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Economic Bulletin





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The macroprudential approach to financial stability *

Svein Gjedrem, Governor of Norges Bank

Introduction

Financial stability has become an increasingly important objective in economic policymaking during recent decades.

In the 1980s, direct regulation of credit markets and capital flows was dismantled in many countries. This prepared the ground for an expansion of the financial system at a faster pace than other parts of the economy. In this process, the financial system has undergone important structural changes and become more complex. The instruments have become more intricate, the activities more diversified and the risks more mobile. As a result of increasing cross-industry and cross-border integration, financial systems have also become more interwoven, both nationally and internationally¹.

In parallel with the strong growth of the financial system, we have seen more frequent instances of widespread financial distress. The resulting macroeconomic costs have often been sizeable. Financial crises have typically been associated with boom and bust cycles in asset prices and credit. Due to sharp growth in house prices and household debt in several countries in recent years, the question of whether monetary policy should be used to mitigate such developments has received increased attention.

In the light of these developments, I would like to address four main questions. What do we mean by financial stability, how do we analyse it, how do authorities cooperate in order to support it, and finally, what instruments are available to secure financial stability?

What do we mean by financial stability?

Despite increasing focus in recent decades, there is still uncertainty as to how best to define the concept 'financial stability'.²

In order for households and enterprises to obtain optimal consumption and investment over time there has to be a well-functioning financial system that can intermediate between savers and borrowers, carry out payments and redistribute risk in a satisfactory manner. This promotes an efficient allocation of real economic resources across different activities and over time. From this point of view, financial stability can be defined as a situation where the financial system is able to meet these requirements, and thereby enhance economic performance and wealth accumulation A more narrow approach is to define financial stability in terms of what it is not, i.e. a situation in which financial instability impairs the real economy. This definition is more passive in terms of implying how one should act under normal circumstances, but has the advantage of focusing on the situations we attempt to avoid.

The latter definition is related to the high costs of financial instability in the last few decades. Costs in terms of loss of GDP can be substantial. As illustrated in Chart 1, a study of the economic costs of banking crises concluded that even though such crises have been less frequent in high-income countries than in low-income countries, they have persisted over a longer period and average total output losses have thus been higher.³

The preferred definition of financial stability varies from country to country. Recognising the need for a relevant operational definition regardless of the current situation in the financial system, Norges Bank has chosen to adopt the broad definition of financial stability.

How do the authorities analyse financial stability?

Given an understanding of what financial stability should imply, the authorities can analyse potential threats to financial stability. There are two complementary approaches:

In the first approach, we need to focus on risk factors originating within the financial system. Institutions, markets and infrastructures are continuously faced with



* The article is based on a keynote address with the same title that was given at the conference entitled "Monetary Policy and Financial Stability", hosted by the Oesterreichische Nationalbank in Vienna on 12 May 2005.

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¹ For further discussion, see Houben, Kakes and Schinasi (2004)

² See for example Schinasi (2004)

³ Hoggarth, Reis and Saporta (2001)

risk factors such as credit, liquidity and market risks. Analyses have become even more challenging in recent years as the financial system has become more complex and interwoven across both industries and borders.

The increased complexity of the financial system is illustrated by the rapidly expanding market of credit derivatives. This is a relatively new financial instrument that comes in many and complex forms. While contributing positively to greater flexibility in risk management, there is also the possibility that risk is more easily concentrated, and that economic agents can take on risks without being fully aware of their ramifications.

When analysing risk originating inside the financial system, it may be useful to divide the approach into two areas.⁴ The microprudential analysis focuses on developments within individual institutions, and is concerned with limiting the distress of individual institutions, thereby protecting depositors. The macroprudential analysis focuses on the financial system as a whole, and aims at limiting system-wide distress and avoiding output costs. An important concept here is systemic risk: the risk that liquidity or solvency problems in a bank may cause liquidity problems or insolvency in other institutions. Thus, correlation and common exposures across institutions are important in the macroprudential approach.

The second approach deals with risks originating from outside the financial system. This field has increasingly been recognised by researchers and policymakers in recent years. Strong growth in debt and asset prices, as well as macroeconomic disturbances like a surge in commodity prices or the unwinding of large imbalances in the world economy, can ultimately affect financial stability in a negative way.

To identify potential sources of instability, we need indicators that contain useful information. With an estimate of the equilibrium values of debt ratios or asset prices, for example, we can study the gap between their current value and their equilibrium value⁵. If the gap is wide, the danger of a significant consolidation is present. However, the results must be interpreted carefully. Equilibrium values are inherently difficult to determine, and it is not obvious that there is a stable and significant relationship between gaps and future economic activity. In addition, decisive factors in the judgement of the financial situation, like agents' confidence in the financial system, are also difficult to incorporate in the analysis.

A related approach is to analyse the potential impact of adverse macroeconomic shocks on financial stability. Stress tests are commonly used for this purpose. Such tests investigate banks' ability to withstand different types of shocks under various economic conditions and with different monetary policy responses. Macroeconomic models have proven to be valuable for conducting stress tests. However, considerable work

Chart 2 International stock market indices. Index. 1 Jan 2004 = 100



remains to be done in order to capture the behaviour of economic agents in the case of extreme macroeconomic events.

Financial markets and institutions have become more interdependent, thereby increasing the possibility of contagion across borders.

Cross-border capital flows have increased considerably in recent decades. Equity markets have moved more in tandem, particularly since the mid-1990s (see Chart 2). This also applies to bond markets. Investors are increasingly spreading their investments across countries. They are both diversifying risk and seeking high returns. In parallel, governments, banks and companies are issuing more debt externally.

The corresponding development in financial institutions, towards an increasing share of large cross-border banks, makes it essential to go beyond a purely national analytical focus. However, this can be a difficult task, as cross-border banks are complex and often part of an even more complex financial conglomerate.

Examples:

- The Iceland-based Kaupthing Group is present in 10 countries and the group's total asset holdings at the end of 2004 were almost twice the size of Iceland's GDP.
- The Sweden-based Nordea Group has substantial market shares in all four Nordic countries. While Nordea's home country is Sweden, its largest market share is in Finland.
- The HSBC Group has 110 million customers worldwide.
- Citigroup is present in about 100 countries and territories.

The central bank has a special responsibility for analysing and monitoring the financial system. The examples of cross-border integration show how important it is to have a strong international focus in finan-

⁴ See for example Borio (2003)

⁵ See for example Borio and Lowe (2004)

cial stability analysis. Generally, the increasing range of analytical challenges has forced central banks to be more innovative. This is reflected in the increasing number of financial stability reports published worldwide.

How do authorities cooperate in order to promote financial stability?

Closely connected to the question of analytical focus is that of the division of responsibility for maintaining financial stability, on both a domestic level and among the authorities in different countries. The task of ensuring financial stability within a country is in most cases divided between the ministry of finance, the central bank and a financial supervisory authority, with the ministry of finance having the overall responsibility. To promote efficient cooperation, the regular exchange of information between these authorities is crucial and some formal framework for cooperation should be established.

The evolution towards larger cross-border banks makes the issue of responsibilities more complicated. In the event of a crisis, central banks, supervisory authorities, political authorities as well as deposit guarantee funds in several countries will be involved.

In contrast to the national banking crises in Norway, Finland and Sweden in the early 1990s, a similar crisis today would most likely involve authorities from all four Nordic countries. Therefore, it is important to establish guidelines in advance to ensure effective crisis management. A special challenge will be to establish leadership. With four ministries of finance involved, the choice of leadership will not be straightforward.

The traditional view is that the host-country authorities are responsible for subsidiary banks, while homecountry authorities are responsible for branches⁶. This view is closely linked to the legal difference between subsidiaries and branches. Subsidiaries are independent legal entities, while branches are not legally independent of their parent bank.

However, host country authorities have little influence over foreign banks' crisis management. One of the key issues is whether the home country authorities should be obliged, in a crisis situation, to take into account the effects of the crisis on other countries where a bank has branches with extensive activities.

There are arguments to suggest that home-country authorities should have more responsibility for host banks also in a subsidiary bank structure. This would reduce the number of authorities that banks have to relate to. It is also in line with developments in banking, where an increasing number of cross-border banks are organised as global firms with subsidiary structures under central management.

The question of coordination is far from being solved. One possible way forward is to transfer some responsibility to supranational institutions. As transfer of responsibility implies transfer of control, this solution is not a simple one in political terms. In the EU, the idea of a European supervisory authority has so far met resistance. A fundamental problem – especially in the case of a financial crisis – is the lack of a corresponding supranational fiscal institution. Today, any financial support must be granted by national authorities. Without formal supranational solutions in place, it is all the more important to ensure cooperation between the central banks and supervisory authorities involved. The fact that a large share of the financial institutions in the new EU member countries are foreign-owned makes this issue even more relevant.

In June 2003, the governors of the Nordic central banks signed an agreement on the management of a potential financial crisis in a Nordic bank with activities in two or more Nordic countries. The agreement contains procedures for the coordination of crisis management among the central banks. The Nordic supervisory authorities have drawn up a similar cooperation agreement.

One particular problem in the Nordic region is the differences in the countries' deposit guarantee schemes. The different schemes vary both with respect to amount guaranteed and type of deposit covered. However, these differences are also widespread across Europe and some convergence of rules and operating procedures is certainly long overdue.

What instruments are available to secure financial stability?

Monitoring and analysis of the financial system result in an assessment of the current situation regarding financial stability. This leads to the question: what instruments are available to enforce and secure financial stability? We can distinguish between preventive measures and measures for crisis resolution. Of relevance to the latter is the role of the central bank as the lender of last resort. In some countries this role was the main reason for establishing the central bank in the first place. Today it remains an important task of central banks, but is reserved for very special situations where financial stability may be threatened. In this address, I will focus on preventive measures.

As a general measure, the authorities use surveillance and regulation to enforce financial stability. Surveillance of markets, institutions and infrastructure may in itself contribute to sound financial risk management.

Effective and appropriate prudential regulation will reduce risks and promote sound financial institutions. For instance, an important aim of the Basel II agreement is to increase the efficiency of financial institutions by revising existing standards for capital requirements for banks. Prudential regulation can also be used by the authorities as a special measure to curb undesirable

⁶ Borchgrevink and Grung Moe (2004)

developments. Countercyclical variations in capital requirements (or collateral requirements) can respond to potential imbalances. However, there are several arguments against using this instrument.

First, it is very difficult to decide the appropriate timing and size of a policy response. Also, while authorities may regulate financial institutions, market outcomes are difficult to control. Risks may be transferred through the market, away from the regulated institutions, only to show up somewhere else.

Financial agents need to operate on a level playing field. In many countries, branches and subsidiaries of foreign banks have large market shares (see Chart 3). If one country decides to increase the domestic capital requirements for banks, this creates competitive distortion in the national markets between domestic banks and branches of foreign banks, the latter complying with the regulations of their home country authorities.

Clear and concise communication, verbally or in writing, from the authorities to the public on the risk factors they consider to be the most pressing could also be used as an instrument in the event of rising financial imbalances. For central banks, a suitable arena could be financial stability reports, an increasingly common publication. These reports can be described as a signalling device. However, there are limits to how effective signalling and information can be in curbing financial imbalances.

Fiscal policy also contributes to financial stability, for example through a stable tax system built on wellfounded economic principles. Some have argued in favour of counter-cyclical changes in the tax system, for example adjustments in tax deduction on interest rate expenses or property tax. However, such changes can prove to be difficult to adopt and implement for institutional and political reasons.

Financial stability and monetary policy

In recent years, the relationship between monetary policy and financial stability has received increased attention. Monetary and financial stability are two intermediate goals for public policy. In my view, these goals are often mutually reinforcing.

Financial stability has a positive influence on price stability. First, it promotes a stable credit supply and capital flow, which is crucial to balanced economic development. Second, financial stability supports the transmission mechanisms of monetary policy. A stable financial system ensures that changes in the monetary policy instrument have the intended effects on market rates. Hence changes in monetary policy will affect the behaviour of consumers and enterprises and, eventually, inflation and economic activity.

Moreover, price stability has a positive influence on financial stability. A successful monetary policy will promote financial stability by removing distorted price signals associated with high and volatile inflation. Low and stable inflation provides households and enterprises with a clear indication of changes in relative prices. Allocation of resources will then be more effective.

It is easy to identify situations where the objectives of price stability and financial stability imply the same medicine. For instance, expansionary periods are often accompanied by stronger inflationary pressures and asset price increases, both implying a need for tighter monetary policy. There are, however, examples of situations where the considerations are more complex.

As Chart 4 illustrates, surges in asset prices and a low and stable general price level of goods and services can appear simultaneously. There may be several reasons for this.

First, a highly credible monetary policy results in low inflation expectations among economic agents. Explicit



Chart 4 Consumer prices (broken lines) and house prices (solid lines). Index. 1996 Q1 = 100



Sources: EcoWin, Australian Bureau of Statistics, Norwegian Association of Real Estate Agents, Association of Real Estate Agency Firms, Finn.no, ECON

or implicit long-term price and wage contracts may be more common. It may then take more time for higher demand to translate into higher inflation. Asset prices, on the other hand, will not be constrained by expectations such as those relating to consumer prices and may well react strongly to changing economic activity.

Second, periods of higher productivity growth may lay the basis for high corporate earnings, heightened optimism and reduced risk awareness. At the same time, with strong productivity growth, inflation remains low. Banks that record low losses and solid results can increase lending without eroding their capital. Debtfinanced investments may then lead to a faster rise in property prices.

Third, strong international competition may contribute to curbing inflation during a period of strong economic expansion.

Given that a conflict between the two goals may arise; how are financial stability considerations incorporated into monetary policy decisions?

There seems to be widespread agreement among central banks that extreme events which could threaten financial stability should be met by resolute use of monetary policy. For example, leading central banks made an effort to ensure continued liquidity in the markets in the aftermath of the terrorist attack on the World Trade Centre on 11 September 2001. As a consequence, the risks confronting the financial system were limited.

However, risks to financial stability due to evolving financial imbalances are likely to develop over a long period of time. From this perspective, the question of whether financial stability considerations should be explicitly included in monetary policy is heavily debated, both in academia and in central banks. The answers diverge and international consensus has not yet been reached.

One view is that an explicit and proactive monetary policy response to financial imbalances is neither desirable nor feasible. A number of concerns have been raised to explain this view.

First, it is well documented that asset price bubbles and financial imbalances are very difficult to identify ex ante. Second, the appropriate timing of a proactive monetary response is likely to be difficult to determine, given the lags in the impact of monetary policy. Third, even in the case where the central bank knew that financial imbalances were building up, the size of the interest rate rise needed to reduce the imbalances might be so large that it could lead to a severe economic downturn.

A more general concern is the potential moral hazard of a systematic, proactive monetary policy response to financial imbalances. For example, investors may "undervalue" the risk they take on if they expect that the central bank will act to offset future financial instability concerns.

In recent years, the idea of using monetary policy to

prevent a build-up of financial imbalances has received increased attention.

Several central banks can be seen as supporters of taking into account the impact of financial imbalances on future output and inflation. Three quotes can serve as examples of the attention paid to financial imbalances in conducting monetary policy, based on slightly different justifications:

- "For example, to the extent that a stock-market boom causes, or simply forecasts, sharply higher spending on consumer goods and new capital, it may indicate incipient inflationary pressures. Policy tightening might therefore be called for but to contain the incipient inflation, not to arrest the stock-market boom per se." (Ben S. Bernanke, Governor, US Federal Reserve Board, October 2002) 7
- "Truly optimal monetary policy cannot avoid that, at times, strains in the financial system might be such that deviations from the desired inflation rate during shorter periods of time have to be accepted, in order to preserve price stability over the medium to long run." (Otmar Issing, Member of the ECB Executive Board, March 2003) ⁸
- "...the developments in credit and house prices are one argument against looser monetary policy. A rate cut followed by a faster hike could bring about problems through their effects on household indebtedness and consumption." (Lars Heikensten, Governor, Central Bank of Sweden, March 2005) 9

Mr Bernanke's quote recognises the channel between the stock-market boom and incipient inflationary pressures. Mr Issing focuses attention on financial imbalances on the grounds that strains in the financial system may conflict with price stability in the long run. Mr Heikensten calls attention to the possible repercussions of financial imbalances on the real economy in a situation where the household debt burden is high and interest rates are increasing rapidly.

Seen from an institutional perspective, flexible inflation targeting is becoming an increasingly common monetary policy regime. With a target horizon that is forward-looking and sufficiently flexible, it is possible to take into account the impact of potential financial imbalances on future inflation and output. However, it is important to keep in mind that the unwinding of financial imbalances may lie many years ahead, well outside the horizon for the inflation target. Some situations may require a careful weighting of the probabilities and costs of not reaching the inflation target within a mediumterm horizon against possible economic turbulence further ahead. In the worst case, this turbulence may trigger a financial crisis.

⁷ Bernanke (2002)

⁸ Issing (2003)

⁹ Heikensten (2005)

Another interpretation of the role of monetary policy is that it demands that financial instability is taken into account beyond its impact on inflation and output. For instance, structural costs may arise as a result of incorrect decisions by economic agents, based on incorrect information in the period characterised by financial imbalances. The Reserve Bank Act in New Zealand explicitly states that the Bank, in formulating and implementing monetary policy, should "have regard to the efficiency and soundness of the financial system".

In Norway, a flexible inflation-targeting country, we have chosen to incorporate financial stability considerations into the monetary policy decision process. This is partly because financial balances are important for inflation and output and partly because this will ensure sufficient attention is paid to the potential risks to financial stability. In addition, departments dealing with financial stability gather structural and empirical information about the financial system and the financial position of households and enterprises. In my view, these are important inputs to the monetary policy process.

Challenges ahead

There has been substantial development in the way we think about financial stability. From viewing it as a state merely distinguished by the absence of a financial crisis, we now see it as a state where the financial system's favourable qualities are allowed to function in an efficient and proper manner.

At the same time, the financial system in itself has changed. Its instruments have become more numerous and more sophisticated. Positive welfare effects are gained because of greater efficiency and more opportunities in the market. The flip side of the coin is that increased complexity makes the system less transparent and harder to follow.

This development is bound to influence the way authorities pay attention to financial stability issues. New challenges have been brought to our attention, new questions have to be raised and new scenarios have to be analysed. As a consequence, new solutions may be required.

We should use the opportunity to plan ahead now, while the outlook for financial stability internationally is benign.

References

- Bernanke, Ben (2002). "Asset price 'bubbles' and monetary policy" Remarks before the New York Chapter of the National Association of Business Economics, New York, 15 October
- Borchgrevink, Henrik and Thorvald Grung Moe (2004). "Management of financial crises in cross-border banks" Norges Bank, *Economic Bulletin*, no. 3/04, pp. 157-164
- Borio, Claudio (2003). "Towards a macroprudential framework for financial supervision and regulation?" *BIS Working Papers* No. 128
- Borio, Claudio and Philip Lowe (2004). "Whither monetary and financial stability? The implications of evolving policy regimes" *BIS Working Papers* No. 147
- Heikensten, Lars (2005). "Introduction on monetary policy" Speech to the Riksdag Committee on Finance, Stockholm, 15 March 2005
- Hoggarth, Glenn, Ricardo Reis and Victoria Saporta (2001). "Cost of banking system instability: some empirical evidence" Bank of England, *Financial Stability Review*, Issue 10, Article 5, June
- Houben, Aerdt, Jan Kakes and Garry Schinasi (2004). "Toward a Framework for Safeguarding Financial Stability" *IMF Working Papers* No. 04/101
- Issing, Otmar (2003). "Monetary and Financial Stability: Is there a Trade-off?" Speech at conference on "Monetary Stability, Financial Stability and the Business Cycle", March 28-29, 2003, Bank for International Settlements, Basle
- Schinasi, Garry J. (2004). "Defining Financial Stability". *IMF Working Paper* No. 04/187

Norges Bank's role in the event of liquidity crises in the financial sector

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Central banks have traditionally had a role as lender of last resort (LLR). This means that the central bank can supply extraordinary liquidity to an individual bank or the banking system when demand for liquidity cannot be met from other sources. This role has changed over time for Norges Bank. In the course of the past 30 years, the stance on extending loans on special terms (S-loans) to banks has become more restrictive. This is partly attributable to the liberalisation of credit markets and increased opportunities for banks to raise funds in the market. Following the banking crisis, Norges Bank's attitude to providing extraordinary liquidity for the individual bank has remained unchanged. The Executive Board's most recent review of the Bank's role as LLR, in March 2004, confirms that extraordinary provision of liquidity should be reserved for situations in which financial stability may be threatened without such support. The review also clarified the Bank's reaction to different types of liquidity problems and its criteria for granting S-loans.

