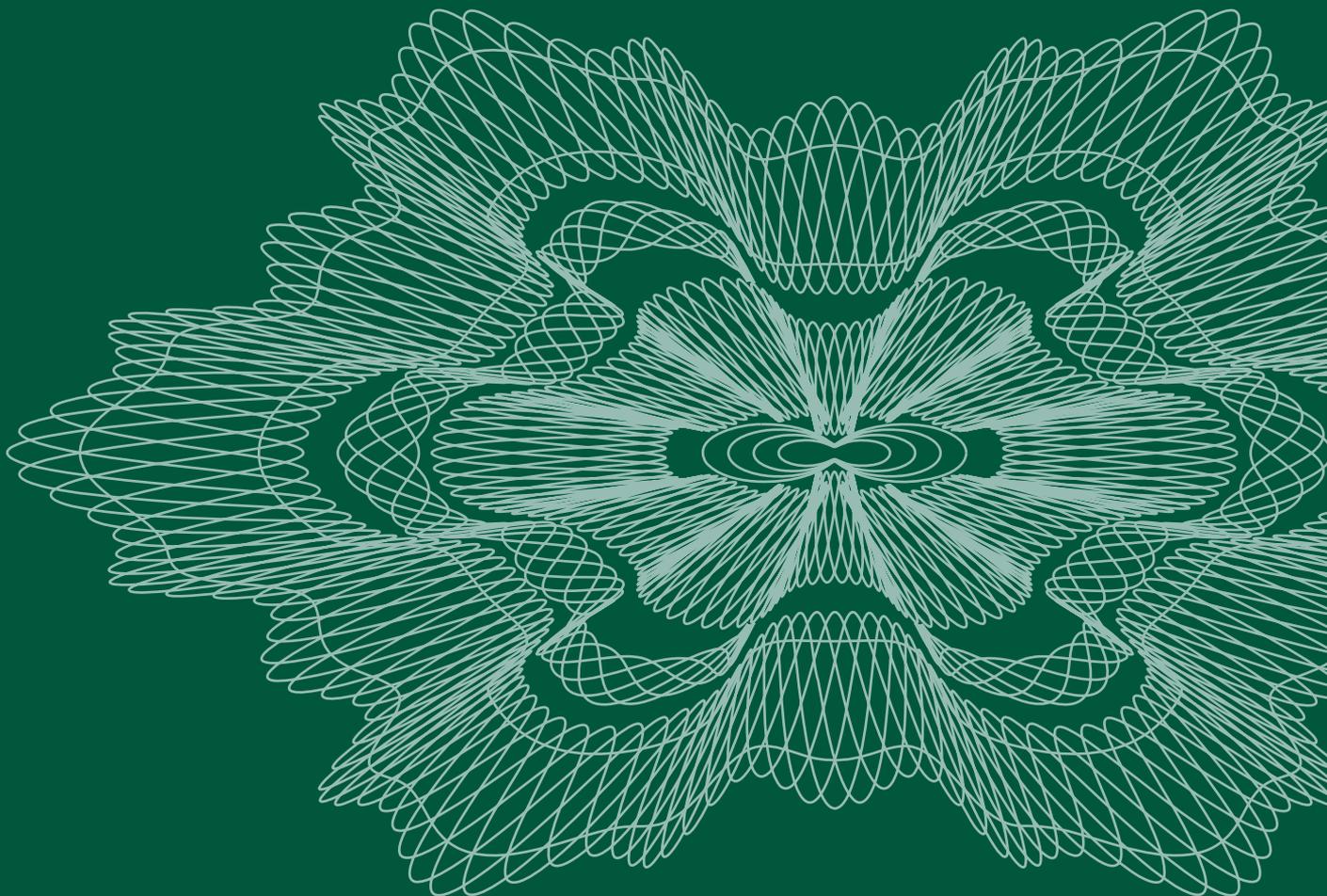




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Review of the ECB's strategy and alternative approaches

Jan F. Qvigstad, Chief Economist and Executive Director, Norges Bank*

Affecting private agents' expectations is an important part of monetary policy. Transparency about the objectives and the reasoning behind monetary policy decisions has therefore become the norm. There is, however, no unique "best" way to handle central bank communication. Institutional aspects and historical experience matter. Norges Bank has followed the advice of academics to publish our own projection of the interest rate – or preferred interest rate path – as a means of influencing private agents' expectations. In our communication, we stress that our projected interest rate path is conditional on economic developments and our understanding of the functioning of the economy – and not an unconditional promise. It is also essential that the public understand the reasoning behind a specific interest rate path. We have therefore developed and published a set of six criteria that we use to assess alternative interest rate paths. These criteria are useful tools both for internal discussion and for external communication.

1. Introduction

Many years ago, central banking was a game of secrecy. The purpose of communication was not to be transparent, but indeed to divert people's attention from your true reaction pattern. Today, most central banks, including the ECB, consider transparency crucial. The ECB publicly announces its monetary policy strategy and regularly communicates its assessment of economic developments. Norges Bank goes even further than this by publishing its own interest rate forecast.

If one asks the question: "What are the similarities and dissimilarities between the ECB and Norges Bank?", one should bear in mind what Alan Blinder and Charles Wyplosz said at the American Economic Association conference last year: "The appropriate volume and methods of central bank communication depend crucially on the nature of the monetary policy committee."¹ So what is useful and correct in Oslo may not be the best solution in Frankfurt. The MPCs are set up in different ways. There is not necessarily "one fit for all". I shall therefore explain what we do in Oslo in terms of communication and strategy and share with you our experiences so far. I will also comment on the ECB practices.

2. The forecast contingent on the central bank's own interest rate forecast

When our MPC² decided to move forward and publish a forecast of the central bank's interest rate path, the decision was based on several arguments. One was the well established theoretical argument that monetary policy mainly works through expectations. Monetary policy is only effective if the central bank is able to influence

interest rate expectations. Michael Woodford expressed this very clearly when he stated that monetary policy is the "management of expectations". "For not only do expectations about policy matter, but (...) very little else matters"³

The central bank has an almost "one-to-one" impact on the shortest money market rates. The shortest rates, however, are of limited importance. How can central banks influence interest rate expectations? When inflation targeting was in its infancy, inflation targeters typically started out by assuming a constant interest rate (CIR) in their inflation reports. If the inflation forecast was above target at the announced time horizon, it was assumed that the central bank would raise interest rates. By the same logic, it is also possible to communicate indirectly to the market by basing forecasts on implied future interest rates in the market (MIR). For a long time, however, academics have advocated that central banks should publish forecasts based on the optimal interest rate path (OIR). Norges Bank does that now. We did not, however, make this move in one giant step. We moved gradually.

The first step was taken in the beginning of 2003 when the MPC started to publish its monetary policy intentions for the next four months - the monetary policy strategy.

The strategy includes an announced interval for the policy rate over the following four months until the next *Inflation Report* is released, conditional on economic developments that are broadly in line with our projections. The interval might in some sense be interpreted as the Bank's four-month forecast interval for the interest rate. So in this sense, Norges Bank had already gained experience of publicised interest rate forecasts, but only for four-month periods.

