation Report 3/06.
Inflation is shown as the CPI-ATE, which is the CPI adjusted for tax changes and excluding energy products. CPI-ATE is a measure of underlying inflation. See Norges Banks Inflation Reports for alternative measures. 12-month change with estimates from Inflation Report 3/06. Monthly figures.

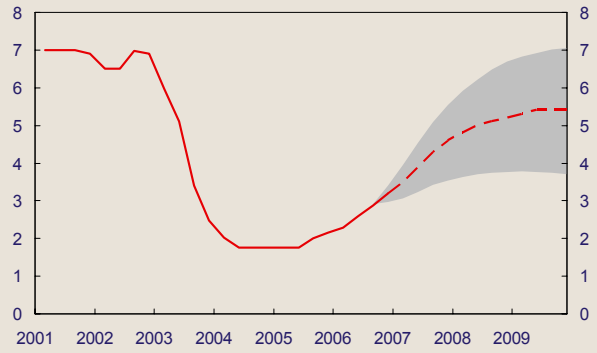
Chart 8 Registered unemployment. Per cent



Source: Norwegian Labour and Welfare Organisation (NAV)

The chart shows seasonally adjusted monthly figures for registered unemployment from January 1980 to January 2007.

Chart 9 Norges Bank's key rate[1]. Per cent

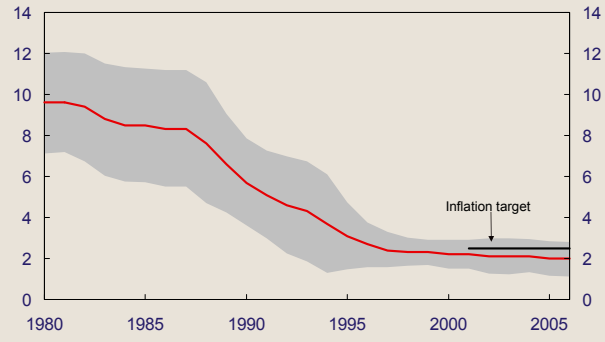


[1] Projections from Inflation Report 3/06

Source: Norges Bank

The chart shows actual developments in and Norges Bank's forecast for the key rate (the sight deposit rate) in Inflation Report 3/06, from 2001 Q1 to 2009 Q4. The shaded area represents one standard deviation. Quarterly figures.

Chart 10 Inflation. Moving 10-year average. Per cent



Sources: Statistics Norway and Norges Bank

The chart shows inflation measured by the CPI from 1980 to 2006. Annual figures. Inflation is measured as a moving 10-year average, calculated 7 years back and 2 years ahead. The band around the CPI is the variation in the average period, measured by +/– one standard deviation. Projections for 2007–2008 from Inflation Report 3/06 form the basis for the estimate.

peaks, one in the mid-1980s and the one that began at the end of the 1990s and continued into the present decade. Both booms culminated in sharply accelerating cost and wage inflation.

Some of the driving forces that have boosted the growth potential of the Norwegian economy and restrained inflation may diminish. Prices for imported goods are no longer decelerating at the same pace. Labour market conditions are tightening in Sweden and Poland. There are also signs that productivity growth in service sectors is slackening.

We are now seeing the first signs of higher wage growth. We cannot ignore previous episodes of abrupt shifts in wage growth during boom periods. On the other hand, improved labour market adaptability and the supply of foreign labour may have a dampening impact. Unemployment may thus stabilise at a lower level than earlier. Moreover, the social partners' experience of the impact of substantial wage increases on interest-rate setting may also restrain pay increases in the centralised settlements.

Economic policy will increasingly have to reflect the capacity constraints facing many Norwegian enterprises.

Given the high level of activity and the prospect of a pick-up in inflation, it is appropriate to increase the policy rate from today's level of 3¾ per cent. We envisage a gradual interest rate increase towards a more normal level of a little more than 5 per cent. Economic developments are uncertain. The uncertainty surrounding the interest rate ahead is illustrated by the shaded area in Chart 9, which is intended to capture the outcome with a 70 per cent probability.

In Norway, inflation fell markedly from the end of the 1980s up to the mid-1990s and has subsequently been low and stable, with considerably less variability than earlier (Chart 10). Inflation has averaged around 2 per cent over the past 5–10 years, i.e. somewhat lower than the target. Thus, the growth potential of the Norwegian economy has been strong and higher than expected.

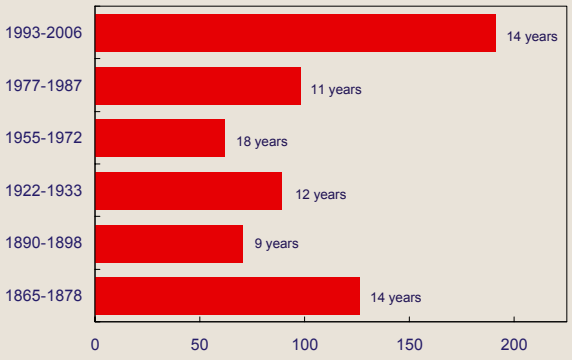
3 Long-term interest rates, income growth and house prices

Favourable economic developments in Norway have had an impact on developments in our property markets. House prices have risen sharply over the past 14 years. Real house prices have almost trebled. This rise has been considerably stronger than earlier (Chart 11). Moreover, the rise in house prices has spanned a long period. With the exception of a few months in 2003, house prices have risen continuously since 1992. This is the second longest period of rising real prices since 1819. Statistics for earlier years do not exist. House prices also rose in the 18 years between 1954 and 1972, albeit at a more moderate pace.

Norway is not the only country where house prices have shown a strong rise over a long period. House price inflation has been particularly high in Ireland and the Netherlands, but Denmark, the UK and Spain also stand out (Chart 12). The countries where house price inflation has been high are the same countries where economic growth has been strongest.

Since prices are rising in tandem in many countries, it is natural to look for common driving forces. With increasing cross-border flows of intermediate goods, capital and increasingly so labour, prices will largely reflect growth and competition in the global economy. If capital or labour becomes too expensive in one country, businesses can relocate production. Prices for fixed factors of production, such as property, will on the other hand reflect income developments in different

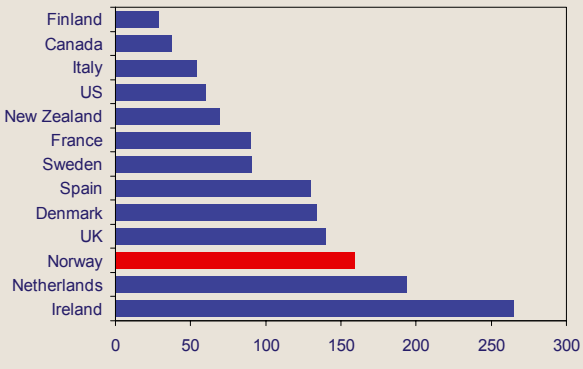
Chart 11 Periods of rising house prices
Number of years and total percentage increase. 1819-2006



Sources: Statistics Norway and Norges Bank

The chart shows total percentage increase in real house prices in per cent in selected periods of rising real house prices in Norway. The length of each period is shown next to the bars. There may be individual years of falling prices within the shown periods. Real house prices are calculated by deflating nominal house prices with the consumer price index. Annual figures.

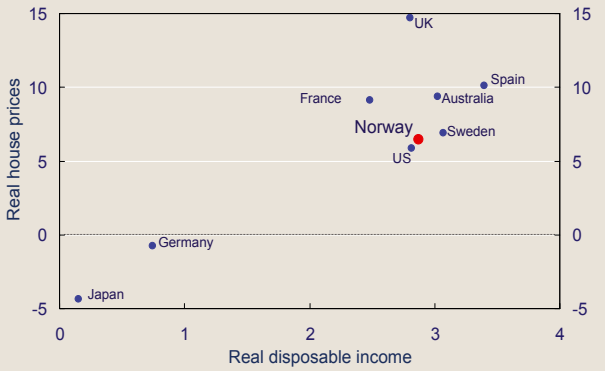
Chart 12 Total increase in real house prices
At end-2005. Per cent



Sources: Paul van den Noord (2006) OECD, Statistics Norway and Norges Bank

The chart shows total increase in real house prices in the ongoing (but yet incomplete) upswings in selected countries. Figures are up to and including the fourth quarter of 2005. Real house prices are calculated by deflating nominal house prices with the consumer price index. Quarterly figures. Source: Paul van den Noord, "Are House Prices Nearing a Peak? A Probit Analysis for 17 OECD Countries" Economic Department Working Papers No 488/2006, OECD. For Norway, annual figures calculated by Norges Bank are used.

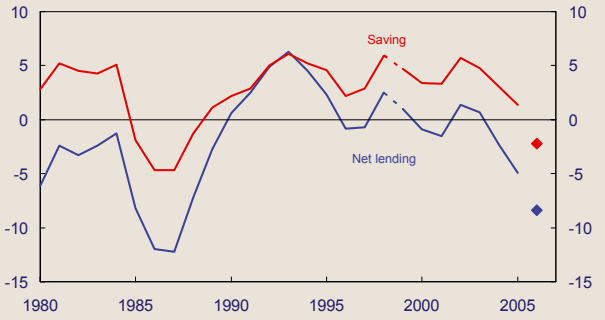
Chart 13 House prices and disposable income
Annual change. Average 1999 -2005



Sources: OECD, Reuters EcoWin, Statistics Norway and Norges Bank

The chart shows average annual growth in household real disposable income and in real house prices in selected countries, from 1999 to 2005. Income figures for Norway are adjusted for estimated reinvested share dividends. Real house prices are calculated by deflating nominal house prices with the consumer price index. Annual figures.

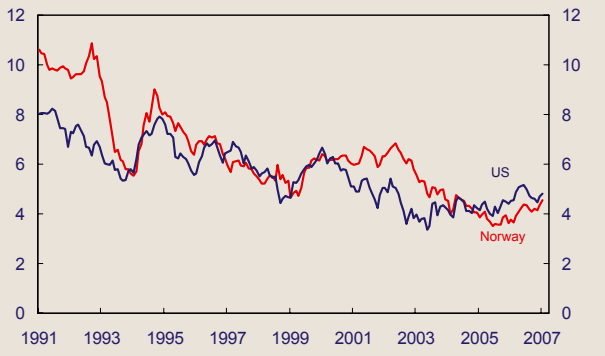
Chart 14 Household saving and net lending
Percentage of disposable income



Sources: Statistics Norway and Norges Bank

The chart shows household saving and net lending as a share of disposable income, measured in per cent, from 1980 to 2006. The indicated figures for 2006 are third quarter observations. There is a break in the series between 1998 and 1999. The series are adjusted for estimated reinvested share dividends for 2000–2005. Annual figures.

Chart 15 Long-term interest rates. Per cent



Source: Reuters EcoWin

The chart shows the interest rate on government bonds with a maturity of about 10 years, for the US and Norway from January 1991 to January 2007. Monthly figures.

countries. Consequently, the rise in property prices will tend to be highest in those countries where income growth is highest (Chart 13).

Norway is now reaping the considerable benefits brought by the strong expansion in Asian countries and changes in the international division of labour. Norway's GDP is increasing sharply and this is reflected in high government revenues and saving, increased household purchasing power and buoyant earnings in the business sector. The rise in house prices is partly being driven by growth in household income. Moreover, this period of prosperity and government budget surpluses may have engendered a sense of security which is also affecting household saving and house purchases. It would appear that household saving has fallen markedly in Norway in the recent past (Chart 14). Saving was probably negative in the latter half of 2006, which would be the first time saving has fallen since 1988. Housing investment in the household sector as a whole is thereby fully debt-financed, i.e. an increase in net debt.

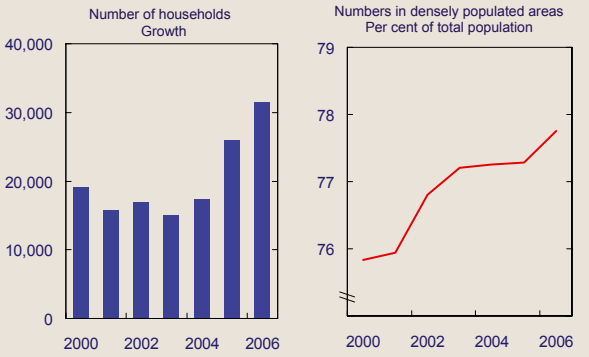
External and domestic interest rates are low in an environment of solid growth. Long-term interest rates have fallen sharply both in nominal and real terms since the beginning of the 1990s (Chart 15). Inflation has declined and contributed to a fall in nominal interest rates. A more stable inflation environment also results in lower real interest rates when investors become more certain about returns. Furthermore, it would appear that high saving in some parts of the world is pushing down long-term interest rates. Saving is high in oil-producing countries, China and other Asian countries.

Long-term interest rates in Norway largely shadow external interest rates because like other countries Norway is keeping inflation in check. Norwegian households primarily finance house purchases by means of floating-rate loans. Long-term interest rates are still of considerable importance because they provide information about the future path of short-term interest rates that borrowers can expect over time.

Unusually low short-term interest rates have probably also boosted the rate of increase in house prices in recent years, but this particular effect will be reversed when the interest rate is raised to a more normal level. Developments in short-term interest rates have influenced the path for house prices over the past 15 years, but periods of low interest rates are followed by periods of higher interest rates. Norges Bank's policy rate is therefore of limited importance for house price inflation over a period of 15 to 20 years.

The housing stock in Norway, which numbers a good 2.2 million dwellings, shows little change from one year to the next. As a result, higher demand for housing will primarily translate into higher prices in the short term. In the 1990s, housing starts in Norway were fairly low in relation to growth in the number of households. Moreover, population growth has been higher in recent years, largely reflecting a high level of immigration

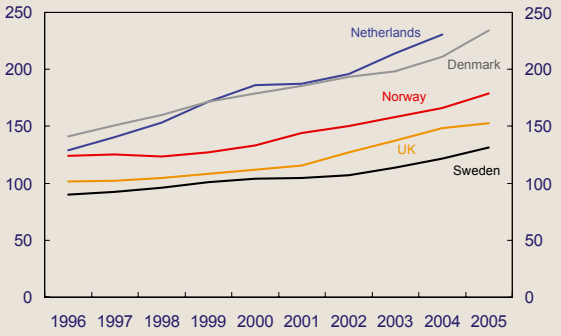
Chart 16 Population structure



Sources: Statistics Norway and Norges Bank

The left-hand part of the chart shows annual growth in the number of households. The figures are estimated by Norges Bank on the basis of Statistics Norway's Population and Housing Census and other population statistics. The right-hand part shows the percentage share of the total population living in densely populated areas. Annual figures.

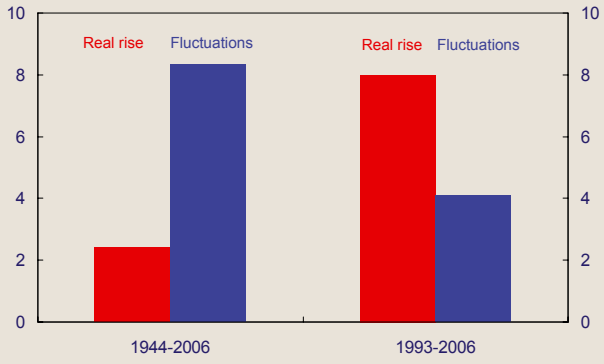
Chart 17 Household debt. Percentage of disposable income



Sources: OECD, Office for National Statistics (ONS), Sveriges Riksbank, Danmarks Nationalbank, BIS and Norges Bank

The chart shows household debt burden in per cent of disposable income in selected countries, from 1996 to 2005. For Norway, the chart shows household loan debt as a percentage of liquid disposable income adjusted for estimated reinvested share dividends. Annual figures..

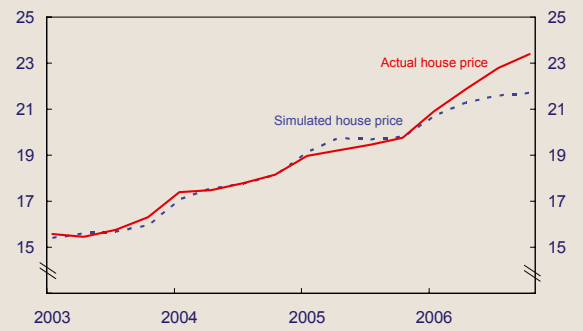
Chart 18 House prices in Norway. Real rise and fluctuations. Per cent



Sources: Statistics Norway and Norges Bank

The chart shows the rise and fluctuation in real house prices for the periods 1944–2006 and 1993–2006. Real house prices are calculated by deflating nominal house prices with the consumer price index. Fluctuations are calculated as the standard deviation of annual growth figures for real house prices. Annual figures.

Chart 19 Actual and simulated house price
In thousands of NOK per square meter



Sources: Norwegian Association of Real Estate Agents, Association of Real Estate Agency Firms, FINN.no, ECON and Norges Bank

The chart shows actual and simulated house price in thousands of NOK per square meter. Simulated house price are calculated by simulations from 2003 Q1 on an empirical house price model developed in Norges Bank, see Dag Henning Jacobsen and Bjørn E. Naug, "What drives house prices?", Economic Bulletin 1/2005, Norges Bank. Quarterly figures.

(Chart 16). In 2006, the population increased by more than 40 000 and the number of households by roughly 30 000.

Furthermore, migration patterns in Norway follow the business cycle. Migration to densely populated areas is now rising. Demands for high standards and new building regulations have also pushed up housing construction costs and thereby house prices.

The rise in house prices has been accompanied by a sharp increase in household debt (Chart 17). In Norway, household debt is now almost twice the level of disposable income, and the debt to income ratio is the highest ever. It is higher than in Sweden and the UK, but lower than in Denmark and the Netherlands.

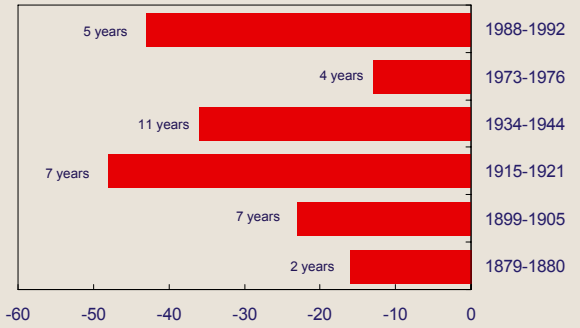
Norway is among the countries with the highest share of owner-occupied dwellings, at around 80 per cent. This high proportion partly accounts for the high mortgage debt of households. In recent years, new loan products have also been launched, facilitating mortgage equity withdrawal. Housing wealth has become more liquid. Borrowers have greater scope for choosing repayment profiles.

We cannot identify the exact level of household debt that can be sustained over time, but the rapid accumulation of debt increases household vulnerability.

Housing investment has been profitable in recent years. Since 1992, the real rise in house prices has averaged 8 per cent, which is markedly higher than for the entire post-war period (Chart 18). At the same time, fluctuations in prices have been considerably smaller.

The main determinants of house price inflation have long been income, unemployment, interest rates and residential construction. In the past year, however, house price inflation has been higher than implied by these factors. A large share of the increase in 2006 cannot be explained by previous patterns (Chart 19).

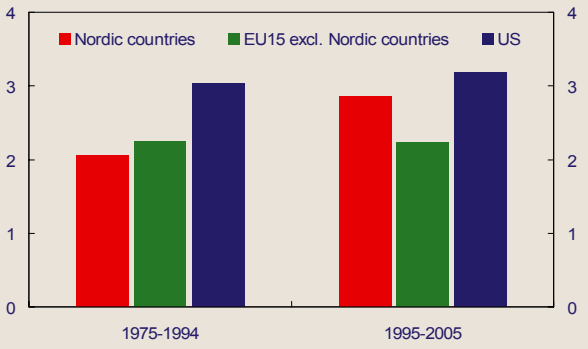
Chart 20 Periods of falling house prices
Number of years and total percentage decline. 1819-2006



Sources: Statistics Norway and Norges Bank

The chart shows total percentage decline in real house prices in per cent in selected periods of falling real house prices in Norway. The length of each period is shown next to the bars. There may be individual years of rising prices within the shown periods. Real house prices are calculated by deflating nominal house prices with the consumer price index. Annual figures.

Chart 21 GDP. Average growth. Per cent



Sources: Groningen Growth and Development Centre and Norges Bank

The chart shows average annual GDP growth in per cent, for the Nordic countries, EU15 excluding the Nordic member countries, and the US, for the periods 1975–1994 and 1995–2005. "Nordic countries" are here Denmark, Finland, Norway and Sweden. Annual figures.

Developments since the beginning of the 1990s may have engendered expectations that house prices will only continue to rise. This may increase house purchases for pure investment purposes and induce younger buyers to enter the housing market earlier than otherwise. The pronounced fall in saving indicates that households are taking greater chances.

The housing market may now be in a state of euphoria.

After a long period of rising house prices, it may therefore be of interest to look at periods of falling prices. Earlier periods of decline have not lasted very long (Chart 20). Generally, the increase has been stronger than the ensuing fall. There are nevertheless examples of periods where house prices exhibited a continuous fall of up to 50 per cent.

Earlier periods of declining house prices probably do not provide a perfect guide. The two most well-known episodes are the fall in house prices around 1990 and the housing market collapse in Christiania (now Oslo) around 1900.

The fall in house prices 15–20 years ago was probably ascribable to the very high real interest rates required to tame inflation and stabilise the exchange rate following two decades of very high inflation. This is not a challenge we are facing today.

The period at the end of the 1890s, just prior to the housing market collapse in Christiania, has some features similar to today's situation. It was a period of rising house prices, a housebuilding boom in Christiania, rising equity prices and rapid credit growth. At the same time, the level of prices for goods and services was stable. After the housing market crash in Christiania in 1899, house prices fell by more than 50 per cent over 5 years. The fall in house prices for the country as a whole was more moderate.

Higher debt will become a mounting financial burden for many households and limit the willingness to pay in the housing market. Long-term interest rates are unusually low and will probably rise over a few years. Moreover, the current level of population and income growth is not sustainable. On balance, developments in these variables will eventually stem the rise in house prices and lead to a period of stagnating or declining prices.