1. Introduction

Through its conduct of monetary policy, Norges Bank normally ensures that the liquidity in the banking system is such that the shortest money market rates remain close to the key rate. In crisis situations, the supply of liquidity through the Bank's ordinary lending facilities may rapidly prove to be inadequate. The central bank must then consider extraordinary measures. A distinction can be made between a liquidity shortage for the individual bank, and for the banking system as a whole.

In the event of a shortage of liquidity in the market, for example as a result of a general loss of confidence in a country's economy and banks, or a credit crunch in international capital markets, both short-term and long-term rates may rise and asset prices may drop sharply. Such crises may therefore have macroeconomic consequences, and the central bank may have a special responsibility for helping to avert a crisis by providing an extraordinary supply of liquidity.

An individual bank may have liquidity problems even under normal market conditions, for example as a result of a loss of confidence on the part of lenders. Central banks do not normally have a responsibility to resolve liquidity problems in such cases, unless there is a possibility of severe knock-on effects for other banks (through the interbank and payment systems) and the economy in general. When crises in one or more banks are attributable to weak risk management and a decline in financial strength, other measures will also be necessary.

In Norway, part of the Ministry of Finance's general responsibility for economic policy entails ensuring that the country has a smoothly functioning financial industry. The Ministry's responsibility also includes legislation pertaining to the area of finance. In crisis situations, the Ministry may consider whether crisis-hit banks should be placed under public administration, be supplied with capital/subordinated loan capital from the state, or whether other crisis measures should be implemented. Kredittilsynet (the Financial Supervisory Authority) is responsible for overseeing the individual institution and has been granted broad powers to intervene in the event of crises or potential crises by issuing requirements and instructions to the individual institution.

Some general remarks about the role of LLR are presented in Section 2. Section 3 contains a more detailed account of how this role has developed over the last 30 years in Norway. Section 4 describes the situation today, while Section 5 presents a summary.

2 The role of LLR and Norges Bank's instruments

2.1 Theoretical considerations

In the 1800s, Thornton (1802) and Bagehot (1873) outlined the elements of the central bank's LLR policy. The key elements were that in the event of liquidity crises, the central bank should be prepared to supply liquidity on a large scale, against provision of satisfactory collateral and at a high interest rate. Satisfactory collateral was considered necessary so that central banks did not have to conduct a credit assessment in each individual case. In practice, the posting of collateral took the form of banks discounting bills of exchange in the central bank. The central bank was able to increase the supply of liquidity by accepting several types of bills (for example bills with a longer residual maturity than was normally accepted). The cost to the central bank was that a broader set of bills normally meant poorer securities quality and a higher credit risk. A high interest rate was viewed as necessary to reduce moral hazard in

¹ I should like to thank Morten Jonassen, Audun Grønn, Arild J. Lund, Kristin Gulbrandsen, Thorvald G. Moe, Bjørn Bakke and Henrik Borchgrevink for useful input.

banks and to encourage market-driven solutions. It might also be necessary to maintain a high interest rate in order to avoid flight of capital and outflow of gold, which, under the gold standard (and fixed rate regimes generally) could lead to a decline in the money supply and provision of credit, deflation and economic down-turns. Although these recommendations were made under a different regime in terms of exchange rate system, regulation and oversight, they still apply.²

Liquidity problems may arise for many reasons, in the form of a liquidity shortage for an individual bank or the banking system as a whole. Bagehot and Thornton appear to have been of the opinion that the central bank should primarily supply liquidity to the market by general means, and let the interbank market handle the distribution of the liquidity.³ This is because banks that are sound and have good risk management systems will normally enjoy confidence in the markets, and will therefore also have adequate access to liquidity.⁴ If the central bank grants extraordinary loans to the individual bank too frequently, lenders to banks may have less incentive to monitor the banks' financial situation and may provide credit too cheaply. This may induce banks to take too much risk. Reliance on extraordinary support from the central bank may also make banks less motivated to find market solutions in the event of liquidity problems. The result may be a less stable banking system.

However, the possibility cannot be excluded that even sound banks may suffer a loss of confidence on the part of depositors and other creditors because they are less well informed about the quality of banks' assets than the banks' management. This is referred to as 'asymmetric information'. When liquidity problems compel a bank to sell its assets, creditors may incur substantial losses. In such cases it may be maintained that the central bank should grant extraordinary loans to the crisis-hit bank in order to avoid an ineffective winding up of a bank that is fundamentally sound. In practice, however, it is very demanding for the central bank or supervisory authorities to evaluate the financial strength of a bank in a short space of time, both because of asymmetric information and because the bank itself does not have full information. The central bank therefore risks incurring a loss if it provides a loan and the market's assessment later proves to be well-founded.

A basic principle is that central banks should not extend loans to banks with solvency problems. In principle, such problems should be solved by the owners supplying fresh capital, or through mergers or acquisitions by private-sector operators. In countries with guarantee funds with a mandate to supply risk capital, as in Norway and the US, the guarantee funds come in as the second line of defence. If a bank is not supplied with sufficient capital to enable it to continue operating in a prudent manner, it will have to be wound up. In Norway, financially weak banks may be placed under public administration. In the event of a systemic crisis, however, public administration may not be very appropriate, because it may have negative consequences for overall provision of credit and the payment system. In such cases the government may intervene as the ultimate authority and supply capital to crisis-hit banks, or take other steps to avert a crisis.⁵

If problems in a bank are discovered early and handled rapidly and efficiently, the need for the central bank to supply extraordinary liquidity or for government authorities to provide solvency support will be less or nonexistent. Calculations show, for example, that a swifter, more efficient handling of the crisis in US savings and loan institutions in the 1980s could have resulted in a considerable reduction in costs to the government (Goodfriend (2001)). Instead, the authorities allowed the banks to continue operating with limited financial strength, with the result that they increased their risk (gambled for resurrection), and their financial strength deteriorated further.

2.2 What instruments are available to Norges Bank?

Although a great deal has been written about the role of LLR, no clear, consensual definition of the role of LLR exists either in theoretical work or in practice. This article takes as its starting point Norges Bank's established lending arrangements and then describes the Bank's policy regarding the injection of extraordinary liquidity into an individual bank or the banking system as a whole.

Norges Bank's lending arrangements can be divided into two main groups:

- General:
 - Monetary policy instruments (fixed-rate loans and deposits and currency swaps)
 - Standing facilities for settlement of interbank claims (intraday loans/sight deposits) via Norges Bank's settlement system (NBO)
- Loans on special terms to a bank (S-loans)

Norges Bank has distinguished between general loan arrangements and S-loans since the Credit Act was introduced in 1965. However, the structure of the arrangements has varied over time.

The aim of Norges Bank's liquidity policy today is that the banking system as a whole shall have substan-

² See Freixas et al. (1999) and Dalen and Lund (2001) for a review of the literature on the role of LLR.

³ This is a view promoted by Humphrey and Keleher (2002) among others.

⁴ According to the acts relating to commercial and to savings banks, banks shall ensure that they are able at all times to meet their liabilities when they fall due. Report no. 6 from the Banking Law Commission (NOU 2001: 23, Activities of financial undertakings) proposes changing to qualitative regulation that places emphasis on good liquidity management practice.

⁵ The Basel Committee on Banking Supervision writes the following (BIS (2002), p. 35): "Public funds are only for exceptional circumstances. Public funds for the resolution of weak banks may be considered in potentially systemic situations, including the risk of loss or disruption of credit and payment services to a large number of customers. An intervention of this nature should be preceded by a cost assessment of the alternatives, including the indirect cost to the economy".

tial sight deposits in the central bank at the end of the day. Should a need to borrow arise, Norges Bank will supply the liquidity that is necessary by means of a fixed-rate loan, or through currency swap agreements. Norwegian banks also have access throughout the day to liquidity (intraday loans) via standing facilities in Norges Bank's Settlement System (NBO). Liquidity is always supplied against collateral in specified interestbearing securities.

A requirement of full provision of collateral also used to be the rule earlier, but from 1965 the requirement that collateral be deposited in Norges Bank was relaxed and after a while abolished. Instead, it was required that the borrowing bank must have specified securities in its portfolio as a basis for borrowing from Norges Bank.

In connection with the foreign exchange crisis in spring 1986, all requirements relating to the furnishing of collateral for banks' automatic borrowing facility in Norges Bank (overnight loans) were abolished. Norges Bank then supplied a substantial amount of liquidity without collateral in order to avoid a sharp increase in money market rates (see Chart 1).⁶ In addition liquidity was supplied through repurchase agreements and currency swaps, i.e. banks made government bonds, bonds issued by state lending institutions and foreign exchange available to the central bank in exchange for liquidity for an agreed period. The volume of repurchase agreements with bonds was reduced in 1987, however, because reductions in the primary reserve requirement meant that more bonds had to be used to meet the liquidity requirements in the banking acts (Norges Bank (1987), p. 15). On 1 June 1987, Norges Bank introduced F-loans (fixed-rate loans that cannot be terminated). Fixed-rate loans were introduced partly to buffer banks' borrowing costs, and hence their lending rates, against short-term fluctuations in money market rates as a result of turbulence in foreign exchange markets. Like overnight loans, fixed-rate loans were issued without



collateral. The supply of fixed-rate loans increased sharply in 1987.

As a result of the exchange rate crisis, Norges Bank was left with large, unsecured overnight loans and fixedrate loans to banks when their solvency problems began in 1987. The requirement of collateral was difficult to re-introduce in the next few years, partly because the loans were large and partly because securities holdings that could be used by banks as collateral were limited. The banks' high loans in Norges Bank were first reduced in 1993. Once the loans were smaller, it was easier for Norges Bank to re-introduce a requirement of collateral. The requirement of partial collateral for overnight loans was introduced in 1993. The requirement was gradually stepped up, and since 1995 has been 100 per cent. When intraday loans were introduced in connection with the transition to a continuous settlement system in November 1987, the requirement of full collateral was adhered to less strictly for the first year after the introduction. Collateral for fixed-rate loans was introduced in 1999.

The requirement that full collateral be posted is necessary to prevent Norges Bank incurring risk. At the same time, experience from 1986 shows that the question of approving a different type of security (for example equities) or waiving the requirement of collateral in the general loan schemes may easily arise in crisis situations. Section 3 of the current regulation concerning banks' right to loans and deposits in Norges Bank states: "Norges Bank may issue more detailed conditions for accepting or rejecting collateral, and in special cases may approve other collateral or depart from the requirement for collateral."

In the event of liquidity problems in an individual bank, Norges Bank can provide loans on special terms. Section 19, third paragraph of the Norges Bank Act states that: "When warranted by special circumstances, the Bank may grant credit on special terms." Pursuant to Section 22, first paragraph, the Bank may also extend loans and other types of credit to enterprises in the financial sector other than banks "in special cases".

3 Norges Bank's evolving role as lender of last resort

3.1 General statements

Norges Bank's role in the financial sector has changed over the past 30 years. Prior to deregulation in the late 1970s, Norges Bank had many responsibilities relating to credit policy in addition to monetary policy. Interbank, money and capital markets were not very well developed, and banks experienced liquidity problems more often than they do today. This happened particularly in periods with a tight credit policy and in

 6 Skånland (1991) writes the following about this: "Up to 1986, it was nevertheless a condition that a paying bank had securities in its portfolio that could form collateral for a loan. Following the exchange rate turbulence the same spring, this precondition had become unrealistic, and had to be abandoned if it was to be possible to maintain the interest rate level that had been established." Skånland (1991, 2004) describes why the interest rate was not raised when the outflow of foreign exchange began in late 1985.

banks that did not adhere loyally to the credit policy guidelines. A number of instruments were used by Norges Bank to meet banks' liquidity needs (for example term deposits and S-loans). The statement of Central Bank Governor Getz Wold in 1975 indicates that Norges Bank assumed broad responsibility for banks' liquidity:

"Under no circumstances will Norges Bank allow a Norwegian commercial bank to suspend its payments. It will also supply the parent bank in question with sufficient liquidity to prevent a foreign subsidiary that is wholly or partly owned by a Norwegian commercial bank from having to suspend its payments. Norges Bank's willingness to lend sufficient liquidity to enable a bank to continue its payments does not imply that the bank in question can expect to continue its activities with no change. Emphasis will be placed on the reasons why such an extraordinary supply of liquidity has been necessary. Norges Bank may attach specific conditions to its liquidity support, for example with respect to the bank's management." (excerpt from a letter to the Bank Democratisation Committee published in NOU 1976: 52, p. 330).

This statement must also be viewed in the light of major problems the previous year in a number of banks in West Germany and the US, among others, and a British subsidiary in Switzerland, and the need to shore up confidence in the international financial system.

As long as banks were subject to tight regulation, they had limited opportunities to incur high risk. There was consequently a low risk that frequent supply of extraordinary liquidity to the individual bank would reward and contribute to high risk-taking. With the liberalisation of the credit markets, Norges Bank's role changed. The need to find market solutions for liquidity problems increased, and Norges Bank gradually placed more emphasis on contributing to the stability of the financial system as a whole than to the liquidity of the individual bank. In the mid-1980s, Central Bank Governor Skånland made the following statement about Norges Bank's role if a bank's financial situation should be threatened:

"If such a case should nevertheless arise, Norges Bank will, in the interests of confidence in the Norwegian banking system, contribute to finding a solution which will protect the interests of the creditors in an appropriate way." (Economic Bulletin 3/1985, p. 217)

In connection with turbulence in the foreign exchange market and fear of liquidity pressure in Norwegian banks, Norges Bank stated in a press release on 30 October 1987 that the central bank would take the necessary steps to boost market confidence in the Norwegian banking system: "In response to questions recently raised, Norges Bank wishes to reiterate its readiness to prevent nervousness in the market prompted by fears that Norwegian credit institutions may become exposed to liquidity pressure. Norges Bank has complete confidence in the soundness of the banking system and, if need be, will adopt the measures necessary to strengthen market confidence in the banking system."

In his annual address in 1988, Governor Skånland repeated his statements about Norges Bank's role in liquidity crises:

"The Banking, Insurance and Securities Commission⁷ ensures that financial institutions meet the statutory capital requirements, and guarantee funds provide depositors with added safety. However, should financial institutions find themselves in a position which could affect general confidence in the credit market, Norges Bank – cognizant of its responsibility as the central bank – is prepared to take such measures as are necessary to bolster market confidence in our financial system."

In order to bolster confidence in the financial system, Norges Bank granted S-loans to a number of banks during the banking crisis. The interest rate on loans was usually on market terms, defined as the current overnight lending rate. When Sparebanken Nord-Norge had solvency problems in 1988-89, Norges Bank additionally provided income support in two ways: a loan on special terms at a subsidised interest rate, which entailed a discount value of NOK 200 million, and write-down of a loan of NOK 500 million. The income support was provided as part of the recapitalisation of the bank in collaboration with the Savings Banks' Guarantee Fund. In Report no. 24 (1989-90) to the Storting, p. 18, the Ministry of Finance wrote that "...Norges Bank's contribution to the refinancing of crisis-hit banks raises a number of questions and problems. ... The write-down of the central bank's loans may therefore, under the circumstances, represent an active use of government funds that should be deliberated by the Storting in advance." One lesson that this provided was that: "In the event of any future crisis situations in Norwegian banks, the Ministry of Finance assumes that the ordinary system of the law will be adhered to. The Ministry refers to the schemes that have been established through the guarantee funds." The Standing Committee on Finance endorsed this view in its follow-up in Recommendation no. 90 (1989-90) to the Storting. Thus the solvency problems in Sparebanken Nord-Norge led to a clarification of the distribution of responsibilities between the central bank, the guarantee funds and the government authorities in the financial safety net in the period that followed.

⁷ Previous English name for the Financial Supervisory Authority - Kredittilsynet

When the acute crisis in Christiania Bank became public knowledge, acting Minister of Finance Tove Strand Gerhardsen published a statement on 14 October 1991 that the Government would take steps to bolster confidence in the Norwegian banking system. The same day, Norges Bank issued the following press release:

"Norges Bank refers to the statement made by acting Minister of Finance Tove Strand Gerhardsen to the effect that the Government will implement the measures necessary to bolster confidence in the Norwegian banking system. Norges Bank additionally points to the fact that one potential measure the Government is considering is transferring capital to the Government Bank Insurance Fund. This will provide a foundation that enables the Fund to strengthen the capital in Christiania Bank so that the bank can fulfil the statutory capital adequacy requirements.

Norges Bank will accordingly continue to ensure that sufficient liquidity is supplied to Christiania Bank and the banking system generally."

Mortgage companies also experienced liquidity problems in 1991. In April 1991, Norges Bank granted an Sloan to Realkreditt, which had begun to have serious liquidity problems⁸, partly as a result of dwindling profitability. Later that year other mortgage companies developed liquidity problems. On 26 November, Norges Bank therefore issued a general statement on liquidity to mortgage companies:

"The problems a number of mortgage companies have faced recently in the bond market cannot be attributed to their financial position. Their capital adequacy is satisfactory, and in several cases is higher than stipulated in the requirements. It is therefore assumed that the situation that has arisen is of a temporary nature, and that it will be rectified as general confidence in the financial market is gradually re-established.

To assist mortgage companies in continuing with their operations on the basis of the ordinary conditions for their funding, Norges Bank may grant liquidity loans to companies in situations where such funding is drying up for reasons that cannot be attributed to the individual company. The conditions for such loans will be agreed on a case-by-case basis."

The statement from Norges Bank may have helped to calm the markets, and there was no need to grant loans on special terms as follow-up to the statement.

In autumn 1992 liquidity problems arose for both mortgage companies and finance companies. The statement of the previous year from Norges Bank was therefore repeated in a press release of 4 September 1992, and extended to include private finance companies.

"Financial markets have been marked by some turbulence and uncertainty the last few days. Norges Bank views this development as transient, but does not rule out the possibility of increased liquidity strains even for companies with a sound capital base.

The present situation bears some resemblance to the problems that arose in the bond market in late autumn 1991, which led to Norges Bank's declaration of liquidity support in favour of mortgage companies on 26 November 1991."

As follow-up, S-loans were granted to one more mortgage company and five finance companies.

In connection with follow-up of the Smith Commission's review of the handling of the banking crisis, Norges Bank issued a statement concerning its general attitude in a submission of 17 December 1999 to the Ministry of Finance:

"Norges Bank is responsible for promoting robust and efficient financial markets and payment systems, i.e. contributing to financial stability. Should a situation arise in which the financial system itself is at risk, Norges Bank, in consultation with other authorities, will consider the need for, and if necessary initiate, measures that may help to bolster confidence in the financial system."