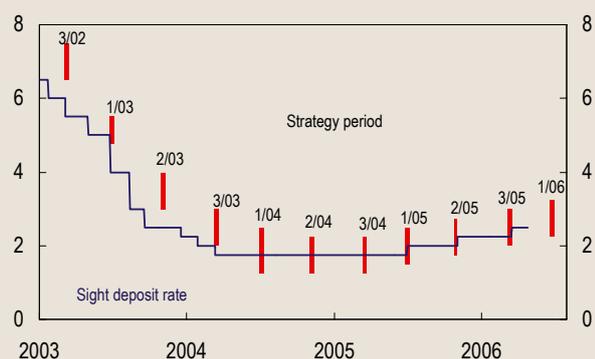
* The article is based on a presentation at the conference "The ECB and Its Watchers VIII" in Frankfurt on 5 May 2006. Please note that the abstract has been added to the web version of the article since the printed version was published.

¹ Blinder, Alan S. and Charles Wyplosz (2005): "Central Bank Talk: Committee Structure and Communication Policy", Paper presented at the session "Central Bank Communication" at the ASSA meetings, Philadelphia, January 9, 2005.

² At Norges Bank, the Executive Board functions as the MPC

³ Woodford, M., (2005, p. 3). "Central-Bank Communication and Policy Effectiveness". Paper presented at FRB Kansas City Symposium on "The Greenspan Era: Lessons for the Future," Jackson Hole, Wyoming, August 25-27, 2005.]

Chart 1. 4-month forecast intervals and outcome. Interval for the sight deposit rate at the end of each strategy period and actual developments. Per cent. 1 Jan 03 – 27 Apr 06



Source: Norges Bank

As shown in Chart 1, we have on a few occasions deviated from the announced strategy. Market agents have not criticised us for this. On the contrary, we have been praised for not being stubborn. When the facts change, we change our mind. So we do not think of an ex ante announcement as a strait-jacket.

As from last November, we have taken this process one step further and published our own forecast of the interest rate three years ahead, as shown in Chart 2. This means that the MPC has now in a sense “assumed ownership” of the interest rate in our projections. Even though explicit interest rate forecasts are rarely seen in central banks, we must keep in mind that investors and analysts have a long tradition of producing such forecasts.

Forecasts for inflation, output, the interest rate and other variables are based on an assessment of the current situation and a perception of how the economy works. There is substantial uncertainty associated with future interest rates, as illustrated in the fan charts. The chart on the left indicates our “conviction” and the chart on the right our “doubt”.

The move towards presenting forecasts based on our best judgment of future interest rates has been a learning process. While our forecasts were based on a constant interest rate (CIR) assumption in 2001 and 2002, our projections

were based on market interest rate expectations (MIR) in 2003 and up to November last year. On some occasions, we stated that it was our view that the interest rate would move on a different path than that indicated by market expectations

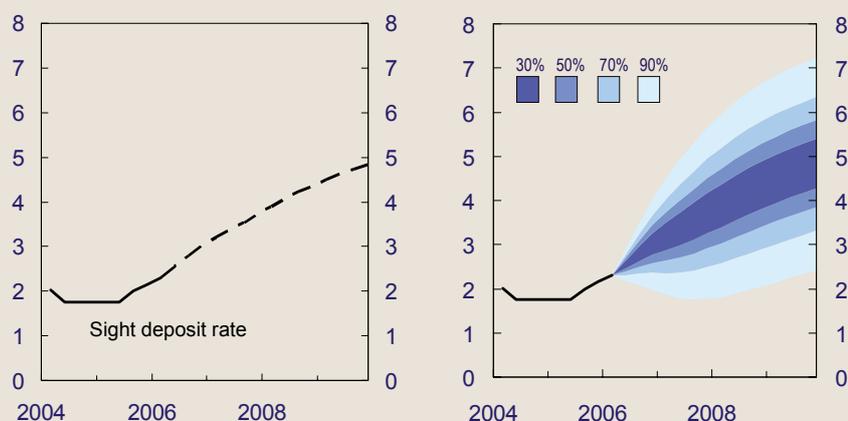
However, monetary policy is probably most effective when the central bank communicates its monetary policy intentions directly rather than commenting on others’ interest rate expectations. By publishing our own interest rate forecast (OIR), we give the public more information about our intentions, conditional on current views and knowledge. This should – we hope – make future interest rates more predictable and monetary policy more effective.

It is also easier to interpret and evaluate our forecasts on the basis of an interest rate assumption that we consider to be realistic.

Our MPC finds it useful to think within the framework of an interest rate path when they decide on the strategy and specific interest rate decisions. They have adopted the view that it is the interest rate path, and not just the current short-term rate, that matters. For the members of the MPC, transparency about how they reach their decision is a natural consequence of this view. One might say they follow the “Duisenberg principle”: “Transparency requires that our communication closely reflects our internal decision-making process.”⁴

So far, our experiences of publishing our own forecast of future interest rates have been good, and the move has been welcomed by market participants, academics and the media. We think we have managed to communicate that the projected interest rate path is an uncertain forecast, and not a promise. However, our interest rate forecasts in the last two inflation reports have been quite close to market interest rate expectations. An

Chart 2. The sight deposit rate in the baseline scenario in *Inflation Report* 1/06 and fan chart. Per cent. Quarterly figures. 04 Q1 – 09 Q4



Source: Norges Bank

⁴ Duisenberg, Wim (2001): “Letter of Dr. W. F. Duisenberg, President of the ECB to the Chairperson of the Committee on Economic and Monetary Affairs”, www.ecb.int.

exciting test of the effectiveness of our new communication strategy will be when our interest rate forecast deviates significantly from market expectations

3. Criteria for a good interest rate path

Princeton University Professor Lars Svensson suggested at this conference last year that the MPC of central banks should engage in an iteration process where the MPC shall “find an instrument-rate path such that projections of inflation and the output gap ‘look good’”. This can be seen as a “down-to-earth” approximation of a complex optimising problem. The MPC then needs criteria that define a “good interest rate path” – criteria to which the MPC can relate. Norges Bank is at present using six criteria of what constitutes a “good” interest rate path.⁵ I would like to add that establishing these criteria is an ongoing process, and should not be interpreted as “commandments” that are carved in stone.

The theoretical framework does not provide concrete or easily communicable guidance. Also, when a committee makes a decision, an agenda for the discussion is needed. Finding a good path means finding a solution to a problem which entails taking many considerations into account at the same time. It is, however, not possible for a committee to discuss everything at the same time. The proposed criteria can therefore be seen as an “ordre du jour” or agenda points for “main issues for discussion”. For external communication and transparency purposes, it is also an advantage that the criteria are easy to understand.

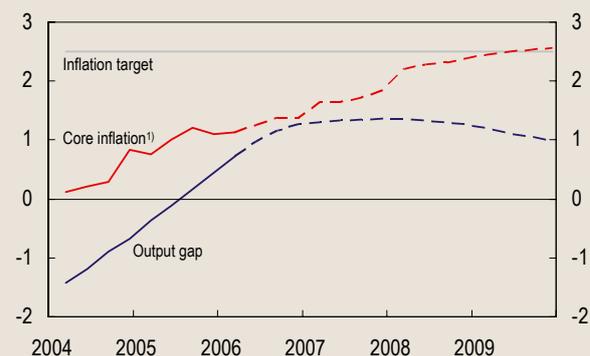
The six criteria are not on an equal footing. Criterion 1 is of primary importance. Monetary policy is all about giving the economy a nominal anchor. Shocks may have driven inflation away from target. If monetary policy is to anchor inflation expectations near the target, interest rate policy must be geared to moving inflation towards the target. Inflation should be stabilised close to the target within a reasonable time horizon, depending on the type of disturbances to which the economy is exposed.