Modernisation of the economic system

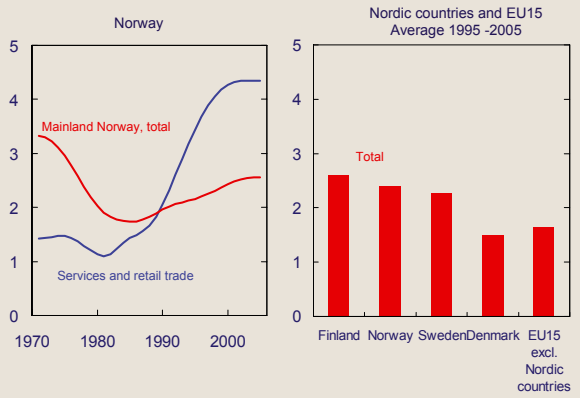
The global economy has become increasingly integrated. Norway and the other Nordic countries are tackling the challenges. Adaptability in the business sector, the willingness to integrate new technology, a relatively efficient public sector, high growth, low inflation and moderate unemployment are now characteristic features of our region. Since the mid-1990s, the Nordic countries have expanded at a faster pace than other European countries and almost as fast as the US economy (Chart 21).

This was not the case only 20 years ago. Following strong economic growth in the post-war period, the Nordic countries lost ground in the 1970s and 1980s. Growth in the Nordic region, particularly in Denmark and Sweden, was lower than in other European countries and the US during this period. Finland recorded strong growth for a long period, but a poorly diversified industry structure made the country vulnerable. Oil brought growth to the Norwegian economy, but the first decades of the oil age were still marked by instability in the mainland economy.

Solid growth in the Nordic countries in recent years has been underpinned by strong productivity gains in most of these countries (Chart 22). Finland and Sweden have a highly developed ICT industry. A feature shared by the Nordic countries is the growing efficiency of service production.

Economic developments in the 1970s and 1980s were unstable both in the Nordic region and in Europe (Chart

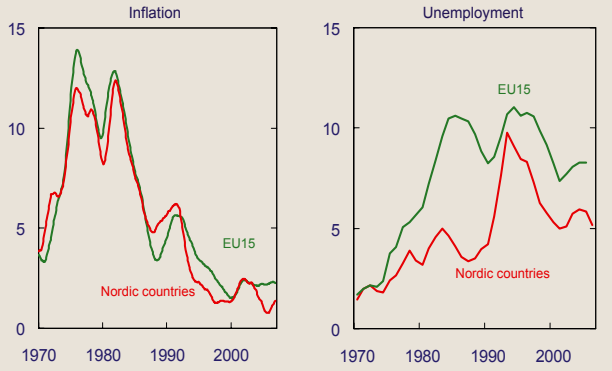
Chart 22 Productivity growth. Per cent



Sources: OECD, Groningen Growth and Development Centre, Statistics Norway and Norges Bank

The chart shows annual productivity growth in per cent. The left-hand panel shows trend productivity growth for mainland Norway, and for services and retail trade, from 1970 to 2005. The right-hand panel shows average annual productivity growth for the period 1995–2005, for individual Nordic countries and EU15 excluding the Nordic member countries. For EU15, the chart shows average productivity growth for individual countries, aggregated using year 2000 PPP weights. Annual figures.

Chart 23 Inflation and unemployment. Per cent



Sources: Reuters EcoWin, OECD and Norges Bank

The chart shows annual inflation in per cent, and the number of unemployed in per cent of the labour force for the Nordic countries and EU15, from 1970 to 2006. The inflation figures are 24-month moving averages, calculated on the basis of 12-month growth rates. Monthly figures. The unemployment figures for the Nordic countries (Denmark, Finland, Norway and Sweden) are aggregated using PPP weights. EU15 figures are from the OECD. Annual figures.

23). Inflation was very high and variable, but was tamed in the 1990s. Falling demand and production resulted in high unemployment. For a long period, there was a tendency in both the Nordic region and elsewhere in Europe for unemployment to climb to higher levels in each cycle. This tendency has been reversed in the Nordic countries, while unemployment still remains high in several European countries.

During the 1980s and 1990s, economic policy was revised in all the Nordic countries. Denmark tightened government budgets as early as the 1980s. The other Nordic countries deregulated credit and housing markets, but this was followed by growth bubbles. At the same time, monetary policy was tightened in order to stabilise the exchange rate and rein in high inflation. This proved to be impossible without a sharp fall in the level of activity and employment, and high interest rates shook the financial system.

Following the crises, the Nordic countries were not locked into a low growth trap. Many enterprises were closed. This freed up labour and other resources that could be channelled to new areas. The decline in itself provided fertile ground for innovation and entrepreneurship – we experienced creative destruction in the Nordic economies.

An elaborate system of direct regulation of activities in the business sector and the labour market was devised in the post-war period. Loans from banks and financial undertakings were regulated through quotas that were set out in a separate credit budget and state banks accounted for a substantial share of credit to households and enterprises. Cross-border capital movements – for example non-resident rights to buy Norwegian equities and Norwegian enterprises' access to foreign funding – were regulated by separate quotas. The government authorities set both short-term and long-term interest rates at a low level, with demand for credit periodically outstripping supply. Credit was rationed. The krone exchange rate was in principle fixed, but was frequently adjusted when cost inflation spiralled out of control despite extensive regulation. House prices in cities were regulated, with queues and under-the-table transactions. Direct price and wage controls were also applied in periods. There was an active business policy through state ownership and support and subsidy schemes.

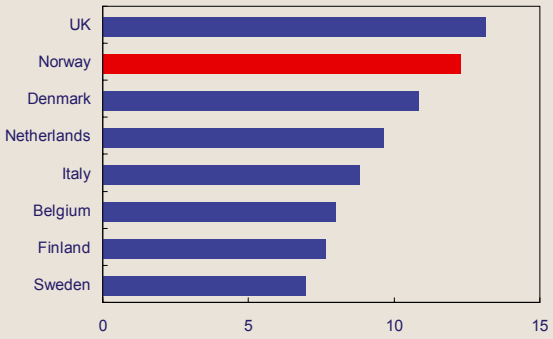
Government spending increased substantially as a share of total GDP, from 35 per cent in 1970 to 50 per cent in 1990, hand in hand with tax increases. The government budget was also used to secure high employment, but unemployment still rose from one cycle to the next.

The experience and lessons of the 1970s and 1980s have left their mark on the current formulation of policy. Prior to, during and following the crises around 1990, policy reforms were introduced in all the Nordic countries. In Norway, the economic system was modernised over a 10–15 year period.

First, as in other countries, increased emphasis was placed on norm-based or rule-based monetary and fiscal policy, and over time a clear division of responsibility was established. Monetary policy steers inflation in the medium and long term and can also contribute to smoothing fluctuations in output and employment. The government budget – growth in public spending – influences the real krone exchange rate and the scale of the tradable sector in the medium term. Government spending and revenues must be in balance in the long term. Wage formation, the economy's structures and incentives determine how efficiently we make use of labour and other economic resources.

Second, trade policy plays an important role for growth in small open economies. Since the beginning

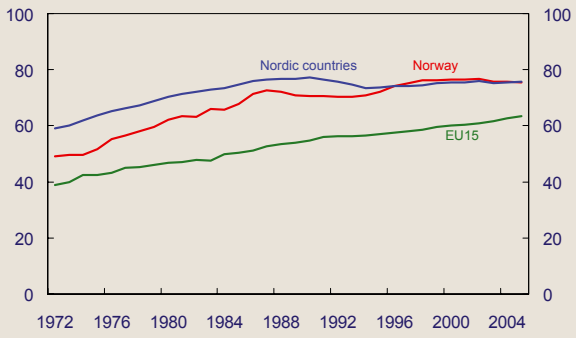
Chart 24 Start ups in the service sector
Per cent of existing enterprises. Average 1998 -2001



Source: Eurostat

The chart shows the average number of annual start ups of businesses in the service sector, in per cent of the number of existing businesses, for the period 1998–2001. For Belgium, the average is based on figures for the period 1998–2000.

Chart 25 Female labour force participation. Per cent



Sources: OECD and Norges Bank

The chart shows the labour force participation rate among women in Norway, the Nordic countries, and in EU15 from 1972 to 2005. The Nordic countries include Finland, Norway and Sweden from 1972 to 1982, and figures for individual countries are aggregated using PPP weights. Denmark is included in the figures for the Nordic countries from 1983. The labour force participation rate for women is defined as the number of women aged 15–64 years in the labour force in per cent of the total female population in the same age group. Annual figures.

of the 1990s, Norway, like Sweden and Finland, has become more closely integrated into Europe. The EEA Agreement, which provides for the free movement of labour, capital, goods and services, has enhanced efficiency in many industries. The recent WTO rounds have covered a broader range of goods and services and the number of member countries has increased. Almost all countries are now members or observers, and the issues are broad-ranging. Trade policy has paved the way for the change in the international division of labour which has brought benefits to Norway and the other Nordic countries.

Third, the tax reform in 1992 was a crossroads. It made it possible to finance the welfare state with a substantially lower loss of efficiency and wealth creation than previously. The key was to reform the deduction schemes for personal and company taxation and to introduce more equal tax treatment of companies across industries and aim at neutral taxation of capital income and interest. Marginal taxes could be lowered. The tax deductibility rate for interest was considerably reduced for households. It became more advantageous to save and less advantageous to borrow.

The pressure on our tax system has also been reduced because public spending control has improved over the past 10–15 years.

Fourth, Norwegian credit markets have undergone structural changes. The function of state banks has become more concentrated and their share of the credit market has been reduced from more than 30 per cent in the 1980s to 8 per cent today. The first wave of banking deregulation in the mid-1980s was not particularly successful. It was only after the banking crisis and the tax reform that Norwegian credit and capital markets started to function efficiently. It became more profitable to channel capital to investment projects that yield the highest social return and locked-in capital was freed up for new industries and businesses.

It became easier for entrepreneurs to start up and build up businesses and capital. Illustrative of the enterprise spirit in the period 1998–2003 – which was not a period of particularly strong growth – was the start-up of 12 new businesses for every 100 existing businesses, which was quite high compared with other countries (Chart 24).

Norwegian credit and capital markets are relatively well developed today. Sound projects will always find funding. The main weakness is still to be found in housing, property and wealth taxation, which favours considerable overinvestment in dwellings and holiday homes.

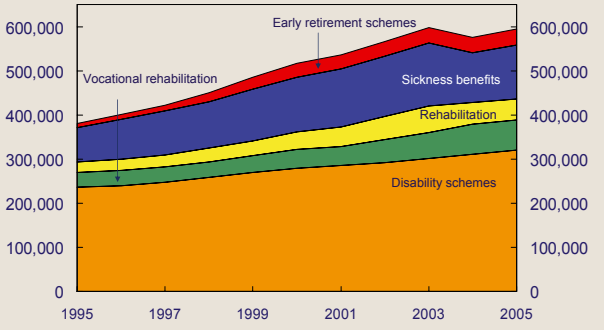
In addition to the changes I have highlighted, the framework conditions for the electricity market, telecom market, aviation and audiovisual industry have changed. Retail trade has been liberalised. State-owned companies were listed on the stock exchange and new forms of managing public entities were developed.

Economic growth has also been bolstered by higher female labour force participation (Chart 25). Higher educational attainment and maternity leave have also made a contribution.

Just as there are new companies that start up each year, there are also many people who change jobs every year. On average for the years 2000–2005, 260 000 work contracts were terminated. Every eighth person changed jobs. At the same time, new jobs were created, bringing net annual job creation to 4 000 in this period. Job change and the diffusion of new technology tend to go hand in hand. The key here is that companies have had the opportunity and capacity to rationalise and adapt when new technology has made this profitable.

The modernisation of economic systems must be given the main credit for the solid performance of Nordic countries over the past 10–15 years. Norway is benefiting from oil, but developments in the main-

Chart 26 Persons on benefit and early retirement schemes
Number of persons. 1995 – 2005



Source: Norwegian Labour and Welfare Organisation (NAV)

The chart shows the number of persons on various benefit and early retirement schemes. The figures for rehabilitation show the number of recipients in December each year. Figures for the other schemes show the number of recipients at end-year. Annual figures.

land economy have also been considerably more stable. Global economic developments have brought us substantial gains, but this does not explain the strong productivity gains in our service industries. Moreover, it may appear that cooperation in companies is better in Nordic countries than in many other European countries. In Norway, there are few examples of objections to investing in new technology on the grounds that it will eliminate jobs. On the contrary, employees will often be the first to support new investments to strengthen a company's position in highly open and competitive markets.

Labour market adaptability is fairly similar in the Nordic region, even though legislation and rules are quite different. For example, there is a high level of employment protection legislation in Norway, Sweden, and Finland but not in Denmark. In Denmark, agreements between the social partners can stipulate firing rules.

The negotiating position that employment protection offers employees can induce companies to go farther in safeguarding employees' interests in the event of restructuring. The social safety net – unemployment benefits and the more permanent benefit schemes – probably also make it easier to gain support for rationalisation.

But this safety net has also become a pretext for not addressing the problems at hand. The increased use of our welfare schemes is increasingly becoming the Achilles' heel of the Norwegian economy.

Sickness absence has risen sharply in Norway and a steadily higher share of the working-age population is on disability benefit or rehabilitation schemes (Chart 26). Many choose to retire under contractual early retirement schemes at the age of 62, and these numbers will probably increase ahead. In Norway, close to 600 000 persons among the working-age population are outside the labour force and on benefit and retirement schemes. This accounts for 25 per cent of the labour force. Sweden has seen a similar development.

The sharp increase in benefits cannot be explained by the population's state of health, which is steadily improving. A survey of more than 31 European countries also shows that there is a high degree of job satisfaction among Norwegians.[4]

Demographic developments will have a dampening impact on demand for public services and social security disbursements over the coming years. The number of elderly among pensioners, i.e. 80 years and older, will not grow and the post-war generation will only start drawing on social security in the next decade. There will still be pressures for higher public spending. Demand for services we have chosen to let the government provide, for example health services, increases markedly when revenues rise at the pace they are rising today. Growth in government revenues – among others the return on the Government Pension Fund which is rising rapidly – also raises our expectations. At the same time, this is also a period of strong growth in demand for labour in the business sector.

With the exception of part-time employees who want to work more, there are now few idle resources in the labour force. We cannot expect a substantial increase in the supply of foreign labour. Workers from other countries, such as Sweden and Poland with families and the largest share of consumption in their home country, have increased production capacity in Norway, but it now appears that the supply of foreign labour is starting to become more limited. Other inward labour migration does not generate higher value added per capita. Immigrants that become permanent residents make the same contribution to increasing demand as to increasing production.

The main challenge is to limit flows of persons into benefit. Recent research findings can provide us with guidance.[5] During periods of restructuring of private and public sector activities, the number of new benefit claims rises. Findings show that the interaction between unemployment benefit schemes and other social security schemes is not optimal. When demand for labour falls, flows into benefit increase. But the flows do not primarily go into unemployment benefit and seeking work and activity, but directly into rehabilitation. And rehabilitation is to a large extent a gateway to disability benefit. A broad range of measures is probably needed to limit these flows. The new government agency the Norwegian Labour and Welfare Organisation is facing considerable challenges. Moreover, there should be strong financial incentives in enterprises to counter employee flows into benefit. Certain schemes should be reassessed, schemes that now function as pure poverty traps, because for certain recipients there is little to be gained financially in early phases from moving from welfare to work.

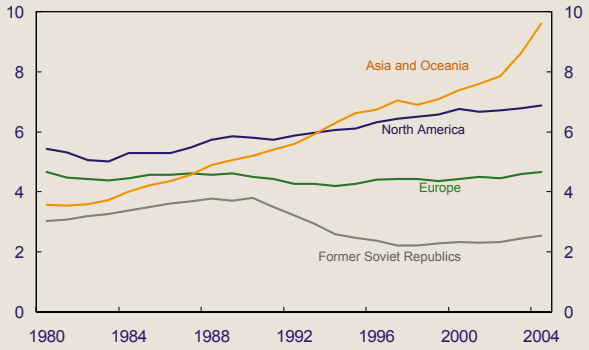
5 Growth and the environment

Strong growth in the world economy is reducing poverty at a faster pace than ever before. Increased trade

[4] European Foundation for the Improvement of Living and Working Conditions (2006):"Fourth European Working Conditions Survey".

[5] Knut Røed:"Hvor stor er arbeidskraftsreserven? Og hvordan kan den mobiliseres?" (How large are labour reserves? And how can they be mobilised?) Presentation at the conference: Arbeidsmarked, lønn og økonomisk politikk, (The labour market, wages and economic policy) University of Oslo, 23 January 2007.

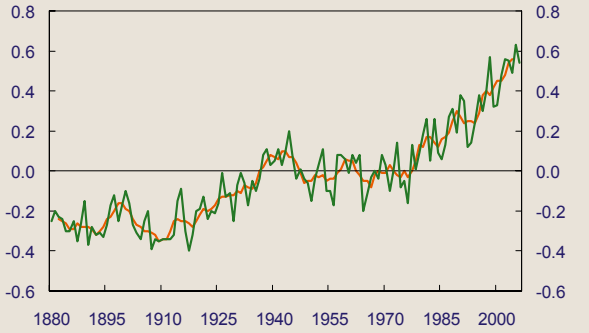
Chart 27 CO_2 emissions. In billions of tonnes



Source: Energy Administration Information (EIA)

The chart shows CO_2 emissions in billions of tonnes in selected regions. Annual figures. 1980–2004.

Chart 28 Global mean temperature
Trend and deviation from average 1951 – 1980, °C



Source: NASA – Goddard Institute for Space Studies

The chart shows the calculated global mean temperature, in the form of trend and deviation from average for the period 1951 to 1980. Annual figures. 1880–2006.

and economic integration are bringing opportunities for raising living standards to ever larger groups.

But growth has a price. This is particularly reflected in increased emissions of greenhouse gases as a result of growing human activity (Chart 27). The highest emission levels per capita are found in rich, industrialised countries. Growth in total emissions is nevertheless highest in Asia.[6]

Scientific findings are clear: In the past 100 years, the global mean temperature has risen by 0.74ºC (Chart 28). There is more than a 90 per cent probability that the increase in gas emissions has contributed to global warming over the past decades. Developments mean that the Arctic ice may melt away, the climate may become more unstable and the supply of safe source water may decline.

The changes also have an economic cost. It is expensive to repair damages to buildings and infrastructure following storms and floods. Insurance pay-outs are rising and premiums are following suit. When insurance is not possible, society must bear the cost directly.

It is important to combine knowledge about nature and knowledge about the functioning of the economy in addressing environmental challenges. Maximum positive impacts and minimal negative impacts are achieved by using instruments that induce businesses and individuals to choose the technology and consumption pattern that stem emissions. Using these instruments releases the full force of market mechanisms. Taxes that require the polluter to pay and tradable emission quotas are important instruments.

When the costs of reduced emissions are to be distributed, it will be tempting for countries to act as free riders. Restrictions and taxes that only apply to one country or to a small group of countries do not solve the problem. There are important lessons to be drawn from international trade cooperation in the post-war period, which was also marked by strong conflicts of interest but still made headway through the period.

It is still uncertain how serious the impact of gas emissions will be. But once the impact comes into full evidence, it may be too late to take corrective action. There is also the risk that the concentration of greenhouse gases in the atmosphere reaches such a high level that it exceeds critical values that cannot be reversed. The right approach is therefore to guard against events that may have serious consequences even if there is a small probability of the event occurring.

Most of us already pay a certain amount every year to guard against the consequences of events we will hopefully never experience. The cost of curbing global warming can be looked upon as such an insurance premium. Higher transport taxes and increased electricity and energy prices are a small price to pay.

6 Conclusion

A prominent feature of Norway is its natural resources. The harvesting of waterfall power, oil and gas, timber and fish are important to income and welfare in Norway. Jacobsen writes:

"(…) But we became a civilised people in the end,
seafarers from the start, rulers
of the whole of the North Atlantic.
And now we are reaping black gold from the seabed
(…)"

and

"(…) so do not (…) dwell in a dream
for we await your hands and goodwill (…)"

We should hope that we have become a civilised people – but we should not believe that we can safeguard welfare simply by reaping black gold from the seabed. Welfare is secured by putting hands back to work, productive labour and the willingness to change – and of no less importance by protecting the environment.

[6] John Llewellyn (2007): "The Business of Climate Change. Challenges and Opportunities", Lehman Brothers, February 2007.

[7] A previous translation of the poem does not exist. The verses included in the address have been translated by Norges Bank's staff translators Janet Aagenæs and Helle Snellingen.

Interest rate projections in theory and practice[1]

Deputy Governor Jarle Bergo

1. Introduction: The importance of the expectations channel in the conduct of monetary policy

The most important task of monetary policy is to provide the economy with an anchor for inflation expectations – a nominal anchor. In Norway, monetary policy is oriented towards low and stable inflation with an annual rise in consumer prices of close to 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. Flexible inflation targeting builds a bridge between the long-term objective of monetary policy, which is to anchor expectations of low and stable inflation, and the more short-term objective of stabilising economic developments.

Preventing inflation expectations from becoming entrenched markedly below target was one of the main reasons for reducing the key policy rate to a very low level when inflation fell and approached zero in 2003 and 2004. At that time there was also spare capacity in the Norwegian economy. Between the end of 2002 and the first quarter of 2004 the key rate was reduced by 5¼ percentage points (see Chart 1). We indicated that the interest rate would remain low until we saw clear signs of rising inflation.