This was very largely a follow-up to former central bank governor Skånland's statements in 1988 to the effect that Norges Bank would consider measures to "strengthen confidence in our financial system". In the light of experience from the banking crisis, Skånland's statement was supplemented to the effect that measures in the event of a loss of confidence would be considered "in consultation with other authorities".

3.2 Previous guidelines for the provision of loans on special terms⁹

The structure of the S-loan scheme has varied considerably over time. Until the mid-1980s, S-loans were granted in the case of large, unpredictable loss of deposits, for the execution of bank mergers, to help banks that had been adversely affected by certain credit policy measures, to assist banks that had suffered major losses and to help banks remedy an imbalance between deposits and lending. S-loans were issued at an interest rate lower than market rates, and therefore constituted an appropriate instrument in banking structure policy. There was varying practice with respect to requiring collateral for S-loans.¹⁰

 $^{^{8}}$ Towards the end of the year, Realkreditt was taken over by DnB.

⁹ Developments in Norges Bank's policy on loans on special terms up to and including 1988 were discussed in a report of 22 November 1988 to the Ministry of Finance (published as Appendix 2 to Report no. 16 (1988-89) to the Storting relating to Kredittilsynet's, Norges Bank's and the Ministry of Finance's treatment of Sparebanken Nord and Tromsø Sparebank).

¹⁰ In 1975, for example, the Supervisory Council of Norges Bank allowed S-loans to be granted as debt instrument loans without posting of collateral. Prior to this, the rule was that S-loans granted as more long-term liquidity support should be provided against collateral in the form of bearer bonds, and in special cases against other collateral.

Table 1. Developments in S-loans 1976-1986. Number and inmillions of NOK at year-end					
	1976	1979	1982	1984	1986
Number	52	11	16	3	1
Granted loans (millions of NOK)	798	650	323	235	165

In 1984, Norges Bank's Executive Board decided that the use of S-loans should be made more restrictive and that the scheme should be used more in Norges Bank's capacity as LLR, as it was defined at that time.¹¹ This meant that S-loans should be employed in cases where liquidity problems stemmed from the individual bank's operations, and as support to banks that had suffered severe losses. S-loans could also be used for carrying out certain bank mergers. After this, the volume of Sloans fell (see Table 1).

The foreign exchange crisis in spring 1986 led to a rise in interest rates on Norges Bank's ordinary lending facilities, and this led to many banks applying for Sloans for various "special reasons". In an Executive Board memo dated 20 May 1986 it was proposed that the applications should be rejected on the grounds that *"the general tightening of short-term borrowing rates in early May was necessary to curb the outflow of capital."* All applications were therefore rejected.

At the Executive Board meeting of 18 February 1987, the principles underlying interest rate conditions for Sloans were examined. The S-loan rate had previously been slightly higher than Norges Bank's discount rate The discount rate was discontinued with effect from 1 January 1987. At the Executive Board meeting, the Sloan rate was set as 11 per cent, which was an increase of 1 percentage point. The increase was related to developments in the general level of interest rates. The S-loan rate was still lower than the interest rate on banks' ordinary borrowing facilities in Norges Bank, and implied continued subsidising of banks that received S-loans.

The S-loan arrangement was reviewed again by the Executive Board on 26 August 1987. It was noted that the S-loan arrangement had been tightened up, in line with the recommendation endorsed by the Board of Directors¹² on 11 May 1984. In an assessment of whether Norges Bank should extend loans on special terms, the memo states that it appears "reasonable to place greatest emphasis on the extent to which such loans can be regarded as natural responsibilities of the central bank, particularly the responsibility of "lender of last resort", i.e. whether these loans are essential for protecting the stability of the banking system." It was pointed out that frequent granting of S-loans could have negative consequences because "... the S-loan arrangement frees banks to some extent from the financial consequences of their own unsound transactions." It was also noted that banks' possibility of acquiring necessary liquidity through Norges Bank's other lending arrangements, liquidity policy instruments and the interbank market, had improved in recent years. S-loans could therefore not be justified on the grounds of the individual bank's liquidity needs to the same extent as in the previous more strongly regulated credit system.

The Executive Board accordingly decided that:

"The main criterion for extending such loans should be that it has been found probable that the bank in question (loan applicant) has or will develop liquidity or solvency problems as a result of which it will be unable without support to achieve a merger with other banks in accordance with current guidelines for banking structure policy. (...) S-loans should continue to be used in extraordinary liquidity situations where special stability interests indicate the necessity (e.g. in connection with obligations in case of conflicts in working life)."

Although this implied a tightening, the S-loan arrangement was nevertheless assigned more responsibilities than merely contributing to the stability of the banking system. This was partly because Norges Bank still played a part in the authorities' banking structure policy.

A number of S-loans were then granted in connection with the banking crisis (see Chart 2). Following a discussion with the Ministry of Finance, it was decided in summer 1998 that S-loans should be granted on the basis of two principles: To resolve a short-term liquidity problem, or to resolve a more long-term structural problem. The first type of S-loan should be granted at market rates (defined as the overnight lending rate, possibly with a premium), while the latter should be granted on favourable interest rate terms if the government wished to contribute to a specific crisis solution by providing income support. During the banking crisis, Norges Bank granted both types of S-loan. The first type



¹¹ The background was the need to clarify the distinction between S-loans and term deposits. From 1975, Norges Bank had had an arrangement with term deposits in Norwegian banks that was intended to dampen the impact of a generally tight credit policy on the most exposed banks and regions. The term deposit arrangement was discontinued in 1988 when it was considered that the interbank market was sufficiently developed.

¹² The governing body preceding the Executive Board.

was granted in most cases, usually to banks that had suffered a loss of confidence from markets (in many cases abroad) and in order to facilitate the desired mergers in the banking sector, to make banks more viable. In connection with the recapitalisation of Sparebanken Nord-Norge, a subsidised loan was also extended, as mentioned in 3.1. The authorities introduced a scheme of clearly subsidised deposits from Norges Bank when the banking problems developed into a systemic crisis in 1991. Since the banking crisis, Norges Bank has not granted S-loans.

3.3 New challenges for LLR policy

Under normal market conditions, solid banks normally enjoy confidence in the markets, and therefore do not have liquidity problems. However, turbulence may arise in financial markets and cause liquidity to dry up. The BIS (2001) points out that certain structural features (including increased use of collateral in various markets and the development of technically sophisticated risk systems) have improved the liquidity of securities markets in normal times, but at the same time increased the risk of a credit crunch in the event of market turbulence.

Securities are used increasingly as collateral to reduce counterparty risk in connection with derivative agreements. Moreover, the use of repurchase agreements, where securities are exchanged for liquidity for an agreed period, has increased sharply in interbank markets in many countries since the 1980s. Central banks also normally require full provision of collateral for their loans. Although increased use of collateral reduces the risk of the individual lender, this trend may also lead to securities markets becoming an important source of contagion. There may be increasing risk of interbank markets that use securities as collateral drying up in the event of a sharp fall or increased volatility in securities markets. Sophisticated risk management systems may have a similar effect, because many market participants use models with similar properties to assess market risk and make investment decisions. As a result, when securities markets fall or become more volatile, many market participants may withdraw simultaneously from particular markets in order to reduce the risk of large losses. The result may be even more pronounced falls and volatility.

Moreover, increasing use of securitisation and credit derivatives, which are techniques for transferring risk, may lead in many countries to securities markets and institutions other than banks becoming increasingly important for financial stability. This can change the central banks' role.

White (2004) maintains that extraordinary supply of liquidity to banks is used less frequently in both Europe and North America. This is in line with developments in Norway. Since the banking crisis, there have been few cases of serious liquidity problems in banks, and S-loans have not been granted. The liquidity problems that arose in a number of smaller banks in autumn 2002 as a result of high losses, particularly in connection with Finance Credit and fish farming loans, and the subsequent loss of lender confidence, were resolved without support from the authorities or from the guarantee funds. Instead they were solved through mergers and acquisitions or liquidation.

According to White, the background to those cases where banks were supplied with extraordinary liquidity was often operational disruptions¹³, which led to problems in the payment system. At the same time, White believes that there may have been a shift over time towards more frequent injection of liquidity into the market. There are several examples of this.

The dramatic fall in share prices in 1987 and the crises in Russia and the US hedge fund LTCM in 1998 prompted an injection of liquidity and monetary policy easing in the US. A number of central banks were also poised to supply more liquidity to the banking system in connection with the millennium rollover. The terror attack in New York on 11 September 2001 caused turmoil in the dollar markets and led to fear of weaker economic developments in many countries. The Federal Reserve carried out both a general easing of monetary policy and more targeted measures to reduce problems in the payment system. A number of central banks made foreign exchange agreements with the Federal Reserve in order to be able to provide dollar financing to their own banks, and lowered their key rates. In situations like this, there may thus be a very close connection between the interests of financial stability and of monetary policy. Norwegian banks, on the other hand, did not experience major problems, and Norges Bank therefore did not establish its own foreign exchange facility. However, the Executive Board discussed this in principle in May 2002, and its stance was published in Financial Stability 1/02, where it states that: "However, extraordinary liquidity supplied in foreign currency is one of the instruments available to the central bank, although it must be reserved for very special situations. In Norway, the use of this instrument would have to be based on an assessment of the stability of Norwegian financial markets and the Norwegian payment system."

The emergence of international cross-border banks makes it more complicated today to assess the optimal means for the authorities to manage crises. In the Nordic countries, cross-border banks are well established. The authorities of the Nordic countries have prepared for such situations by drawing up agreements on exchange of information and some criteria for managing crises (Borchgrevink and Moe (2004)).

Developments in the financial sector may therefore change the risk picture facing central banks with respect to LLR policy. Like other central banks, Norges Bank

¹³ In November 1985 a computer error at the Bank of New York resulted in the bank disbursing funds for purchased bonds but not accepting incoming payments for bonds that were sold. The bank incurred a large liquidity deficit that only the Federal Reserve had the resources to cover at short notice.

has a contingency plan for liquidity crises, and last reviewed its stance on providing extraordinary liquidity in March 2004.

4 The Executive Board's most recent review of the role of LLR

4.1 Promotion of financial stability receives top priority

Since the 1970s, Norges Bank has attempted to limit its responsibility to mainly supplying liquidity to the banking system as a whole, and has become more restrictive about extending S-loans. This is because the liberalisation of the financial sector increased the efficiency of the interbank, money and capital markets, and improved banks' possibility of procuring liquidity in the market. Frequent injection of extraordinary liquidity to individual banks could thus entail a greater risk of the central bank rewarding and contributing to moral hazard with respect to the individual bank, and reducing market efficiency.

The banking crisis led to a clearer definition of the distribution of responsibilities between central bank, guarantee funds and the government authorities in the financial safety net. It was specified in particular that Norges Bank itself shall not increase its risk and impose losses on the state. Norges Bank has not granted S-loans since the end of the banking crisis, and since 1999 has required that full collateral be provided for its loans.

At present, the liquidity of the interbank, money and capital markets is satisfactory. The risk of liquidity crises that affect the banking system as a whole therefore appears to be low. For the same reason, the risk of the individual bank experiencing liquidity problems also appears to be low, unless the banks themselves have poor risk management and deteriorating financial strength and lose market confidence. However disruptions of various types may occur and lead to liquidity crises.

The Executive Board's most recent review of the Bank's role as LLR in March 2004 confirms the course that has been pursued since the banking crisis to the effect that *extraordinary supply of liquidity should be reserved for situations where financial stability may be threatened without such support.* The Executive Board also clarified the Bank's reaction to different types of liquidity problems and its criteria for granting S-loans. Two types of liquidity problem were discussed: 1) Liquidity problems that arise suddenly as a result of operational failure of payment systems or failure of funding markets, and 2) liquidity problems resulting from more fundamental problems (poor risk management, deteriorating financial strength etc.) in individual banks.

4.2 Operational failure and liquidity problems

Acute liquidity problems in individual banks will probably lead to insufficient cover for payment settlements in Norges Bank's settlement system (NBO). Norges Bank may then approve other types of collateral, or waive the requirement that collateral be posted for intraday loans in order to ensure the execution of payment settlements. Such a move would be made in the interests of maintaining the efficiency of and confidence in the payment system. However, Norges Bank and the banking industry have placed emphasis on establishing solutions that do not entail a need to supply unsecured liquidity. One element of these solutions is that a bank that cannot meet its commitments is removed from the settlements, and that the positions of the other banks are recalculated, excluding their positions in relation to this bank.

An acute shortage of liquidity in the banking system as a whole would probably lead to many banks having insufficient cover for payment settlements in NBO, even at the end of the day, and to short money market rates rising. Norges Bank has the authority to approve another type of collateral or waive the requirement that collateral must be furnished for fixed-rate loans. Such a move would be aimed at *bolstering financial stability and/or avoiding an undesirable increase in short-term money market rates*.

In order to reduce the risk of Norges Bank rewarding opportunistic behaviour by banks or incurring losses, extraordinary intraday loans or fixed-rate loans should be reserved for situations where it is *evident that liquidity problems are of a short-term nature and are not due to more fundamental problems*.

There will be special events that trigger such situations, such as drying up of liquidity in markets that are important to Norwegian banks, or failure of the central infrastructure for payment settlements.

Disruptions in banks' own payment settlement systems may also lead to liquidity problems. Frequent supplies of extraordinary liquidity in the event of such problems may reduce banks' incentive to prevent operational failure.

4.3 Liquidity problems that are due to more fundamental problems in a bank – use of S-loans

Liquidity problems in a bank will often be a symptom of poor risk management and deteriorating profitability and financial strength, with subsequent loss of market confidence. Kredittilsynet has a central role in such situations. The Act on the Government Bank Insurance Fund has procedures designed to contribute to solving liquidity problems before they become serious and cause problems such as insufficient cover in payment settlements. When Kredittilsynet discovers potential liquidity and solvency problems, it shall inform Norges Bank, partly because Norges Bank can provide S-loans. If Kredittilsynet has reason to assume that a bank has solvency problems, the Government Bank Insurance Fund shall also be informed.

When liquidity problems are due to more fundamental problems, measures targeting the causes of the problems will be important for effective crisis-management. Norges Bank may in the event provide S-loans. The following criteria and terms apply to S-loans:

- S-loans should be restricted to situations where financial stability may be threatened if such support is not provided.
- In most cases, a decision about an S-loan will be a matter of special importance that must first be submitted to the Ministry of Finance. Norges Bank will request that Kredittilsynet make an assessment of: the causes of the liquidity problems, the liquidity and solvency situation of the banks in crisis, and measures that may solve the liquidity problems.
- Before an S-loan is provided to banks that have, or are at risk of developing weak capital adequacy, there should be a plan to recapitalise the bank.
- S-loans should be provided against posting of full collateral or guarantees.
- The interest on the S-loan should be set higher than the market rate applying generally.
- Financial institutions other than banks may be granted S-loans in special cases.

5. Summary

Norges Bank's role in relation to the financial sector has changed over the past 30 years. Prior to the liberalisation of credit markets in the late 1970s, Norges Bank had many responsibilities relating to credit policy in addition to monetary policy. During the regulated credit regime, interbank, money and capital markets were only developed to a limited extent, and banks experienced liquidity problems more often than they do today. Norges Bank had a number of arrangements for meeting banks' liquidity needs. As long as banks were subject to tight regulation, they had limited opportunities to incur high risk. Norges Bank has subsequently attempted to confine its responsibility to mainly supplying liquidity to the banking system as a whole, and has become more restrictive about providing S-loans. Since the banking crisis, the Bank's attitude to providing extraordinary liquidity to the individual bank has remained firm, and no S-loans have been granted.

Liquidity in money and capital markets is currently satisfactory in Norway and other countries with well developed financial markets. Banks that are solid and have good risk management systems will normally enjoy market confidence, and will therefore have adequate access to liquidity. However, various kinds of failure may occur.

Like other central banks, Norges Bank has a contingency plan in case of liquidity crises. The Executive Board's most recent review of the Bank's role as LLR in March 2004 confirmed that extraordinary supply of liquidity should be reserved for situations where financial stability may be threatened without such support. The Executive Board also clarified the Bank's reaction to different types of liquidity problems and its criteria for granting S-loans. It was established that extraordinary liquidity infusions through fixed-rate loans (for financial stability and/or monetary policy reasons) or intraday loans (for payment system reasons) may be appropriate when it is evident that the liquidity problems are of a short-term nature and not due to more fundamental problems in banks. When liquidity problems are due to more fundamental problems on the other hand, such as poor risk management and deteriorating financial strength, measures targeting the causes of the problems will be important for effective crisis-management. In such cases, cooperation with other authorities will be important, and Norges Bank can provide S-loans as part of the overall management of the crisis. However, Norges Bank cannot increase its risk, and will require provision of full collateral as far as possible.

Literature

- Bagehot, W. (1873): Lombard Street: A Description of the Money Market, London, H. S. King
- Bakke, B. and K. Gerdrup (2003): "Banks' counterparty risk – results of a survey conducted by Norges Bank and the Banking, Insurance and Securities Commission", *Economic Bulletin* 2/03, Norges Bank
- Bank for International Settlements (2001): "Structural Aspects of Market Liquidity from a Financial Stability Perspective". A discussion note. Committee on the Global Financial System, Basel
- Bank for International Settlements (2002): "Supervisory Guidance on Dealing with Weak Banks". Basel Committee on Banking Supervision, Basel
- Borchgrevink, H. and T. G. Moe (2004): "Management of financial crises in cross-border banks", *Economic Bulletin* 4/04, Norges Bank
- Dalen, D. M. and A. J. Lund (2001): "Håndtering av finansielle kriser: Sentralbankens rolle", (Handling of financial crises: the role of the central bank) Økonomisk forum no. 3, Samfunnsøkonomene

- Freixas, X., C. Giannini, G. Hoggarth and F. Soussa (1999): "Lender of last resort: a review of the literature", *Financial Stability Review*: November 1999. Bank of England
- Goodfriend, M. (2001): "Financial stability, deflation, and monetary policy" in Ninth International Conference, "The role of monetary policy under low inflation: deflationary shocks and their policy responses", Bank of Japan, *Monetary and Economic Studies*, Special Edition, vol 19, no S-1, February
- Humphrey, T. M. and R. E. Keleher (2002): "The Lender of Last Resort: A Historical Perspective", in Goodhart, C. and G. Illing (ed.) *Financial Crisis, Contagion, and the Lender of Last Resort.* Oxford University Press
- Recommendation no. 90 (1989-90) to the Storting. Recommendation from the Standing Committee on Finance regarding Kredittilsynet's, Norges Bank's and the Ministry of Finance's treatment of Sparebanken Nord-Norge in 1989

Norges Bank (1987): Annual Report 1987

- NOU (Official Norwegian Report) 1976: 52 *Om demokratisering av forretningsbankene* (On democratisation of commercial banks). Ministry og Justice and the Police
- NOU (Official Norwegian Report) 2001: 23 *Finansforetakenes virksomhet* (Activities of financial enterprises). (Report no. 6 from the Banking Law Commission)

- Sveriges Riksbank (2003): "The Riksbank's Role as Lender of Last Resort", *Financial Stability Report* 2/2003, Sveriges Riksbank
- Skånland, H. (1991): "Sentralbankens oppgaver i dag og i fremtiden" (The tasks of the central bank today and in the future), *Occasional Papers* no. 19, Norges Bank
- Skånland, H. (2004): "Doktriner og økonomisk styring. Et tilbakeblikk" (Doctrines and economic management in retrospect), Occasional Papers no. 36, Norges Bank
- Storting Report 16 (1988–89) Om Kredittilsynets, Norges Banks og Finansdepartementets behandling av Sparebanken Nord og Tromsø Sparebank (About Kredittilsynets' Norges Bank's and the Ministry of Finance's treatment of Sparebanken Nord and Tromsø Sparebank).
- Storting Report 24 (1989-90) Om Kredittilsynets, Norges Banks og Finansdepartementets behandling av Sparebanken Nord og Tromsø Sparebank (About Kredittilsynet's Norges Bank's and the Ministry of Finance's treatment of Sparebanken Nord-Norge in 1989).
- Thornton, H. (1802): An Enquiry into the Nature and Effects of the Paper Credit of Great Britain. London: Hatchard
- White, W. R. (2004): "Are changes in financial structure extending safety nets?", *BIS Working Paper*, No 145, Basel, January.