Criteria 2 to 5 are of a more secondary nature and are only of interest if they underpin and support criterion 1, or at least do not weaken the prospects for price stability. Criterion 6 is of a different nature again, and will be discussed later in this speech.

Chart 3 shows our projections for inflation and the output gap in the previous *Inflation Report*. Provided long-term inflation expectations are on target, the inflation gap and the output gap should be in reasonable proportion to each other until they close. This is criterion 2.

What is meant by “reasonable” is partly a matter of preference, or the “lambda” in the loss function. But it

Chart 3. Inflation and output gap. Projected CPI-ATE¹⁾ and output gap in the baseline scenario in *Inflation Report 1/06*. Quarterly figures. Per cent. 04 Q1 – 09 Q4



¹⁾ CPI-ATE: CPI adjusted for tax changes and excluding energy products. A further adjustment is made for the estimated effect of reduced maximum day-care rates from January 2006
Sources: Statistics Norway and Norges Bank

also means that monetary policy should be *efficient* in the sense that it should not be possible to reduce both the inflation gap and the output gap within the policy horizon.

Striking a good balance between the inflation gap and the output gap will contribute to public support of the inflation targeting regime and thereby enhance the credibility of the nominal anchor.

But what if we are wrong on central assumptions? Criterion 3 states that interest rate developments should result in acceptable developments in inflation and output also under alternative, albeit not unrealistic, assumptions concerning the economic situation and the functioning of the economy. The strategy should ensure that we are able to bring the economy “back on track” without incurring excessive costs if we discover that we were wrong on central assumptions.

Criterion 4 is partly implied by criterion 3. When we are uncertain about the economic situation and the functioning of the economy, aggressive interest rate changes might often turn out to be harmful. Some caution may also be motivated by financial stability considerations. However, if the credibility of the nominal anchor is threatened, there could be a case for a more aggressive policy.

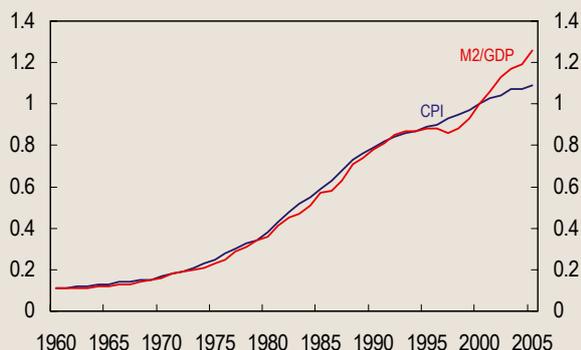
Interest rate policy must also be assessed in the light of developments in property prices and credit. This is criterion 5.

So how do we use these criteria to develop our interest rate forecast? The process can, somewhat simplified, be described as follows. First, model-based forecasts using judgment are drawn up, with various interest rate reaction functions that reflect different policy preferences. The six criteria are useful cross-checks to ensure that the forecasts are not completely “off track”. Then, the MPC discusses the alternative interest rate paths, and the six criteria serve as a broad “ordre du jour”

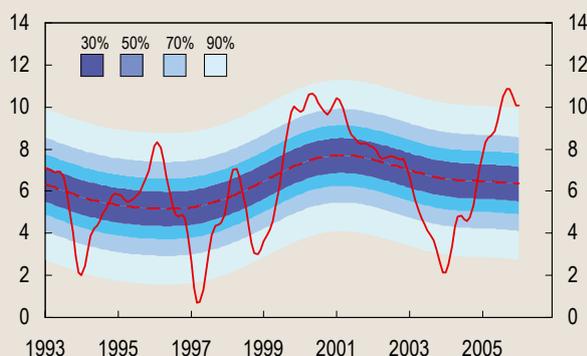
⁵ Qvigstad, J. F. “When does an interest rate path “look good”? Criteria for an appropriate future interest rate path”, *Norges Bank Working Paper 2006/5*

Chart 4 Cross-checks

4a. CPI and real scaled money supply (M2/GDP). GDP at constant prices. Index, 2000 = 1. Annual figures. 1960 – 2005



4b. Money supply (M2). 12-month growth, estimated trend growth and intervals. Per cent. Monthly figures. Jan 93 – Jan 06



to provide a basis for discussions. When the MPC has specified its judgment and policy preferences, new model-based forecasts are drawn up, where the MPC's judgments are taken into account. The process is therefore an iterative top-down bottom-up process. The criteria are only rough guides, and we do not commit to any particular rule for the interest rate setting. We only commit to an interest rate path that "looks good", on the basis of our understanding of the economy and the absence of any shocks.

Criterion 6 is about cross-checking. In the central bank world of inter-bank settlements, we are familiar with "yellow-light situations". Why simple cross-checking when our traditional methods are so sophisticated? Our analysis has a foundation in advanced economic theory and mathematical tools. Still, we must acknowledge how little we actually know. Athanasios Orphanides, who is also on this panel, will tell you all about the difficulty in measuring the output gap. Making an assessment of the true level of underlying inflation is also complicated.

It is therefore necessary to cross-check our interest rate setting by assessing our policy in the light of simple rules which are less dependent on a specific analytical

framework. On the other hand, the rules will not capture all the details in the projections, but can provide an indication of whether the proposed current interest rate path is reasonably adapted to the economic situation.

As we now publish our own interest rate forecast, market interest rate expectations are one cross-check of particular interest. If our own interest rate forecast deviates significantly from market expectations, it is important to understand the reason for the discrepancy. For example, if market participants have expectations about international developments that differ from our own, there may not be reason for concern. But if they have misunderstood our intentions or reaction function, we must do a better job in terms of communicating our strategy.

Last, but definitely not least, we have the monetary cross-check. In the long run, there is an undeniable relationship between the money supply and prices, as illustrated by Chart 4.

In an inflation targeting regime, there is a danger of devoting excessive attention to the business cycle frequency component of the inflation process, which dominates inflation developments within the target horizon of 1 – 3 years. However, we must not forget the low-frequency component of the inflation process, which goes beyond the normal target horizon. In order to secure a credible nominal anchor, it is essential to control the low-frequency movements of inflation. Chart 4 also shows actual and trend growth in the money supply in the period 1993–2005, and the historical variation around trend growth.

The ECB has provided an important way of thinking about and analysing long-run trends in the inflation process. We aim to further develop low-frequency analyses of the inflation process in Norway.

We must always bear in mind that it is not possible to fine-tune the interest rate to achieve the inflation target with a high degree of precision. Cross-checks are vital also within the framework of flexible inflation targeting. The cross-checks cannot provide guidance as to whether we should raise interest rates by 25 bp at a specific meeting or not. But they can perhaps help us to avoid some serious mistakes.

4. Concluding remarks

Transparency about the objectives and the reasoning behind monetary policy decisions has become the norm. There is, however, no unique "best" way to handle central bank communication. Institutional aspects and historical experience matter. In our setting, we find it useful to publish our own forecast of the interest rate path and make public the criteria the MPC applies when deriving this forecast.