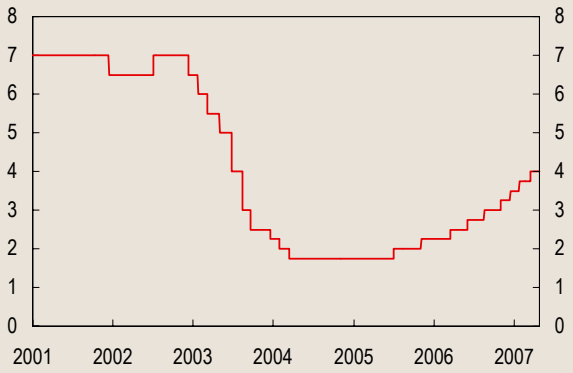
Since summer 2003, the Norwegian economy has been in a clear upswing. Low interest rates, high oil prices and a favourable global environment have been important driving forces. Growth is strong in most industries, and profitability in the business sector is solid. Underlying inflation is still considerably below the inflation target. However, several factors point to higher inflation further ahead. We are now normalising the interest rate gradually. Between the summer of 2005 and the beginning of 2007, the key rate has been increased by 2.0 percentage points and there are prospects of further interest rate hikes.

The shortest money market rates are determined by the central bank via the key policy rate (see Chart 2). But private-sector consumption and investment decisions depend more on expectations regarding future developments in the key rate. To be successful, monetary policy must be able to influence these expectations. The public must therefore understand the central bank's intentions in interest-rate setting. Transparency regarding Norges Bank's monetary policy assessments probably improves the predictability and effectiveness of monetary policy.

In recent years, we have tried to facilitate the public understanding of our actions. The background material for the Executive Board's monetary policy meetings is published and the assessments underlying interest rate decisions are explained. As from the end of 2005, Norges Bank has published its own interest rate forecast. From using technical assumptions or others' assessments, we have now taken ownership of the interest rate path in our projections. In the Monetary Policy Report[2], Norges Bank publishes the interest rate path that in the Bank's view provides a reasonable trade-off between stabilising inflation at target and stabilising developments in output and employment.

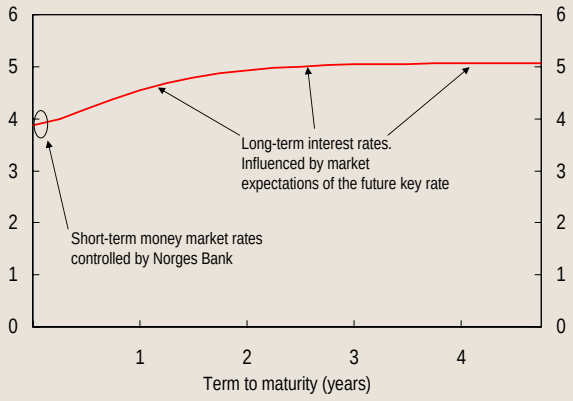
So far, the experience of publishing our own interest rate forecasts has been positive. It seems that economic agents

Chart 1 Key policy rate in Norway



Source: Norges Bank

Chart 2 Yield curve mid-January 2007[1)]



[1]Estimated on the basis of swap rates with up to ten years maturity

Source: Norges Bank

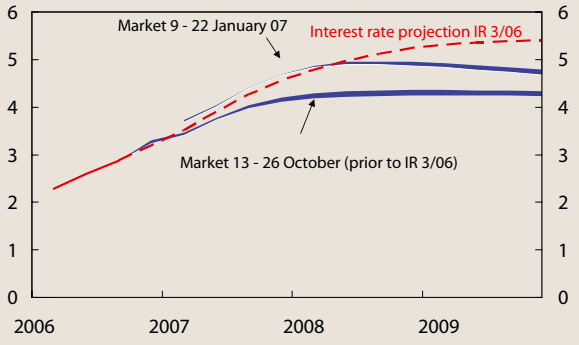
1 The article is based on the speech of the same title, given at the Foreign Exchange Seminar of the Association of Norwegian Economists at Sanderstølen on 26 January 2007.

2 As from 2007, the title of the Report has been changed from *Inflation Report* to the *Monetary Policy Report.*

have understood the nature of the forecasts. Nevertheless, there is considerable uncertainty surrounding the interest rate path, which is why we present fan charts with uncertainty intervals around the forecasts. In addition, the Monetary Policy Report contains several different sensitivity analyses to illustrate alternative interest rate paths that would be preferable should economic developments deviate from the baseline scenario. We also present a kind of "interest rate accounts", where we explain any changes in the interest rate path since the previous Report, for instance caused by actual developments in key variables differing from our assumptions. The specific interest rate path cannot and must not be looked upon as a guarantee, a path to which we unconditionally have committed ourself. To the contrary, should economic developments deviate from the projected path, the interest rate path will also shift. Instead, it can be said that through our communication we commit ourself to a pattern of behaviour, a response pattern. If interest rate expectations can be influenced, it will in many cases be useful for a central bank to commit itself to a predictable response pattern. This kind of commitment can, if it is perceived as credible, enhance the effectiveness of monetary policy.

A relevant question is the extent to which our communication actually influences interest rate expectations. Forward interest rates derived from yields at various maturities will in the absence of term premia and other risk premia normally reflect the market's short-term interest rate expectations[3]. When *Inflation Report* 3/06 was published in the beginning of November last year, the forward interest rate was on a par with our forecast for the next six months, but considerably lower thereafter (see Chart 3). Since then, forward rates have increased and approached Norges Bank's interest rate path. It is of course debatable whether it is our communication and actions or new information that has brought about the alignment. It is probably both. Forward rates somewhat further out are still lower than our forecast. The reason may be that market participants have a different perception of the interest rate path that is necessary to stabilise inflation at target and to achieve stable developments in output and employment. Alternatively, the market may have the same short-term interest rate expectations as Norges Bank, but because of extraordinary conditions long-term bond prices are being pushed up and, consequently, long-term bond yields are being pushed down.

Chart 3 Norges Bank's interest rate projection and forward rates



Source: Norges Bank

2. What is the normal interest rate level?

When preparing an interest rate forecast, we must have a view of what the normal interest rate level is. Long-term bond yields have been at historically low levels in recent years. From lying in a broad range around 10 per cent at the end of the 1980s, they have fallen to around 4 per cent in the past few years (see Chart 4). Developments in nominal interest rates must be seen in the light of inflation developments. Since 1960, inflation has been relatively low and stable only in the past 10–15 years, i.e. since the first half of the 1990s (see Chart 5). High and variable inflation pushed up nominal interest rates earlier, both directly and via an inflation risk premium. Uncertainty about future inflation generates uncertainty as to the real value of investments and investors may require an extra compensation – a risk premium – for this. Low and stable inflation over the past 10–15 years has probably led to a decline in the normal interest rate level. Nevertheless, it would appear that long-term interest rates have been lower in recent years than one would believe to be a sustainable level, at least in the very long run.

According to economic growth theory, in the long term the real interest rate is determined by structural fundamentals such as productivity and population growth and households' long-term saving preferences, that is,

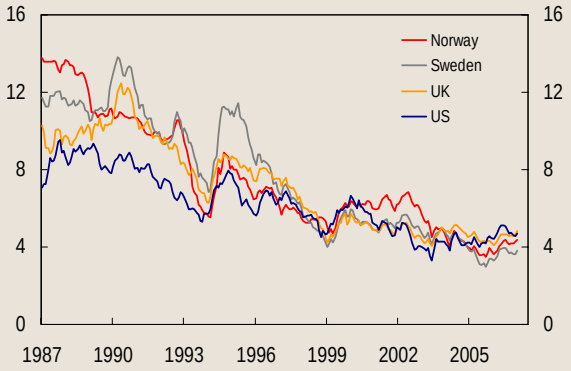
$$r^* = g + n + \rho,$$

where r^* is the long-term normal real interest rate, g is productivity growth, n is population growth and ρ is housholds' time preference rate regarding saving and consumption.[4] It seems reasonable that there is a positive long-term relationship between an economy's potential growth and the real interest rate. If potential growth is higher than the real interest rate, the return on fixed investment will be higher than the cost of investing. This provides an incentive to increase fixed investment. Higher demand for fixed investment

[3] Forward interest rates – often referred to as implied interest rates – are calculated so that a short-term bond, when rolled over and reinvested at the implied interest rates, generates the same yield as a long-term bond. For example, if we observe today's one- and two-year interest rates ('short-term' and 'long-term' interest rate respectively), the implied forward interest rate one year ahead will be expressed by the equation $(1+i_{0,2})^2 = (1+i_{0,1})(1+i^*_{1,1})$, where $i_{0,2}$ is the two-year interest rate, $i_{0,1}$ is the one-year interest rate and $i^*_{1,1}$ is the implied one-year rate one year ahead. The expectations hypothesis holds that the implied interest rate is equal to the market's interest rate expecations and the expected return from rolling over short-term bonds is equal to the return on a long-term bond. However, if term premia exist, the expected return from rolling over short-term bonds is dfferent from the return on a long-term bond. If the term premium is positive, forward interest rates will overstimate expected future short-term interest rates, while they will be understimated if the term premium is negative.

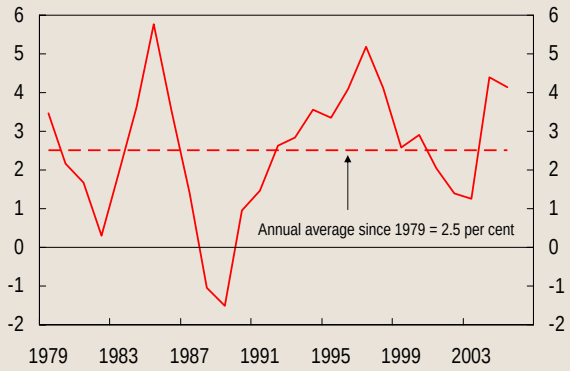
[4] The expression above builds on a variant of the Ramsey model, which is a standard theory of economic growth. For a further discussion of this model, see Blanchard and Fisher (1989) 'Lectures on Macroeconomics', MIT Press and Romer (2001) 'Advanced Macroeconomics', McGraw Hill.

Chart 4 Long-term bond yields (10 year)



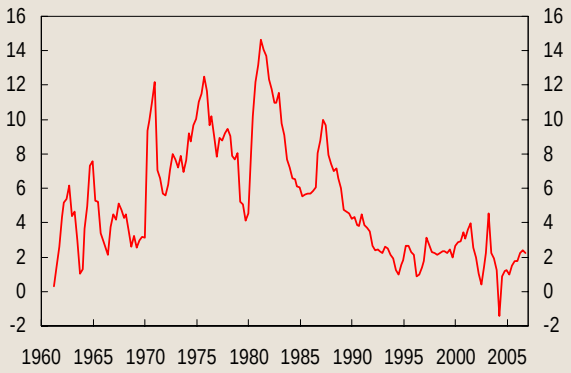
Source: Reuters/EcoWin

Chart 6 Annual growth in GDP mainland Norway. 1979-2005



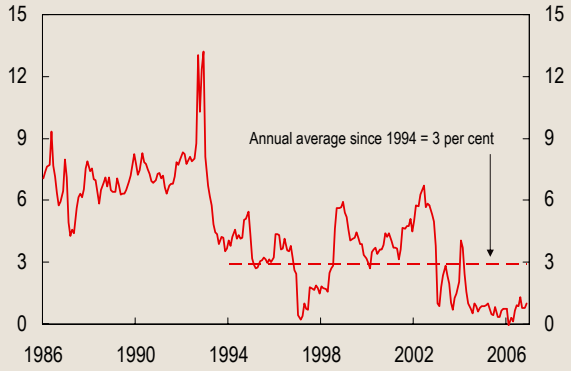
Source: Statistics Norway

Chart 5 Inflation in Norway (Annual change in consumer prices)



Source: Statistics Norway

Chart 7 Short-term real interest rate in Norway[1]



[1]Three-month nominal money market rate minus annual change in consumer prices. Source: Statistics Norway

normally leads to higher real interest rates.

Higher potential growth can also influence real interest rates in the long term as households seek to smooth consumption over time. Higher potential growth generates expectations of higher future income. Households may then want to borrow against expected future income and thereby reduce saving already today. Lower saving implies higher real interest rates. The time preference rate can be looked upon as an expression of households' impatience in consumption. The higher the degree of impatience, the more households will want to consume today at the expense of future consumption, and the higher the real interest rate has to be in order to provide sufficient savings to meet investment demand.

It is important to stress the long-term perspective of this analysis. In the really long term, it seems reasonable that it is potential growth and saving preferences that determine the relationship between desired saving and desired investment and thereby also the real interest rate. In the short- and medium-term, however, the economy is regularly exposed to shocks that influence economic developments, and thereby also the interest rate. It is not unlikely that we might see sizeable deviations of actual rates from the theoretical rates over longer periods. Such deviations may be exactly what are needed to bring the economy back towards a new and sustainable equilibrium. Moreover, uncertainty and risk premia are often disregarded in the theoretical world. In the real world, different types of risk premia exist that can lead to deviations from these stylised theoretical considerations.

Potential growth and particularly the time preference rate are difficult to estimate. From 1979 to the present, average annual growth in GDP in mainland Norway has been about 2.5 per cent. If we confine ourselves to the past 10–12 years of low and stable inflation, average growth has been somewhat higher at around 3 per cent (see Chart 6).

There have been wide variations in the short-term real interest rate in Norway. In the 1980s and the beginning of the 1990s, the real interest rate was high and varied around 6–7 per cent. Since the mid-1990s, the real interest rate has been considerably lower and varied around 3 per cent (see Chart 7). The period of low and stable inflation is probably more representative of the future than the 1980s when inflation was high and volatile.

Against the background of historical developments in

growth and real interest rates over the past 10–12 years, it may seem reasonable to assume that the normal real interest rate level in Norway is in the range of 2½–3½ per cent. If we add the inflation target to this, a range of around 5–6 per cent may be a reasonably normal level for the nominal interest rate. On an uncertain basis, the normal interest rate for Norway is now estimated to lie in the lower end of this range.

Long-term interest rates seem to have been lower in recent years than the normal level determined by growth and inflation prospects. The cause of the low level of long-term interest rates has been a theme of discussion in the international financial literature in recent years.[5] One reason that is cited is the high level of saving in some Asian countries, particularly China, and in oil-exporting countries. Moreover, it has been pointed out that investment has been low in several regions of the world, possibly as a result of previous periods of over-investment. A preference for higher saving and a preference for lower investment both contribute to lower interest rates. Moreover, monetary policy in China and other Asian countries is oriented towards exchange rate stability. To ensure exchange rate developments in line with the objectives of monetary policy, the Asian central banks buy US dollars and invest in US government bonds. This contributes to keeping US long-term interest rates at a low level, which in turn have a considerable impact on developments in long-term interest rates in other parts of the world.

In addition, new accounting and solvency rules are being introduced in many countries. The new rules provide pension funds in particular with incentives to lengthen asset maturities, improving the balance between asset and debt maturities. Increased demand for long-term bonds pushes up bond prices and pushes down yields.[6]

Normally, an investor will, on an expectations basis, be compensated in the form of a positive term premium for holding long-term bonds instead of rolling over short-term bonds. Various conditions relating to saving and investment patterns in the world economy and new accounting and solvency rules may have led to a marked fall in term premia in recent years. In some markets, they can even be negative.

The level of long-term interest rates is frequently used as an indicator of the normal interest rate level. If low long-term interest rates are caused by extraordinary conditions and not expectations of low growth and low inflation, long-term market interest rates may underestimate the normal interest rate level.

3. Optimal monetary policy and commitment

In order to produce a forecast that reflects a reasonable trade-off in monetary policy, we have drawn up a set of guidelines, which are presented in the Monetary Policy Report.The criteria cannot provide an absolutely precise guide as to how the interest rate should be set, but point to factors we should have considered and assessed.

The central trade-off in a flexible inflation targeting regime is between inflation prospects and the prospects for capacity utilisation in the economy. If monetary policy is to anchor inflation expectations around the target, the interest rate must be set so that inflation moves towards the target. Inflation should be stabilised near the target within a reasonable time horizon. The inflation gap and the output gap should also be in reasonable proportion to each other until they close.

Let us now look at monetary policy within a theoretical framework. In the literature on optimal monetary policy, the trade-offs are often specified in the form of a loss function, which the central bank attempts to minimise. In principle, many goal variables can be included in such a loss function, but it is normal to assume that inflation and the output gap are included. The cumulative loss can then be expressed by the following equation,

$$L = E_t \sum_{k=0}^{\infty} \beta^k \left[\left(\pi_{t+k} - \pi^* \right)^2 + \lambda \left(y_{t+k} \right)^2 \right]$$

Here π is inflation, π^* is the inflation target and y is the output gap. β is a discount factor. λ is a parameter that expresses how much weight is given to stable output versus low and stable inflation. If λ is greater than 0, this is often referred to as flexible inflation targeting.

Thirty to forty years ago, economic policy was widely regarded as an optimal control problem where the authorities could minimise society's loss function directly and mechanically. Economic policy could in a sense be viewed as an engineering art. However, in 1977 Finn Kydland and Edward Prescott warned against this approach to economic policy conduct.[7] In their work, for which they were later awarded the Nobel Prize, they showed that if the authorities in each period attempt to optimise on a discretionary basis, a suboptimal equilibrium may arise. The reason lies in economic agents' expectations formation.

Kydland and Prescott argued in favour of a rule-based policy, where policymakers commit to a certain pattern of behaviour. They also pointed out that it would generally be tempting to "reoptimise" at a later time and thereby ignore earlier promises. This temptation is often referred to as the "time inconsistency problem". For a rule-based policy to be successful, it must be credible so that economic agents can fairly safely assume that decision-makers will actually follow their announced response pattern.

Norway's experience of various fixed exchange rate

5 Though the literature is vast, see for example Ahrend, R., P. Catte and R. Price (2006) 'Factors behind low long-term interest rates', Working Papers 490, OECD, www.oecd.org, IMF (2005) 'Global Imbalances A Saving and Investment Perspective', World Economic Outlook September 2005, www.imf.org, IMF (2006) 'Awash with cash: Why are corporate savings so high?', World Economic Outlook April 2006, www.imf.org, and Rajan, R. G. (2006) 'Is there a global shortage of fixed assets?', Remarks 1 December, www.imf.org.

6 For more details, see "Implications of changes in pension fund regulations for the bond market", box in Financial stability 1/2006, Norges Bank, see norges-bank.no.

7 Kydland, F. and E. Prescott (1977), "Rules rather than discretion: The inconsistency of optimal plans", Journal of Political Economy, 85, 473–490.

regimes during the post-war period provides a good illustration of the difference between discretionary policy and commitment policy. In the period 1946–1971, the krone was pegged to the US dollar. The IMF had to authorise any changes in the exchange rate. By participating in an international system we achieved credibility as to the authorities' commitment to the fixed exchange rate. The period was marked by high economic growth and low inflation.

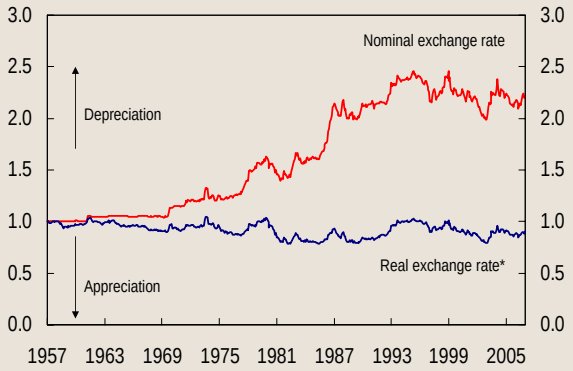
During the devaluation period in the 10 years between 1976 and 1986, the credibility of the fixed exchange rate regime was severely impaired. In this period, a total of ten devaluations or "technical adjustments" that entailed a devaluation were made, often aimed at correcting the previous deterioration in Norway's relative cost position. Chart 8 shows that while the Norwegian krone gradually lost value in nominal terms against the Deutsche mark, in real terms the value was broadly constant. Such repeated "reoptimisations" eventually led to expectations that the authorities would not honour their promise of a fixed exchange rate in the future. Instead, there were growing expectations that if price and cost inflation became too high, the authorities would devalue the krone. The social partners and businesses then factored in higher inflation in their wage demands and price-setting. The result was higher cost and price inflation without the desired effect on competitiveness and employment.

The Norwegian economy was lacking a nominal anchor during the devaluation period in the 1970s and 1980s, which fuelled inflation and instability. The ten-year period of devaluations is an example of how purely discretionary policymaking can lead the economy onto a suboptimal path, pointed out by Kydland and Prescott.

The last devaluation came in 1986. Thereafter, the interest rate was used to keep the exchange rate fixed. The Norwegian economy had to undergo an extensive turnaround operation. Confidence in the Norwegian krone had to be restored in order to avoid persistently high inflation. This required very high interest rates. It took a long time for foreign exchange markets to gain confidence in the strategy shift in exchange rate policy. It was not until 1990 that Norwegian interest rates were on a par with external interest rates. By tying ourselves to a reaction pattern, monetary policy credibility was restored and the way was paved for more stable economic developments.

In the wake of Kydland's and Prescott's recommendations, both fiscal policy and monetary policy have become more rule-based in many countries. Policy rules are useful in that they give weight to long-term objectives when faced with day-to-day economic policy challenges. Since the early 1990s, many countries have implemented institutional reforms, such as central bank independence in the conduct of monetary policy to reach government-defined objectives. At the same time, the objectives of monetary policy have become clearer, with the primary objective normally being low and stable inflation. Thus, the authorities in many countries have thereby committed to give priority to the long-term goals in monetary policy.

Chart 8 Nominal and real exchange rate. NOK/DEM. (As from 1999 calculated implicitly via the euro exchange rate). Index 1957=1



*Nominal rate deflated by relative consumer prices

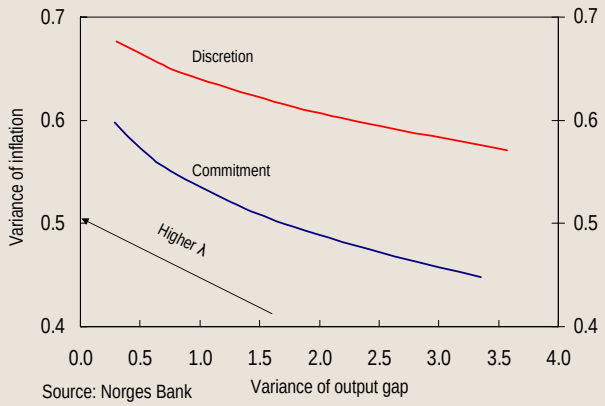
Source: Reuters/EcoWin

The conduct of monetary policy under a flexible inflation targeting regime, given the defined objectives, also gives rise to challenges concerning commitment to a pattern of behaviour. However, the benefit of a commitment policy in relation to a discretionary policy is perhaps not as straightforward as for example that of a fixed exchange rate regime.