The output gap in Norway – a comparison of different methods

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Are pressures in the economy strong or subdued? The answer to this question is important to a central bank operating an inflation-targeting monetary policy regime, because the degree of pressure in the economy can provide some indication of future inflation. The level of output that is at any time consistent with stable inflation is usually referred to as potential output. The output gap, which measures the difference between actual and potential output, is a commonly used measure of inflationary pressures in the economy.

The output gap is not directly observable, and must therefore be estimated. Different calculation methods, however, often produce different values for the output gap. In this article, a set of alternative methods for estimating the output gap are presented and compared. The different methods show a consistent pattern for the output gap, but there are also important differences. Our study shows that if the assessment of economic pressures is solely based on developments in the output gap as measured by one method, there is a risk of misjudging the economic situation. Assessments of the output gap must therefore also be based on professional judgment and supplementary indicators.

Assessments of the state of the economy are based on continuous monitoring and analysis of a number of economic indicators that represent different aspects of the economy. In order to summarise and quantify economic pressures, the output gap has proved to be a useful starting-point. Most inflation-targeting central banks therefore publish estimates of developments in the output gap in addition to inflation projections.

In a situation where employment is high in relation to the total labour force and the capital stock is fully utilised, there will be a tendency for price and wage inflation to rise. Conversely, price and wage inflation will tend to decrease when unemployment is high and capital utilisation is low. This also means that at any given time there exists a level of resource utilisation that would be consistent with stable developments in prices and wages. The corresponding level of output is usually referred to as potential output. The output gap is the difference between actual and potential output. If actual output is higher than potential output, the output gap is positive, indicating pressures in the economy. In isolation, this is usually accompanied by rising inflation. A negative output gap indicates spare capacity and falling inflation.

The output gap is also an important variable in itself, as a measure of economic fluctuations. Over time, economic resources are utilised efficiently when economic growth is stable and the output gap remains close to zero. Employment and unemployment will then be stable.

It may be useful to think of potential output as consisting of two components. On the one hand, a *constant* rate of increase in the labour force, capital and technological progress will result in steady annual growth in potential output. This component of potential output can

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be represented by a smooth, deterministic trend that is solely dependent on time. On the other hand, there are a number of reasons for potential output growth to vary over time. Technological advances can result in strong productivity growth and changes in the level of potential output. The supply of natural resources can vary. The labour supply depends on factors such as preferences between work and leisure, institutional factors and demography. Capital stock depends on the level of fixed investment. Changes in these production conditions (the supply side of the economy) might result in changes in potential output beyond those indicated by purely deterministic developments. As a rule, these changes will lead to long-term or permanent shifts in potential output, (although the changes may also be temporary). When these factors are added to the deterministic trend, it becomes clear that potential output can no longer be described as a smooth trend.

If actual output is equal to potential output, the output gap will be zero. This occurs very seldom since the economy is also exposed to more short-term, cyclical disturbances, which are related to the demand side of the economy.

Actual output can thus be divided into three components:

- a deterministic trend,
- changes in production conditions (supply-side disturbances of some duration), and
- the output gap (temporary demand-side disturbances).

This division is useful for two reasons. First, the division shows that variation in economic growth over time may be due to disturbances (shocks) on both the supply side and the demand side of the economy. The output gap and the inflation outlook are only affected by temporary demand shocks². Second, the division provides a useful guideline when calculating and interpreting the unobservable variables potential output and the output gap.

Different methods for estimating the output gap can produce different values. This has given rise to a number of studies, including some recently carried out by central banks³. Historical estimates of the output gap might also change when data are revised and new information emerges⁴. The problem of data revisions applies to both actual and potential output, and there is therefore uncertainty concerning both components of the output gap.

In this article, we will focus on estimating and comparing different methods for estimating the output gap and will for the present disregard the problems associated with data revision and new information. In Section 1, the different methods are explained and estimates based on Norwegian data are presented. In Section 2, we review some simple criteria for comparing the alternative estimates. Our conclusions are presented in the third and final section.

1. Methods for estimating the output gap

A few methods for estimating the output gap have been discussed previously in Norges Bank's quarterly *Economic Bulletin*, see Frøyland and Nymoen (2000). The issue of measuring the output gap has also been discussed in a number of boxes in Norges Bank's Inflation Report, most recently in *Inflation Report 2/*04. In this article, we will present a set of internationally recognised and commonly used methods, then estimate alternative output gaps using Norwegian data and compare the different methods.

The output gap can be defined as

(1) $ygap_t = y_t - y_t^*$

The variables are expressed in logarithms, with the output gap, $ygap_t$, being the percentage deviation between actual output (y_t) and potential output (y^*_t) .





Chart 1 presents a graphical illustration⁵ of the relationship between the output gap and actual and potential output.

Historically, the first, simple methods for estimating the output gap were based on the assumption that output was moving along a linear trend in the long term. The trend was interpreted as an indication of potential output. A linear trend, however, is a very strict assumption that does not allow for possible variations in potential output over time, cf. the above discussion.

Over recent decades, a number of alternative methods for estimating the output gap have been developed. The alternative methods can be categorised in several ways. We have chosen to group the methods into two main categories: univariate methods (methods that use information inherent in GDP only) and multivariate methods (methods that also use additional variables).

1.1 Univariate methods

Univariate methods only use information in the time series itself (here, mainland GDP) to estimate the output gap. Most of these methods calculate a trend as an expression of potential output. Some methods model the output gap directly.

There are many alternative univariate methods, from the very simple to the relatively complicated. Three examples will be reviewed here. The estimates are based on seasonally-adjusted figures from the quarterly

 $^{^2}$ This interpretation of the output gap is derived from the traditional definition of the output gap as a measure of economic developments. In an alternative interpretation of the output gap, based on more recent macroeconomic theory, real demand shocks also affect potential output. Potential output is defined as the output level that would result if prices and wages were fully flexible. This definition has its foundation in welfare economics theory. The main difference between this definition and the one we have selected as our basis is the effect of demand shocks. According to our definition, an unexpected increase in, for example, public expenditure would not have any effect on potential output and would therefore have full impact on the output gap. According to the alternative definition, however, the potential output level would also increase in the short term, with a smaller increase in the output gap as a result. Our definition largely disregards effects on potential output caused by short-term disturbances.

³ See for example Scott (2000), Citu and Twaddle (2003) and Rennison (2003).

⁴ The problems of measuring the output gap in real time have received increasing attention in recent years: in any specific quarter (t), preliminary information is available concerning economic developments up to and including the previous quarter (t-1). The output gap in real time for quarter (t-1) is estimated on the basis of this information. As time passes, new information emerges and preliminary figures are revised. In final estimates, the output gap in quarter (t-1) will have a different value than that shown in the estimates from quarter (t). See for example Bernhardsen, Eitrheim, Jore and Røisland (2004) for a comparison of the output gap based on Norwegian real-time data and final data using several alternative methods.

⁵ The chart is taken from Frøyland and Nymoen (2000).

national accounts for the period 1978 Q1 to 2004 Q2. In spite of seasonal adjustment of the figures, variations in the quarterly figures result in substantial, random disturbances in the output gaps. Although the calculations are based on quarterly data, in the figures presenting the various output gap, we have aggregated the quarterly figures to annual figures. For 2004, published figures for the first half of the year have been used.

Hodrick-Prescott filter (HP)

The Hodrick-Prescott filter is a simple, widely used technical method⁶. The HP filter is a method for finding the value of potential output yt^* that minimises the difference between actual output and potential output while imposing constraints on the extent to which growth in potential output can vary. The following expression is minimised:

(2)
$$Min\left\{y_{t}^{*}\right\}_{t=1}^{T}\left\{\sum_{t=1}^{T}\left(y_{t}-y_{t}^{*}\right)^{2}+\lambda\sum_{t=2}^{T-1}\left[\left(y_{t+1}^{*}-y_{t}^{*}\right)-\left(y_{t}^{*}-y_{t-1}^{*}\right)\right]^{2}\right\}$$

The first term in the equation is the square of the difference between actual output and potential output. The second term is the square of the change in potential output growth. λ is a parameter with values between zero and infinity that determines the extent of permissible variations in potential growth. λ is determined outside the model. In the borderline case where λ is infinite, there will be minimal variation in potential growth. The result is a linear trend with a level of growth that is constant. In the opposite borderline case where $\lambda = 0$, the difference between actual output and potential output is as small as possible. These two variables will then be identical and the output gap will be zero at all times.

One advantage of the HP filter is that the method is simple to use. Flexibility in potential output growth is permitted by setting an appropriate value for λ . One disadvantage is that the level of potential output is more affected by variations in actual output at the beginning and at the end of the period than in the rest of the period. This is because the HP filter for any given point uses observations both backwards and forward in time in order to estimate potential output (two-sided filtering). At the end of the series, there are only observations backwards in time, and the two-sided filter gradually becomes a one-sided filter. The higher the value assigned to λ is, the greater the end-point problem becomes.⁷ The problem can to some extent be reduced by extending the time series for GDP using estimates. Another disadvantage is that the value of λ must be determined in advance. In their study of business cycles in the US economy, Kydland and Prescott (1990) proposed a value of 1600 for quarterly figures, and this has become an international standard. They found that with this value, minimisation of (2) gave a GDP trend that was reasonable.

Charts 2a and 2b illustrate the importance of the value of λ . Chart 2a shows two output gaps estimated with λ equal to 1600 and 40 000⁸ respectively. Chart 2b shows how potential growth varies with the value of λ . With λ at the lowest value, fluctuations in the output gap are smallest and there is thus more variation in potential output. This may be interpreted to mean that variations in GDP can to a lesser extent be explained by temporary disturbances on the demand side.

Although the two output gaps largely tell the same story, there are some clear exceptions: During the downturn in the first half of the 1990s, the output gap based on $\lambda = 1600$ turns and becomes less negative as early as 1989, while the output gap based on $\lambda = 40000$ does not turn until 1991/1992. Another exception is the change from 2003 to 2004, which varies considerably according to the value of λ . In our comparison of methods later on in this article, we follow international practice and use an output gap based on $\lambda = 1600$.

Band-pass filter (BP)

The fluctuations we observe in a time series have different causes. Each cause gives rise to fluctuations that occur with regular frequency. The short-term variations in GDP, for example seasonal variations and irregular



Chart 2b. HP filter. Potential GDP growth for mainland Norway for various values of λ . Per cent



⁶ For a more detailed discussion, see Kydland and Prescott (1990).

⁷ See Bernhardsen, Eitrheim, Jore and Røisland (2004) for a more detailed discussion of the HP filter and the end-point problem.

 $^{^{8}}$ Statistics Norway uses λ = 40000 in its analyses of the Norwegian economy.



components, are high-frequency variations. Long-term developments in GDP, or the trend, will typically be low-frequency variations. Between these extremes lie frequencies corresponding to the length of a business cycle, normally 2-8 years. A time series such as GDP might thus comprise low-frequency long cycles (trend), medium-frequency business cycles and high-frequency seasonal variations and irregularity.

Use of the band-pass filter is based on the idea that fluctuations in a time series are composed of fluctuations from different sources. The filter largely removes the high- or low-frequency components of the GDP series, leaving the fluctuations that can be interpreted as cyclical fluctuations. This is achieved by means of a time series analysis based on an estimated moving average of GDP. This method for estimating the output gap is based on Baxter and King (1999). The band-pass filter estimates the output gap directly, while potential GDP is defined as actual GDP minus the output gap.

Like the HP filter, the band-pass filter is a two-sided filter. However, in contrast to the HP filter, the bandpass filter does not become a one-sided filter at the beginning and end of the period being analysed. Estimating the output gap for the first and last part of the period is therefore impossible. This is a drawback of this method. A common solution to the problem is to extend the time series. The estimated output gap then becomes particularly uncertain towards the end of the estimation period. In our analysis, the band-pass filter is extended by means of a simple, mechanical projection. An advantage of this filter compared with the HP filter, however, is that we can make use of historical experience with regard to the duration of business cycles (by considering the frequency of cyclical fluctuations) when estimating the output gap. Thus, we can state with some certainty that the business cycle has the length that has historically been observed for business cycles.

Chart 4. Univariate unobserved components method (UC). Output gap. Per cent of potential GDP



Univariate "unobserved component" methods (UC) The "unobserved component" method is based on the premise that an observable variable is composed of two or more components that are not observable. The basic idea is that the unobservable variables can be identified by assuming that they affect the variable that can be observed. In addition, we must specify the underlying processes that are behind the unobservable variables over time. Both the unobservable variables and the observable variable are modelled and estimated as a "maximum likelihood" system using the Kalman filter⁹.

Among the simplest UC models are the local linear trend models. The following equations provide an example of these models:

(1')
$$y_t = y_{t+1}^* + ygap_t$$

(3) $y_{t-1}^* - y_{t-1}^* = \delta_{t-1} + \eta_t$
(4) $\delta_t = \delta_{t-1} + v_t$

(5)
$$ygap_t = \rho_1 ygap_{t-1} + \rho_2 ygap_{t-2} + \varepsilon_t$$

This specification is taken from Clark (1987). We start with equation (1'), which states that GDP (y) can be decomposed into the unobserved variables potential GDP (y*) and the output gap (ygap). Equations (3) and (4) determine how potential GDP grows. It is assumed here that both the level and rise in potential GDP can vary over time. To be precise, we assume that potential output follows a random walk with drift¹⁰, where η and v are random and normally distributed residuals that are independent of each other (white noise). This specification places few constraints on permitted variations in unobservable potential output. Equation (5) says that the output gap depends on separate back-dated values and a "white noise" add factor. ρ_1 and ρ_2 are coefficients.

One advantage of this method in relation to the other univariate methods described above is that both y^* and ygap are modelled directly. The result, however,

⁹ The Kalman filter is an estimation procedure that is particularly appropriate for estimating equation systems where one or more variables may be unobservable.

¹⁰ Random walk is a process where the value of a variable at a point in time is the value of the variable in the preceding period plus a white noise residual. This means that changes in the variable are random, and historical developments cannot be used to estimate values in the future. Since economic time series usually increase over time, a trend factor is added. The process is referred to as random walk with drift. The drift can contain a deterministic trend, or it can itself consist of a random walk process. In the model presented here, λ represents the drift in a random walk process for potential GDP in equation (3). In equation (4), λ is itself modelled as a random walk process.

depends on how potential GDP and the output gap are modelled. The method also makes it possible to provide some indication of the uncertainty surrounding the estimated output gap by estimating the standard deviation.

The three methods reviewed so far are examples of methods for decomposing GDP into potential output and the output gap using variation in GDP only. Charts 2 to 4 indicate that, in qualitative terms, the different methods provide the same description of cyclical movements. For a more detailed discussion, see section 2.

1.2 Multivariate methods

Multivariate models make use of a number of variables to estimate potential output and/or the output gap. The idea is that there are relationships between variation in GDP and variation in other observable variables that can be used. The term "multivariate methods" covers a wide range, and three different methods are presented here. The first method models the supply side of the economy by assuming that potential output depends on available resources and technology. The next two methods assume that the rise in prices for goods and services that are domestically produced (domestic inflation) and unemployment can contribute to explaining developments in the output gap. These two methods make use of the same explanatory variables, while the modelling of relationships and estimation methods is different.

Production function method (PF)¹¹

This method assumes that output can be described by a production function. A production function describes the supply side of the economy, where output is determined by available technology and the input factors labour and capital. Potential output may be perceived as



the resulting output level if the input factors are neither exposed to strong pressures nor partially unutilised. The difference between actual output and estimated potential output can then be interpreted as the output gap.

The aggregated production function for the economy 12 can be expressed as a Cobb-Douglas production function:

(6)
$$y_t = \alpha_0 + \alpha_1 l_t + (1 - \alpha_1) k_t + e_t$$

where y is GDP, l is person-hours, k is capital stock, e is total factor productivity and α_0 is a constant. The coefficients α_1 and $(1 - \alpha_1)$ are the factor shares for labour and capital respectively. Total factor productivity is calculated as the residuals from equation (6) using the least-squares method.

The potential levels of person-hours, capital and total factor productivity are then used to estimate potential output, y^* :

(7)
$$y_t^* = \alpha_0 + \frac{2}{3}l_t^* + \frac{1}{3}k_t^* + e_t^*$$

We have inserted values for the factor income shares, which can be estimated, according to the Ministry of Finance (1997), at $\frac{2}{3}$ for person-hours and $\frac{1}{3}$ for capital for mainland enterprises.

Potential use of person-hours depends on the potential level of the labour force, working hours per employee and equilibrium unemployment¹³. Potential capital stock is assumed to be the same as actual capital stock since it is difficult to determine to what extent capital stock is used in the production process. Equilibrium unemployment and the potential levels of total factor productivity, the labour force and working hours are calculated using the HP filter¹⁴.

The advantage of this method is that it is based on a theoretical foundation and intuitively seems reasonable. It is, however, based on one of many possible types of function. The underlying data may also cause problems; measuring the capital stock is particularly uncertain. It is also a disadvantage that potential employment is unobservable and must be estimated, and that both actual and potential total factor productivity are unobservable. Since we have used the HP filter to estimate potential employment and factor productivity, the end-point problems of the HP filter also feature here.

Multivariate "unobserved component" method (MVUC)

The univariate "unobserved component" model can be expanded by including a number of variables that are assumed to contain information about the output gap. In

 $^{^{11}}$ Based on the description in Frøyland and Nymoen (2000).

¹² We follow the approach described in Frøyland and Nymoen (2000) and estimate a production function for the sectors manufacturing, construction, services and distributive trades. These sectors account for about ¾ of output in mainland Norway.

¹³ Equilibrium unemployment can be defined as the level of unemployment that is consistent with stable wage and price developments. Alternative estimates of equilibrium unemployment are discussed in Frøyland and Nymoen (2000).

 $^{^{14}}$ The values of the parameter λ in the calculations of the potential levels are determined on the basis of what seems reasonable.





the model used in this article, information about unemployment and the rise in prices for goods and services produced in Norway (domestic inflation) is included in addition to GDP. It is assumed that the output gap influences domestic inflation, and that there is a relationship between labour market tightness and the output gap¹⁵.

Labour market tightness, the "unemployment gap", is defined as the difference between actual unemployment and equilibrium unemployment. Since equilibrium unemployment is unobservable, we now have a total of three unobservable variables in the model: the output gap, potential output and equilibrium unemployment. Domestic inflation is included as an observable variable.

An advantage of the MVUC method over univariate methods is that it uses more information. In addition, the method makes it possible to give some indication of the uncertainty associated with the estimated output gap. In order to make use of the extended information, however, some assumptions have to be made about the relationship between the different variables. The quality of the estimated output gap will depend on how realistic these assumptions are.

"Structural vector autoregression" (SVAR) model

The SVAR method uses information from a number of variables that have a high degree of correlation, such as GDP, unemployment and domestic inflation, to estimate potential GDP and the output gap. In contrast to many methods where the output gap is calculated as the difference between actual GDP and estimated potential GDP, the SVAR method is similar to the UC method in that potential output and the output gap are determined simultaneously in the model¹⁶.