Norges Bank's management of cash inventories

Knut Are Aastveit, economist in the Financial Markets Department, and Thomas Kjørstad, economist in the Chief Cashier's Department¹

In order to fulfil its obligations regarding the supply of notes and coins, Norges Bank needs to hold cash inventories. The level of inventories must be considered with regard to ordinary and extraordinary circumstances. In order to predict demand and reduce the uncertainty concerning inventory requirements, sound models that can enhance the understanding of changes in cash circulation are required. The explanatory variables for cash demand can be divided into three different groups: general macro-economic variables, variables that express the competition between cash and deposits, and variables that may provide insight into the illegal economy. A newly developed model for cash demand shows that demand for actual cash is dependent on real consumption at the point of sale, bank interest rates and a negative linear trend that captures developments in the payment system, in addition to the historical value of real cash. The model-based forecasts show that demand for cash will increase in the next quarters before decreasing towards the end of 2006 and further through 2007.

1 Introduction

According to the Norges Bank Act, Norges Bank is required to issue notes and coins (statutory responsibility for issuing notes and coins). Under the Norges Bank Act, Norges Bank is also responsible for ensuring that cash is available (statutory responsibility for supplying cash). Responsibility for issuing notes and coins and the banknote monopoly entails issuing notes and coins in the amounts implied by demand and ensuring that notes and coins are available to society (see Eklund, Solberg and Veggum, 2005). Norges Bank's goal is to fulfil these obligations in an economical, efficient and secure manner.

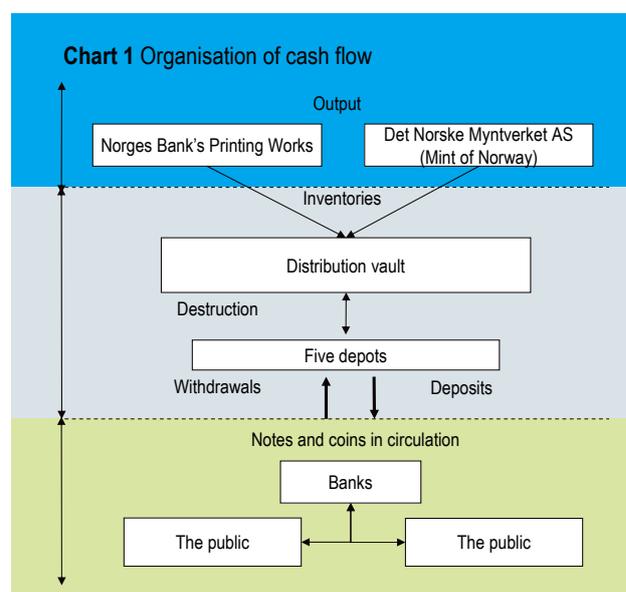
In 2001, Norges Bank outsourced most of the services associated with cash storage and the handling of deposits and withdrawals from the central bank depots. Norges Bank is still responsible for procurement of banknotes and coins, as well as storage and transport associated with the central bank depots. For this reason, analysing future cash needs is an important task.

Section 2 of the article gives a brief introduction to the organisation of cash holdings in Norway. Section 3 explains the necessity of holding inventories of banknotes and coins. Section 4 discusses factors that affect the circulation of cash and section 5 explains the structure of a model for cash demand. The use of the model is then demonstrated in section 6. Section 7 discusses the model's importance in logistical planning.

2 Organisation of cash supply

The physical flow of cash may be divided into three steps: production, storage and circulation (see Chart 1). Production of coins takes place at the Mint of Norway, while Norges Bank is responsible for the production of banknotes. During the course of 2007, the printing works in Norges Bank will be closed, and thereafter

production will take place externally. Storage is organised with a central cash distribution vault and five depots located around the country. The cash distribution vault is operated by Norges Bank, while Norsk Kontantservice AS (NOKAS) operates the depots on behalf of Norges Bank. The quantity of notes and coins in use in the community at any given time is often called the circulation of notes and coins, or cash circulation.² The cash circulation level changes when banks need cash and make withdrawals from Norges Bank, or when they have a surplus of cash and make deposits in Norges Bank. In this context banks operate to all intents and purposes as an intermediary between the public and Norges Bank. In practice, this means that it is the public's demand for notes and coins that determines the level of cash circulation.



¹ Thanks to Gunnvald Grønvik and Karsten Gerdrup for useful comments and suggestions. The analysis is based on Aastveit (2005). Especial thanks to Terje Skjerpen (Statistics Norway) for sound guidance. The analysis was performed using PcGive 10.1 (Hendry and Doornik 2001).

² The amount of notes and coins in circulation is defined as the sum of Norwegian notes and coins that is held by banks and money holding sectors (the public and financial enterprises other than banks and state lending institutions).

3 The need to hold cash inventories

One of Norges Bank's goals is to fulfil its statutory responsibility for supplying cash in as secure and cost-efficient a manner as possible. This means that Norges Bank must be able to meet banks' demand for cash, both under normal circumstances and under more extraordinary circumstances. Total inventories required must be assessed in the light of both of these circumstances.

Uncertainty regarding future demand for cash affects estimates of holding levels. It is therefore important to have a sound understanding of which factors affect demand for cash and how these may affect demand in the future.

3.1 Supply capability under normal circumstances

There are various reasons for the need to hold cash inventories. Demand is seasonal, and the purpose of the stock is to help meet these demand fluctuations. The inventories are also held to deal with various types of uncertainty, such as other variations in demand and transport delays or supply delays.

When determining the appropriate level of operating inventories under normal circumstances, two needs are assessed: transaction stock and buffer stock.

- *Transaction stocks* serve to cover normal requirements during the period between one delivery and the next from the producer. On the basis of estimated demand for cash and expected destruction, the transaction stock is determined by minimising the sum of order, transport and storage costs. A large proportion of the production costs for notes and coins are fixed, which means that unit costs are reduced when the volume increases. On the other hand, larger volumes increase the capital tied up in the storage of cash. Transport is often costly due to security requirements and long distances. It will therefore be cost-efficient to exploit certain capacities during transport. By minimising total costs, one can determine the optimal order volume and the resulting size of the transaction stock.
- *Buffer stocks* serve as a buffer against uncertainty, primarily uncertainty regarding demand for cash. Not all uncertainty can be eliminated. This is why it is necessary to decide how much uncertainty the Bank should attempt to cover. We refer to this as choice of supply capability, i.e. the probability of being able to meet demand for a denomination when the transaction stock approaches the level where it needs to be replenished and until a new order arrives. The size of the buffer stock required grows exponentially in step with the supply capability required. The higher the supply capability, the higher the buffer stock. This in turn will affect stock holding costs. The optimal supply capability may be difficult to determine, but is a

balance between increased costs and the consequences of stock depletion. The negative consequences of cash stock depletion are regarded as significant by Norges Bank. Consequently, the Bank aims to have a relatively high supply capability.

Inventory policy during normal circumstances can thus be expressed as the aim of minimising overall order, transport and storage costs in addition to setting targets for supply capability.

3.2 Emergency preparedness

The need to maintain emergency stocks in case of extraordinary circumstances is related to the public's cash requirements in such circumstances. Extraordinary circumstances are said to occur in the case of various forms of failure or disturbances in key public infrastructure, e.g. electronic payment systems. The size of the stocks that Norges Bank needs to hold in order to handle such situations is determined by what the Bank chooses to be prepared for and the degree of preparedness that is chosen.

3.3 Total cash inventories

Norges Bank's operating and emergency inventories may essentially be treated as two separate stocks. Norges Bank has nevertheless chosen to consider them as one due to the small probability of extraordinary circumstances occurring simultaneously with the depletion of the entire stock for ordinary circumstances. This reduces the overall stock requirements. The overall stocks are thus set as cash needs in ordinary circumstances plus a minimum stock that is intended to cover certain extraordinary circumstances.