The benefit of commitment to a pattern of behaviour lies in the fact that today's prices, wages and exchange rates depend on expectations concerning future activity levels and interest rates. If, for example, a shock brings down inflation to a level that is considerably lower than the target in the short run, it is not only a low interest rate today, but even more so expectations of low interest rates in the future that will push up inflation. By committing to a response pattern that implies an expansionary monetary policy, not only in the immediate term but also somewhat further ahead, inflation may pick up faster. But if economic agents expect the central bank to discard this promise, inflation will not pick up to the same extent as would otherwise be the case. Over time such a commitment policy will improve stability in both inflation and the activity level compared to a policy based on discretion.

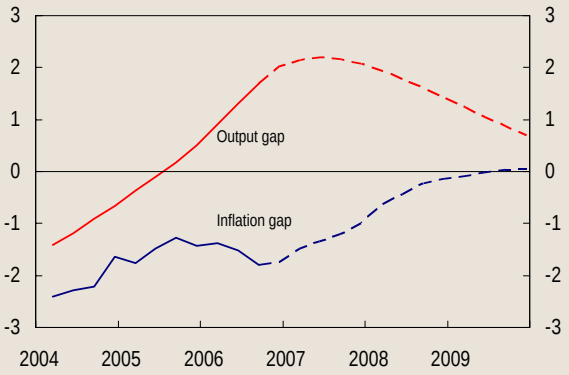
Let me attempt to illustrate the gains of committing to a response pattern rather than pursuing a purely discretionary policy. We have developed tools that allows us to find interest rate paths that minimise the loss function, given a model of the economy's functioning and given economic shocks. Within the framework of a small macroeconomic model, we have estimated the magnitude of the shocks to which the Norwegian economy has been exposed over the past 10–15 years. Under the two different assumptions about monetary policy, discretion and commitment, we have estimated how large the variance of output and inflation will be over

Chart 9 Discretion versus commitment



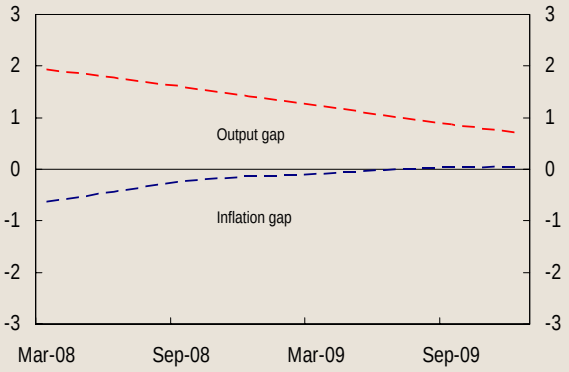
Source: Norges Bank

Chart 10a Trade-off in Inflation Report 3/06



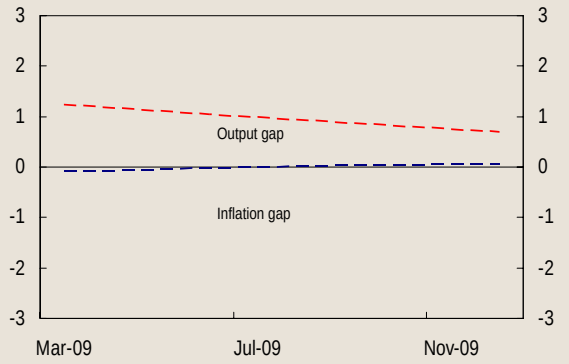
Source: Norges Bank

Chart 10b Trade-off in Inflation Report 3/06. 2008 - 2009



Source: Norges Bank

Chart 10c Trade-off in Inflation Report 3/06. 2009



Source: Norges Bank

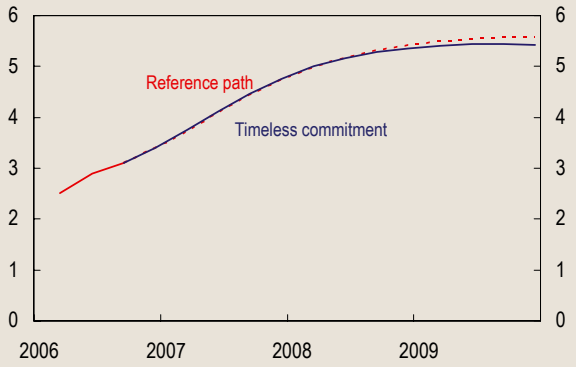
time. We have assumed that the economy is exposed to the same shocks as in history. It should be emphasised that this exercise is only meant as an illustration based on a stylised economic model.

Chart 9 shows the variance of inflation on the vertical axis and variance of the output gap on the horizontal axis. By minimising the loss function above under discretion and commitment respectively, subject to the model of the economy, we obtain different combinations of the variance of inflation and the variance of the output gap. By varying the weight on the output gap, lambda, in the loss function, we obtain a line for each strategy. The lines represent the minimum loss that can be achieved under commitment and under discretion. As long as private-sector decisions are partly based on expectations about the future, and the central bank through its actions and communication can influence these expectations, the chart illustrates a result that is independent of the explicit economic model: If the central bank can commit itself credibly to a response pattern, it will be able to achieve a better outcome over time than if in each period it attempts to optimise the situation. This is illustrated in the chart in that the line that represents a commitment strategy lies closer to the origo point than the line that represents a discretionary strategy. If, however, economic agents are purely backward looking, there would not be any differences between the two approaches, and the two lines would converge into one. The more forward-looking the economic agents are, the greater the difference between the outcomes will be. The way in which monetary policy is implemented and communicated may therefore influence the functioning of the economy through the expectations channel. By committing to a pattern of behaviour, the expectations channel can be used effectively.

Let us now take a closer look at our projections in *Inflation Report* 3/06 (see Chart 10a). The inflation gap closes gradually from below, while the output gap closes from above. According to the Bank's view, these paths provide a reasonable trade-off between the objective of stabilising inflation at target and stabilising developments in output and employment.

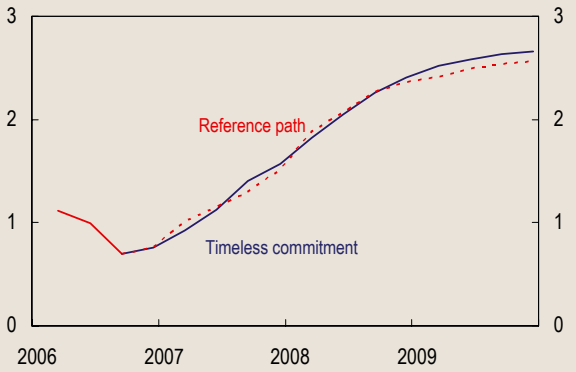
Let us now use a time machine and travel forward to 2008. Chart 10b, which is a magnified part of Chart 10a, gives an impression that we now put less weight on the output gap. The picture becomes even clearer if we travel forward yet another year in time to 2009, as shown in Chart 10c. Inflation is now very near the target, while the output gap is still clearly positive. It may thus seem as if we are placing more weight on the output gap in

Chart 11a Reference path IR 3/06 and timeless commitment: Interest rate



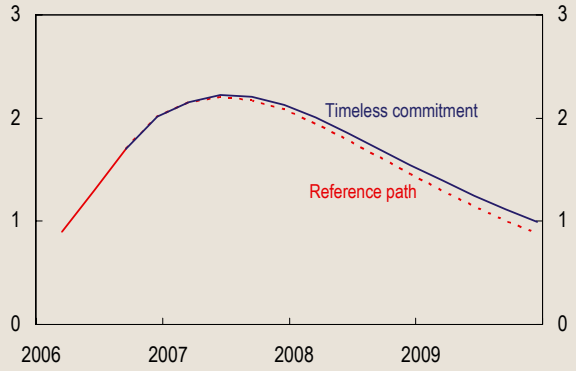
Source: Norges Bank

Chart 11b Reference path IR 3/06 and timeless commitment: Inflation



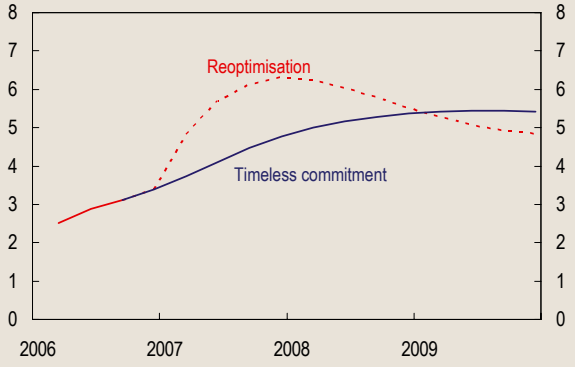
Source: Norges Bank

Chart 11c Reference path IR 3/06 and timeless commitment: Output gap



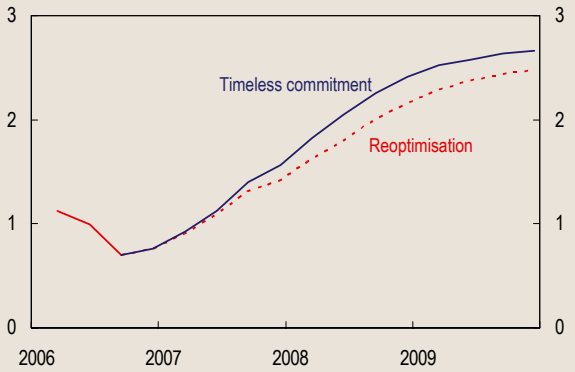
Source: Norges Bank

Chart 12a Timeless commitment versus reoptimisation: Interest rate



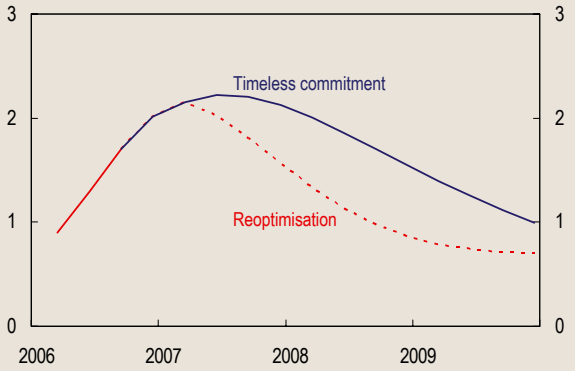
Source: Norges Bank

Chart 12b Timeless commitment versus reoptimisation: Inflation



Source: Norges Bank

Chart 12c Timeless commitment versus reoptimisation: Output gap



Source: Norges Bank

the beginning of the period than at the end of the period. This suggests that the reference path in *Inflation Report* 3/06 is not consistent with a discretionary policy, where you make the best out of the situation in each period. Such a strategy would have involved a higher interest rate in order to provide a better balance between inflation and output towards the end of the projection period. Rather, it seems that the reference path has elements of commitment.

Let us therefore assume that we follow the response pattern we have committed ourselves to earlier. In the literature, one such strategy is referred to as commitment under a timeless perspective.[8] It is possible to calculate, within the confines of our models, an optimal interest rate path based on such a strategy (see Charts 11a–c).

In this example, we have been able to reconstruct (approximately) the reference path in *Inflation Report* 3/06 by minimising a loss function under commitment in a timeless perspective. To reconstruct the reference

8 See for example Woodford, M. (1999) "Commentary: How should monetary policy be conducted in an era of price stability?", Paper presented at the Jackson Hole conference, see http://www.columbia.edu/%7Emw2230/jhole.pdf <http://www.columbia.edu/%7Emw2230/jhole.pdf>.

path, the weight on the output gap in the loss function, lambda, has been set at 0.3. We also had to place a weight on changes in the interest rate in the loss function. This weight, which penalises large changes in the interest rate, can be defended based on considerations regarding robustness and financial stability.

What is the outcome if we depart from our established response pattern, that is, if we succumb to the temptation of reoptimising? On the basis of a theoretical exercise given a very simple model of the economy, Charts 12a–c illustrate what might happen if the central bank reoptimises today, but promises never to do so again. In the model, this will result in a marked rise in interest rates today. But such an approach has been criticised in the literature. If the central bank departs from its response pattern today, it is easy to believe that it will do the same in the future. It may therefore be difficult to gain credibility for such a policy. Even if it may feel tempting, it is important to be aware of the possible costs associated with departing from an established response pattern. It will then be more demanding to influence private-sector expectations. Frequent reoptimisations will in practice undermine the benefit of commitment and lead to a discretionary policy.

The benefit of commitment hinges on the credibility of the central bank's actions and communication. Thus, it can be argued that it is important to adhere to the previously communicated response pattern and behave consistently over time. This puts the central bank in a better position to utilise the expectations channel. Inflation can then over time be stabilised with smaller fluctuations in output and employment than would otherwise be the case.

Here it is crucial to reinvoke the point made above. Even if monetary policy follows a commitment strategy, the interest rate path may well change from one report to the next. If for example new information concerning economic developments leads to a change in the outlook, the interest rate path will normally shift as well. In this respect, one can say that the commitment is to a response pattern, not to a specific interest rate path. Reacting to new information is part of a predictable pattern of behaviour.

4. Final remarks

I have discussed some of the aspects of the conduct and communication of monetary policy based on our own experience of presenting an interest rate forecast, but also based on monetary policy theory as described in the international economics literature. Theory can often provide a useful platform for analysing the challenges we are facing with regard to practical monetary policy.

In practice, we are facing more challenges than we can address within the confines of economic models. The models can, for example, seldom help us in assessing uncertainty and risk. The monetary policy strategy we are pursuing must also take account of and guard against particularly adverse developments. While economic models as a rule are based on the assumption that the inflation target is fundamentally credible, in practice we must be on guard with respect to developments that weaken the credibility of the inflation target as a nominal anchor in the economy. Normally, the interest rate will be changed gradually. In cases where there is a risk of inflation deviating substantially from target over a longer period or when high financial market volatility or a wage-cost shock indicates that the credibility of monetary policy is in jeopardy, it may be appropriate with more pronounced interest rate changes.

Models and theory can never provide a perfect recipe for how to set the interest rate – they are only tools. Norges Bank's response pattern will also be based on judgment and qualitative analyses. We have drawn up a set of criteria which are given emphasis when we prepare the interest rate forecast. Gains can be derived from predictable and consistent behaviour over time. Economic models can help us to systematise and challenge judgment. Monetary policy can probably make a more effective contribution to low and stable inflation and to stablising economic developments when the central bank is transparent about its assessments and analyses.

Developments in the credit market – new types of loans and the volume of fixed-rate loans in Norway

Gunnar Almklov and Espen Tørum, economists in the Statistics Department, and Marita Skjæveland, economist in the Financial Markets Department

This article describes developments in various types of loans from financial institutions[1] and the volume of loans with a fixed-rate period, i.e. fixed-rate loans. In recent years, the credit market has evolved rapidly. The number of loan products is increasing and growth in borrowing has been high. Furthermore, borrowers have more choice with regard to loan repayment profiles. For instance, interest-only loans have become more common. At the same time, the number of fixed-rate loans has fallen from the already low level of recent years. In Denmark and Sweden, the number of fixed-rate loans is significantly higher. However, the share of fixed-rate loans has recently been declining in these countries as well.

1 Introduction

In recent years, the credit market in Norway has been marked by high and rising lending growth, strong competition and rapid emergence of new loan products. This article takes a closer look at some characteristics of these developments, with special focus on growth in credit to households and non-financial enterprises (hereafter merely referred to as enterprises). In addition to looking at total growth in credit in these two sectors, their loans will be split up into various subcategories. We will also take a closer look at some new loan products which have been launched in recent years.

The number of fixed-rate loans affects how quickly and how strongly monetary policy changes (interest rate changes) feed through to the credit market and possibly further into the real economy, in other words how efficient the transmission mechanism is. The higher the share of floating-rate loans and the shorter the lock-in period for fixed-rate loans, the faster monetary policy will have an effect. However, fixing the interest rate may cause greater predictability in the public's debt-servicing expenses and may contribute to preventing payment problems for particularly vulnerable groups. Fixed-rate loans may thus have a positive effect on financial stability.

The high credit growth over several years has led to a higher debt burden for households. Corporate debt has also increased markedly over the past year, which implies that interest rate changes may have a larger impact on the public's debt-servicing capacity in the future. The number of fixed-rate loans may be of importance in the assessment of this picture. We will therefore provide an overview of the scope of and developments in fixed-rate loans for households and enterprises. This overview is partly based on Norges Bank's new statistics on *loans by fixed-rate period*, which go back to the first quarter of 2004.

The fixed-rate loan statistics and the other background information for this article have given us a broader basis for estimating the extent to which the public hedges against interest rate increases through fixed-rate loans. However, we do not have sufficient information to comment on the degree to which the public as a whole is

Definition of sectors

In the statistics, participants are grouped by socio-economic function based on the UN's System of National Accounts (SNA) 1993. In this article we have focused on these main groups: financial enterprises, non-financial enterprises, local government and households. These groups may be defined as follows:

Financial corporations channel credit from participants with accumulated capital to participants with borrowing requirements. This main sector consists of banks, state lending institutions, mortgage companies, finance companies, insurance companies and pension funds, mutual funds, financial holding companies, financial auxiliaries, and development and investment companies etc. Measured by lending, banks are decidedly the largest group.

Non-financial enterprises produce goods and services. This main sector is often split into public and private non-financial enterprises, but that distinction has not been made in this article.

Households consume goods and services and consist of wage-earners, social security recipients etc. In addition, the self-employed, unincorporated enterprises, limited partnerships and housing cooperatives are also included in the household sector.

Local government consists of municipalities and counties.

The public is defined here as municipalities, non-financial enterprises and households and is the most commonly used sector aggregate in relation to credit indicators.

[1] See definition in Box

protected against interest rate increases. For example, we are lacking information on the scope of interest rate swaps and other derivatives. This is particularly important when estimating the extent of hedging by enterprises and municipalities.

2 The credit market

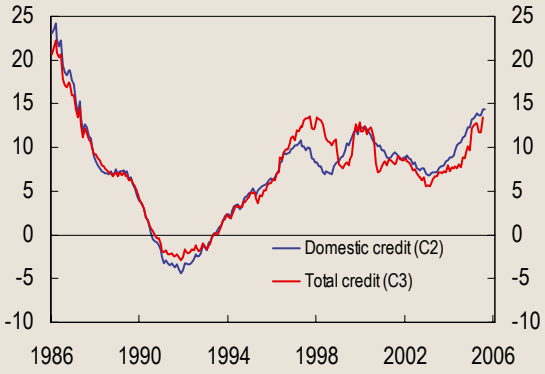
2.1 Credit to the public[2]

In the description of credit developments we will be looking at developments in the credit indicators C2 and C3. C2 measures credit from domestic lenders. C3 also includes credit from foreign lenders and is thus a measure of total credit to the public. The credit indicators describe developments in the public's gross debt and are well suited as indicators of developments in the real economy.[3] In addition, the credit indicators provide information about the various sectors' financial position and are thus also important contributors to the analysis of financial stability. An advantageous feature of the credit indicators is that they have good real-time properties,[4] which means that there are few revisions, especially in C2.

Table 1 shows that the level of domestic credit to the public has more than doubled since 1995. Chart 1 shows that growth rose sharply in the 1990s, after having been low for a period, and has remained high since the end of that decade.

Credit from domestic lenders currently represents about 83 per cent of total credit to the public. The statistics do not include detailed information about credit from foreign lenders distributed by borrowing sectors. It is therefore not possible to quantify precisely the size of total borrowing in various sectors. Still, we know that it is primarily enterprises that raise loans from foreign lenders, while households and municipalities only take up loans abroad to a very limited degree. According to *Household financial accounts*, gross domestic *loan* debt accounts for more than 90 per cent of total household debt.[5]

Chart 1 Domestic credit (C2) and total credit (C3) to the public. 12-month growth. Per cent. Monthly figures. December 1986 – July 2006



Source: Norges Bank

Table 1. Domestic lenders' share of domestic credit (C2). Per cent

	1990	1995	2000	2005	2006*
Domestic lenders					
Banks	48.9	55.7	64.2	67.9	69.7
State lending institutions	17.5	18.7	11.5	8.4	7.9
Mortgage companies	15.5	6.6	9.9	10.5	10.0
Finance companies	2.2	3.3	4.6	4.9	4.3
Insurance companies	7.5	6.6	2.0	1.0	1.0
Bonds and short-term paper	6.5	8.4	7.3	6.7	6.6
Other credit	1.9	0.7	0.5	0.6	0.5
Total	100	100	100	100	100
Memorandum:					
C2 – NOK billion	931	936	1 461	2 272	2 451
C3 – NOK billion	1 063	1 081	1 841	2 751	2 928

* Figures for 2006 were calculated at end-July. The C3 figure for 2006 was calculated at end-June.

2.2 Domestic lenders

Banks[6] are the largest lenders and account for as much as 70 per cent of domestic credit to the public (see Table 1). The banks' share has increased by a good 14 percentage points over the past ten years.

State lending institutions currently include the Norwegian State Housing Bank (Husbanken), the Norwegian State Educational Loan Fund (NSELF) and Innovation Norway. These are specialised lending institutions that provide loans and financing for a limited range of purposes. In the past, such institutions were important public instruments for the allotment of subsidised credit, but their significance in this respect has been reduced in recent years. State lending institutions currently account for 8 per cent of domestic credit to the public. In 1990, by comparison, there were ten state lending institutions which together accounted for 18 per cent of domestic credit.

Mortgage companies extend loans secured on dwellings, commercial buildings and the like. They primarily finance their lending activities through funding or by issuing bonds, notes and short-term paper. Finance companies include various types of lending companies. They specialise in loan products such as factoring, leasing, overdraft facilities and credit card loans, mainly financed by funding.