The basic idea behind this method is to split GDP into three components: a deterministic trend, a component determined by disturbances, or shocks, that have a permanent effect on the supply side of the economy, and a component determined by temporary shocks that affect demand in the short term. The first two components represent potential GDP, while the latter can be interpreted as the output gap.

The method used to identify the SVAR model is based on an article by Blanchard and Quah (1989), which showed how a priori restrictions can be imposed on long-term multipliers in a model of endogenous variables in order to identify underlying structural shocks. Blanchard and Quah distinguished primarily between demand and supply shocks. By estimating a model consisting of GDP and unemployment, they assumed that only supply shocks can have a long-term effect on the level of GDP. Demand shocks can have an effect on GDP in the short term, but the effect of these shocks will vanish in the long term. Since unemployment is assumed to be stationary¹⁷, no shock can (by definition) have a long-term effect on the level of unemployment. The assumption that demand shocks cannot have a longterm effect on the level of GDP (and unemployment) is fully consistent with a standard aggregated demand and supply model, where the supply curve becomes vertical in the long term.

In our analysis here, we expand the model of Blanchard and Quah to include domestic inflation. Moreover, since employment increased in the course of our estimation period (1982 Q1 to 2004 Q2), some of the shocks must also be able to affect equilibrium unemployment over time. With three variables, we can identify three shocks: two demand shocks and one supply shock. We assume that none of the demand shocks can have a long-term effect on unemployment. However, one of the demand shocks is allowed to have a long-lasting effect on GDP. ¹⁸ This has been done to permit the possibility that some demand shocks can have substan-





¹⁵ The model is described in more detail in the appendix to this article.

¹⁶ The model is described in more detail in the appendix to this article. See Bjørnland, Brubakk and Jore (2005) for a comprehensive technical explanation (to be published). See also Bjørnland (2004) for a more detailed application of SVAR models to the Norwegian economy.

¹⁷ A stationary variable fluctuates around its average, and these fluctuations do not increase or decrease over time.

¹⁸ It may for example be argued that demand shocks can result in temporary changes in potential output due to changes in capital accumulation. This effect is, however, expected to be small, since capital accumulation is slow. Impulse responses also show that the effect on GDP of this demand shock disappears in the medium term (4-6 years).

tial effects on output in the medium term, although without permanent changes in unemployment as a result.¹⁹ The supply shock can have a long-term effect on both GDP and unemployment, resulting in unemployment at a permanently higher level.

The SVAR method has the advantage of imposing relatively few constraints on the relationship between the variables in the system. These models are therefore often regarded as being data-driven. The SVAR method also has the advantage that there are no end-point problems apart from those caused by data revisions.

The few restrictions imposed on the SVAR model are taken from economic theory. If these restrictions are not consistent with how the economy actually works, however, this might produce misleading results. The assumption that demand shocks only affect developments in the output gap and do not affect potential output may be an example of a restriction that is too stringent. We have, however, introduced somewhat more flexibility in the model by taking into account that some shocks can in periods affect both the output gap and potential output.

2. Comparison of methods

For an overall picture of the differences between the methods, all the output gaps are shown in Chart 8.

The different output gaps describe the main economic fluctuations as they are commonly referred to, with two downturns starting in the 1980s, an upturn from the mid-1990s and a downturn over the past couple of years. Nonetheless, the PF method differs from the other methods in estimating a considerably more negative output gap during the downturn in the early 1980s. Like the MVUC method, the PF method also estimates a more severe downturn at the beginning of the 1990s than the other methods. From around 1995 to 2003, the output gaps correspond fairly closely, particularly from 2001. The output level in 2003 is approximately 1 - $1\frac{3}{4}$ per cent lower than its potential level. From 2003 until (the first half of) 2004, the methods show varying degrees of increase in the output gap. The increase is particularly large for the PF method, which finds that the output gap will be clearly positive in 2004.

Developments in the different output gaps from 2003 to 2004 reflect to a certain extent the properties of the individual methods. With the SVAR and MVUC methods, it is assumed that there is a relationship between the output gap and developments in domestic inflation: a fall in inflation implies that the output gap is negative. With these methods, the fall in domestic inflation through 2003 and in the first half of 2004 therefore pushes up potential output and pushes down the output gap. Most of the increase in GDP growth from 2003 to the first half of 2004 is thus interpreted by these methods as an increase in potential output.





As mentioned above, the PF method is the only method that shows a clearly positive output gap in 2004. The increase in GDP growth is largely interpreted as an increase in the output gap. With this method potential GDP is determined by potential levels in employment, real capital and total factor productivity. Since these explanatory factors show little change²⁰ from 2003 to 2004, potential GDP will also remain approximately unchanged.

The three univariate methods show similar developments through the period, including from 2003 to 2004. With two of these methods, the HP and BP filters, the estimate for the output gap is particularly uncertain towards the end of the period. This problem does not apply to the third univariate method, the UC method. The reason why the three methods nonetheless show the same result is that the output gap is close to zero. Endpoint problems are therefore less important.

Tables 1 to 4 contain a statistical summary of the different methods for the period 1982 to 2004.²¹

Table 1 compares some key properties of the output gap. One reasonable criterion is that the average value of the output gap should over time be close to zero. The PF method differs from the other methods here, with an average value for the output gap of -0.8. Another criterion that may indicate whether the output gaps are reasonable is the degree of fluctuation, measured by the standard deviation and highest and lowest values. However, we have no objective measures here, beyond indicating that the output gaps should not be "too wide" or "too narrow". One end of the scale implies that poten-

Table 1. Statistical summary for the output gap, 1982 to 2004							
Method	HP	BP	UC	PF	MVUC	SVAR	
Average	-0.05	-0.06	0.03	-0.70	-0.17	0.10	
Standard deviation	1.07	0.96	1.18	2.17	2.11	1.46	
Lowest value	-1.7	-1.4	-1.4	-4.6	-3.5	-2.1	
Highest value	2.7	2.4	2.8	2.5	3.2	3.3	

¹⁹ We have also tested whether this demand shock can have a long-term effect on unemployment, but find that most of the effect applies to unemployment in the short term.

²⁰ The HP filter was used to calculate potential employment and potential total factor productivity. Alternative values for the smoothing parameter λ affect developments in these variables. We have assessed different values of λ . Allowing for a reasonable range of variation, potential output is not affected to any substantial extent.

 21 In this period, the output gap was calculated using all the methods.

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Table 2. Correlation between output gaps calculated by different	t
methods, 1982 to 2004	

Metode	HP	BP	UC	PF	MVUC	SVAR
HP	1	0,99	0,95	0,81	0,75	0,68
BP		1	0,96	0,86	0,80	0,74
UC			1	0,91	0,88	0,78
PF				1	0,87	0,65
MVUC					1	0,86
SVAR						1

tial GDP grows at a relatively steady pace and that changes in GDP growth are mainly due to demand, resulting in wide variations in the output gap. At the other extreme, changes in GDP are dominated by supply-side conditions, and variations in the output gap are therefore small. On the basis of these assessments, it cannot be concluded that any of the output gaps are clearly unreasonable. With the PF and the MVUC methods, however, the calculations show deeper cyclical troughs than with the other methods and the largest standard deviations.

Table 2 shows the correlation coefficients between the different methods. As expected from looking at the charts, the correlation between the alternative output gaps is generally high, particularly between the univariate methods. The correlation coefficients are lowest between the SVAR and PF methods.

The share of periods where the output gap is positive (negative) when calculated by the different methods is an alternative measure of the correlation between the different output gaps. This is of particular interest in analyses where the focus is on whether the gap is positive or negative. Table 3 confirms the impression from the charts and Table 2 that the alternative methods provide similar descriptions of cyclical developments.

It is also interesting to investigate whether the different methods yield the same conclusion as to when an upturn or a downturn begins. Table 4 shows the year pinpointed by the different methods as the turning point in the business cycle. A turning point may be defined as the year the output gap reaches its highest (or lowest) absolute value within a period generally regarded as an upturn (or downturn). We have not included the trough in the early 1980s since calculations of the output gap using the SVAR method start in 1982.

Table 3. Share of periods where different output gaps are positive (negative) in pairs, 1982 to 2004						
Method	HP	BP	UC	PF	MVUC	SVAR
HP	1	0.96	0.96	0.96	0.91	0.78
BP		1	1.00	0.91	0.96	0.83
UC			1	0.91	0.96	0.83
PF				1	0.87	0.83
MVUC					1	0.87

SVAR

Method	ЦВ	DD		DE		SV/A D
renou	пг	DF	UC	ГГ	NIV UC	JVAN
Upturn mid-1980s	1987	1987	1987	1986	1986	1986
Downturn early 1990s	1989	1989	1991	1991	1991/92	1991
Upturn late 1990s	1998	1998	1998	1998	1998	1998
Downturn early 2000s	2003	2003	2003	2003	2003	2003

The different methods are in relative agreement in indicating that the upturn in the mid-1980s peaked in 1986/1987. This is in line with the general perception of the business cycle (see for example Bjørnland (2000) and Johansen and Eika (2000)). However, the methods pinpoint different dates for the trough in the early 1990s. The HP and BP methods date the turning point as early as 1989, while the MVUC method indicates 1991/1992. In the rest of the period, the methods concur: the upturn ended in 1998 and the subsequent downturn troughed in 2003.

If we regard the different output gaps qualitatively through the period as a whole, the univariate methods indicate that the three downturns in the period have been equally severe. This is in contrast to the more common view that the downturn in the first half of the 1990s was more severe than the other two. The unemployment rate was clearly higher in this downturn than in the other two. The reason why the output gap is not more negative in this period is that the lower growth rate over a number of years markedly reduces the rate of growth in potential GDP. Since unemployment can also change due to supply-side shocks, this is not necessarily unreasonable, even though it may conflict with the traditional view.

On the whole, the SVAR method presents a picture that is in line with the univariate methods with regard to the magnitude of the business cycles. The output gap in 2003 is at the same level as during the previous downturn. As indicated above, this is not necessarily unreasonable since the SVAR method explicitly allows unemployment to increase permanently following a supplyside shock. The output gaps as measured by the PF and the MVUC methods correspond most closely through the period with the general view of cyclical fluctuations, in the sense that the downturn in the early 1990s is regarded as the most severe.

So far, we have compared some properties of the different output gaps. An alternative approach is to test to what extent they contribute to explaining inflation developments. More formally, this involves estimating an equation for inflation that includes the output gap as an explanatory variable. To shed some light on this, we have used a simple Phillips curve relationship between domestic inflation and the output gap:

(8)
$$\pi_{t} = \alpha + \sum_{j=1}^{4} \beta_{j} \pi_{t-j} + \sum_{j=0}^{4} \lambda_{j} ygap_{t-j} + \varepsilon_{t},$$

Table 5. Estimation and prediction results						
Metho	b					
Evaluation	HP	BP	UC	PF	MVUC	SVAR
R ²	0.81	0.81	0.81	0.82	0.82	0.83
F(5.71)	1.87 [0.11]	1.92 [0.10]	2.17 [0.07]	2.24 [0.06]	2.68 [0.03]*	3.21 [0.01]*
RMSE (4-step)	0.314	0.300	0.304	0.310	0.298	0.286

 R^2 indicates the goodness-of-fit properties of the model. F(5.71) is a test to establish whether the output gap contributes to explaining inflation developments. The figure in brackets is the significance level of the test. * indicates that a hypothesis stating that the output gap does not contribute to explaining inflation can be rejected at the 5 per cent level. RMSE (Root Mean Square Error) measures the predictive properties of the model. We have estimated all the models up to 1999 Q4 and then predicted inflation four quarters ahead. The model was then re-estimated up to 2000 Q1, and we again predicted inflation four quarters ahead. This procedure is repeated until the end of the period.

where π is domestic inflation. α , β and λ are coefficients and ε is a white noise add factor. Current inflation is expressed as a linear function of past inflation and current and past output gaps. Four lags are included in the estimation.²² We have estimated one model for each output gap, for the period 1983 Q1 to 2004 Q2. Some estimation and prediction results based on this model are included in Table 5.

R² indicates that all the models have good properties with regard to goodness-of-fit, and that the three multivariate output gap models are only marginally better than the univariate output gap models. Output gaps computed using the multivariate methods SVAR and MVUC explain domestic inflation better than the other models. This is not surprising since when calculating the output gap, SVAR and MVUC also use domestic inflation in the estimation procedure. The other methods of measuring the output gap can also be said to contain some information about inflation. Naturally, the two multivariate models SVAR and MVUC also have the best predictive properties, based on RMSE.

It may also be interesting to compare these results with a model where domestic inflation is solely determined by back-dated inflation values. Such a model yields an RMSE of 0.36, which is greater than all the values reported in Table 5. Including the output gap in the Phillips curve as specified in equation (8) therefore yields a better prediction of future inflation than a model that excludes the output gap.

3. Conclusion

Assessments of pressures in the economy and the inflation outlook are issues that are important to most central banks. The output gap is frequently used as a measure for summarising such assessments. The purpose of this article is to provide an overview of some commonly used methods for computing the output gap.

Our comparison of the methods illustrates that although output gap calculations are uncertain, alternative calculations describe qualitatively the same historical path for the output gap. There is also a high degree of correlation between the methods in the period as a whole. However, in some periods, some methods diverge from the others both with regard to the magnitude of fluctuations and the dates of the turning points. The PF method in particular differs from the other methods. For example, the output gap is calculated by this method at close to ³/₄ per cent towards the end of 2004, while the other methods compute output gaps that are close to zero or negative. With regard to the usefulness of the output gap in predicting inflation, the multivariate methods SVAR and MVUC show the best results.

In certain periods, however, some methods generate different results from the others. Uncertainty is particularly pronounced at the very end of the calculation period. If the assessment of pressures in the economy is solely based on developments in the output gap as measured by one method, there is a risk of misjudging the economic situation.

A central bank would never base its assessment of pressures in the economy on simple, mechanical calculations of the output gap. Developments in the output gap must be viewed in conjunction with a number of other types of analysis and information about the economy, such as information concerning special conditions that cannot easily be captured in specific figures for the output gap. Alternative calculations of the output gap might, however, provide useful support in these assessments.

²² More complicated models can of course be used. We have decided to focus on this simple model, however, in order to allow us to establish the precise contribution from the output gap. Bjørnland, Brubakk and Jore (2005) provide a more exhaustive analysis with results from alternative models.

References:

- Basdevant, O. (2003): On applications of state-space modelling in macroeconomics, Reserve Bank of New Zealand *Discussion Papers*, DP2003/02. <http://www.rbnz.govt.nz/research/discusspapers/ dp03_02.pdf>
- Baxter, M. and R. King (1999): Measuring Business Cycles: Approximate Band-Pass Filters for Economic Time Series, *Review of Economics and Statistics*, Vol. 81, pp. 575-593. http://ideas.repec.org/a/tpr/restat/v81y1999i4p575-593.html
- Bernhardsen, T., Ø. Eitrheim, A.S. Jore and Ø. Røisland (2004): Real-time Data for Norway: Challenges for Monetary Policy, *Discussion Papers* 26/2004, Deutsche Bundesbank. <www.bundesbank.de/ download/volkswirtschaft/dkp/2004/200426dkp.pdf>
- Bjørnland, H. (2000): "Detrending methods and stylized facts of business cycles in Norway - an international comparison". *Empirical Economics*, 25, pp. 369-392. http://ideas.repec.org/a/spr/empeco/v25y2000i3 p369-392.html>
- Bjørnland, H.C. (2004): The role of the exchange rate as a shock absorber in a small open economy, *Open Economies Review*, 15, 23-43. http://folk.uio.no/hildecb/OpenEcRew.pdf
- Bjørnland, H.C., L. Brubakk and A.S. Jore (2005): Measuring the output gap in Norway – an assessment. To be published in *Working Papers*, Norges Bank
- Blanchard, O.J and D. Quah (1989): The Dynamic Effects of Aggregate Demand and Supply Disturbances, *American Economic Review*, 79, 655-673. http://ideas.repec.org/a/aea/aecrev/v79y1989i4p655-73.html
- Citu, F. and J. Twaddle (2003): The output gap and its role in monetary policy decision-making, *Reserve Bank Bulletin* March 2003 (Vol 66, no 1). Reserve Bank of New Zealand. <www.rbnz.govt.nz/research/bulletin/2002_2006/ 2003mar66_1citutwaddle.pdf>

- Clark, P. (1987): The cyclical component of U.S. economic activity. *Quarterly Journal of Economics*, 102(4), 797-814. http://ideas.repec.org/a/tpr/qjecon/v102y1987i4p797-814.html
- Frøyland, E. and R. Nymoen (2000): "Output gap in the Norwegian economy – different methodologies, same result?", *Economic Bulletin* 2/00, 46-52. http://www.norges-bank.no/english/publications/ economic_bulletin/2000-02/bulletin-2000-02.pdf
- Gerlach, S. and F. Smets (1999): Output gaps and monetary policy in the EMU Area. *European Economic Review*, 43, 801-812.
- Johansen, P. R. and T. Eika (2000): Drivkrefter bak konjunkturforløpet på 1990-tallet (Driving forces behind cyclical developments in the 1990s), *Economic Survey* 6/2000, Statistics Norway. <www.ssb.no/emner/ 08/05/10/oa/200006/johansen.pdf>
- Kydland, F. E. and E. C. Prescott (1990): Business Cycles: Real Facts and a Monetary Myth, Federal Reserve Bank of Minneapolis *Quarterly Review*, Spring, 3-18.

<http://minneapolisfed.org/research/qr/qr1421.pdf>

- Ministry of Finance (1997). Fakta og analyser (facts and analyses). Annex to *Report No. 4 (1996-1997) to the Storting, Long-term programme* 1998-2001, 74
- Rennison, A. (2003): "Comparing Alternative Output-Gap Estimators: A Monte Carlo Approach", Bank of Canada *Working Papers* 2003-8 www.bankofcanada.ca/publications/working.papers/ 2003/wp03-8.pdf
- Scott, A. (2000): Stylised facts from output gap measures, Reserve Bank of New Zealand *Discussion Papers*, DP2000/07. www.rbnz.govt.nz/research/discusspapers/dp00_7.pdf

Multivariate "unobserved component" model (MVUC)

The MVUC model is an example of so-called statespace models. The literature on applications of statespace modelling in macroeconomics is reviewed in Basdevant (2003).

The model is described by the following equations²³:

$$(1') y_t = y_t^* + ygap_t$$

(9)
$$\Delta y_t^* - \Delta y_{t-1}^* = \mu_{t-1} + \varepsilon_t^{y^*}$$

 $(10) \qquad \mu_t = \mu_{t-1} + \varepsilon_t^{\mu}$

(11)
$$u_t - u_t^* = \beta_1 (u_{t-1} - u_{t-1}^*) + \beta_2 ygap_{t-1} + \varepsilon_t^u$$

(12)
$$u_t^* - u_{t-1}^* = \gamma_{t-1} + \varepsilon_t^{u^*}$$

(13)
$$\gamma_t = \gamma_{t-1} + \varepsilon_t^{\gamma}$$

(14)
$$\pi_t = \alpha_1 \pi_{t-1} + \alpha_2 \pi_{t-2} + \alpha_3 ygap_{t-1} + \varepsilon_t^{\pi}$$

(15)
$$ygap_t = \rho_1 ygap_{t-1} + \rho_2 ygap_{t-2} + \mathcal{E}_t^{y_g}$$

Again, our starting point is the definitional relationship in equation (1). The change in the growth rate of potential GDP follows a random walk process²⁴ given by (9) and (10). These two equations correspond to equations (3) and (4) in the univariate unobserved component model, indicating how the level and rise in potential GDP varies. In the multivariate model, the process is modelled with even greater flexibility, cf. equations (3) and (9). Equation (11) shows that there is a relationship between variation in the output gap and variation in the unemployment gap. The coefficient preceding *ygap* is negative. It is assumed that the change in unobservable equilibrium unemployment follows a random walk process given by (12) and (13). This is a relatively flexible specification, allowing equilibrium unemployment to change level in the estimation period. Equation (14) can be interpreted as a Phillips curve with backward-looking inflation expectations. The underlying process for the output gap in equation (15) is the same as in the univariate model. All the residuals, ε_{t} , are assumed to be independent and normally distributed.