By obtaining a sound understanding of the factors that influence the circulation of cash, the central bank will be able to reduce the uncertainty and thereby the levels of the overall stock.

3.4 Estimates

There are several methods for estimating demand for cash. Norges Bank has chosen to view future cash demand from both a micro and macro-perspective. From a micro-perspective, the demand for each denomination at each depot is considered. Short-term demand (one to twelve months) is estimated with the aid of historical seasonal variations and trends.

Estimates based on the macro-perspective cover the overall cash demand in the longer term (1–3 years). These estimates are used in the planning of order volumes from producers. In addition, the forecasting process provides an understanding of the mechanisms that affect cash demand. A model based on these assumptions is presented in sections 5 and 6.

4 What affects cash circulation?

When assessing demand for cash, it is appropriate to make use of economic theories concerning demand for money. These theories employ different definitions of the money supply, and various forms of deposits are included.³ Cash in circulation is a small portion of what is usually referred to as money. Cash competes with various forms of deposits⁴ in electronic transactions. The greater the liquidity of such deposits, the lower the demand for cash.⁵ Because cash may be used for anonymous payments on the spot, it is better suited than deposits in the illegal economy. The growth and size of the illegal economy may therefore affect demand for cash.

The explanatory variables for cash demand may therefore be divided into three different groups: general macroeconomic variables in money demand theory, variables that express the competition between cash and deposits and variables that may provide insight into the illegal economy. Each of these groups is discussed below.

4.1 Macroeconomic variables

Money and its function

Macroeconomic explanatory variables include variables from theoretical money demand models. The empirical literature has primarily focused on the demand for broad monetary aggregates.⁶ Broad monetary aggregates have proven to be relatively stable functions over time. In addition, there has proven to be a certain relationship between price trend and growth in broad monetary aggregates. Money demand measured by narrower concepts has a tendency to be more unstable over time and the relationship with price trend is weaker.⁷

Money is often assigned three functions: a medium of exchange in financial transactions, a unit of measurement for value and a store of value (e.g. McCallum (1989)). As we take a closer look at factors that determine demand for cash, we shall concentrate on money's function as a medium of exchange in financial transactions and as a store of value. The latter point is discussed in connection with the illegal economy.⁸

The transaction motive

Cash, as opposed to other financial assets, provides no interest or return. The public does however hold cash, partly because it simplifies transactions. It may be presented as a problem of optimisation to balance the expected gain in the transaction from holding an extra unit of cash against the cost in the form of lost interest. A model for calculating demand for cash should therefore include

both a variable that expresses the transaction gain and one that expresses the loss of interest due to holding cash.

The more payment transactions one wants to carry out, the more cash one wants to hold. There is a close correlation between the number of transactions and disposable income. However, in a modern, highly developed economy such as the Norwegian economy, there will be a number of types of transactions where cash is no longer a feasible means of payment. Cash will typically only be used as a means of payment in transactions that are carried out at the actual point of sale. Using disposable income as an indicator of the amount of the transaction will therefore express a broader range of transactions than is desirable. The transaction motive for holding cash is probably best expressed by using a narrow definition of consumption. We have therefore chosen to express the transaction motive with a variable that includes consumption at the point of sale (cf. Aastveit 2005).

When the public hold cash, they pay an alternative cost in the form of lost interest income. By placing money in interest-bearing financial instruments, one may earn interest income on them. This means that the higher the interest rate is, the higher the cost of holding cash will be. Since cash is mainly used for transactions with settlement at the point of sale, only money in transaction accounts may be viewed as a realistic alternative to the use of cash. Therefore, the alternative cost of holding cash is probably best expressed by a weighted average of the rate of interest offered by banks for deposits in transaction accounts.

4.2 Cash or card?

Developments in the payment system

In the past 10 to 20 years we have seen significant developments in the payment system. In particular, there has been a rapid increase in the use of electronic payment instruments, which has reduced the use of cash.

In empirical economic literature there have been attempts to use different explanatory variables to express this development. However, this has proved difficult due to short and somewhat inadequate data series. Another issue is that developments have taken place so quickly that it may be difficult to identify the effect of each of the new instruments. An example of this is that cheques were a common medium of exchange for much of the 1970s and 1980s, while their use has declined significantly since about 1990. This has led some writers, e.g. Fischer et al. (2004), to argue that technological developments in the payment system are best captured

³ In the money supply statistics published by Norges Bank, the public's liquidity (M2) is defined as the sum of cash, bank demand deposits, deposits and unused bank overdrafts and building loans. Cash comprises only slightly more than 4 per cent of this definition of money.

⁴ Deposits are defined as bank deposits in transaction accounts. Bank deposits in transaction accounts include deposits (in kroner or foreign currency) that may be immediately converted to notes and coins or used as a method of payment without incurring costs other than ordinary transaction and arrangement fees.

⁵ Liquid assets are defined as assets that can be either used directly or may easily be converted in order to make immediate transactions.

⁶ In theoretical models money is defined as a non interest-bearing means of payment. It is often appropriate to interpret the money supply in these models as the monetary aggregate M1. The reason for this is that in many countries the deposit rate on transaction accounts is very low (also historically) and thus nearly interest free. Alternatively, "interest rate" in most theoretical models can also be interpreted as the yield on bonds minus the interest rate on transaction accounts.

⁷ In Norway, narrow monetary aggregates have been more unstable in the short and medium term.

⁸ Money's function as a store of value will also be emphasised by including interest that represents the alternative cost of holding cash. From the perspective of increasing one's return, cash is poorly suited to be a store of value. However, cash may be well suited as a store of value for concealing income/wealth from the authorities. Unfortunately, there is little information about this.

by including a (negative) linear trend. By introducing such a trend, one can capture the effect of the payment system evolving in a direction where more technology-based transactions, and hence less cash, are used. It can therefore be said that a negative trend represents the effect of a gradual substitution away from cash.

It is still relevant to discuss some specific variables that may capture the effect of technological developments on cash demand.

The availability of cash and liquidity of cash deposits

An increase in the number of ATMs will initially lead to lower costs (in the form of time used) for making withdrawals and easier access to cash. According to Baumol (1952) and Tobin (1956), this should reduce the transaction-motivated demand for cash (i.e. cash holdings for transaction purposes). Theoretically, however, it is also conceivable that an increase in the number of ATMs may increase demand for cash because the availability of cash increases. Cash will thereby be easier to use and be a better alternative than other means of payment (see Drehmann and Goodhart (2000)). Theoretically, an increase in the number of ATMs will therefore have an indeterminate effect on cash demand.

The trend in the number of point-of-sale terminals is another variable that may express the effect of developments in the payment system. The more point-of-sale terminals, the easier it is to use payment cards for transactions at points of sale, which viewed in isolation has a negative effect on demand for cash. However, in 1992 the option to withdraw cash (“cashback”) when making purchases was introduced. Theoretically, cashback could have four effects on cash demand. Two of the effects are the same as the effects of an increase in the number of ATMs, i.e. an indeterminate effect. In addition, the introduction of cashback could lead to faster recirculation of cash among the public; in other words, the velocity of cash circulation increases. In isolation, this will have a negative effect on demand for cash from Norges Bank. Second, cashback is free for the account holder. It is therefore cheaper to use cash than other payment instruments. In isolation, this will have a positive effect on demand for cash. Thus, in isolation the introduction of cashback will have an indeterminate effect on demand for cash. The aggregate effect of an increased number of point-of-sale terminals on cash demand would therefore be purely negative until the introduction of cashback in 1992, while in the period following 1992 the effect would be uncertain.