The group insurance companies includes non-life and life insurance companies, private and municipal pension funds, as well as the contractual early retirement scheme (AFP) and the Pension Scheme Under Collective Wage Agreements (FTP). Insurance companies were previously major credit providers, but their share of domestic credit to the public was only one per

[2] See definition of the sector called "public" in Box
[3] See Gerdrup, Hammersland and Naug (2006).
[4] See Bø, Rødstadsand and Tørum (2003).
[5] Household financial accounts for the first quarter of 2006 (Norges Bank).
[6] Banks include savings banks, Norwegian and foreign-owned commercial banks as well as branches of foreign banks.

cent in July 2006. The bulk of these loans are extended to households and municipalities.

2.3 Credit to households and enterprises

Households

Households constitute the largest borrowing sector. Household credit accounts for more than 60 per cent of total domestic credit to the public (see Table 2). This implies that developments in household finances are important for financial undertakings' credit risk[7]. Historically, losses on household loans have been moderate compared with corporate loans. Weaker financial developments in the household sector and a deterioration of their financial position may still have a considerable impact on the economy in general. An increase in the interest rate will force households to use a larger share of their disposable income on debt servicing, and may also lead to increased saving. Due to these factors, there will be a reduction in household consumption. Lower demand from the household sector may affect enterprises' earnings and debt-servicing capacity. Subsequently, this may affect output and employment.

Household debt growth has been high in the last five-year period. Since mid-2000, annual growth in household credit has generally been more than 10 per cent (see Chart 2). Household loans may generally be divided into two groups: mortgage loans and other loans. A mortgage loan means that the loan is secured on the borrower's dwelling (or leisure property). Over the past ten years the share of mortgage loans has risen by approximately 10 percentage points to 77 per cent of total credit to households (see Table 3). The strong growth in mortgage loans is partly related to the sharp rise in house prices. The growth is partly a result of an increase in collateral values due to the strong rise in house prices coupled with the introduction of new types of loans designed to facilitate mortgage equity withdrawal (see section on new loan products below).

Table 2. Various borrowing sectors' share of domestic credit (C2). Per cent

Borrowing sector	1990	1995	2000	2005	2006*
Households	54.5	59.6	55.4	61.4	60.5
Enterprises	38.2	31.9	36.6	31.0	32.2
Local government	7.3	8.5	8.0	7.7	7.3
Total	100	100	100	100	100
C2 – NOK billion	931	936	1 461	2 272	2 451

* Figures for 2006 were calculated at end-July.

Table 3. Credit to households. Mortgage loans and other loans. In billions of NOK

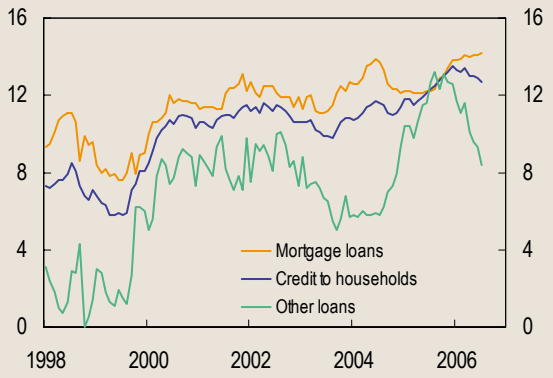
Types of lending	1996	2000	2005	2006*
Mortgage loans in C2	400	578	1 056	1 140
Other loans in C2	188	231	339	343
Mortgage loans as share of domestic credit to households (Per cent)	68.1	71.4	75.7	76.8

* Figures for 2006 were calculated at end-July.

"Other loans" include various types of unsecured loans or loans secured on objects other than dwellings (and leisure property), such as cars, boats or financial instruments. "Other repayment loans" (excluding mortgage loans) is the largest subcategory of other loans. At the end of July 2006 the holdings of these loans amounted to more than NOK 280 billion. Student loans account for approximately 30 per cent of other repayment loans. Holdings of credit card loans[8] have more than doubled in the course of the past ten years and now amount to just under NOK 40 billion.

In July 2006, banks accounted for more than 80 per cent of credit to households from domestic lenders.[9] State lending institutions followed as the second largest lender with a share of 11 per cent, while mortgage companies and finance companies together accounted for approximately 6 per cent.

Chart 2 Credit to households. 12-month growth. Per cent. Monthly figures. January 1998 – July 2006



Source: Norges Bank

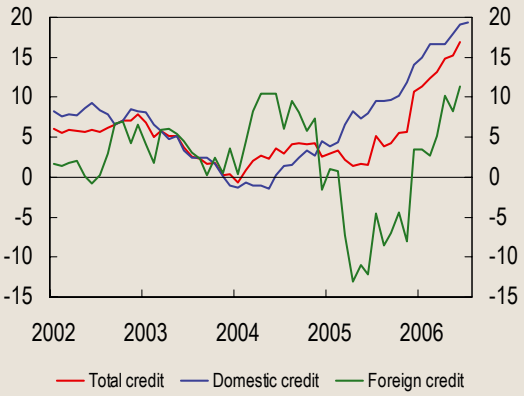
Enterprises

Total gross corporate debt can be divided into loans from domestic and foreign lenders. The credit indicator for domestic credit (C2) is specified by borrowing sector, while credit from foreign sources has not been broken down by sector in the statistics. This means that it is impossible to determine precisely the size of total gross corporate debt (C3). In order to estimate total gross corporate debt, we have assumed, for simplification, that all credit from foreign sources is raised by the corporate sector.

Enterprises' credit from domestic lenders amounted to approximately NOK 790 billion at end-July 2006.

[7] Credit risk is the risk of losses due to the inability of a counterparty to meet his obligations, for example when a borrower does not pay interest and/or instalments.
[8] The term credit card loan is used as a collective term for bank overdraft facilities, user credit and operating credit. In addition to credit card loans, this category includes overdraft facilities, drawing rights schemes, borrowing rights on wage and deposit accounts, and overdrafts of deposit accounts without drawing rights.
[9] According to the credit indicator (C2) for July 2006.

Chart 3 Credit to mainland non-financial enterprises. 12-month growth. Per cent. Monthly figures. January 2002 – July 2006



Source: Norges Bank

This represented about 32 per cent of domestic credit to the public. Corporate debt fluctuates widely as developments in most industries to a large extent follow business cycles. As with the household sector, banks constitute the largest domestic lender to enterprises. Bank lending accounted for approximately 64 per cent of domestic credit to enterprises, while mortgage companies and finance companies accounted for 11 and 7 per cent respectively. The rest of the funding was accounted for by the short-term paper and bond markets.

Credit to the public from foreign lenders amounted to approximately NOK 497 billion at the end of June 2006. By assuming that the enterprise sector receives all the credit from foreign lenders, total credit to enterprises amounted to about NOK 1 278 billion in the same month. Credit to mainland enterprises from domestic and foreign lenders amounted to NOK 729 billion and NOK 274 billion respectively. The petroleum and shipping industry accounted for around 7 per cent[10] of domestic credit to enterprises and approximately 45 per cent of credit from foreign lenders. Chart 3 shows developments in mainland enterprises' total credit distributed by domestic and foreign lenders.

2.4 New loan products for the household sector

In recent years, a number of new loan products have been introduced, making the household loan market more flexible. Credit lines secured on dwellings[11] is a new loan product that facilitates mortgage equity withdrawal. The number of banks that offer these loans has increased over the past year. These loans are flexible in the sense that the entire loan may either be disbursed as a lump sum or as monthly payments. The repayment schedule is largely determined by the individual customer, who only pays interest on the credit amount drawn. Credit lines secured on dwellings amounted to nearly NOK 63 billion at the end of July 2006. The available data for these loans extend back to December 2005. During the first seven months of 2006, holdings of credit lines secured on dwellings have increased by 85 per cent. The increased flexibility provided by this product has probably contributed to maintaining high growth in household credit in recent months.

During the past year, a number of banks have also started offering mortgage loans with interest rate ceilings. These are floating-rate loans, but borrowers are protected against interest rates above a certain level. Some banks offer such loans to first-time home buyers without extra costs. Traditionally, this is a group of borrowers who are particularly vulnerable to interest rate increases. At present, there are no statistics on the volume of this product in Norway.

Another pronounced trend in the credit market is that debt-financing for the purchase of financial instruments has increased in recent years. This applies, for instance, to loans for the purchase of equities or so-called structured products, including equity-linked deposits and equity-linked bonds. For structured products, returns are linked to changes in the value of portfolios or indices that consist of financial or non-financial assets. A large number of structured products are guaranteed savings products. This means that investors are guaranteed the return of the entire amount or a predetermined portion of the nominal investment at maturity.

When banks provide loans for the purchase of financial instruments, those instruments are normally used as collateral. An annual survey, based on a selection of banks and conducted by Kredittilsynet (the Financial Supervisory Authority of Norway), shows that the selected banks' loans collateralised by financial instruments amounted to NOK 47 billion in the third quarter of 2005.[12] This was an increase of NOK 16 billion in the course of one year. A large portion of these loans were extended to the household sector. Norges Bank's financial statistics show that the share of investments in structured products that are financed by loans has increased from 57 per cent to 67 per cent during the first seven months of 2006. The statistics show that households account for over 90 per cent of investments and borrowing in connection with these products. In recent years, some market participants have also started offering loans collateralised by equities and other financial instruments, but statistics on this area are so far limited. Loans for the purchase of financial instruments seem to a large extent to be associated with favourable tax conditions.

Moreover, household borrowing terms have steadily become more flexible with regard to repayment profiles. Kredittilsynet's mortgage loan survey in autumn 2005 showed that interest-only loans are more common than registered in previous surveys. In 2005,

[10] Gross lending at the end of July 2006.

[11] This type of loan is known under various names in Norway, for instance flexiloans.

[12] Surveys conducted by Kredittilsynet include financial instruments other than the structured products that are covered by Norges Bank's statistics. This applies to loans for the purchase of equities and units in securities funds, among other things.

one of every eight new loans covered by this survey featured an interest-only period. The average interest-only period is four to five years. In addition, the average maturity for new approved mortgage loans has increased by approximately two years during the past four years. This increased flexibility makes it easier to service higher loans than previously.

3 The volume of fixed-rate loans

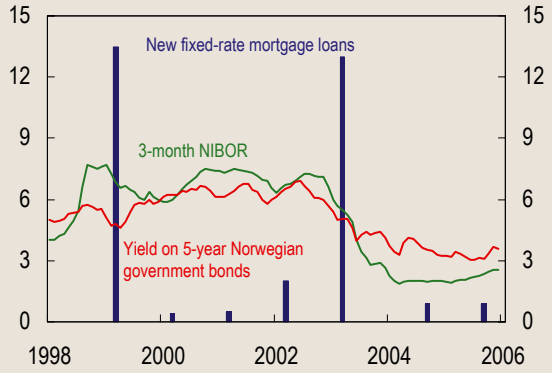
When raising a loan, the borrower may choose between various types of interest rate terms (see the box in this section for an overview). As mentioned in the introduction, the share of loans with fixed interest rates will influence how quickly and how strongly monetary policy changes (interest rate changes) influence household and corporate behaviour and the real economy. Moreover, the volume of fixed-rate loans will have a bearing on borrowers' vulnerability to interest rate changes and thereby also affect financial enterprises' credit risk. This section takes a closer look at reasons behind the low number of fixed-rate loans in Norway, and provides some general observations on this topic.

3.1 Relevant factors when choosing between fixed and floating interest rates

Kredittilsynet's survey of mortgage loans for 1999 and 2003 showed that the share of fixed-rate loans was relatively high compared with other years. These two years were characterised by a decline in short-term interest rates, while long-term rates were lower than short rates (see Chart 4). Using this as a background, we have listed some factors which may contribute to explaining the low number of fixed-rate loans in Norway.

- Fixed-rate loans provide predictability with regard to debt-servicing expenses and may thus be perceived as an insurance against higher interest rates. Many borrowers probably believe that their financial position is solid enough and therefore do not need the predictability provided by fixed-interest rates.
- When interest rates declined in 2002–2004, many borrowers chose to fix their interest rates. These bor-

Chart 4 New fixed-rate mortgage loans as a percentage of new mortgage loans[1] to households, 3-month NIBOR[2] and yield on 5-year Norwegian government bonds. Per cent.



[1] Information from a survey by Kredittilsynet in which a selected group of Norwegian banks have each categorised their first 100 loans to households from a certain date.

[2] Norwegian Interbank Offered Rate.

Sources: Kredittilsynet (The Financial Supervisory Authority of Norway) and Norges Bank

Various types of interest rate terms on loans from financial institutions

When raising a loan, borrowers may choose between various types of interest rate terms.

Floating interest rate means that the interest rate terms may be altered continuously, but if the borrower is a consumer he must be given at least six weeks written notice before the change enters into force, cf. the Financial Contracts Act §50 no 3. Changes in interest rates in the money market, changes in margins, changes in collateral value and the parties' bargaining power may contribute to changes in the interest rate on the loan.

Variable interest rate means that the interest rate is tied to a formal decision rule, which usually means that the interest rate is adjusted in pace with a benchmark rate in the money market, for instance "NIBOR plus 1 per cent". Loans with variable interest rates usually have a fixed margin agreed for the life of the loan.

Fixed interest rate means that the parties have agreed on a certain interest rate for a period ahead. In Norway, a typical fixed-rate mortgage has previously had a fixed interest rate for 3 or 5 years, while recently it has also become more common with a 10-year fixed interest rate. A fixed-rate agreement is usually binding both for borrower and lender during the agreed period and in the event of an early repayment of the loan, the borrower must normally pay a penalty if the market rate at the time of repayment is lower than the fixed interest rate in the loan agreement, or receive a discount if it is higher (cf. the Financial Contracts Act §54 no.1).

Interest rate ceiling is a combination of fixed and floating interest rates. This means that the interest rate is floating, but only up to a predetermined maximum level. This product is relatively new to the consumer market, while professional operators have had the possibility of constructing such ceilings for quite some time by using derivatives.

rowers did not benefit from the subsequent interest rate cuts and may therefore have reservations about fixing their interest rates again. This experience may also have made other borrowers reluctant to take up fixed-rate loans.

- Borrowers probably place more emphasis on lower regular payments now than on secure regular payments in the future. If the floating interest rate is lower than the fixed rate, then more people will choose floating-rate loans.
- The range of long fixed-rate agreements offered is very limited. Fixed-rate agreements would provide more security, if borrowers were given the option of a longer fixed-rate period, such as in Denmark.
- Norway does not have the same tradition of fixed-rate loans as, for instance, Denmark and Sweden.
- Fixed-rate loans reduce borrowers' flexibility. If the interest rate level is lower than in the fixed-rate agreement, borrowers will have to pay an early redemption penalty. This may contribute to making borrowers reluctant to take up fixed-rate loans. However, when fixed-rate loans are repaid early, borrowers will be granted a discount if the interest rate is higher at the time of repayment.

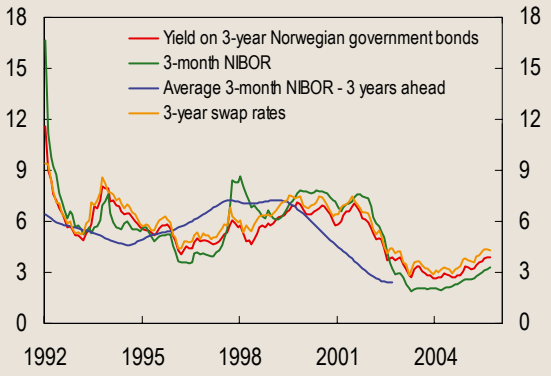
3.2 Profitability assessments in relation to the choice between fixed and floating interest rates

When choosing between fixed and floating interest rates, participants must base their decisions on expectations concerning the future interest rate path. This applies both when lenders are pricing their fixed-rate products and when borrowers are considering these offers. Whether fixing the interest rate has been profitable or not for the borrower is only possible to assess in retrospect. In order to make a complete empirical evaluation of the profitability of fixing the interest rate, it is essential to have data series that extend back over a lengthy period and preferably over several business cycles in order to identify systematic differences. We do not have such long data series, but we have still made some simple calculations.

When pricing loans, lenders base their prices on their funding rate[13], adding a margin[14] (premium) to cover administrative costs, risk premium etc. This applies to both fixed-rate and floating-rate loans. In order to finance fixed-interest rate lending, lenders may, for instance, issue a bond with the same maturity. In this case, a possible funding rate may be the bond yield[15]. It is common for lenders to finance fixed-rate loans by borrowing at a short-term NIBOR rate and then enter into an interest rate swap agreement in which they receive the NIBOR rate and pay a fixed swap rate. This implies that swap rates with maturities of 3 years, 5 years and 10 years, respectively, may be used as funding rates when calculating prices for fixed-rate loans with similar maturities. Similarly, a three-month NIBOR funding rate may be used when calculating the price for floating-rate loans. The differences between swap rates and average three-month NIBOR[16] may therefore shed light on price differences between fixed-rate and floating-rate loans respectively.

Charts 5 and 6 show a comparison of three and five year swap rates, respectively, against average future three-month NIBOR for the same time periods. The charts indicate that it has varied over time as to whether fixed- or floating-rate loans have been more profitable. For some periods, swap rates (yellow curves) have been higher than average money market rates (blue curves)

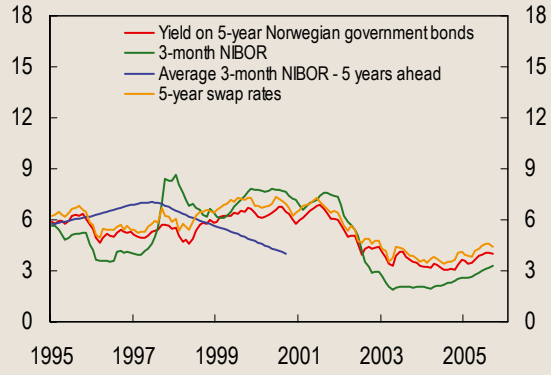
Chart 5 3-month NIBOR[1], 3-month NIBOR - average 3 years ahead, yield on 3-year Norwegian government bond and 3-year swap rates. Per cent. Monthly figures.
December 1992 – July 2006



[1] Norwegian Interbank Offered Rate.

Source: Norges Bank

Chart 6 3-month NIBOR[1], average 3-month NIBOR – 5 years ahead, yield on 5-year Norwegian government bonds and 5-year swap rates. Effective interest rates. Per cent. Monthly figures.
December 1995 – July 2006



[1] Norwegian Interbank Offered Rate.

Source: Norges Bank

[13] i.e. an interest rate which relates directly to funding costs.
[14] This margin is defined as the lending rate minus funding costs.
[15] Among the lending sectors, banks' bond yields will naturally be close, although slightly above government bond yields with similar maturities in accordance with various risk premiums.
[16] Calculated as an average of monthly observations for three-month NIBOR, 3 years, 5 years and 10 years ahead in time, respectively.

Table 4. Credit from domestic sources (C2) distributed by floating-rate loans, fixed-rate loans and bonds etc. Per second quarter 2006. Per cent

	Floating-rate	Fixed-rate less than 1 year	Fixed-rate over 1 year	Bonds and short-term paper
Total C2	79.5	6.2	8.5	5.9
Households	86.4	3.9	9.6	–
Enterprises	72.4	8.0	4.7	14.9
Local government	53.1	16.2	14.1	16.6

during the period, thus making it profitable to have floating interest rates. In other periods, the opposite has been the case.

Since banks also add a margin (premium) to their funding rates, a comparison of swap rates with the average of three-month NIBOR rates is inadequate as a retrospective evaluation of whether fixed-rate loan prices have been lower than floating-rate loan prices in a given period. Data collected from the six largest banks in Norway may indicate that the margins on new fixed-rate loans have been somewhat higher than the margins on new loans with floating interest rates in the past three years. A possible explanation for this deviation may be that there is stronger competition for floating-rate loans than for fixed-rate loans. It may also be the case that banks' risk assessments associated with various types of loans imply that the margin on fixed-rate loans should be higher than on floating-rate loans. However, our assessments of variations in margins between fixed-rate and floating-rate loans are only based on some rough average calculations.

3.3 The volume of fixed-rate loans

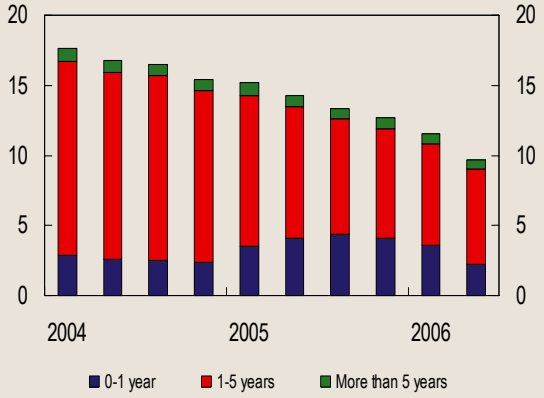
As of the first quarter of 2004, specifications for identifying the volume of fixed-rate loans distributed by borrowing sectors were introduced in the *Official accounts reporting for banks and financial undertakings* (ORBOF). On the basis of these statistics, we have calculated the share of domestic credit (C2) that consists of fixed-rate and floating-rate loans respectively.[17] The estimates show that approximately 80 per cent of domestic credit is extended at floating interest rates (see Table 4). Nearly 90 per cent of domestic credit to households is extended at floating interest rates. Floating-rate loans account for approximately 70 per cent of domestic credit to enterprises, given that short-term paper and bonds are defined as fixed-rate loans and derivatives are excluded.

Households

Previous analyses of households have shown that the share of fixed-rate loans has been low in Norway.[18] This is confirmed by fixed-rate statistics, which indicate that the share of fixed-rate loans to households has been declining throughout the period for which we have statistics (see Chart 7). The majority of fixed-rate loans to households have a remaining fixed-rate period of between one and five years. Developments indicate that a large share of households do not renew fixed-rate agreements when they mature and that the number of new fixed-rate agreements is low.