The model is estimated with maximum likelihood by using the Kalman filter^{25,26}, and the estimation period is 1980 Q3 to 2004 Q2.

"Structural vector autoregression" (SVAR) model

The idea used to identify the SVAR model is based on an article by Blanchard and Quah (1989), which showed how a priori restrictions can be imposed on long-term multipliers in a model in order to identify underlying structural shocks.

If we let z be a vector of three stationary variables $(\Delta u_t, \Delta y_t, \Delta p_t)'$ where Δ denotes quarterly changes, u_t is unemployment, y_t is GDP and p_t is the domestic price level, the variables can be written as a function of the underlying structural shocks

(16)
$$z_t = B_0 \varepsilon_t + B_1 \varepsilon_{t-1} + B_2 \varepsilon_{t-2} + \dots = \sum_{j=0}^{\infty} B_j \varepsilon_{t-j}$$

where B is a (3x3) matrix of coefficients and ε_t is white noise residuals that capture demand and supply shocks.²⁷ The model described above identifies three structural shocks: two demand shocks and one supply shock. We assume that none of the demand shocks can have a long-term effect on unemployment, but that they allow for a more persistent effect on GDP from one of the demand shocks. This demand shock can then be interpreted as having more real effects than the other demand shock, which can be interpreted as a purely nominal demand shock. The supply shock can have a long-term effect on both GDP and unemployment.

By systematising the three uncorrelated structural shocks as:

 $\varepsilon_t = (\varepsilon_t^{AS}, \varepsilon_t^{RD}, \varepsilon_t^{AD})'$, where ε_t^{AS} is an aggregated supply shock, ε_t^{RD} is a real demand shock and ε_t^{AD} is an aggregate demand shock, we can write the change in GDP as follows:

(17)
$$\Delta y_{t} = \sum_{j=0}^{\infty} \beta_{21,j} \varepsilon_{t-j}^{AS} + \sum_{j=0}^{\infty} \beta_{22,j} \varepsilon_{t-j}^{RD} + \sum_{j=0}^{\infty} \beta_{23,j} \varepsilon_{t-j}^{AD} ,$$

where the subscript numbers 21, 22 and 23 refer to the place of Δy in the *z* vector.

We calculate the effect on the level of GDP by accumulating the shocks. The restriction that aggregate demand shocks cannot have a long-term effect on the level of GDP is implemented by imposing $\sum_{j=0} \beta_{23,j} = 0$.

Similarly, we impose restrictions that neither of the two demand shocks can have a permanent effect on unemployment.

In the SVAR model, potential GDP (the long tem trend) will be represented by the first term in (17), which is accumulated supply shocks, while the output gap is the share of GDP that is explained by the two demand shocks.²⁸ The estimated model implies that the two demand shocks increase GDP and reduce unemployment temporarily, while prices gradually rise.²⁹ In total, the demand shocks explain 60-70 per cent of GDP developments in the first year, with a subsequent gradual decline in impact.

 23 The model specification is based on standard economic theory, which is often used in research on monetary policy issues. See, for example, Gerlach and Smets (1999) 24 See footnote 10

25 See footnote 10

²⁹ The VAR model contains 5 lags. Goodness-of-fit properties are satisfied.

 $^{^{26}}$ The estimation results are presented in Bjørnland, Brubakk and Jore (2005).

²⁷ A constant is also included in the estimation.

 $^{^{28}}$ Here we have assumed that the real demand shock that can have a lasting impact on GDP will influence the output gap in the first two years. Thereafter the real demand shock contributes to developments in trend growth (potential output).

Final pair of coins to mark the centennial celebration 1905 – 2005

The final pair in Norges Bank's series of coins commemorating the end of Norway's union with Sweden was issued on 7 June 2005, the hundredth anniversary of the Storting resolution that led to the dissolution of the union with Sweden in 1905.

Norges Bank has issued a series of commemorative coins to mark the event. The coin series comprises three gold and three silver coins. The first pair was issued on 27 November 2003 to commemorate the day in 1905 when King Haakon VII took his oath in the Storting. The second pair was issued on 23 September 2004, the day in 1905 when Norway and Sweden came to an agreement in Karlstad regarding a peaceful dissolution of the union.

The coins have been issued in cooperation with Hundreårsmarkeringen - Norge 2005 AS (Norge 2005) (The Centennial Celebration – Norway 2005 Ltd.), which is in charge of the official programme marking the end of the union. Norge 2005 is responsible for marketing and sales of the coins.

The gold coins have a face value of NOK 1 500 and are being minted in an issue limited to 10 000 coins. The

silver coins have a face value of NOK 100, and the issues in 2003 and 2004 were limited to 65 000 coins. The silver coin being issued in 2005 will have a maximum issue of 100 000. The coins are being produced on assignment from Norges Bank at Det Norske Myntverket AS.

The motif on the obverse (front) of the coin has been designed by former coin engraver Øivind Hansen. The motif on the front of the coin is the same for all of the coins and is a triple portrait of Norway's three kings during the period. The motif on the reverse (back) of the gold coins has been designed by sculptor Tomasz B. Ozdowski, while the motif on the reverse of the silver coins has been designed by sculptress Danuta Haremska. The motifs on the reverse of the coins depict Norway during a century of change, from an agricultural society to a modern society facing the challenges of a high-tech future.

The gold coin:

Diameter:	27 mm
Weight:	16.96 g
Alloy:	917/1000 Au, remainder Ag, i.e. 15.55 g
	fine gold (1/2 ounce)
Edge:	Plain



Distinguishing characteristics

Obverse:

A triple portrait of Norway's three kings during the 100year period. From right to left: H.M. Kong Harald V, King Olav V and King Haakon VII. Below the triple portrait is the motto of all three kings: ALT FOR NORGE (All for Norway). To the right under the triple portrait are the artist Øivind Hansen's initials, ØH, and the date, 2005.

Reverse:

Here the artist has illustrated the new age by means of binary code – "computer language" – which consists of zeros and ones. Above the motif: 1905-2005, flanked on the left by the initials of the Director of Det Norske myntverket AS, Magne Flågan: MF and on the right by the mintmark of Det Norske Mynverket: the crossed pick and hammer. Below the motif the inscription: 1500 KRONER. To the right of the last 1, the signature of the artist, Tomasz B. Ozdowski, TB.

The silver coin

Diameter:	39 mm
Weight:	33.8 g
Alloy:	925/1000 Ag (sterling silver) i.e. 31.1 g
	fine silver (1 ounce)
Edge:	Plain





Distinguishing characteristics

Obverse:

A triple portrait of Norway's three kings during the 100year period. From right to left: H.M. Kong Harald V, King Olav V and King Haakon VII. Below the triple portrait is the motto of all three kings: ALT FOR NORGE (All for Norway). To the right under the triple portrait are the artist Øivind Hansen's initials, ØH, and the date, 2005.

Reverse:

The computer age is illustrated by means of an electronic circuit board on a broad horizontal band. Above this band are series of zeros and ones – binary code, or "computer language". Under the band is the inscription 1905-2005, flanked by the signature of sculptress Danuta Haremska, HD, to the left, and of Director Magne Flågan, MF, to the right. Below this, 100 KR, and underneath Det Norske Myntverket's mintmark: the crossed pick and hammer.

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

Financial institution balance sheets

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

	31.12.2004	31.01.2005	28.02.2005	31.03.2005	30.04.2005
FINANCIAL ASSETS					
Foreign assets	268 399	284 663	290 926	272 255	262 310
International reserves	268 360	284 627	290 889	272 227	262 269
Other assets	39	35	37	29	40
Government Petroleum Fund investments	1 015 471	1 070 462	1 073 545	1 089 913	1 101 570
Domestic claims and other assets	3 995	4 320	3 378	2 649	38 091
Loans	494	497	501	503	31 498
Other claims	1 815	2 145	1 208	482	4 935
Fixed assets	1 395	1 387	1 379	1 372	1 367
Gold collection	291	291	291	291	291
TOTAL ASSETS	1 287 865	1 393 789	1 367 850	1 364 816	1 401 970
LIABILITIES AND CAPITAL					
Foreign liabilities	51 167	73 811	82 986	67 405	62 835
Deposits	309	620	618	615	638
Borrowing	48 993	71 316	80 504	64 898	60 337
Other liabilities	289	254	271	289	260
Counterpart of Spesial Drawing Rights allocation in IMF	1 575	1 620	1 593	1 603	1 600
Government Petroleum Fund deposits	1 015 471	1 070 462	1 073 545	1 089 913	1 101 570
Domestic liabilities	173 925	161 148	160 135	155 325	185 985
Notes and coins in circulation	47 595	45 175	44 599	44 679	44 461
Treasury	88 816	76 368	82 496	75 925	127 280
Other deposits	37 158	39 256	32 431	34 470	13 922
Borrowing	0	48	0	0	46
Other debt	356	301	609	251	275
Equity	47 302	47 302	47 302	47 302	47 302
Financial result	0	0	3 882	4 872	4 279
TOTAL LIABILITIES AND CAPITAL	1 287 865	1 393 789	1 367 850	1 364 816	1 401 970
Commitments					
Allotted, unpaid shares in the BIS	258	258	258	258	258
International reserves					
Derivatives and forward exchange contracts sold	83 020	100 641	82 157	102 763	104 665
Derivatives and forward exchange contracts purchased	87 931	99 513	83 215	93 844	100 564
Government Petroleum Fund					
Derivatives and forward exchange contracts sold	534 611	607 293	465 072	596 179	568 004
Derivatives and forward exchange contracts purchased	526 161	573 522	460 182	578 269	556 197
Rights ¹⁾					
International reserves:					
Options sold	341	223	0	487	734
Options purchased	598	3 149	1 782	3 234	4 408
Government Petroleum Fund:					
Options sold	2 232	1 093	0	2 726	4 309
Options purchased	3 992	14 371	8 800	15 685	21 332

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

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

	31.12.2004	31.01.2005	28.02.2005	31.03.2005	30.04.2005
Gold	0	0	0	0	0
Special drawing rights in the IMF	2 181	1 962	1 952	1 964	1 909
Reserve position in the IMF	5 250	5 350	5 190	5 247	4 703
Loans to the IMF	535	539	519	499	485
Bank deposits abroad	77 923	77 087	75 712	54 346	49 260
Foreign Treasury bills	112	615	624	458	490
Foreign Treasury notes	0	95	75	0	0
Foreign certificates	928	949	837	605	771
Foreign bearer bonds ¹⁾	126 733	146 355	147 178	151 410	144 461
Foreign shares	54 500	56 154	56 786	57 838	57 508
Accrued interest	199	-4 479	2 016	-140	2 682
Total	268 361	284 627	290 889	272 227	262 269

¹⁾ Includes bonds subject to repurchase agreements.

Source: Norges Bank

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

	31.03.2004	30.06.2004	30.09.2004	31.12.2004	31.03.2005
Cash holdings and bank deposits	2 252	2 396	2 497	2 754	2 733
Total loans	189 541	189 393	189 623	189 572	191 887
Of which:					
To the general public ¹⁾	186 850	186 607	186 585	186 543	188 866
Claims on the central government and					
social security administration	-	-	-	-	-
Other assets	5 883	4 700	5 557	3 878	6 196
Total assets	197 676	196 489	197 677	196 204	200 816
Bearer bond issues	24	20	20	16	16
Of which:					
In Norwegian kroner	24	20	20	16	16
In foreign currency	-	-	-	-	-
Other loans	188 204	188 341	188 139	187 718	190 261
Of which:					
From the central government and					
social security administration	188 204	188 341	188 139	187 718	190 261
Other liabilities, etc.	6 081	5 064	5 736	4 767	6 825
Share capital, reserves	3 367	3 064	3 782	3 703	3 714
Total liabilities and capital	197 676	196 489	197 677	196 204	200 816

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

Sources: Statistics Norway and Norges Bank

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

	31.03.2004	30.06.2004	30.09.2004	31.12.2004	31.03.2005
Cash	4 157	4 633	4 390	4 649	4 636
Deposits with Norges Bank	27 772	18 046	29 768	37 017	34 514
Deposits with Norwegian banks	23 586	32 390	21 230	18 383	18 375
Deposits with foreign banks	43 252	54 376	25 867	27 174	56 638
Treasury bills	7 170	7 280	5 074	6 451	5 896
Other short-term paper	4 695	13 626	11 759	8 429	11 626
Government bonds etc. ²⁾	7 070	7 300	7 862	6 858	5 728
Other bearer bonds	108 253	117 961	118 235	125 075	125 398
Loans to foreign countries	52 883	61 235	52 597	51 570	53 315
Loans to the general public	1 212 904	1 245 327	1 277 267	1 303 674	1 326 817
Of which:					
In foreign currency	88 128	85 142	82 131	72 915	73 015
Loans to mortgage and finance companies, insurance etc. ³⁾	120 103	125 617	92 022	92 839	102 082
Loans to central government and social security admin.	546	706	713	637	2 384
Other assets ⁴⁾	162 244	145 233	149 879	122 756	152 001
Total assets	1 774 635	1 833 730	1 796 663	1 805 512	1 899 410
Deposits from the general public	798 519	834 449	813 423	844 789	856 953
Of which:					
In foreign currency	27 405	29 771	28 727	29 028	34 593
Deposits from Norwegian banks	27 284	32 924	21 254	18 927	20 249
Deposits from mortg. and fin. companies, and insurance etc. ³⁾ Deposits from central government, social security	50 318	51 384	53 165	53 008	67 218
admin. and state lending institutions	8 423	8 305	8 008	6 198	6 447
Funds from CDs	71 972	73 819	77 116	77 938	87 173
Loans and deposits from Norges Bank	6 816	18 745	5 502	5 275	3 296
Loans and deposits from abroad	235 694	246 385	226 177	222 298	268 067
Other liabilities	463 035	451 220	471 127	451 278	469 036
Share capital/primary capital	31 276	31 708	31 714	31 767	32 025
Allocations, reserves etc.	77 682	77 857	78 125	79 526	84 884
Net income	3 616	6 934	11 052	14 508	4 062
Total liabilities and capital	1 774 635	1 833 730	1 796 663	1 805 512	1 899 410
Specifications:					
Foreign assets	186 196	206 172	175 553	152 371	188 013
Foreign debt	501 660	504 876	492 533	459 128	505 451

¹⁾Includes commercial and savings banks.

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

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

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

Sources: Statistics Norway and Norges Bank

Table 5. Banks.¹⁾ Loans and deposits by sector ²⁾. In millions of NOK

	31.03.2004	30.06.2004	30.09.2004	31.12.2004	31.03.2005
Loans to:					
Local government (incl. municipal enterprises)	9 304	9 234	8 913	7 873	10 891
Non-financial enterprises ³⁾	358 150	360 523	363 014	357 567	361 013
Households ⁴⁾	845 450	875 570	905 340	938 233	954 912
Total loans to the general public	1 212 904	1 245 327	1 277 267	1 303 674	1 326 817
Deposits from:					
Local government (incl.municipal enterprises)	41 849	43 031	37 093	41 169	42 199
Non-financial enterprises ³⁾	233 651	235 336	235 285	261 619	255 835
Households ⁴⁾	523 019	556 083	541 045	542 001	558 920
Total deposits from the general public	798 519	834 449	813 423	844 789	856 953

¹⁾ Includes commercial and savings banks.

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

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

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

Sources: Statistics Norway and Norges Bank

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

	31.03.2004	30.06.2004	30.09.2004	31.12.2004	31.03.2005
Cash and bank deposits	3 519	3 084	4 699	2 265	6 708
Notes and certificates	852	2 166	3 366	4 288	1 815
Government bonds ¹⁾	680	1 122	1 606	137	625
Other bearer bonds	58 051	60 538	59 585	53 788	59 338
Loans to:					
Financial enterprises	41 048	41 311	43 542	47 222	51 265
The general public ²⁾	216 425	222 139	225 171	236 800	241 116
Other sectors	9 224	9 443	9 115	9 188	8 947
Others assets ³⁾	9 462	7 623	5 090	6 475	8 803
Total assets	339 261	347 426	352 174	360 163	378 617
Notes and certificates	32 757	26 303	26 755	7 123	3 196
Bearer bonds issues in NOK ⁴⁾	56 761	53 665	53 468	55 764	51 589
Bearer bond issues in foreign currency ⁴⁾	122 970	135 009	136 285	159 559	182 799
Other funding	108 981	115 930	117 646	119 498	122 643
Equity capital	12 571	12 893	13 140	13 058	13 146
Other liabilities	5 221	3 626	4 880	5 161	5 244
Total liabilities and capital	339.261	347 426	352,174	360 163	378 617

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

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

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

⁴⁾ Purchase of own bearer bonds deducted.

Sources: Statistics Norway and Norges Bank

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

	31.03.2004	30.06.2004	30.09.2004	31.12.2004	31.03.2005
Cash and bank deposits	2 380	2 365	2 166	2 387	2 095
Notes and certificates	141	129	134	53	88
Bearer bonds	0	0	0	0	0
Loans ¹⁾ (gross) to:	98 070	102 425	99 460	103 489	104 080
The general public $^{2)}$ (net)	93 313	96 524	94 650	98 298	97 696
Other sectors (net)	4 540	5 671	4 559	4 965	6 142
Other assets ³⁾	2 679	3 022	2 387	2 377	3 238
Total assets	103 270	107 941	104 147	108 306	109 501
Notes and certificates	0	0	0	0	30
Bearer bonds	533	533	657	657	165
Loans from non-banks	12 461	12 706	12 472	12 386	13 596
Loans from banks	74 688	78 033	74 981	79 243	78 887
Other liabilities	6 722	7 183	6 564	6 302	7 000
Capital, reserves	8 866	9 486	9 473	9 718	9 823
Total liabilities and capital	103 270	107 941	104 147	108 306	109 501

¹⁾ Includes subordinated loan capital and leasing finance.