The cost of transactions

When making a payment at a retail outlet (e.g. a grocery), there are in practice two means of payment: cash or payment card. If we choose the latter, a small fee will normally have to be paid to use the payment card.⁹ The size of this fee depends on the terms of the individual bank. According to ordinary market theory, it is reasonable

to assume that a fee for the use of alternative payment instruments promotes the use of cash. As an example of this, a high price on the use of cheques is probably the reason why cheques are currently very rarely used for point-of-sale transactions at present. We have therefore constructed a variable that indicates the fee for using various payment instruments (cf. Aastveit (2005)).

4.3 The illegal economy

Cash is unique in the sense that it may be used for anonymous point-of-sale transactions. Whereas the use of deposits in transaction accounts is registered, the use of cash cannot be traced. Neither the payer nor the receiver can be identified by information in the settlement. The properties of cash therefore make it difficult to gain an overview of how often and in what type of transactions it is used. This makes cash a suitable means of payment in the illegal economy. It has gradually become recognised that the illegal economy has a considerable effect on cash demand (cf. e.g. Dotsey (1988)).

There are mainly two different types of motives behind the use of cash in the illegal economy. It may therefore be appropriate to distinguish between them and their effect on demand for cash. First, it is well known that cash is the primary means of payment in criminal circles. We have very little information regarding the amount and prevalence of crime. It is also difficult to find suitable variables that detect the effect of this type of illegal economy on cash demand.

A second motive for using cash is the need to conceal income and thereby evade paying taxes and duties to the authorities. Here too, there is very little information on how widespread this type of illegal economy is. In an attempt to capture the effect of tax evasion on demand for cash, we have looked at various tax variables. Tax variables that have been tested are: the average tax rate for the household sector, the average tax rate for wage-earners, and tax (and pension contribution) as a percentage of gross domestic product (GDP). Tanzi (1982) and later Rogoff (1998) argue that these variables should have a positive effect on cash demand.¹⁰ They maintain that the higher marginal tax is, or the higher the percentage of tax (and pension contributions) as a share of gross domestic product, the greater the incentive will be for participants in the economy to attempt to evade tax by transferring part of their financial activity to the illegal economy. Since cash is the most common payment instrument in the illegal economy, this will probably lead to an increased demand for cash.

A theoretical motive for tax evasion that no one has attempted to model concerns the effect of inflation and tax on net worth. Low inflation and low bank interest rates combined with wealth tax may lead to a loss after taxes on bank deposits, while the profit on cash that is not declared for wealth taxation will be close to nil. An increase in real wealth taxation as a result of lower

⁹ It is worth noting that the user only pays such fees if debit cards are used. If credit cards are used, the shop pays the fee.

¹⁰ In Rogoff (1998) a theoretical model of demand for cash is also presented. Among other things, he argues here that a variable for marginal tax may capture the effect of this type of illegal economy.

inflation could thereby lead to an increase in tax evasion and increased demand for cash.

5 A cash demand model

We model cash demand deflated by prices (real cash).¹¹ One reason for this is that it is primarily real consumption of goods and services that is relevant to the public. A behavioural context for the public's adaptation should therefore relate the demand for real cash holdings to planned real transactions.¹²

We started modelling with a flexible, dynamic model that took into consideration the effects of households' consumption at retail outlets, banks' deposit rates, the number of ATMs, the number of point-of-sale terminals, the price of using alternative means of payment, various tax variables and lagged values of the cash itself. See Charts 2 to 7 for an illustration of the data series. In addition, we included a linear trend. This was included in an attempt to capture the aggregate effect on demand for cash of developments in the payment system. A large number of explanatory variables and combinations of variables have been tested, where quarterly data from the first quarter of 1980 up to and including the second quarter of 2004 have been used.¹³

The series for numbers of ATMs and numbers of point-of-sale terminals proved to be strongly correlated.¹⁴ In order to avoid multicollinearity problems, we chose to include only one of these variables at a time as an explanatory variable in the estimated equation. However, it turned out that none of them had a significant effect on demand for real cash.

Nor did the price of using alternative payment instruments have a significant effect on cash demand. One reason for this may be measurement errors associated with the variable, mainly due to a lack of data (cf. Aastveit (2005)).

A general problem with regard to the analysis and modelling of demand for cash has been the way in which the illegal economy should be treated. As mentioned, we have tried to include various tax variables in an attempt to detect the part of the illegal economy that is associated with tax evasion and its effect on demand for cash. However, it turns out that none of the variables are significant.

The preferred model that we are left with is specified in the appendix. The model is a so-called error-correction model for the logarithm of the demand for real cash.¹⁵ The model shows that demand for real cash

depends on real consumption at retail outlets, banks' deposit rates and a negative linear trend that is intended to capture developments in the payment system, in addition to lagged values of the cash itself.¹⁶ The expression in brackets measures the deviation from an estimated long-term relationship between real cash, real consumption at retail outlets and banks' deposit rates. The coefficient of -0.41 indicates that demand for real cash increases (decreases) by 0.41 per cent in quarter t if the demand for real cash is one per cent below (above) the estimated long-term relationship in quarter $t-1$ (all else being constant).

According to the model, demand for real cash will increase by 0.53 in the long-term if real consumption at retail outlets increases by one per cent and the other explanatory factors remain constant. The long-term effect on real cash of a change in interest rates is slightly weaker. According to the model, the demand for real cash will be reduced by 0.02 per cent in the long term if banks' deposit rate increases by one percentage point and the other explanatory factors remain constant.

6 Forecasts and use of the model

As mentioned, the purpose of a cash demand model is to underpin management of the purchase and storage of notes and coins. In order for Norges Bank to order cash in as efficient a way as possible in the future, we are dependent on accurate forecasts.

The model is based on quarterly data and will be periodically re-estimated when information from new quarters becomes available. New forecasts will then be made.

The model presented in the appendix is a single-equation model. This means that attempts to make forecasts with the aid of this model must be based on assumptions as to how the explanatory variables will develop. Ordinarily, Norges Bank will base its assumptions regarding private consumption at retail outlets and banks' deposit rates on the projections for private consumption and interest rates published in the *Inflation Report*.

Chart 9 shows the model-based forecasts for cash demand up to and including 2007.¹⁷ The projections were prepared using data up to and including the second quarter of 2004. The chart also shows actual developments in demand for cash in the period after the forecasts were made.

The chart shows that the model-based forecasts were accurate during the period from the third quarter of 2004 up to and including the third quarter of 2005. The only

11 The price variable that is used to deflate demand for cash is related to the variable consumption at retail outlets. The price variable is calculated as the ratio of consumption at retail outlets in current prices to consumption at retail outlets in fixed prices. This means that the individual price indices for each sub-component in the consumption term 'consumption at retail outlets' will be weighted by the percentage the respective sub-component constitutes of the total value of consumption at retail outlets.

12 Another reason that it is more appropriate to model demand for real cash is that the series for real cash is integrated of order 1. This means that the series for percentage changes in real cash is stationary. The series for nominal cash is neither integrated of order 0 nor integrated of order 1.