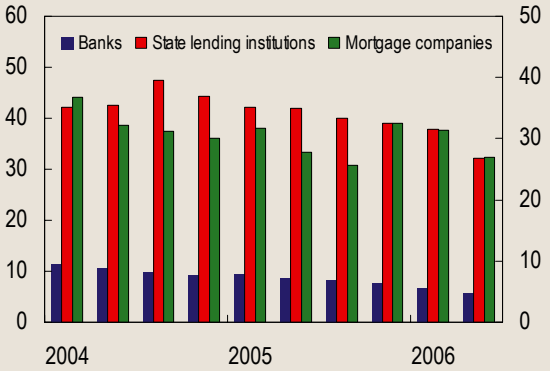
Distributed by lender sector, statistics show that fixed-rate loans as a share of total lending to households, is particularly low for banks (see Chart 8). In addition, this share has been declining in the past two years. The share of loans with a remaining fixed-rate period of more than one year has been particularly low. However, banks are responsible for a large share of gross fixed-rate lending

Chart 7 Fixed-rate loans to households as a percentage of total loans from banks, mortgage companies and state lending institutions, by fixed-rate period. Quarterly figures. 2004 Q1 – 2006 Q2



Source: Norges Bank

Chart 8 Fixed-rate loans to households as a percentage of total loans by lender sector. Quarterly figures. 2004 Q1 – 2006 Q2



Source: Norges Bank

[17] The share of fixed-rate loans from sources which are included in the indicator of domestic credit to the public (C2), and which are not covered by the fixed-rate statistics, has been estimated.

[18] See the Norwegian Savings Banks Association 2003.

to households. At end-June 2006, mortgage companies had outstanding loans to households amounting to NOK 44 billion, of which 32 per cent were fixed-rate loans. 17 per cent of loans from mortgage companies to households were loans with a remaining fixed-rate period of more than one year.

At the end of the second quarter of 2006, fixed-rate loans accounted for 32 per cent of total gross lending from state lending institutions to households. Most of these had remaining fixed-rate periods of more than one year. The share of fixed-rate loans from state lending institutions has been declining during the period for which we have statistics. The Norwegian State Housing Bank (Husbanken) and the Norwegian State Educational Loan Fund (NSELF) account for the bulk of household loans from state lending institutions. Both these institutions offer fixed-rate loans for three and five years.[19] Just over 60 per cent of loans from Husbanken to households are fixed-rate loans (see Chart 9). Following an increase in the share of fixed-rate loans in Husbanken in the course of 2004, this share has remained relatively stable over the past year. Of the interest-bearing loans to households from NSELF, just over 25 per cent are extended at a fixed interest rate, mainly with remaining fixed-rate periods of between one and five years.

The procedures for interest rate setting in Husbanken and NSELF differ somewhat from those of private lenders. The lending rate in state lending institutions is largely set on the basis of the interest rate on Treasury bills and government bonds with a lag of 3 to 6 months.

Compared with Denmark and Sweden, the share of fixed-rate loans to Norwegian households is very low (see Chart 10). In Denmark, mortgage companies are the most important providers of household loans secured on dwellings. Mortgage companies rely on funding in the bond market, which is more developed in Denmark than in Norway. Among other things, there is a larger market for bonds with long maturities. A precondition for enabling financial enterprises to offer fixed-rate loans with moderate margins and favourable terms is that there are smoothly functioning markets for long-term fixed-rate borrowing or derivatives which may reduce the interest rate risk.

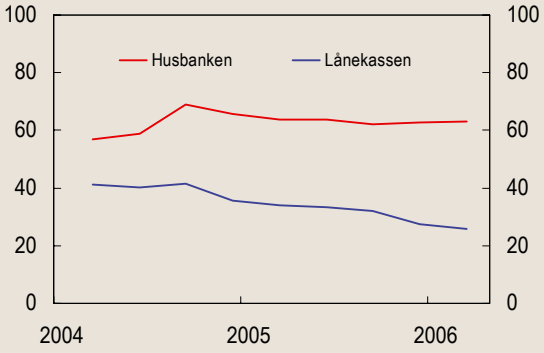
The well-developed bond market in Denmark makes it possible to transfer risk related to early repayment to investors. Thus, it is possible to borrow long-term (up to 30 years) at a fixed interest rate for the entire life of the loan, including a possibility of early repayment without an early redemption penalty (cf. Frankel et al. (2004)). Still, borrowers have to pay for this option through a higher margin on the fixed interest rate.

The share of fixed-rate loans has been declining both in Sweden and Denmark in the last two years. In Sweden, the share of new floating-rate loans has generally been in the interval 50–60 per cent in the year to June 2006. In Denmark, the option of taking up variable-rate loans was introduced for the first time in 1997. The sinking share of fixed-rate loans may therefore be related to increased availability of floating-rate mortgages. Mortgage loans with interest rate ceilings are popular products in Denmark, and these are recorded in the statistics as loans with variable interest rates as long as the interest rate does not exceed the agreed interest rate ceiling. This product has now also been introduced in Norway (see Section 2.4).

Enterprises

Enterprises fund their activities partly by borrowing from financial undertakings and partly by issuing bonds, notes and short-term paper. Whether bonds,

Chart 9 Husbanken and Lånekassen[1,2]. Fixed-rate loans to households as a percentage of total loans. Quarterly figures. 2004 Q1 – 2006 Q1

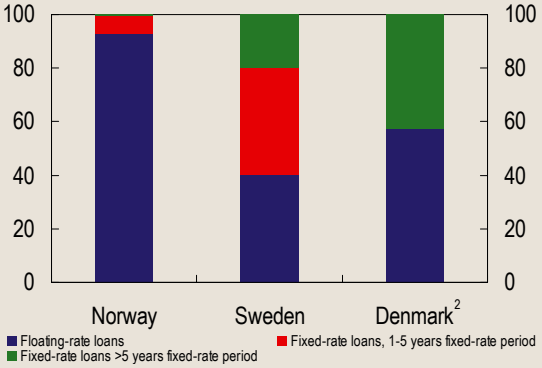


[1] Husbanken and Lånekassen are classified as state lending institutions and they are both atypical given their high degree of fixed-rate loans as a percentage of total loans.

[2] Lånekassen: Fixed-rate loans as percentage of total interest-bearing loans (excluding non-performing loans).

Sources: Husbanken (The Norwegian State Housing Bank) and Lånekassen (Norwegian State Educational Loan Fund)

Chart 10 Fixed-rate and floating-rate loans as a percentage of households' total mortgage loans in Sweden, Denmark and Norway[1]. June 2006



[1] For Norway: fixed-rate and floating-rate loans as a percentage of total loans to households.

[2] For Denmark: Initial fixed-rate period is 20-30 years (the entire term of the loan). The distribution of fixed-rate loans by term to maturity is not known. Therefore, all fixed-rate loans are classified as loans with more than 5 years fixed-rate period.

Sources: Sveriges Riksbank, Danmarks Nationalbank and Norges Bank

[19] As from October 2006, Husbanken also offers fixed-rate loans with a 10 year fixed-rate period.

notes and short-term paper should be classified as fixed-rate loans is debatable, but the majority of these loans are usually extended with a fixed coupon rate. Some bonds and short-term paper have various types of floating interest rates. There are no statistics that enable us to distribute bonds and short-term paper between fixed or floating interest rates. Thus, in Table 4, bonds and short-term paper have been presented as a separate group. When it comes to analysing the extent of fixed-rate loans among enterprises, a complicating element is that these are often professional participants that may use the swap and derivatives market in order to change their interest rate profile. This means, for instance, that an enterprise which issues bonds or raises fixed-rate loans from a lender can alter the interest rate stream on the loan through the derivatives market, so that, in reality, the enterprise is paying a floating interest rate without this being reflected in the statistics.

Chart 11 shows that just under 15 per cent of corporate loans from financial undertakings had fixed interest rates and only 4 per cent had a fixed rate for more than one year. These shares have been reduced during the period for which we have statistics.

Chart 12 shows that just over half of mortgage companies' loans to enterprises are fixed-rate loans. In the second quarter of 2006, this amounted to approximately NOK 40 billion. Around NOK 13 billion of these loans had remaining fixed-rate periods of one year or more. In the same period, banks had outstanding fixed-rate loans worth NOK 41 billion, but this only accounted for 8 per cent of banks' total lending to enterprises. By comparison, state lending institutions' fixed-rate loans to enterprises only amounted to approximately NOK 900 million at the same time. This represented around 12 per cent of their total lending to enterprises.

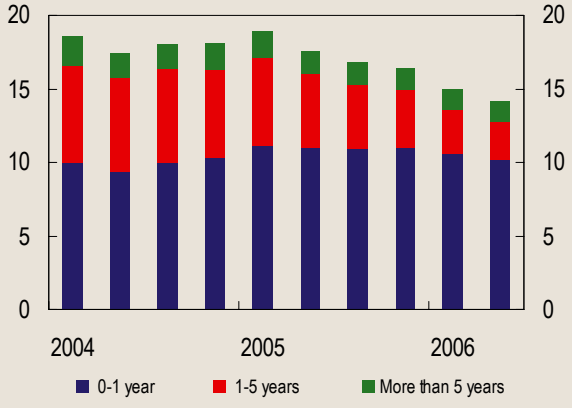
4 Summary

In this article we have given a brief description of the credit market in Norway and taken a closer look at various types of loans. We have also looked at the volume of fixed-rate loans from financial corporations. The new statistics on lending distributed by fixed-rate periods to a large extent confirm the picture indicated by previous surveys, which conclude that Norwegian households mainly raise floating-rate loans and thus, few households hedge against interest rate increases. In addition, these statistics have provided a better basis then previously for analysing the fixed-rate structure among borrowers. Kredittilsynet's survey of mortgage loans shows that the share of new fixed-rate mortgages is very low. The survey also indicates that a larger share of households appear to choose fixed-rate loans when short-term interest rates are declining and long-term rates are lower than short-term rates. Fixed-rate loans are much more common in Sweden and Denmark, although in recent years the trend has been falling in these countries as well.

Assessed on the basis of the fixed-rate statistics, monetary policy will have a considerable impact on the Norwegian public. Households account for the bulk of the public's gross loan debt, and they have only to a limited extent fixed their interest rates. However, within the corporate (and local government) sector, there are a number of large participants that have the opportunity and expertise to hedge against interest rate increases in ways other than by fixed-rate loans, for instance by using derivatives etc. This makes it somewhat more difficult to assess to what extent these sectors, and thereby the public as a whole, have hedged against interest rate increases.

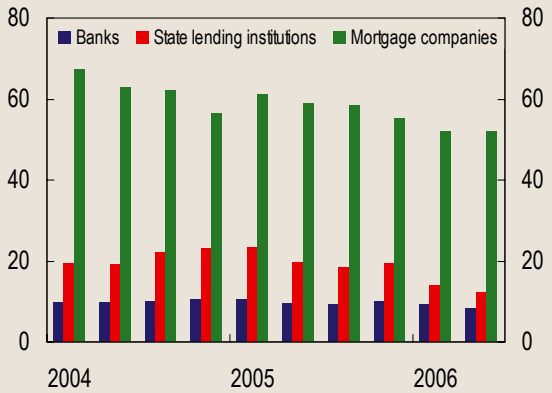
The credit market is marked by the frequent launching of new loan products and by increasing availability.

Chart 11 Non-financial enterprises. Fixed-rate loans as a percentage of total loans from banks, mortgage companies and state lending institutions, by fixed-rate period. Quarterly figures. 2004 Q1 – 2006 Q2



Source: Norges Bank

Chart 12 Non-financial enterprises. Fixed-rate loans as a percentage of total loans by lender sector. Quarterly figures. 2004 Q1 – 2006 Q2



Source: Norges Bank

In particular, credit lines secured on dwellings have shown a substantial increase recently. The sharp rise in house prices in recent years has contributed to increased housing wealth (increased collateral values), enabling many to increase their borrowing using their existing homes as collateral. Our analyses indicate that many have made use of this opportunity.

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Housing investment and house prices

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In this article, we analyse developments in housing investment and the interaction between demand and supply in the housing market. The analysis indicates that the pronounced increase in housing investment since 2004 is related to low interest rates and high house prices. In the past 3½ years, house prices have increased by close to 50 per cent. The sharp rise in housing demand has pushed up house prices, since supply is determined by the existing housing stock in the short term. Capacity constraints in the building sector are preventing a rapid adjustment of the total housing supply to increased demand. When the housing stock over time adapts to demand, this will in isolation push down house prices. House prices may therefore have become higher in the short term than they will be in the somewhat longer term. However, a model-based analysis illustrates that there may be a soft landing for house price inflation despite monetary policy tightening and an increased supply of dwellings.

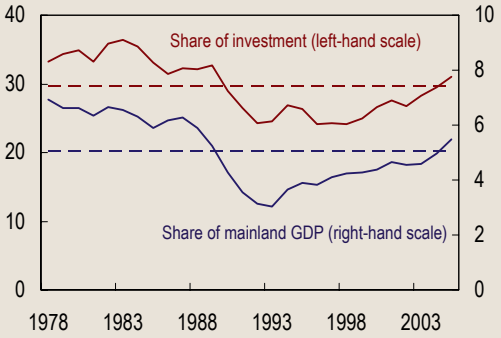
1 Introduction

A substantial portion of household demand comprises housing purchases, renovation and rehabilitation. Since 1978, fixed housing investment has averaged about one third of total fixed investment and 5 per cent of gross mainland GDP (see Chart 1).

Fluctuations in housing investment influence cyclical developments in the Norwegian economy. At the same time, developments in the housing market may affect financial stability. About three quarters of Norwegian households own their own dwelling. Housing wealth accounts for close to 60 per cent of households' total wealth, and a substantial portion of banks' lending to households is secured on dwellings. Housing investment may also influence total gross household debt, as household borrowing normally increases with sales of new dwellings.[2] A higher level of housing investment than that necessary to maintain the housing stock results in an increase in housing capital. Over time, an increase in housing stock will in isolation push house prices down. If house prices decline, collateral values may fall below the value of many of the associated housing loans. This increases the risk of loan losses for banks. A fall in house prices will also reduce household wealth and the possibility of raising a mortgage-secured loan. This may dampen private consumption and the general level of economic activity.

Since housing investment has a bearing on business cycles, banks' collateral and household debt, we aim to identify the most important macroeconomic forces driving investment in dwellings. We also seek to elucidate how rapidly and strongly housing investment reacts to changes in the explanatory factors. In addition, we analyse the interaction between demand and supply in the housing market.

Chart 1 Gross fixed investment in dwellings as a share of mainland fixed investment and mainland GDP. Per cent. Annual figures. 1978 – 2005



Source: Statistics Norway

The next section considers which macroeconomic factors may influence housing investment. Section 3 presents the empirical model and Section 4 analyses the interaction between housing investment and house prices.

2 Which factors influence housing investment?

This section discusses possible explanatory factors behind housing investment based on economic theory. It forms the basis for the empirical analysis in the next section.

Analyses of the housing market often employ models in which house prices are determined by demand for housing services and the supply of housing capital, while housing investment is determined by investment profitability.[3] Investment profitability depends positively on house prices. Higher house prices result in higher

1 We would like to thank Tor Oddvar Berge, Eivind Bernhardsen, Solveig Erlandsen, Snorre Evjen, Gunnvald Grønvik, Kåre Hagelund, Kjersti-Gro Lindquist, Bjørn Naug, Kjetil Olsen og Knut Sandal for useful contributions and comments. The analysis was carried out using PcGive 10.1 (Hendry and Doornik 2001).

2 See Jacobsen and Naug (2004)

3 See for example Mankiw and Weil (1989), Meen (2001, Chapter 3.6) and Poterba (1984).

housing investment and thereby higher housing capital. An increase in housing capital contributes in turn to curbing the rise in house prices. Norges Bank has previously estimated house price models using demand factors and housing stock as explanatory variables.[4] An empirical model for housing investment, simulated in conjunction with a house price model, can be used for a more long-term analysis of the housing market. The focus in this section is on developments in the supply of housing capital.

Property developers' housing capital investment

The presentation below broadly follows Obstfeld and Rogoff (1996) and Hubbard (1998). The point of departure is the investment decision of a typical enterprise that earns income from selling completed housing capital. This means that income is earned by selling new dwellings and services such as rehabilitation and renovation.[5] In order to accumulate housing capital, the enterprise has to invest. The enterprise chooses the investment level that maximises its value. The real value of the enterprise at a time t, V_t, is given by the value of the sum of the current and discounted future profit:

$$(1) \qquad V_t = \max \sum_{s=t}^{\infty} \left(\frac{1}{1+R}\right)^{s-t} \left[\Pi(K_s) - CJ_s - C\frac{\Phi}{2}\cdot\frac{(J_s-\delta K_s)^2}{K_s}\right]$$

under the condition $K_{s+1} = (1-\delta)K_s + J_s$

The present value of future profit is calculated by means of a discount factor which depends on the real interest rate, R. The discount factor is shown in the first set of brackets in equation (1), and the real interest rate is here assumed to be constant. The first expression in the square brackets, the function $\Pi(K_s)$, expresses the real income the enterprise earns in each period through selling housing capital, K_s. The enterprise's costs are expressed in the next two expressions in the square brackets. The first expression represents the direct costs, where C is the real factor price of housing investment, J_s. C is an index composed of prices for factor inputs such as materials, labour, land etc. Simplifying, in this section we assume below that the real factor price, C, is equal to 1. In addition to the direct costs, the enterprise incurs extra costs associated with changes in its capital assets, expressed as $C\cdot\Phi\cdot(J_s - \delta K_s)^2/2K_s$, where Φ is a constant and positive parameter. If, for example, the enterprise wishes to increase the scope of building projects in a given period, there are extra costs associated with the procuring of factor inputs. The extra costs reflect the fact that it is more expensive for the enterprise to invest a large amount in a single period than to distribute its investment over several periods. The larger the enterprise – in terms of the size of its fixed capital – the lower the extra costs.

The condition under equation (1) describes the relationship between capital and gross investment, and δ is the depreciation rate. If investment is higher than what is required to maintain the existing capital, net investment is positive and the capital stock will increase.

The investment decision

The enterprise maximises its value, shown through equation (1), with respect to investment and desired future capital stock. See annex for a mathematical derivation. The first order condition describing the enterprise's investment decision is given by:

$$(2) \qquad \frac{J_s}{K_s} = \frac{Q_s - 1}{\Phi} + \delta$$

The investment decision depends negatively on the size of the parameter Φ, which is part of the expression of extra costs, and positively on the depreciation rate δ. The investment decision also depends positively on the present value of the future return on housing investment, Q_s. The variable Q_s can be expressed as follows:

$$(3) \qquad Q_s = \sum_{i=1}^{\infty} \frac{(1-\delta)^{i-1}}{(1+R)^i}\left[\Pi_K(K_{s+i}) + \frac{\Phi}{2}\left\{\frac{J_{s+i}^2}{K_{s+i}} - \delta^2\right\}\right]$$

The first element in the square bracket denotes the rise in income following a marginal increase in the housing stock. The second element, which also contributes positively to return, shows that increased investment today reduces *future* extra costs. The present value of the sum of the two elements is Q, which expresses the market value of one extra unit of capital relative to investment costs.[6] Equation (2) shows that net investment is positive if the value of a marginal increase in capital is greater than the investment costs ($Q > 1$).

In the derivation above, the variable Q_s contains all information relevant to the investment decision. However, this variable cannot be observed empirically. An alternative is therefore to use an *average Q*, expressed as the ratio of average house prices to costs of increasing the housing capital. This average Q will not necessarily capture all information relevant to the investment decision.[7] The real interest rate is a particularly important variable for estimating the profitability of investments. Since we only observe average Q, we investigate whether the real interest rate is a determinant of housing investment as well as the ratio of house prices to construction and land costs.[8] The real interest rate measures

4 See Eitrheim (1993) and Jacobsen and Naug (2005).

5 For simplicity we ignore the fact that some households build their own houses and perform their own renovation.

6 The name of variable Q is associated with the Q theory of investment behaviour (see Tobin (1969).

7 In the case where the enterprise has constant returns to scale in both the production function and the adjustment cost function, and in addition faces given prices in the product market, marginal Q will be equal to average Q (see Hayashi, 1982). The derivation in this section requires no explicit assumption about the production function or whether the enterprise is a price-taker or not.

8 A number of empirical analyses of housing investment/housing starts include the interest rate as an explanatory factor in addition to house prices and construction costs (see for example Barot and Yang (2002), Berger-Thomson and Ellis (2004), Egebo, Richardson and Lienert (1990), Meen (2001), Topel and Rosen (1988) and Tsoukis and Westaway (1994).

both the real interest expenses associated with loan-financing building projects and the real return lost by financing the construction of dwellings with equity.

Different information for property developers and lenders

A number of studies have pointed out that the costs of financing investment projects may be lower if the enterprise uses its own capital rather than loans.[9] This is because lenders do not have full information regarding the risk associated with the investment. They may therefore require a risk premium for loans that are not secured on the enterprise's assets.[10] The risk premium will in general increase with the size of the unsecured loan and push financing costs up and investment down. Enterprises that increase their earnings can finance a larger share of their investment with equity. An improved capacity for internal funding may therefore lead to increased investment. In the empirical analysis in the next section we investigate whether retained earnings by property developers is an important explanatory factor for housing investment.

Land prices

Available land is a necessary factor input for house building. Land prices are therefore a factor price for property developers who sell new dwellings. There are no time series for representative trends in average land prices in Norway. One alternative is to use one or more other variables that can capture changes in land prices. We therefore discuss briefly which macroeconomic factors may affect developments in land prices.

When housing demand in a particular area increases, it results in higher prices for land and dwellings in the area. Developing new plots of land in reasonable proximity can take a long time, as this requires municipal zoning and often infrastructure development. In the short and medium term, the factors that drive housing demand will therefore also to a large extent determine developments in land prices.[11] An empirical analysis of house prices carried out in Norges Bank indicates that interest rates, income, unemployment and households' expectations regarding their own financial position and the Norwegian economy are important factors behind housing demand.[12] Household income growth, in particular, is a central, long-term force driving developments in housing demand and house prices, and thereby probably land prices as well.