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

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

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

	31.03.2004	30.06.2004	30.09.2004	31.12.2004	31.03.2005
Cash and bank deposits	21 252	18 430	21 879	21 393	24 511
Norwegian notes and certificates	16 743	22 731	20 078	28 418	28 253
Foreign Treasury bills and notes	5 872	2 555	2 761	5 509	8 801
Norwegian bearer bonds	146 591	147 247	146 334	141 636	145 202
Foreign bearer bonds	123 189	130 335	130 826	128 066	130 729
Norwegian shares, units, primary capital certificates and interests	55 091	50 108	61 116	66 330	70 277
Foreign shares, units, primary capital certificates and interests	54 704	61 237	60 724	65 879	68 155
Loans to the general public ¹⁾	20 262	19 737	18 380	17 918	17 566
Loans to other sectors	712	685	650	948	945
Other specified assets	54 750	54 559	61 061	59 385	58 989
Total assets	499 166	507 624	523 809	535 482	553 428

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

Source: Statistics Norway

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

	31.03.2004	30.06.2004	30.09.2004	31.12.2004	31.03.2005
Cash and bank deposits	7 095	8 179	5 854	5 856	6 658
Norwegian notes and certificates	11 423	12 539	13 144	15 537	12 109
Foreign notes and certificates	654	1 260	2 097	4 292	5 686
Norwegian bearer bonds	19 776	18 730	20 320	20 026	20 196
Foreign bearer bonds	12 179	12 750	12 425	11 796	15 179
Norwegian shares, units, primary capital certificates, interests	8 653	8 734	9 182	9 583	11 014
Foreign shares, units, primary capital certificates, interests	7 104	7 757	8 063	6 168	6 833
Loans to the general public $^{1)}$	1 308	1 287	1 338	1 396	1 426
Loans to other sectors	203	207	201	239	264
Other specified assets	47 426	43 496	40 168	41 348	44 756
Total assets	115 821	114 939	112 792	116 241	124 121

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

Source: Statistics Norway

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

	31.03.2004	30.06.2004	30.09.2004	31.12.2004	31.03.2005
Bank deposits	6 312	7 132	7 059	5 624	8 173
Treasury bills, etc. ¹⁾	4 772	4 131	3 887	5 604	4 712
Other Norwegian short-term paper	21 817	21 218	19 464	16 508	16 850
Foreign short-term paper	232	236	245	279	318
Government bonds, etc. ²⁾	4 974	5 435	6 278	6 1 3 2	5 498
Other Norwegian bonds	28 824	30 379	34 073	37 102	39 568
Foreign bonds	6 859	6 950	7 232	8 256	9 424
Norwegian equities	32 242	32 627	33 617	35 854	37 631
Foreign equities	51 975	53 674	56 304	64 169	73 840
Other assets	4 038	4 157	4 334	4 680	5 123
Total assets	162 044	165 937	172 492	184 208	201 138

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

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

Sources: Norges Bank and Norwegian Central Securities Depository

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

	31.03.2004	30.06.2004	30.09.2004	31.12.2004	31.03.2005
Central government and social security administration	673	586	511	450	369
Banks	2 088	2 225	2 396	2 642	2 740
Other financial enterprises	34 782	40 107	45 977	53 293	58 513
Local government admin. and municipal enterprises	13 721	13 799	14 109	14 847	15 254
Other enterprises	25 542	23 669	22 244	21 474	25 220
Households	76 189	75 699	76 507	79 626	83 851
Rest of the world	5 703	6 508	7 403	8 531	11 844
Total assets under management	158 698	162 592	169 148	180 863	197 792

Sources: Norges Bank and the Norwegian Central Securities Depository

Securities statistics

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

Holding sector	31.03.2004	30.06.2004	30.09.2004	31.12.2004	31.03.2005
Central government and social security administration	312 837	313 479	330 408	336 151	357 770
Norges Bank	3	3	3	3	3
State lending institutions	21	20	21	3	3
Banks	24 336	24 831	15 806	18 432	20 367
Insurance companies	29 197	29 701	32 226	33 355	32 668
Mortgage companies	7	7	7	1	1
Finance companies	3	2	3	3	3
Mutual funds	34 870	35 122	36 659	38 868	41 328
Other financial enterprises	30 272	27 699	28 491	27 785	29 600
Local government administration and municipal enterprises	4 977	4 726	4 996	5 158	5 425
State enterprises	8 282	8 731	7 188	7 356	8 198
Other private enterprises	156 172	162 929	168 838	192 688	198 528
Wage-earning households	51 887	50 028	54 423	58 397	62 678
Other households	2 445	2 365	2 632	2 522	2 601
Rest of the world	250 851	271 278	316 727	343 992	398 321
Unspecified sector	526	502	496	355	312
Total	906 685	931 424	998 924	1 065 067	1 157 804

Sources: Norwegian Central Securities Depository and Norges Bank

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

	31.03.2004	30.06.2004	30.09.2004	31.12.2004	31.03.2005
Banks	29 983	30 146	30 140	31 195	31 453
Insurance companies	2 700	1 584	1 584	1 561	1 561
Mortgage companies	2 194	2 244	2 244	2 244	2 244
Finance companies	5	5	5	5	5
Other financial enterprises	17 120	17 069	16 995	16 590	16 689
Local government administration and municipal enterprises	197	197	197	197	197
State enterprises	18 277	18 277	17 945	17 797	17 801
Other private enterprises	45 511	45 588	47 199	48 627	48 988
Rest of the world	6 296	7 206	7 250	6 772	7 230
Unspecified sector	0	0	0	0	0
Total	122 284	122 317	123 560	124 989	126 168

Sources: Norwegian Central Securities Depository and Norges Bank

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

2005 Q1							Pu	ırchasin	g/ selling	sector							
	Cent.gov'									Local			Wage-		Rest		
	and		State		Insur.	Mort.	Fin.		Other	gov't &		Other	earning	Other	of		
	social	Norges	lending		com-	com-	com-	Secur.	financ.	munic.	State	private	house-	house-	the	Unsp.	
Issuing sector	security	Bank	inst.	Banks	panies	panies	panies	funds	enterpr.	enterpr.	enterpr.	enterpr.	holds	holds	world	sector	Total ²⁾
Banks	0	0	0	1 870	-366	0	0	-235	92	0	0	-111	-253	-106	-760	-1	130
Insurance companies	0	0	0	0	0	0	0	0	0	-1	0	0	1	0	0	0	0
Mortgage companies	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Finance companies	0	0	0	0	0	0	0	0	0	0	0	2	-2	0	0	0	0
Other financial enterpr.	8	0	0	573	-2 663	0	0	-141	146	-7	5	-167	113	-61	2 509	0	314
Local gov't. admin. and																	
municipal enterprises	0	0	0	0	0	0	0	14	-1	0	0	-3	-11	0	0	0	0
State enterprises	-12 319	0	0	92	136	0	0	5	83	-2	349	-148	381	29	11 429	-1	35
Other private enterprises	-1 852	0	0	1 520	-773	0	0	-1 452	125	-131	0	-2 671	-975	-54	8 818	4	2 558
Rest of the world	58	0	0	1 660	-135	0	0	142	-738	28	5	155	-183	24	-513	-1	503
Unspecified sector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	-14 105	0	0	5 715	-3 800	0	0	-1 667	-293	-114	359	-2 942	-930	-168	21 483	1	3 540

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

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

Sources: Norwegian Central Securities Depository and Norges Bank

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

	31.03.2004	30.06.2004	30.09.2004	31.12.2004	31.03.2005
Central government and social security administration	28 173	28 049	27 256	34 470	30 231
Norges Bank	8 884	7 571	7 963	0	0
State lending institutions	122	105	101	82	78
Banks	82 415	90 254	92 251	90 599	86 817
Insurance companies	224 418	221 806	230 185	225 084	228 508
Mortgage companies	16 983	16 630	17 785	16 461	17 044
Finance companies	127	110	135	113	148
Mutual funds	34 734	37 329	41 894	44 966	46 656
Other financial enterprises	5 877	8 042	9 1 1 9	9 093	8 952
Local government administration and municipal enterprises	22 187	22 943	23 979	23 228	22 444
State enterprises	2 585	2 756	2 857	2 829	3 410
Other private enterprises	24 968	25 201	25 821	27 136	27 259
Wage-earning households	21 269	22 390	22 481	22 560	23 327
Other households	6 990	7 448	7 804	7 694	8 065
Rest of the world	78 628	77 176	72 241	67 815	74 366
Unspecified sector	213	228	216	113	89
Total	558 573	568 038	582 091	572 245	577 396

Sources: Norwegian Central Securities Depository and Norges Bank

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

	31.03.2004	30.06.2004	30.09.2004	31.12.2004	31.03.2005
Central government and social security administration	157 946	157 012	159 945	134 748	138 348
State lending institutions	144	123	119	98	94
Banks	163 638	174 496	180 675	185 988	191 410
Insurance companies	252	252	252	252	252
Mortgage companies	62 996	58 968	60 651	61 791	57 035
Finance companies	500	500	625	625	125
Other financial enterprises	2 619	2 699	2 699	3 671	3 671
Local government administration and municipal enterprises	57 326	58 505	59 047	60 616	60 309
State enterprises	29 215	33 107	33 404	33 595	33 595
Other private enterprises	34 085	36 035	34 898	37 210	39 518
Households	213	213	99	96	35
Rest of the world	19 156	21 096	21 657	22 255	22 299
Unspecified sector	0	0	0	0	0
Total	528 090	543 006	554 072	540 946	546 690

Sources: Norwegian Central Securities Depository and Norges Bank

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

2005 Q1							Pι	ırchasin	g/ selling	sector							
	Cent.gov'i and		State		Insur.	Mort.	Fin.		Other	Local gov't &		Other	Wage- earning	Other	Rest of		
T	social	Norges	lending	Danka	com-	com-	com-	Secur.	financ.	munic.	State	private	house-	house-	the	Unsp.	T = t = 1 ²)
Central government and social security admin	-4 107	Бапк	0	-1 579	2 028	2 263	panies	-595	140	108	-54	-44	-13	26	5 464	sector	3 647
State lending inst	- 107	0	-4	15/7	2 020	2 205	0	0	0	100	0	0	0	20	0	0	-4
Banks	-144	0		589	2 791	-466	35	2 505	-393	-23	128	351	165	469	356	7	6 371
Insurance companies	0	0	0	-5	19	0	0	0	0	2	0	0	0	0	-19	0	-3
Mortgage companies	-597	0	0	-796	-2 478	-1 212	0	317	2	-165	83	-73	233	-56	-9	0	-4 752
Finance companies Other financial	0	0	0	-244	-24	0	0	-46	0	-4	0	-19	-11	-2	-151	0	-500
enterprises Local gov't. admin.	0	0	0	14	1	0	0	5	0	-3	0	-25	7	4	-2	-1	0
enterprises	-27	0	0	143	824	18	0	-393	-48	-744	40	30	-20	26	49	0	-101
State enterprises Other	93	0	0	-1 011	697	0	0	129	-51	189	214	-91	18	-7	-180	0	-1
private enterprises	2	0	0	16	387	0	0	275	199	-45	193	-102	129	-12	1 425	0	2 467
Households	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rest of the world	0	0	0	-548	333	0	0	-146	14	-22	0	69	254	31	59	1	44
Unspecified sector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	-4 779	0	-4	-3 422	4 577	604	35	2 0 5 2	-127	-708	604	98	763	477	6 991	7	7 168

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

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

Sources: Norwegian Central Securities Depository and Norges Bank

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

	31.03.2004	30.06.2004	30.09.2004	31.12.2004	31.03.2005
Central government and social security administration	1 744	1 379	1 812	11 741	9 512
Norges Bank	6 689	10 232	10 117	0	0
State lending institutions	0	0	0	0	0
Banks	13 355	19 510	17 117	16 938	18 273
Insurance companies	44 357	46 338	43 489	54 064	48 787
Mortgage companies	2 139	2 710	3 145	3 162	1 361
Finance companies	17	17	3	0	0
Mutual funds	26 993	25 364	23 781	22 610	22 072
Other financial enterprises	4 264	5 411	4 158	4 604	3 990
Local government administration and municipal enterprises	2 146	1 826	2 022	1 593	1 216
State enterprises	5 284	2 563	4 348	4 418	7 415
Other private enterprises	5 049	2 064	2 276	2 358	2 306
Wage-earning households	41	37	17	22	29
Other households	889	852	880	913	685
Rest of the world	10 058	9 192	6 533	4 882	5 473
Unspecified sector	0	0	0	0	0
Total	123 024	127 495	119 698	127 304	121 118

Sources: Norwegian Central Securities Depository and Norges Bank

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

Issuing sector	31.03.2004	30.06.2004	30.09.2004	31.12.2004	31.03.2005
Central government and social security administration	62 332	66 426	61 051	66 000	53 000
Counties	574	694	694	554	565
Municipalities	5 531	5 251	5 257	4 601	4 889
State lending institutions	0	0	0	0	0
Banks	38 203	44 213	41 715	40 050	48 558
Mortgage companies	3 260	1 317	997	3 322	1 797
Finance companies	0	0	0	0	0
Other financial enterprises	19	19	19	0	0
State enterprises	2 510	2 310	2 225	1 825	1 950
Municipal enterprises	6 3 2 6	5 681	6 066	6 987	6 122
Private enterprises	6 299	8 062	6 966	6 486	7 671
Rest of the world	3 723	2 000	2 600	2 700	2 600
Total	128 777	135 973	127 590	132 525	127 152

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

Credit and liquidity trends

Table 19. Credit indicator and money supply

				Percentage growth							
	Volume	e figures at end NOKbn	of period	Ove	r past 12 mor	nths	Over past 3 annualise	months,			
	C2 ¹⁾	C3 ²⁾	M2 ³⁾	C2 ¹⁾	C3 ²⁾	M2 ³⁾	C2	M2			
December 1996	992.5	1 166.0	564.4	6.0	5.7	6.4	7.8	4.6			
December 1997	1 099.1	1 309.6	578.5	10.2	10.4	1.8	10.2	3.0			
December 1998	1 192.8	1 461.4	605.3	8.3	12.6	4.4	6.5	5.4			
December 1999	1 295.0	1 620.9	670.1	8.4	8.6	10.5	10.0	8.4			
December 2000	1 460.9	1 842.4	731.8	12.3	11.2	8.8	12.2	7.3			
December 2001	1 608.2	2 010.3	795.4	9.7	7.8	9.3	9.3	10.5			
December 2002	1 724.9	2 098.7	855.3	8.9	7.9	8.3	10.1	9.0			
December 2003	1 846.5	2 230.7	873.1	6.8	5.5	1.9	7.3	1.8			
January 2004	1 863.4	2 259.9	880.3	6.8	5.4	1.3	7.0	1.4			
February 2004	1 874.2	2 274.2	877.2	7.0	5.5	2.0	7.1	2.0			
March 2004	1 882.4	2 274.3	886.7	7.1	5.6	3.7	7.2	6.6			
April 2004	1 894.4	2 296.1	883.8	7.2	5.6	4.6	7.7	10.5			
May 2004	1 909.0	2 304.8	889.6	7.1	5.6	4.6	8.2	11.5			
June 2004	1 930.3	2 332.9	919.3	7.5	5.7	5.6	8.6	8.0			
July 2004	1 937.2	2 347.1	912.4	7.7	6.3	4.8	8.5	4.6			
August 2004	1 947.1	2 339.9	897.6	7.7	5.7	3.7	8.5	3.1			
September 2004	1 961.1	2 371.0	902.3	8.0	6.1	5.6	8.9	2.9			
October 2004	1 975.9	2 381.5	906.3	8.3	6.2	4.6	9.7	9.6			
November 2004	1 991.3	2 386.6	932.6	8.4	6.6	9.2	10.3	12.0			
December 2004	2 004.2		935.8	8.8		7.5	10.1	14.4			
January 2005	2 018.2		940.8	8.9		7.2	9.7	6.6			
February 2005	2 031.7		949.3	9.0		8.6	9.6	7.7			
March 2005	2 054.5		969.6	9.6		9.6	11.0	11.5			
April 2005	2 082.5		961.7	10.3		9.1					

 $^{1)}$ C2 = Credit indicator. Credit from domestic sources; actual figures.

 $^{2)}$ C3 = Total credit from domestic and foreign sources; actual figures.

 $^{3)}$ M2 = Money supply (see note to Table 21).

⁴⁾ Seasonally adjusted figures.

Source: Norges Bank

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

	31.12.2	002	31.12.2	003	31.12.2	004	30.04.2005	
	Amount	%	Amount	%	Amount	%	Amount	%
Private banks	1 097 144	8.2	1 185 722	7.8	1 303 672	10.0	1 366 398	11.7
State lending institutions	185 932	5.3	188 593	1.4	186 542	-1.1	189 415	1.6
Mortgage companies	182 006	10.9	210 326	15.3	236 799	13.0	242 288	11.3
Finance companies	83 234	9.9	89 257	7.0	98 297	14.9	99 871	14.5
Life insurance companies	23 124	-5.5	20 628	-10.8	17 919	-13.1	17 566	-12.6
Pension funds	3 936	5.2	3 295	-16.3	3 295	0.0	3 295	0.0
Non-life insurance companies	926	-0.9	1 285	38.8	1 396	8.6	1 396	7.4
Bond debt ²⁾	107 399	19.8	114 147	6.3	123 801	8.5	126 358	9.4
Notes and short-term paper	26 145	10.1	19 614	-25.0	20 067	2.3	23 335	14.5
Other sources	15 036	33.1	13 646	-9.2	12 426	-8.9	12 540	-2.0
Total domestic credit (C2) ³⁾	1 724 882	8.9	1 846 513	6.8	2 004 214	8.8	2 082 462	10.3

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

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

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

Table 2	1. Com	position	of mone	vlaque v	. In	millions	of NOK
			•••••••	·) •••••••·			

	Notes	Transaction					Change in
Actual figures at	and	account		Other			M2 last 12
end of period	coins	deposits	M1 ¹⁾	deposits ²⁾	CDs	M2 ³⁾	months, total
December 1996	43 324	208 073	247 938	294 741	21 686	564 365	34 108
December 1997	46 014	227 382	269 597	278 741	30 200	578 538	14 173
December 1998	46 070	237 047	279 189	292 820	33 322	605 331	26 793
December 1999	48 020	300 128	343 494	295 820	30 802	670 116	64 785
December 2000	46 952	328 816	371 339	326 350	34 152	731 841	61 725
December 2001	46 633	344 110	386 148	370 171	39 048	795 367	63 526
December 2002	44 955	360 341	400 623	409 704	45 001	855 328	59 961
December 2003	46 249	387 309	428 996	407 337	36 806	873 139	17 811
January 2004	42 801	388 505	427 385	419 593	33 284	880 262	13 670
February 2004	42 224	393 706	432 244	415 276	29 726	877 246	18 479
March 2004	41 872	398 672	436 799	416 023	33 895	886 717	32 407
April 2004	42 057	391 151	429 453	428 562	25 775	883 790	39 269
May 2004	43 162	393 995	432 802	425 358	31 404	889 564	38 834
June 2004	43 704	428 193	467 793	419 011	32 459	919 263	48 235
July 2004	43 735	422 117	461 620	419 108	31 643	912 371	41 477
August 2004	43 191	406 141	445 281	421 549	30 792	897 622	30 452
September 2004	43 103	409 565	448 700	422 173	31 435	902 308	47 011
October 2004	43 232	414 667	453 881	419 012	33 377	906 270	37 350
November 2004	43 902	421 022	461 052	431 965	39 535	932 552	75 618
December 2004	47 595	430 092	473 432	423 193	39 182	935 807	62 668
January 2005	45 175	430 080	471 134	433 248	36 458	940 840	60 578
February 2005	44 599	433 726	474 259	439 826	35 189	949 274	72 028
March 2005	44 679	445 990	486 433	443 036	40 087	969 556	82 839
April 2005	44 461	439 778	480 084	440 264	41 316	961 664	77 874

¹⁾ Narrow money, M1, comprises the money-holding sector's stock of Norwegian notes and coins plus the sector's

transaction account deposits in Norges Bank, commercial banks and savings banks (in NOK and foreign currency).