13 We have used a so-called "general-to-specific" approach as a basis for choice of model. See, for example, Hendry and Krolzig (2001) for a more detailed description of this method.

14 The variables had a correlation coefficient of 0.94.

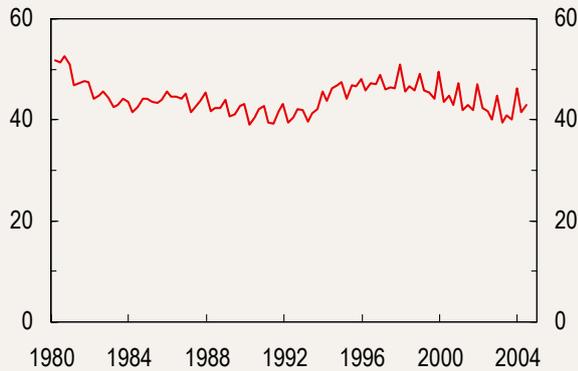
15 This type of model makes it very easy to interpret both short-term and long-term effects on demand for real cash of a change in one of the explanatory variables. For a more detailed discussion and interpretation of such a cash demand model, see Aastveit (2005).

16 Lagged values of cash itself are included in order to correct the model for autocorrelation. At the same time, such lags will to a certain degree capture any seasonal effects.

17 In order to make the forecasts more robust, a so-called constant adjustment has been added so that the model hits the mark exactly in the final observation. For a thorough explanation of constant adjustment, see Clements and Hendry (1998).

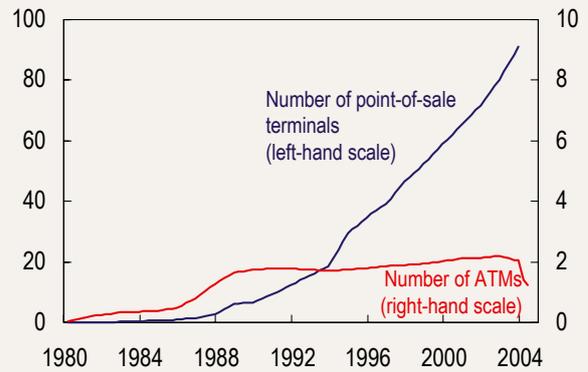
Chart 2-7 Illustration of data series

Chart 2 Actual cash. In billions of 2001 NOK



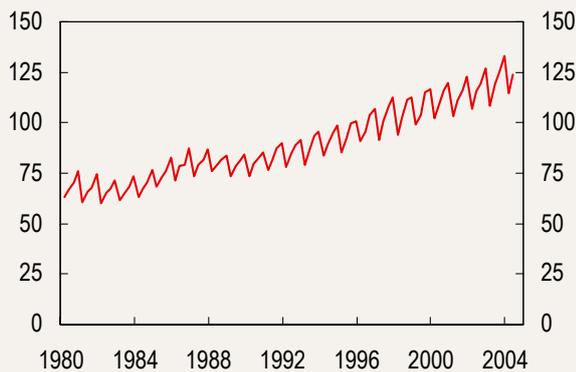
Source: Statistics Norway and Norges Bank

Chart 5 Number of ATMs and point-of-sale terminals. In 1000s



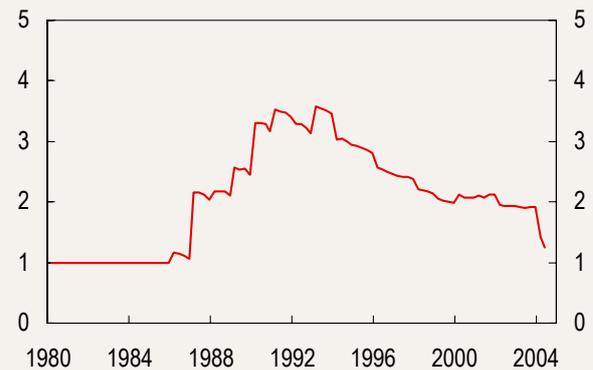
Source: Norges Bank

Chart 3 Real consumption at point of sale. In billions of 2001 NOK



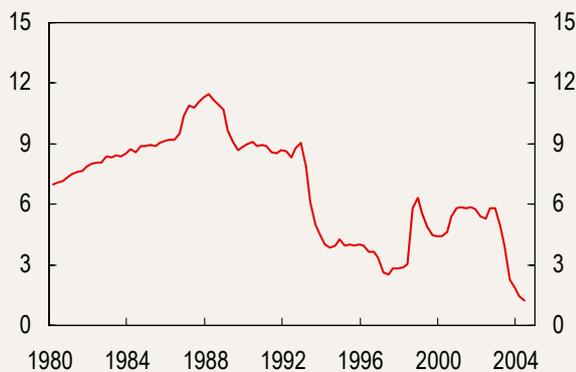
Sources: Statistics Norway and Norges Bank

Chart 6 Price for use of alternative payment instruments. NOK



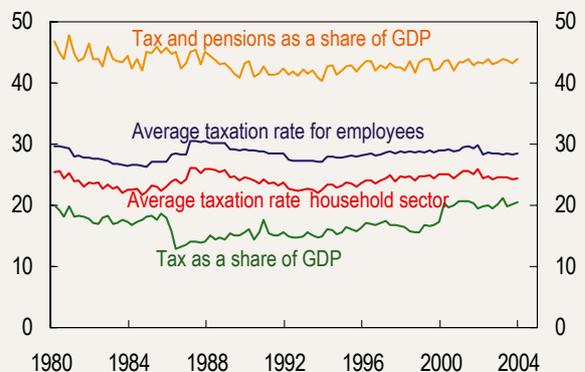
Source: Norges Bank

Chart 4 Banks' deposit rate. Percentage points



Source: Norges Bank

Chart 7 Average taxation rate and tax as a share of GDP
Percentage points

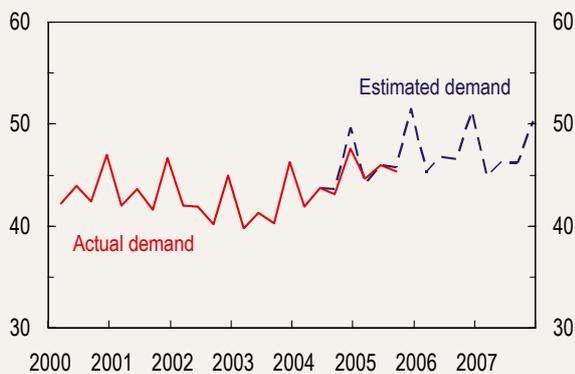


Source: Statistics Norway

exception is the fourth quarter of 2004, where the forecasts overshoot actual demand for cash by 4 per cent.

With regard to developments over the next two years, the model forecasts that demand for cash will increase during the next quarters before decreasing towards the end of 2006 and further through 2007.

Chart 9 Estimated (our model) demand for cash.
In billions of NOK



Source: Norges Bank

7 Conclusion

Increased focus on improving cash supply efficiency has resulted in the modernisation of inventory policies and the development of a cash demand model. The model only provides information concerning aggregate developments in cash circulation. Further work on the model will therefore include testing of how well it works with different denominations or groups of denominations, such as ATM notes or coins.

So far, we have little experience with the new policy and use of the model. However, we have gained greater knowledge about the logistics processes and an improved understanding of the factors that affect cash circulation.