In low-density areas, there will over time be ample supply of land available for residential construction. In the long term, land prices in these areas will therefore be determined by the alternative value of the land. The alternative value is mainly given by the return on agriculture and forestry.[13] As a result of a shortage of available land in urban and high-density areas, land prices in central areas will over time be determined by factors other than those applying to low-density areas. For many households who work in urban areas, there is a value associated with living centrally, because it will save travel costs. Travel costs consist of both direct transport costs and time costs. The desire to live centrally and close to services and one's place of work pushes land prices up in and near urban areas (see Alonso (1964) and Wheaton (1974)). Households therefore have to weigh up a higher price for a centrally located dwelling against increased travel costs if they choose a (cheaper) dwelling farther away. In simplified terms, prices for both dwellings and land will therefore rise from the edges of urban areas in towards the city centres, where they will be highest. If real income increases over time, the value placed on leisure time by employees and the self-employed will also rise. The value of the saved travel costs will thus rise as well. This leads to higher land prices in central areas. As three quarters of the Norwegian population lives in urban and high-density areas, and migration to urban areas has increased markedly since the mid-1980s, income growth may have had a general impact on the average price of land.[14] We therefore set up the following equation for the price of land, *PL*:

$$(4) \qquad PL/P = h(Y/P, Z) \qquad h_1 > 0$$

P is the general price level, *Y* is household disposable income and *Z* is a vector of other factors that may influence land costs. The equation expresses that there is a positive relationship between real household income and real land prices. Examples of variables that can be incorporated in vector *Z* are the real interest rate, unemployment, household expectations and local government regulations.

The framework for the empirical model

From the discussion above we would expect that factors such as the real interest rate, house prices and construction and land costs have a bearing on the relationship between housing investment and housing stock. In addi-

[9] See Myers and Majluf (1984) and Hubbard (1998) for a theoretical discussion. See for example Fazzari, Hubbard and Peterson (1988) and Gilchrist and Himmelberg (1995) for empirical analyses.

[10] This risk premium does not reflect ordinary credit risk. A positive probability of loan losses (and administrative costs) will result in a supplementary premium on the interest rate also in the case where both borrower and lender have full information regarding the probability of default and loan losses.

[11] A similar assumption is made in Statistics Norway's MODAG model (see Boug et al., 2002 Chapter 5.5).

[12] See Jacobsen and Naug (2005).

[13] The alternative value of the area is relevant to the price of the undeveloped land. The costs of developing infrastructure may be higher for land in rural areas than in central areas.

[14] See the 2001 population and housing census for information on how large a share of the population lives in densely or sparsely populated areas, respectively.

tion, we investigate whether retained earnings of property developers influence housing investment. These relationships can be expressed through the following general function:

(5) $J/K = g(R, PH/P, PJ/P, PL/P, E/P)$

$$g_1 < 0,\ g_2 > 0,\ g_3 < 0,\ g_4 < 0,\ g_5 > 0$$

where

J = gross fixed housing investment
K = housing capital at constant prices
R = real interest rate
PH = house price index
P = index of the general price level in the economy
PJ = construction costs
PL = land prices
E = retained earnings of property developers
g_i = the derivative of g(•) with respect to argument i

A rise in the real interest rate will result in higher financing costs and hence lower housing investment. Conversely, higher real house prices will increase the profitability of building new dwellings, and thus increase housing investment. Higher real construction and land costs have a negative effect on profitability and contribute to pushing down housing investment. An increase in retained earnings may make a positive contribution to profitability by curbing the financing costs associated with housing investment.

By inserting (4) in (5) we get:

(6) $J/K = g(R, PH/P, PJ/P, h(Y/P, Z), E/P)$
$= f(R, PH/P, PJ/P, Y/P, E/P, Z)$

$$f_1 < 0,\ f_2 > 0,\ f_3 < 0,\ f_4 < 0 \text{ og } f_5 > 0$$

An increase in the real interest rate has a direct negative effect on housing investment, shown as the first argument in equation (6). However, a higher real interest rate, expressed through vector Z, may have a positive effect on housing investment, as an increase in real interest rates probably pushes down land prices. The first effect is expected to dominate, so that higher real interest rates result in lower housing investment.

Equation (6) shows a negative relationship between housing investment and household income, since the income variable represents developments in land prices. Higher income may, as mentioned, increase land prices, and thereby decrease housing investment. We expect to find a negative relationship between building activity and real disposable income if house prices carry sufficient information about housing demand.[15]

By using a semi-logarithmic functional form for equation (6), we set up the following equation for fixed housing investment:

(7) $\ln J = c + \beta_1 R + \beta_2 \ln PH/P + \beta_3 \ln PJ/P + \beta_4 \ln Y/P + \beta_5 \ln K + \beta_6 \ln E/P + \beta_7 \phi(Z)$

where c is a constant and the βi's are coefficients we wish to estimate. Equation (7) is the basis for the specification of the empirical model.

3 An empirical model of housing investment

The modelled time series for housing investment is part of the quarterly national accounts. These quarterly investment figures are mainly based on figures for housing starts. Although investment in residential construction constitutes the largest single component of housing investment, rehabilitation and renovation are also significant components.[16]

In long-term analyses of the housing market, the reciprocal effects of house prices and housing stock/investment must be taken into account. These reciprocal effects may be an argument for estimating the equations for house prices and housing investment simultaneously.[17] When estimating an equation system where house prices and housing investment are determined simultaneously, we carried out tests which confirmed that housing investment can be modelled as a single equation.[18]

We tested for effects of the following variables (see Section 2):

[15] When the estimated housing investment model is simulated in conjunction with an equation for house prices, higher income will increase housing investment. This is because the increase in income works through both house prices and land prices, and the net effect on housing investment is positive.

[16] Rehabilitation of dwellings involves some demolition and building, while renovation is defined as less extensive maintenance and necessary repairs. Housing investment also includes transaction costs (mainly estate agents' fees) in connection with the sale of existing dwellings and land. Investment in leisure homes is also added, but constitutes only a small share of total housing investment.

[17] House prices are normally an explanatory factor in models of housing investment. However, the supply side in house price models is normally represented by the entire housing stock (see for example Meen (2001), Chap. 6.3).

[18] We estimated a vector-autoregressive model of order 4 which contained the relationship between housing investment and housing stock, house prices, interest rates, construction costs and a proxy variable for land prices. All variables were measured as real variables, as defined in Box 1. With 64 quarterly observations, we had to impose two restrictions in order to estimate the VAR(4) model. One restriction was that the relationship between housing investment and housing capital is constant. The other restriction was that the coefficients of the variables that capture developments in construction and land costs are identical in size and sign. These restrictions were tested in the estimation of the single-equation model shown in Box 1, and they were not rejected by data. The cointegration analysis was carried out using a VAR (2) model, which is a valid reduction of the VAR (4) model. We identified two long-term relationships: one between housing investment, housing stock, house prices, construction and land costs and interest rates, and one between construction and land costs, interest rates and a trend variable. Only the first cointegrating vector was significant in the (reduced form) housing investment equation. In the long-term relationship for housing investment, all other variables were found to be weakly exogenous to the parameters in the vector. A Wu-Hausman test showed that the variables were also weakly exogenous with respect to the short-term dynamics in the housing investment equation. With weak exogeneity of the other variables in the housing investment relationship, inference can be made in the conditional single-equation model without loss of efficiency. We therefore estimated a single-equation model of housing investment in which we included both current and lagged values of the variables, in order to take account of possible lags in investment behaviour. We then imposed valid restrictions which simplified the interpretation of the dynamics.

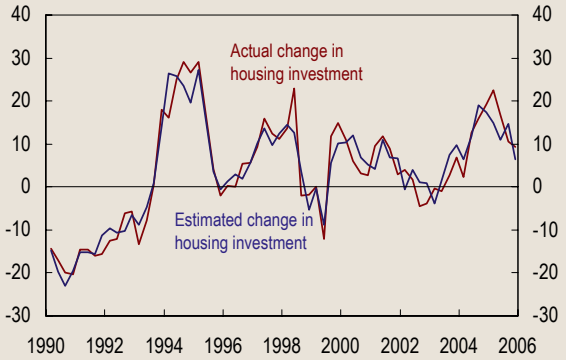
- Household real disposable income[19]
- Unemployment
- An indicator of household expectations concerning their own financial situation and the Norwegian economy
- The real value of retained earnings of property developers (defined as the building industry and the relevant segment of the property management industry)
- Housing capital at constant prices
- Real house prices
- Real construction costs
- Banks' real lending rate[20]

It may, as mentioned, be reasonable to assume that house prices and land prices are influenced by the same factors. In an attempt to capture developments in (unobservable) land prices, we test for effects of income, unemployment and expectations in the investment equation. As housing investment also includes renovation and rehabilitation, which are assumed to increase with income growth and greater optimism, we could have found direct effects of these factors that were not channelled through land prices. However, coefficients and t-values for unemployment and the consumer confidence indicator were close to zero. Household real disposable income, on the other hand, was found to be statistically significant, and the coefficient of the variable had a negative sign. This is interpreted to mean that income growth captures developments in land prices, which is consistent with the discussion in Section 2.

There may be a positive relationship between internal funding capacity and housing investment (see discussion in Section 2). However, we found no statistically significant effect of retained earnings of property developers. This may indicate that the magnitude of asymmetric information between borrowers and lenders is limited, so that the costs of using internal or external finance are approximately the same. However, if asymmetric information is prominent, and residential construction is normally debt-financed, the absence of any effect may be because the risk premium required by lenders is (partly) captured by the average lending rate in the model.

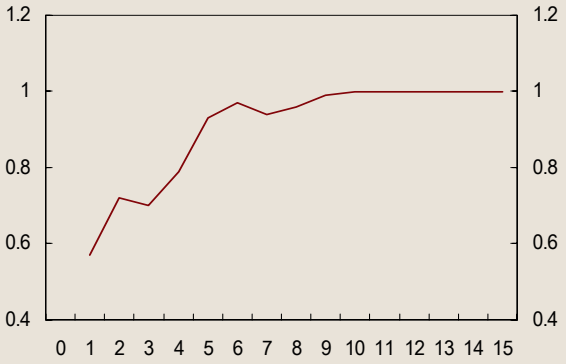
The preferred model, shown in Box 1, is estimated on data from 1990 Q1 to 2005 Q4. The model is an equilibrium correction model of the logarithm of gross fixed housing investment. It contains the effects of the real lending rate, real house prices, real construction costs, housing stock and household real income as a proxy variable for real land prices. Chart 2 shows that the model fits data well over the estimation period.

Chart 2 Actual and fitted housing investment. Percentage change over 4 quarters. 1990 Q1 – 2005 Q4



Sources: Statistics Norway and Norges Bank

Chart 3 Model-based change in housing investment due to a permanent one per cent increase in real house prices. Percentage change over time. Quarterly figures



Source: Norges Bank

How is housing investment affected by changes in the explanatory factors?

According to the model, the level of housing investment will increase by one per cent over time if real house prices increase permanently by one per cent and all other factors remain constant.[21] The effect is fairly rapid: in the course of the first year following a house price rise, almost three quarters of the effect occurs, and it feeds fully through after about two years (see Chart 3). Similarly, but with the opposite effect, an increase in real construction costs of one per cent will result in a one per cent fall in housing investment. Here, too, three quarters of the effect occurs after one year, and after almost two years the long-term effect feeds fully through. An increase of one per cent in household real disposable income, which is assumed to capture

[19] Tax-motivated fluctuations in share dividends have had a considerable effect on measured developments in household disposable income in recent years. The variable has therefore been adjusted so that it does not contain reinvested share dividends in the years 2000 – 2005.

[20] We used the rise in the consumer price index adjusted for tax changes and excluding energy products as a measure of inflation expectations in the variable for real lending rate. This gave a better fit than using the rise in the (unadjusted) consumer price index. This may indicate that expected inflation at the time of the investment decision is less correlated with price fluctuations due to tax changes or fluctuations in energy prices.

[21] DiPasquale and Wheaton (1994) find an elasticity of construction with respect to house prices of 1.0–1.2 per cent. The empirical analysis was carried out on US annual data over the period 1963–1990. Topell and Rosen (1988), using US quarterly data from 1963 to 1983, find an elasticity of 2¾ per cent for the same variable. Tsoukis and Westaway (1994) used UK quarterly data from 1970 to 1990 and found the corresponding elasticity to be 0.97 per cent.

Box 1. A model of housing investment

$$\Delta j_t = \underset{(8.0)}{4.04} - \underset{(2.6)}{0.17}\,\Delta_2 j_{t-2} + \underset{(6.7)}{0.57}\,\Delta_3(ph-p)_{t-1} - \underset{(6.5)}{2.62}\,\Delta_4\Big(I - 1/3 \cdot \sum_{j=-1}^{1}\Delta_4 pate_{t-j}\Big)_t$$

$$- \underset{(8.0)}{0.75}\,[j_{t-1} - k_{t-10} - (ph-p)_{t-4} + (pj-p)_{t-4} + (y-p)_{t-1} + 5.19\,(I - 1/3 \cdot \sum_{j=-1}^{1}\Delta_4 pate_{t-j})_{t-4}]$$

$$\underset{(3.3)}{-0.05}\,S1 - \underset{(5.1)}{0.08}\,S2 - \underset{(4.4)}{0.06}\,S3 + \varepsilon_t$$

$$R^2 = 0.71, \quad \sigma = 0.038, \quad AR_{1\text{-}4} : F(4, 52) = 1.06, \quad ARCH_{1\text{-}4} : F(4, 48) = 0.19,$$

$$NORM : \chi^2(2) = 0.45, \quad HET : F(11, 44) = 0.91, \quad RESET : F(1, 55) = 0.04.$$

Estimation period: 1990 Q1 – 2005 Q4. Estimation method: Ordinary least squares. Absolute *t* values are shown in brackets under the estimates. Lower-case letters indicate that variables are measured on a logarithmic scale. Δis a difference operator:

$$\Delta X_t = (X_t - X_{t-1}),\ \Delta_2 X_t = (X_t - X_{t-2}),\ \Delta_3 X_t = (X_t - X_{t-3}),\ \Delta_4 X_t = (X_t - X_{t-4}).$$

The variables are defined as follows:

J	=	Gross fixed housing investment. Source: Statistics Norway
PH	=	House price index. Sources: Norwegian Association of Real Estate Agents (NEF), Association of Real Estate Agency Firms (EFF), FINN.no and ECON
P	=	Consumer price index. Source: Statistics Norway
I	=	Banks' average lending rate for private non-financial enterprises. Source: Statistics Norway
PATE	=	Consumer price index adjusted for tax changes and excluding energy products. Source: Statistics Norway
K	=	Housing capital at constant prices. Source: Statistics Norway
PJ	=	Deflator for gross investment in housing services. Source: Statistics Norway
Y	=	Household disposable income adjusted for reinvested dividends. Sources: Statistics Norway and Norges Bank
Si	=	Variable which is equal to 1 in quarter *i*, otherwise zero.
ε	=	Regression residuals (unexplained variation in left-side variable)

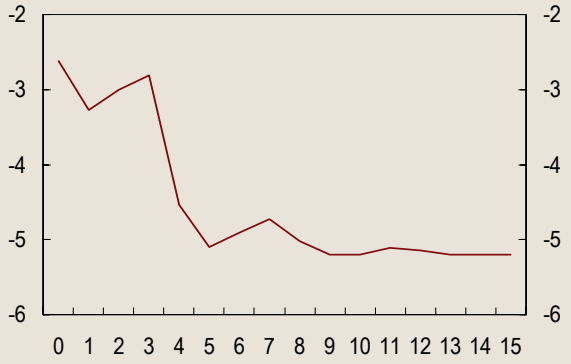
R^2 is the share of the variation in the left-side variable that is explained by the model, εis the standard deviation of the regression residuals, $AR_{1\text{-}4}$ is a test for 4th order autocorrelation in the residuals, $ARCH_{1\text{-}4}$ is a test for 4th order ARCH residuals, *NORM* is a test of whether the residuals are normally distributed, *HET* is a test for heteroskedacity and *RESET* is a test of the model's functional form.

developments in land prices, will also push down housing investment one per cent. Here the full effect occurs after a year and a half.

Housing investment reacts both rapidly and strongly to changes in banks' real lending rates. The model indicates that housing investment will fall by almost 5¼ per cent in the long term if the real interest rate increases permanently by one percentage point and the other explanatory factors remain unchanged. Most of the effect is exhausted after one year (see Chart 4).

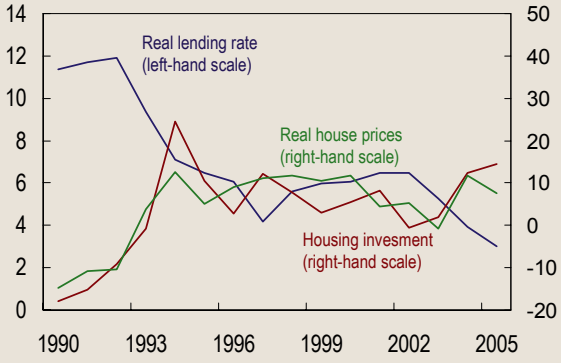
Over time, an increase in housing stock will result in higher housing investment because of increased maintenance requirements. In the long term, an increase in housing stock of one per cent will push up housing investment by one per cent. Thus the ratio of housing investment to housing stock over time will be constant

Chart 4 Model-based change in housing investment due to a permanent one percentage point increase in the real lending rate. Percentage change over time. Quarterly figures



Source: Norges Bank

Chart 5 Real lending rate and growth in real house prices and fixed investment in dwellings. Per cent. Annual figures. 1990-2005



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

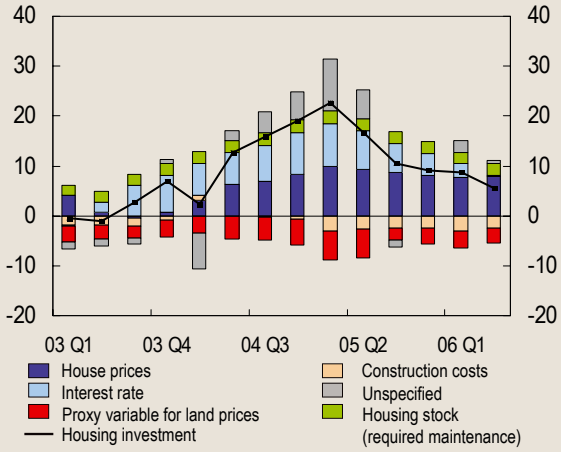
for given values of the other explanatory factors. The effect of higher housing stock is slow, however, because residential construction and upgrading today result in increased maintenance requirements only after the dwellings have been exposed to wear and tear over a period. In the model, increased housing stock will result in higher maintenance investment after 2½ years, and the full effect will come into evidence after about 4 years.

What has driven housing investment in recent years?

Falling house prices and higher interest rates eroded profitability in the building industry in the early 1990s. Housing investment fell markedly during this period. Interest rates fell from 1993 to 1998, and house prices rose steadily from 1993 and up to the first half of 2003. Housing investment increased from 1994 until the turnaround in the Norwegian economy in 2002. Since the pick-up in the Norwegian economy in the second half of 2003, both house prices and residential construction have increased markedly. Chart 5 indicates that developments in house prices and interest rates are key forces driving housing investment.

Chart 6 shows the direct, estimated contributions from the model's explanatory factors to four-quarter growth in housing investment from 2003 Q1 to 2006 Q2. The decomposed contributions are based on the estimated model and developments in the explanatory variables. In addition to higher maintenance investment as a result of increased housing stock, the marked increase in housing investment since 2004 is particularly influenced by developments in the real interest rate and real house prices. According to the model, the decline in interest rates from December 2002 to March 2004 pushed up housing investment by over 6 percentage points in the period from the second half of 2003 up to and including the first half of 2005. Moreover, higher house prices have pushed up housing investment

Chart 6 4-quarter growth in housing investment and calculated contributions from explanatory variables in percentage points. 2003 Q1 – 2006 Q2. Real variables



Sources: Statistics Norway and Norges Bank

by between 6 and 10 percentage points since 2004 Q2. From the same time, and up to and including 2005 Q2, some of the growth in housing investment is explained by factors outside the model.

Higher land prices (measured by the proxy variable) have had the most pronounced dampening impact on housing investment in recent years. Construction costs pushed down housing investment relatively less in this period. This may reflect a particularly ample supply of labour in the building industry: inward labour migration from among others new EU member states may have had a dampening effect on the rise in costs in the building industry. In addition, higher capacity, as a result of inward labour migration, may have increased the industry's adaptability to improved profitability. Such an effect is not directly captured in the model, and may help to explain the unspecified contribution in Chart 6 in 2004 and into 2005.

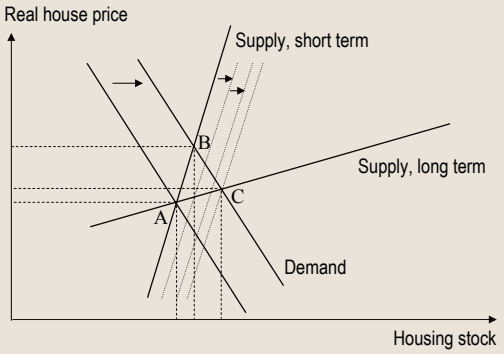
4 Can house prices fall as a result of high residential construction?

In this section, we analyse the interaction between the demand and supply side of the housing market. House prices have increased by close to 50 per cent since summer 2003. This has contributed to growth in housing investment. Higher housing investment increases the housing stock, and over time this curbs house price inflation. Since capacity in the building industry is limited, residential construction will at all times be low compared with the total housing stock. It therefore takes time before the overall supply of dwellings is adapted to increased demand. House prices may thus have increased more in the short term than they will in the somewhat longer term, when the housing stock is once again adapted to demand.