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

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

Source: Norges Bank

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

		Financial investments								
		Year			94		Year		At 31	Dec.
	2002	2003	2004	2003	2004	2002	2003	2004	2003	2004
Currency and deposits	47.8	26.4	30.4	5.3	5.0	529.1	556.8	587.0	556.8	587.0
Securities other than shares	1.8	2.8	1.1	0.9	-0.7	23.0	27.9	29.6	27.9	29.6
Shares and other equity	14.9	30.2	35.4	8.5	7.7	148.3	161.5	184.2	161.5	184.2
Mutual funds shares	-2.1	4.1	1.1	2.2	-0.3	59.8	78.3	86.4	78.3	86.4
Insurance technical reserves	32.0	45.9	52.6	14.5	14.1	506.3	568.1	630.7	568.1	630.7
Loans and other assets ¹⁾	20.1	30.8	21.9	5.8	8.3	167.9	200.0	223.5	200.0	223.5
Total assets	114.5	140.3	142.6	37.1	34.1	1 434.4	1 592.6	1 741.4	1 592.6	1 741.4
Loans from banks (incl. Norges Bank)	72.0	92.2	113.6	30.2	34.5	727.8	822.1	938.7	822.1	938.7
Loans from state lending institutions	7.5	2.5	0.1	-0.6	0.5	156.0	158.5	158.6	158.5	158.6
companies	13.8	15.9	14.8	4.9	3.0	80.5	96.2	106.0	96.2	106.0
Loans from insurance companies	0.4	-2.4	-0.9	-2.4	0.0	16.5	14.0	13.1	14.0	13.1
Other liabilities ²⁾	8.0	-1.1	4.1	7.2	6.7	143.3	142.7	151.1	142.7	151.1
Total liabilities	101.7	107.1	131.8	39.4	44.6	1 124.1	1 233.5	1 367.5	1 233.5	1 367.5
Net financial investments / assets	12.8	33.2	10.8	-2.3	-10.5	310.3	359.1	374.0	359.1	374.0

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

 $^{2)}\mbox{Other}$ loans, securities other than shares, tax liabilities and accrued interest.

Table 23. Money	market liquidity	/. Liquidity	y effect from 1 Januar	y to end	period. In millions of NO
-----------------	------------------	--------------	------------------------	----------	---------------------------

	1.1 -	31.12	1.1	- 31.5
Supply+/withdrawal-	2003	2004	2004	2005
Central government and other public accounts				
(excl. paper issued by state lending institutions and government)	-13 408	-43 666	-61 178	-86 108
Paper issued by state lending institutions and government	-41 322	19 008	-5 268	-2 424
Purchase of foreign exchange for Government Petroleum Fund	14 620	46 870	0	14 710
Other foreign exchange transactions	0	75	75	622
Holdings of banknotes and coins ¹⁾ (estimate)	-1 337	-1 266	3 039	2 837
Overnight loans	0	0	0	0
Fixed-rate loans	12 000	0	47 000	47 000
Other central bank financing	18 716	-12 079	47	371
Total reserves	-10 731	8 942	-16 285	-22 992
Of which:				
Sight deposits with Norges Bank	-10 731	8 942	-16 285	-22 992
Treasury bills	0	0	0	0
Other reserves (estimate)	0	0	0	0

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

Source: Norges Bank

Interest rate statistics

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

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

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

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

							Interest rate differential
	DKK	GBP	JPY	SEK	USD	EUR	NOK/EUR
January 2004	2.1	4.0	0.0	2.7	1.1	2.1	0.1
February 2004	2.1	4.1	0.0	2.5	1.1	2.1	-0.2
March 2004	2.1	4.3	0.0	2.3	1.1	2.0	-0.3
April 2004	2.1	4.3	0.0	2.1	1.1	2.0	-0.2
May 2004	2.2	4.5	0.0	2.1	1.2	2.1	-0.2
June 2004	2.2	4.7	0.0	2.1	1.5	2.1	-0.2
July 2004	2.2	4.8	0.0	2.1	1.6	2.1	-0.2
August 2004	2.1	4.9	0.0	2.1	1.7	2.1	-0.2
September 2004	2.1	4.9	0.0	2.1	1.9	2.1	-0.3
October 2004	2.1	4.8	0.0	2.1	2.1	2.1	-0.2
November 2004	2.1	4.8	0.0	2.1	2.3	2.2	-0.3
December 2004	2.1	4.8	0.0	2.1	2.5	2.2	-0.3
January 2005	2.1	4.8	0.0	2.0	2.6	2.1	-0.3
February 2005	2.1	4.8	0.0	2.0	2.8	2.1	-0.3
March 2005	2.1	4.9	0.0	2.0	3.0	2.1	-0.2
April 2005	2.1	4.9	0.0	2.0	3.1	2.1	-0.2
May 2005	2.1	4.8	0.0	2.0	3.2	2.1	-0.1

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

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

Sources: OECD and Norges Bank

	0		
	3-year	5-year	10-year
January 2004	3.2	3.7	4.5
February 2004	2.8	3.4	4.3
March 2004	2.7	3.3	4.1
April 2004	3.1	3.9	4.7
May 2004	3.3	4.1	4.9
June 2004	3.3	4.1	4.7
July 2004	3.1	3.8	4.5
August 2004	3.0	3.6	4.3
September 2004	2.8	3.5	4.2
October 2004	2.8	3.5	4.2
November 2004	2.7	3.3	4.0
December 2004	2.7	3.2	3.9
January 2005	2.7	3.2	3.9
February 2005	2.7	3.2	3.8
March 2005	2.9	3.4	4.0
April 2005	2.9	3.3	3.9
May 2005	2.8	3.2	3.7

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

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

							Interest rate differential
	Germany	Sweden	France	UK	Japan	US	NOK/DEM ²⁾
January 2004	4.3	4.7	4.2	4.8	1.3	4.1	0.3
February 2004	4.2	4.6	4.1	4.8	1.2	4.1	0.1
March 2004	4.0	4.4	4.0	4.7	1.4	3.8	0.1
April 2004	4.2	4.6	4.2	4.9	1.5	4.3	0.5
May 2004	4.3	4.7	4.3	5.1	1.5	4.7	0.6
June 2004	4.4	4.8	4.4	5.2	1.8	4.8	0.3
July 2004	4.3	4.6	4.3	5.1	1.8	4.5	0.2
August 2004	4.2	4.5	4.1	5.0	1.6	4.3	0.1
September 2004	4.1	4.4	4.1	4.9	1.5	4.2	0.1
October 2004	4.0	4.3	4.0	4.8	1.5	4.1	0.2
November 2004	3.9	4.2	3.9	4.7	1.5	4.2	0.2
December 2004	3.7	4.0	3.6	4.5	1.4	4.2	0.3
January 2005	3.6	3.9	3.6	4.6	1.4	4.3	0.3
February 2005	3.6	3.8	3.6	4.6	1.4	4.2	0.1
March 2005	3.8	3.9	3.8	4.8	1.5	4.5	0.2
April 2005	3.6	3.6	3.6	4.6	1.3	4.4	0.3
May 2005	3.4	3.4	3.4	4.4	1.3	4.2	0.3

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

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

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

Sources: OECD and Norges Bank

		Loans, excl. non-accrual loans								
		Local	Non- financial public	Non- financial private	-	Credit lines	Repaymen	nt loans		
	Total loans	govern- ment	enter- prises	enter- prises	House- holds	Overdrafts and building loans	Housing loans	Other loans		
2004 Q1 All banks	4.34	2.98	3.14	4.58	4.28	6.76	4.01	4.51		
2004 Q2 All banks	4.13	2.84	2.88	4.34	4.08	6.63	3.82	4.27		
2004 Q3 All banks	4.12	2.88	2.83	4.27	4.09	7.01	3.77	4.21		
2004 Q4 All banks	4.04	2.90	2.78	4.13	4.02	6.87	3.69	4.11		
2005 Q1 All banks	3.97	2.89	2.94	4.04	3.96	6.74	3.63	3.98		

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

	Total deposits	Local govern- ment	Non- financial public enterprises	Non-financial private enterprises	House- holds	Deposits on transaction accounts	Other deposits
2004 Q1 All banks	1.42	1.02	1.66	1 37	1.40	1 13	1.67
2004 Q2	1.42	1.92	1.00	1.57	1.40	1.15	1.07
All banks	1.25	1.81	1.73	1.25	1.20	1.00	1.49
2004 Q3 All banks	1.28	1.82	1.70	1.28	1.24	1.02	1.52
2004 Q4 All banks	1.27	1.78	1.71	1.26	1.22	1.04	1.48
2005 Q1 All banks	1.29	1.81	1.70	1.31	1.23	1.06	1.50

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

Source: Norges Bank

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

	Housing	Other	Total
	loans	loans	loans
31.03.2004	3.7	5.2	4.5
30.06.2004	3.6	5.1	4.4
30.09.2004	3.6	5.1	4.4
31.12.2004	3.6	4.8	4.3
31.03.2005	3.6	4.7	4.3

Source: Norges Bank

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

	Housing	private	Total
	loans	enterprises	loans
31.03.2004	5.1	5.4	4.5
30.06.2004	4.8	4.9	4.1
30.09.2004	4.8	4.8	4.0
31.12.2004	4.2	4.6	3.7
31.03.2005	4.0	4.3	3.5

Profit/loss and capital adequacy data

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

				1
	2003	2004	2004	2005
Interest income	5.8	4.2	4.3	4.2
Interest expenses	3.9	2.4	2.6	2.5
Net interest income	1.9	1.8	1.7	1.7
Total other operating income	0.9	0.9	0.9	0.8
Other operating expenses	1.6	1.6	1.7	1.4
Operating profit before losses	1.2	1.1	0.9	1.1
Recorded losses on loans and guarantees	0.4	0.1	0.1	0.0
Ordinary operating profit (before taxes)	0.7	1.1	1.1	1.1
Capital adequacy ratio ²⁾	12.4	12.2	12.0	12.0
Of which:				
Core capital	9.7	9.8	9.3	9.6

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

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

Source: Norges Bank

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

			Q	1
	2003	2004	2004	2005
Interest income	8.5	6.4	7.1	6.2
Interest expenses	3.8	2.1	2.2	2.0
Net interest income	4.7	4.3	4.9	4.2
Total other operating income	2.3	1.4	1.6	1.9
Other operating expenses	4.0	3.1	3.3	3.7
Operating profit before losses	3.0	2.6	3.2	2.3
Recorded losses on loans and guarantees	1.0	0.6	0.9	0.5
Ordinary operating profit (before taxes)	2.0	2.0	2.3	1.9
Capital adequacy ratio ²⁾	10.9	11.3	10.8	11.1
Of which:				
Core capital	9.4	9.6	9.3	9.4

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

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

Source: Norges Bank

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

				1
	2003	2004	2004	2005
Interest income	4.4	3.3	3.5	3.1
Interest expenses	3.8	2.7	3.0	2.6
Net interest income	0.7	0.5	0.6	0.5
Total other operating income	0.0	0.0	0.0	0.0
Other operating expenses	0.1	0.1	0.1	0.1
Operating profit before losses	0.5	0.4	0.5	0.4
Recorded losses on loans and guarantees	0.0	0.0	0.0	-0,0
Ordinary operating profit (before taxes)	0.5	0.4	0.5	0.4
Capital adequacy ²⁾ Of which:	12.2	12.3	11.9	12.2
Core capital	9.6	9.3	9.4	9.2

¹⁾ All Norwegian parent companies.

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

Exchange rates

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

	Trade-weighted							
	krone	1	100	1	100	100	1	
	exchange rate ¹⁾	EUR	DKK	GBP	JPY	SEK	USD	
January 2004	105.45	8.5925	115.36	12.42	6.41	94.04	6.81	
February 2004	107.82	8.7752	117.77	12.96	6.51	95.63	6.94	
March 2004	105.34	8.5407	114.65	12.72	6.42	92.49	6.97	
April 2004	103.00	8.2938	111.42	12.46	6.43	90.47	6.92	
May 2004	101.55	8.2006	110.21	12.21	6.10	89.83	6.83	
June 2004	102.74	8.2856	111.45	12.47	6.24	90.62	6.83	
July 2004	104.82	8.4751	113.98	12.73	6.32	92.16	6.91	
August 2004	103.06	8.3315	112.04	12.45	6.19	90.70	6.84	
September 2004	103.42	8.3604	112.40	12.27	6.22	91.96	6.84	
October 2004	101.52	8.2349	110.71	11.91	6.06	90.87	6.60	
November 2004	100.18	8.1412	109.55	11.65	5.98	90.48	6.27	
December 2004	100.90	8.2181	110.55	11.83	5.91	91.52	6.13	
January 2005	100.99	8.2125	110.38	11.76	6.06	90.77	6.26	
February 2005	102.51	8.3199	111.79	12.06	6.09	91.58	6.39	
March 2005	100.63	8.1871	109.95	11.83	5.90	90.09	6.20	
April 2005	100.62	8.1763	109.75	11.97	5.89	89.19	6.32	
May 2005	99.66	8.0773	108.50	11.81	5.97	87.88	6.37	

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

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

Source: Norges Bank

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

	GBP/USD	EUR/GBP	USD/EUR	EUR/JPY	JPY/USD
January 2004	1.8223	0.6921	1.261	134.1105	106.34
February 2004	1.8683	0.6768	1.265	134.7664	106.57
March 2004	1.8268	0.6712	1.226	133.0724	108.53
April 2004	1.7999	0.6655	1.198	129.0620	107.75
May 2004	1.7872	0.6714	1.200	134.3959	112.00
June 2004	1.8272	0.6642	1.214	132.8262	109.44
July 2004	1.8422	0.6657	1.226	134.0781	109.32
August 2004	1.8188	0.6693	1.217	134.5203	110.50
September 2004	1.7932	0.6813	1.222	134.4870	110.08
October 2004	1.8059	0.6914	1.249	135.9705	108.89
November 2004	1.8593	0.6986	1.299	136.0822	104.77
December 2004	1.9291	0.6947	1.340	139.0986	103.79
January 2005	1.8777	0.6986	1.312	135.6150	103.38
February 2005	1.8866	0.6897	1.301	136.5290	104.93
March 2005	1.9087	0.6922	1.321	138.8740	105.12
April 2005	1.8944	0.6829	1.294	138.8290	107.31
May 2005	1.8552	0.6838	1.269	135.3574	106.70

Balance of payments

Table 37. Balance of payments. In millions of NOK

	2002	2003	2004
Goods balance	186 009	192 390	217 923
Service balance	21 524	19 426	21 031
Net interest and transfers	-13 641	-11 472	-7 738
Current account balance	193 892	200 344	231 216
Distributed among:			
Petroleum activities	255 813	277 264	322 860
Shipping	18 283	17 506	22 781
Other	-80 204	-94 426	-114 425
Net capital transfers etc. to other countries	1 463	-4 712	1 028
Net investment in financial assets \ Net capital outflow	192 429	205 056	230 188
Distributed among:			
Norwegian foreign investment	395 536	329 350	436 451
Foreign investment in Norway	271 860	190 807	259 982
Unallocated (incl. errors and omissions)	68 753	66 513	53 719
Distributed by purpose:			
Direct investment	28 722	2 445	10 210
Portfolio investment	189 775	41 987	193 483
Other investment in financial assets	-140 593	91 822	-64 028
International reserves	45 772	2 289	36 804
Unallocated (incl. errors and omissions)	68 753	66 513	53 719
Distributed by sector:			
Government administration ¹⁾	149 163	134 546	175 279
Norges Bank	30 762	13 580	29 100
Banks	-73 450	-29 139	-43 409
Insurance	6 698	25 129	65 307
Other financial enterprises	-26 677	-24 554	-47 134
Non-financial enterprises etc.	29 224	19 221	15 703
Unallocated (incl. errors and omissions)	76 709	66 273	35 342

¹⁾ Including the Petroleum Fund.

Sources: Statistics Norway and Norges Bank

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

	31.12.2002		31.	31.12.2003			31.12.2004		
_	Assets	Debt	Net	Assets	Debt	Net	Assets	Debt	Net
Government administration ¹⁾	837	281	556	1 174	381	793	1 428	463	965
Norges Bank	234	63	171	262	62	201	282	63	219
Banks	126	391	-265	193	489	-296	154	482	-328
Insurance	190	29	161	219	25	193	259	17	242
Other financial enterprises	104	197	-93	131	242	-111	149	313	-164
Non-financial enterprises etc.									
- Public enterprises	120	155	-35	143	173	-30	200	194	6
- Private enterprises	366	506	-140	371	523	-152	317	560	-243
- Households and non-profit organisations	72	31	41	89	32	57	97	37	60
Unallocated (incl. errors and omissions)	5	0	5	7	0	7	86	5	81
All sectors	2 055	1 653	401	2 589	1 928	661	2 973	2 135	838

¹⁾ Including the Petroleum Fund.

N.B. There is uncertainly associated with the underlying data. This applies among other things to non-residents' ownership of Norwegian shares, where estimates have been used to arrive at market values. Statistics Norway uses nominal values, which gives rise to differences.

Sources: Statistics Norway and Norges Bank

International capital markets

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

					Outstanding
	2001	2002	2003	2004	At 31.12.04
Total Of which vis-à-vis:	859.4	742.4	1 075.1	2 275.0	19 192.9
Non-banks Banks (and undistributed)	442.1 417.3	315.2 427.2	544.9 430.2	892.3 1 382.7	6 931.7 12 261.3

¹⁾ International assets (external positions) comprise

- cross-border claims in all currencies

- foreign currency loans to residents

- equivalent assets, excluding lending

Source: Bank for International Settlements

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

		December						
	2001	2002	2003	2004				
US dollar (USD)	45.1	41.9	39.4	37.7				
Deutsche mark (DEM)								
Swiss franc (CHF)	2.1	2.0	1.8	1.7				
Japanese yen (JPY)	6.1	5.6	4.9	4.8				
Pound sterling (GBP)	5.3	5.3	5.5	5.5				
French franc (FRF)								
Italian lira (ITL)								
EURO	28.5	33.6	37.7	39.5				
Undistributed ¹⁾	12.9	11.6	10.7	10.8				
Total in billions of USD	11 627.9	13 370.3	15 999.5	19 192.9				

¹⁾ Including other currencies not shown in the table, and assets in banks in countries other than the home countries of the seven currencies specified.

Source: Bank for International Settlements

Foreign currency trading

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

	Purchased net from:					Purchased gr	Purchased gross from:		Sold gross to:	
_		Other	Non-			Non-		Non-		
	Central	financial	financial	Foreign		financial	Foreign	financial	Foreign	
	gov't ²⁾	inst. ³⁾	sector	sector	Total	sector	sector	sector	sector	
April 2004	0.0	26.4	39.0	124.1	189.5	78.0	455.8	39.0	331.7	
May 2004	0.0	20.3	39.3	130.7	190.3	78.6	452.1	39.3	321.4	
June 2004	0.0	18.8	48.0	134.5	201.3	81.9	428.1	33.9	293.6	
July 2004	0.0	15.6	49.8	116.2	181.6	81.6	359.5	31.8	243.3	
August 2004	-0.2	11.0	45.4	118.1	174.3	77.0	360.1	31.6	242.0	
September 2004	-0.4	15.2	42.9	131.7	189.4	74.5	388.2	31.6	256.5	
October 2004	-0.3	25.0	32.9	123.5	181.1	68.4	329.7	35.5	206.2	
November 2004	-0.6	26.1	35.4	130.6	191.5	75.9	346.4	40.5	215.8	
December 2004	0.0	20.7	39.8	147.1	207.6	80.4	343.5	40.6	196.4	
January 2005	0.0	13.2	41.2	147.4	201.8	78.9	294.8	37.7	147.4	
February 2005	0.0	24.1	52.9	120.4	197.4	91.9	277.4	39.0	157.0	
March 2005	0.0	26.8	49.1	139.4	215.3	95.2	342.9	46.1	203.5	
April 2005	-0.2	42.9	50.6	125.4	218.7	99.8	348.9	49.2	223.5	

¹⁾ Excl. exchange rate adjustments.

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

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

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

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

	31.03.2004	30.06.2004	30.09.2004	31.12.2004	31.03.2005
Foreign assets, spot	243 887	265 607	236 109	211 492	239 298
Foreign liabilities, spot	460 346	458 072	434 817	420 406	470 564
1. Spot balance, net	-216 459	-192 465	-198 708	-208 914	-231 266
2. Forward balance, net	201 952	193 924	196 350	202 197	216 859

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