These adjustments are illustrated in Chart 7. The housing market is initially in equilibrium, as shown by adjustment at point A. A sharp increase in demand then results in a new, short-term adjustment at point B, where house prices have increased markedly. As a result of limited capacity in the building industry, the short-term supply curve will have a steeper slope than the long-term supply curve. The price rise makes more housing projects profitable, with an attendant increase in residential construction. This is illustrated in the chart by the rightward shift of the short-term supply curve in each period, for example in each year. The housing stock increases as long as house prices are higher than the level shown by the long-term supply curve. Over time, adjustment is reached at point C, where the housing market is again in long-term equilibrium. House prices have then been pushed down compared with the short-term equilibrium, as shown by the vertical distance between points B and C.

The sharp increase in both house prices and building activity prompts an analysis of the negative price effect of increased housing stock and factors that may counteract the effect of an increased supply of dwellings. To illuminate this, we simulate models of house prices and housing investment. Housing stock measured as housing capital at constant prices is incorporated in the house price model, while house prices are an explanatory factor in the model for housing investment. In order to capture the effect of housing investment on house prices, the simulations must also include the definitional relationship between housing investment and housing capital. The equation for housing investment is shown in Box 1, and the equations for house prices and housing stock are reported in Annex 2. The other explanatory factors in the house price model are the interest rate, unemployment, disposable income and an indicator of household expectations regarding their own financial situation and the Norwegian economy.[22] In such a housing market model, house prices are determined by demand factors and total housing stock, and carry all necessary information about the demand side for the housing investment decision. See Jacobsen and Naug (2005) for further discussion of (an earlier version of) the house price model and the forces driving housing demand.

Chart 7 Illustration of adaptation between demand and supply in the housing market in the short and long term



Projected developments in explanatory factors

In simulating developments in house prices, housing investment and housing stock, assumptions must be made about developments in the exogenous explanatory factors during the simulation period. The exogenous variables are consumer prices, interest rates, unemployment, total income, the housing investment deflator (which measures construction costs) and an indicator of household expectations regarding their own financial situation and the Norwegian economy. The household expectations indicator is assumed to be neutral, and it is measured in such a way that the assumption is realised by setting it equal to zero over the simulation period. Up to end-2009, developments in the other explanatory factors are based on projections in *Inflation Report* 3/06. Thereafter, they approach a projected long-term trend, and from 2011 they follow the long-term path. The assumptions about long-term developments in the explanatory variables are based partly on historical experience. The simulations must not be interpreted as Norges Bank's projections. The purpose is only to illustrate how a particular path for economic developments may influence housing market adjustment. It is assumed that in the long-term the explanatory factors change as follows each year:

- Consumer prices increase in line with the inflation target of 2½ per cent.
- The real money market rate is close to 2¾ per cent. The average lending margin on loans to households is one percentage point, and for enterprises the figure is 1¾ percentage points.

[22] Jacobsen and Naug (2005) did not find direct effects of either the total population or the share of the population aged 20–24 and/or 25–39. In this model, demographic changes influence house prices indirectly by influencing aggregate household income.

- Registered unemployment is 3¼ per cent of the labour force, i.e. the average for the past 25 years.

- Total household real income increases by 2½ per cent. This reflects: *(i)* real income growth per person-hour of 2 per cent, equivalent to assumed productivity growth; and *(ii)* assumed growth in person-hours of ½ per cent. To simplify, it is assumed that the growth in person-hours over time reflects population growth. An assumed annual population growth of ½ per cent will result in an estimated population close to the middle alternative of Statistics Norway's projections.[23]

- The housing investment deflator is based on the total weighted costs of various factor inputs associated with residential construction. In calculating the deflator, the cost indices are adjusted by a factor (based on a price index for new detached dwellings) which captures changes in profit margins and productivity. Since 1978 the average annual rise in both the housing investment deflator and the consumer price index has been about 4½ per cent. In the simulations, the housing investment deflator therefore rises in pace with consumer prices.

- Real land prices (measured by the proxy variable) increase by 2½ per cent. The assumption that the average real land price increases over time is discussed briefly below.

Does the real marginal cost of residential construction increase in the long term?

Over time the ratio of the average house price to the representative cost of building one extra dwelling must be constant. For the past fifty years, the annual average rise in real house prices has been 2½ per cent.[24] This does not support the proposition that the real marginal cost of residential construction is constant over time.

We assumed on the basis of the historical data above that the real housing investment deflator is constant in the long term. The investment deflator measures actual construction costs and is adjusted by a factor that captures productivity changes. However, the deflator does not include land prices, and available land is a necessary factor input for residential construction. If a substantial portion of housing demand is concentrated on central areas in the long term, the shortage of available land in such areas may result in rising, long-term real marginal costs for residential construction for the country as a whole. In the simulations we let (the proxy variable for) real land prices increase by 2½ per cent annually in the long term.[25]

The house price level at the start of the simulations

Since the second half of 2005, house prices have increased somewhat more than the empirical house price model implies. This may indicate that the rise in house prices is high compared with a fundamental value determined by the interest rate, income, unemployment and housing stock. However, the strong rise in prices may reflect structural changes in recent years that are not (fully) captured by the model. Globalisation has resulted in a low rise in prices for imported goods and higher prices for oil and some other Norwegian export goods. This improvement in the terms of trade may have raised household income expectations. Structural changes may also have contributed to the fall in long-term interest rates. This may have generated expectations of a permanently lower real interest rate level. At the same time, new loan products have given households greater scope for choosing the repayment profile for their loans. These factors may have contributed to the rise in house prices in recent years.

Since there is uncertainty as to whether house prices deviate from or are close to an equilibrium value, we carry out two alternative simulations. At the start of simulation A, house prices are somewhat higher than implied by the model. Assuming that the strong rise in prices may reflect structural driving forces, we make an alternative, simplified assumption that house prices are now equal to an estimated equilibrium value. At the start of simulation B the model's constant term is therefore adjusted so that house prices are in line with the model's prediction.

Developments in house prices, housing investment and housing stock

Charts 8 and 9 show the result of the simulations of the three equations from 2007 to 2050. The real interest rate will increase through a gradual rise in interest rates and inflation as projected in *Inflation Report* 3/06. Increased real interest rates and high growth in the housing stock curb the rise in real house prices at the start of both simulations, whereas strong developments in the labour market make a positive contribution. In simulation A in Chart 8, the rise in house prices is also pushed down because house prices are initially higher than the model's prediction. The rise in prices in the initial years of the simulation period is therefore lower in simulation A than in simulation B shown in Chart 9. The result is that growth in housing investment and housing stock is also lower in simulation A. This explains why real house prices in the next phase decline less in simulation A than in simulation B.

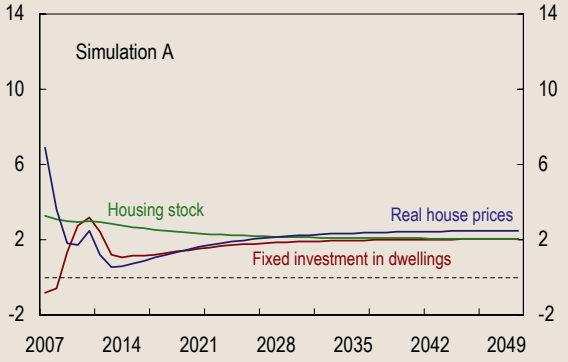
In both alternatives, income growth is assumed to

[23] In this model, housing demand will therefore be driven in the long term by population growth and average growth in real income. See DiPasquale and Wheaton (1994), Mankiw and Weil (1989) and Poterba (1984) for a discussion of housing demand in the long term.

[24] See Eitrheim and Erlandsen (2004) for a more detailed description of the time series for house prices. The index for the period 1819 to 1986 is based on data from the cities Oslo, Bergen, Trondheim and Kristiansand. From 1986 it is based on data for house sales throughout Norway.

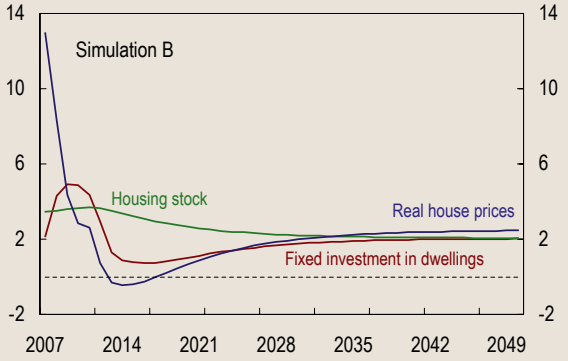
[25] Other studies also emphasise the importance of the fact that a limited supply of a necessary factor input in residential construction results in a rising long-term supply curve (see for example DiPasquale and Wheaton (1994) and Kenny (1999)).

Chart 8 Real house prices, fixed investment in dwellings and housing stock. Annual growth. Per cent. 2007-2050



Source: Norges Bank

Chart 9 Real house prices, fixed investment in dwellings and housing stock. Annual growth. Per cent. 2007-2050

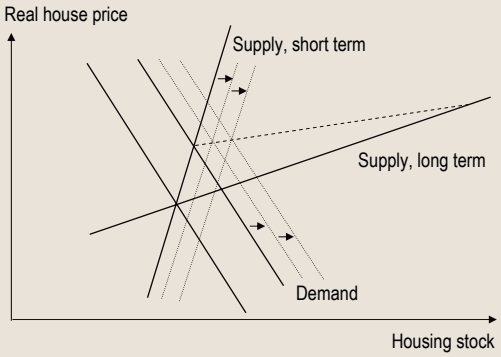


Source: Norges Bank

remain high throughout the period, while growth in the housing stock declines compared with the starting point for the simulations. As a result, the rise in real house prices picks up gradually. Until the long-term equilibrium path is reached, demand growth in both simulations is approximately in line with the increase in supply. In the long term, real house prices increase in pace with the growth in real income, and the ratio of real house prices to real construction costs and real land prices is constant. Moreover, housing investment and housing stock grow at the same pace over time, by 2 per cent annually. This is equivalent to the annual growth in housing stock over the last 20 years. The simulations indicate that the adjustment to a long-term equilibrium may take a long time.

There is substantial uncertainty associated with such calculations. Experience shows that the economy is exposed to disturbances that may cause a fall in house prices, but also to positive shocks that boost house prices. Although real house prices have increased on average every year since 1819 (the starting point for the house price series), history also shows periods of falling prices. High house prices and extensive construction activity increase the possibility of a price fall if a downturn occurs. If demand for dwellings should decline, house prices could fall markedly.

Chart 10 Illustration of adaptation between demand and supply in the housing market in the short and long term



Can structural factors contribute to a soft landing for house prices?

The simulations shown in Charts 8 and 9 illustrate that house price inflation may have a fairly soft landing, despite high construction activity and a gradual tightening of monetary policy. Chart 7 showed an adjustment from one static, long-term equilibrium to another. Chart 10 shows a simplified illustration of the simulations. The broken line is intended to show a dynamic adjustment, i.e. a path for market clearance in each period, for example each year.

Chart 10 illustrates that the stable house price trend depends on two factors: *(i)* the slow adjustment of the overall housing supply must be accompanied by a certain growth in housing demand, and *(ii)* the real cost of building one extra dwelling must increase over time, i.e. the long-term supply curve must have a positive slope.

The interest rate in Norway has been lower than what is considered as a neutral level over a substantial period. If the interest rate rises in line with the interest rate path in *Inflation Report* 3/06, the interest rate level will be normalised. The normalisation of the interest rate reflects low unemployment and signs that wage growth is picking up, among other things. Strong developments in the labour market generate positive impulses to housing demand at the beginning of the simulation period. We have assumed that housing demand over time is driven by stable population growth and increasing real income per capita. The demand growth that accompanies the slow adjustment of the overall housing supply therefore holds up real house prices in the short and medium term.

Around three quarters of the population of Norway lives in cities and high-density areas. This indicates that a substantial share of households prefers to live centrally. The shortage of available land in central areas may result in rising, long-term marginal costs for residential construction for the country as a whole. If the real cost of building one extra dwelling increases over time, real house prices will also increase in the long term when the housing stock is adjusted to increased demand.

5 Conclusion

Housing investment has increased markedly since 2004, and in 2005 the number of housing starts was at its highest since the early 1980s. We have analysed factors determining developments in housing investment using an empirical model. The model's explanatory factors are interest rates, house prices, construction costs, housing stock and household income as a proxy variable for land prices. The analysis indicates that the recent upswing in housing investment is related to low interest rates and strong rise in house prices. In the same period, land prices have contributed most – viewed in isolation – to pushing housing investment down. Developments in construction costs have contributed to a lesser extent. This may be partly attributable to the increased supply of foreign labour, which has curbed the rise in costs in the building industry.

In order to shed light on the interaction between demand and supply in the housing market, we have simulated models for housing investment and house prices up to 2050. Developments in the models' explanatory factors are based on projections in *Inflation Report* 3/06 up to end-2009, and thereafter estimates of long-term developments based partly on historical experience. The simulations show stable developments in house prices despite higher interest rates and high building activity. This is because the overall housing stock adapts slowly to an increase in demand for housing, and growth in the supply of dwellings is still accompanied by some rise in demand. The simulations do not provide evidence that we must assume further strong growth in demand in order to hold up house prices in the first years of the simulation period.

Real house prices in the simulations increase over time. This is because we have assumed that the real cost of building one extra dwelling will increase in the long term. Rising long-term marginal costs may be related to a preference by a considerable share of the population for residing in central areas, where there is a shortage of available land. There is substantial uncertainty associated with the estimates, and the simulations must not be interpreted as Norges Bank's projections. Experience shows that the economy is exposed to disturbances that result in periods of low house price inflation. Conversely, positive shocks have resulted in unexpected price rises. A time series from 1819 to 2005 shows that Norwegian house prices over time have increased more than the general price level in the economy.

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Annex 1

We consider a profit-maximising enterprise (see Section 2 for a definition of the variables).

$$(1) \qquad V_t = \max \sum_{s=t}^{\infty} \left(\frac{1}{1+R} \right)^{s-t} \left[\Pi(K_s) - I_s - \frac{\Phi}{2} \frac{(I_s - \delta K_s)^2}{K_s} \right]$$

under the condition $K_{s+1} = (1-\delta)K_s + I_s$

The factor price is set equal to 1. During each period, the enterprise maximises value with respect to investments and future capital stock. We use the Lagrange method:

$$(1') \qquad L_t = \sum_{s=t}^{\infty} \left(\frac{1}{1+R} \right)^{s-t} \left\{ \Pi(K_s) - I_s - \frac{\Phi}{2} \frac{(I_s - \delta K_s)^2}{K_s} - Q_s \left(K_{s+1} - (1-\delta)K_s - I_s \right) \right\}$$

where the Lagrange multiplier, Q_s , represents the shadow price of capital. By deriving with respect to I_s, a first-order condition is obtained:

$$(2) \qquad \frac{\partial L_t}{\partial I_s} = 0 \Rightarrow -1 - \Phi \frac{I_s - \delta K_s}{K_s} + Q_s = 0 \Leftrightarrow 1 + \Phi \frac{I_s - \delta K_s}{K_s} = Q_s \Leftrightarrow \frac{I_s}{K_s} = \frac{Q_s - 1}{\Phi} + \delta$$

We then derive with respect to K_{s+1}, which yields the first order condition:

$$(3) \qquad \begin{aligned} \frac{\partial L_t}{\partial K_{s+1}} = 0 \Rightarrow -Q_s + \frac{1}{1+R} \left\{ \Pi_K(K_{s+1}) - \left(-\frac{\Phi}{2} \left[\frac{I_{s+1}^2}{K_{s+1}^2} - \delta^2 \right] \right) + (1-\delta) Q_{s+1} \right\} = 0 \\ \Leftrightarrow Q_s = \left(\frac{1}{1+R} \right) \left\{ \Pi_K(K_{s+1}) + \frac{\Phi}{2} \left[\frac{I_{s+1}^2}{K_{s+1}^2} - \delta^2 \right] \right\} + \left(\frac{1-\delta}{1+R} \right) Q_{s+1} \end{aligned}$$

In order to simplify the notation, we define:

$$\Pi_K(K_{s+1}) + \frac{\Phi}{2} \left[\frac{I_{s+1}^2}{K_{s+1}^2} - \delta^2 \right] \equiv \Psi_{s+1}$$

By using equation (3), dating all variables one period forward and then substituting for Q_{s+1}, we get:

$$Q_s = \frac{1}{1+R} \Psi_{s+1} + \frac{1-\delta}{1+R} \left[\frac{1}{1+R} \Psi_{s+2} + \frac{1-\delta}{1+R} Q_{s+2} \right]$$

By continuing the substitution we get:

$$Q_s = \frac{1}{1+R} \Psi_{s+1} + \frac{1-\delta}{(1+R)^2} \Psi_{s+2} + \cdots\cdots + \frac{(1-\delta)^{j-1}}{(1+R)^j} \Psi_{s+j} + \left(\frac{1-\delta}{1+R} \right)^j Q_{s+j}$$

$$Q_s = \frac{1}{1+R}\Psi_{s+1} + \frac{1-\delta}{(1+R)^2}\Psi_{s+2} + \cdots\cdots + \frac{(1-\delta)^{j-1}}{(1+R)^j}\Psi_{s+j} + \left(\frac{1-\delta}{1+R}\right)^j Q_{s+j}$$

We assume that the requirements for $[(1-\delta)/(1+R)]^j \to 0$ when $j \to \infty$ are fulfilled so that:

$$(4) \qquad Q_s = \sum_{j=1}^{\infty} \frac{(1-\delta)^{j-1}}{(1+R)^j}\Psi_{s+j} = \sum_{j=1}^{\infty} \frac{(1-\delta)^{j-1}}{(1+R)^j}\left\{\Pi_K(K_{s+j}) + \frac{\Phi}{2}\left[\frac{I_{s+j}^2}{K_{s+j}} - \delta^2\right]\right\}$$

See Section 2 for interpretation of equation (4).

Annex 2

A model of house prices:

$$\Delta ph_t = \underset{(7.6)}{-0.33} - \underset{(6.7)}{2.92}\,\Delta IM_{t-2} - \underset{(2.9)}{1.27}\,\Delta IM_{t-1} + \underset{(2.8)}{0.31}\,\Delta y + \underset{(2.8)}{0.04}\,EXP_t$$

$$- \underset{(7.2)}{0.12}\,[(ph - pate)_{t-1} + \underset{(4.1)}{0.39}\,u_t + \underset{(10.7)}{2.65}\,(y - pate - 0.75\,k)_{t-1} + \underset{(3.7)}{6.02}\,(IM - 1/12 \cdot \sum_{j=0}^{11}\Delta_4 pate_{t-j})_{t-1}]$$

$$+ \underset{(7.6)}{0.04}\,S1 + \underset{(2.8)}{0.02}\,S2 - \underset{(0.9)}{0.01}\,S3 + \varepsilon_t$$

$R^2 = 0.85,\ \sigma = 0.015,\ AR_{1\text{-}4} : F(4, 47) = 1.35,\ ARCH_{1\text{-}4} : F(4, 43) = 0.48,$
$NORM : \chi^2(2) = 3.78,\ HET : F(19, 31) = 0.44,\ RESET : F(1, 50) = 0.00.$

Estimation period: 1990 Q2 – 2005 Q4. Estimation method: Ordinary least squares. Absolute *t* values are shown in brackets under the estimates. Small letters indicate that variables are measured on a logarithmic scale. Δ is a difference operator: $\Delta X_t = X_t - X_{t-1}$.

See Jacobsen and Naug (2005) for further discussion of (an earlier version of) the model.

The equation for housing capital (at constant prices):

$$K_t = (1 - \Phi)\,K_{t-1} + J_t$$

The variables are defined in Box 1, with the following exceptions:

IM = Banks' average lending rate on repayment loans secured on dwellings. Source: Statistics Norway

EXP = Indicator of household expectations concerning their own financial position and the Norwegian economy, adjusted for the effects of interest rates and unemployment. Sources: TNS Gallup and Norges Bank

Φ = 0.0063, quarterly depreciation rate. Source: Statistics Norway

Tables previously published in *Economic Bulletin*

The Statistical Annex in Economic Bulletin has been reduced with effect from no. 1/06. The subsequent issues provided an overview of the statistics published up to and including no. 4/05, with website references. As from no. 1/07, the Statistical Annex has been removed entirely, partly because the majority of Norges Bank's statistics gathering activities have been transferred to Statistics Norway and partly because the statistics are updated more frequently on the Internet. The following is a list of tables published in Economic Bulletin up to and including 4/06, with website references.

1. Norges Bank. Balanse sheet
   http://www.norges-bank.no/publisert/balanse/
2. Norges Bank. Investments for Government Pension Fund – Global
   http://www.norges-bank.no/petroleumsfondet/rapporter/
3. Banks. Balanse sheet
   http://www.norges-bank.no/front/statistikk/no/fiks/
   http://www.ssb.no/emner/10/13/10/orbofbm/
4. Banks. Loans and deposits by public sectors
   http://www.norges-bank.no/front/statistikk/no/fiks/
   http://www.ssb.no/emner/10/13/10/orbofbm/
5. Banks. Profit/loss and capital adequacy data
   http://www.ssb.no/emner/10/13/10/orbofrk/
6. Banks. Average interest rates on NOK loans and deposits
   http://www.ssb.no/emner/11/01/orbofrent/
7. Securities registered with the Norwegian Central Securities Depository (VPS), by issuing sector, nominal value
   http://www.ssb.no/emner/11/01/vpstat/
8. Securities registered with the Norwegian Central Securities Depository (VPS), by holding sector, market value
   http://www.ssb.no/emner/11/01/vpstat/
9. Credit indicators and money supply
   http://www.ssb.no/emner/11/01/k2/
   http://www.ssb.no/emner/11/01/m2/
   http://www.ssb.no/emner/11/01/k3/
10. Financial accounts of the household sector
    http://www.ssb.no/emner/09/01/finsek/
11. Consumer price indices
    http://www.ssb.no/emner/08/02/10/kpi/ (CPI for Norway only)

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