In the future, the model will play a key role in long-term planning with regard to the procurement of notes and coins from external suppliers. In the case of actual orders, however, the model must be combined with micro-models, where the distribution among different regions and denominations is included.

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Appendix: A model of cash demand

$$\begin{aligned} \Delta cu_t = & 2.10 - 0.002 trend_t + 0.409 \Delta cu_{t-4} + 0.308 \Delta cu_{t-8} + 0.162 \Delta c_t - 0.012 \Delta i_t \\ & (3.14) \quad (4.37) \quad (5.35) \quad (3.80) \quad (3.39) \quad (3.03) \\ & - 0.410 [cu_{t-1} - 0.527 c_{t-1} + 0.022 i_{t-3}] - 0.044 D_{1991.2,t} + 0.047 D_{1993.4,t} + 0.053 D_{1997.4,t} \\ & (6.50) \quad (4.21) \quad (2.98) \quad (2.45) \quad (2.58) \quad (2.86) \\ & + 0.0468 D_{1999.4,t} + \varepsilon_t \\ & (2.53) \end{aligned}$$

$$\begin{aligned} R^2 = 0.92 \quad \sigma = 0.0173 \quad AR_{1-5}: F(5.71) = 0.84 \quad ARCH_{1-4}: F(4.68) = 0.95 \\ NORM: \chi^2(2) = 1.86 \quad HET: F(20.55) = 1.22 \quad RESET: F(1.75) = 2.43 \end{aligned}$$

Estimation period: 1980 Q1 – 2004 Q2.

Estimation method: Least square method

Absolute t-values are provided in brackets below the estimates. In the long-term context, long-term t-values are provided.¹ The equation fulfils requirements (diagnostic tests) that are relevant for a well specified model. It also passes (recursive) Chow tests for structural breaks at one per cent significance level during the last ten years. The explanatory variables (consumption at retail outlets and interest rate) have weak exogeneity with regard to all of the parameters in the structural equation for real cash.²

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

cu	= The logarithm for real cash. Source: Norges Bank, Statistics Norway (SN).
c	= The logarithm for real consumption at retail outlets. Source: SN.
i	= Weighted average of the banks' deposit rate for transaction accounts. Source: Norges Bank.
$D_{1991.2}$	= Dummy variable for 1991 Q1. Introduction of a new 500 krone note at the same time as Series V of the 1000-krone note is withdrawn from circulation. We assume that when the public turn in their old 1000-krone notes, many choose to deposit them in an account instead of exchanging them for new notes.
$D_{1993.4}$	= Dummy variable for 1993 Q4. 1993 and the first half of 1994 are an unstable period in the Norwegian economy. The model has problems with reproducing the trend in demand for cash during this period. We have therefore chosen to introduce this dummy variable.
$D_{1997.4}$	= Dummy variable for 1997 Q4, due to exceptionally large outstanding holdings of cash among the public at the year end.
$D_{1999.4}$	= Dummy variable for 1999 Q4 due to an exceptional demand for cash at the turn of the millennium.
ε	= Regression residuals (unexplained variation in the left-hand variable).
R^2	= The percentage of variation in the left-hand variable that is explained by the model
σ	= Standard deviation of regression residuals.
AR_{1-5}	= A test of 5th order autocorrelation in the residuals.
$ARCH_{1-4}$	= A test for 4th order ARCH residuals.
NORM	= A test for whether the residuals have a normal distribution.
HET	= A test for heteroscedasticity.
RESET	= A test of the model's functional form.

The expression in brackets measures deviation from an estimated long-term relationship between demand for real cash and real consumption at retail outlets and the banks' deposit rates.

¹ These are calculated using the same method as in Kmenta (1997, p. 486).

² Test for weak exogeneity has been performed as suggested by Boswijk and Urbain (1997).

Developments in household debt. An analysis of microdata for the period 1986-2003

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Household debt in Norway has increased substantially since the 1980s. This article uses microdata to describe developments in household debt, income and financial assets from 1986 to 2003. Our findings show that an increase in average debt, the number of households and the share of indebted households has contributed to the increase in debt since 1986. Most households have a moderate or low debt-to-income ratio. Debt among households with a high debt-to-income ratio was reduced as a percentage of total debt after the banking crisis in 1988-1992, but these developments have been reversed since 1998. This primarily reflects strong debt growth among young households. Our analysis shows that financial assets have primarily increased in households without debt or with a low debt-to-income ratio. The accumulation of financial wealth can therefore only to a limited extent be regarded as a buffer against increases in interest expenses.

1 Introduction

As in other countries, household debt in Norway has grown rapidly in the past few years and at a faster pace than household income.² This is related to developments in house prices.³ Debt growth has resulted in an increase in the household debt burden (debt as a percentage of disposable income), which now exceeds the level prevailing at the end of the 1980s. In the same period, however, household financial assets have increased substantially. From a macroeconomic perspective, Norwegian households' financial position is still strong. However, a macroeconomic approach is not always the best way of identifying financial vulnerability, primarily because it does not take differences between the various types of households into account. Even though the situation seems sound at the aggregated level, some groups of households may be particularly exposed to disturbances to the economy. Analyses of microdata for households are therefore a supplement to the macroeconomic analysis. Since the mid-1990s, Norges Bank has employed micro-level data from Statistics Norway's Income and Property Statistics for Households in its analyses of the household sector. Since Norges Bank now has direct access to the underlying data, more specialised analyses can be conducted. Using the micro-level data as a basis, this article examines developments in household debt, income and assets from 1986 to 2003. This period includes the liberalisation of the credit market in the 1980s and disturbances such as the banking crisis in 1988-1992. It will therefore be possible to observe whether and how the structural changes that have occurred have affected household debt.

This article is organised as follows: Section 2 provides a brief overview of the underlying data. Section 3 deals with the shares of indebted households, while Section 4 analyses the effects on debt of demographic conditions and other factors. Section 5 focuses on skews in the

distribution of household debt, income and assets. Debt and financial assets for groups of households, defined according to income, age and debt-to-income ratio, have been analysed to estimate each group's share of total debt and financial assets. Section 6 summarises our findings.

2 Underlying data

Income and property statistics for the period 1986-2003 provide information on households' average income, income composition and distribution, and similar information about financial assets. The statistics are mainly based on figures from the income and property distribution surveys, which are surveys of representative samples of households. Income and property information is based on tax returns for all members in the selected households in addition to information on tax-free income from a number of public registers.

Up to 1990, about 5000 households were included in the survey. The sample has been expanded since then. In 2003, which is the latest year for which figures are available, the sample comprises approximately 17 000 households. Because of the relatively low number of observations in the late 1980s, interpretation of the data in this period is more uncertain. Several definitions in the underlying data have been changed in the analysis period. The analysis in this article has been conducted using figures prepared by Statistics Norway to ensure that the time series are as consistent as possible throughout the period to 2003.

In the article, household debt is defined as total debt recorded in the tax return statistics. It includes both mortgage debt and non-mortgage debt. The term income refers to disposable income. It is calculated as income excluding tax and interest expenses, but including housing income. When ranking households by income, however, we use deciles for income after

¹ We would like to thank Bent Vale, Birger Vikøren, Karsten Gerdrup and Snorre Evjen for their valuable comments.

² See Chart 1 in the summary in Norges Bank (2005) and the ECB (2005a), p. 53

³ For the relationship between house prices and household debt, see Jacobsen and Naug (2004)

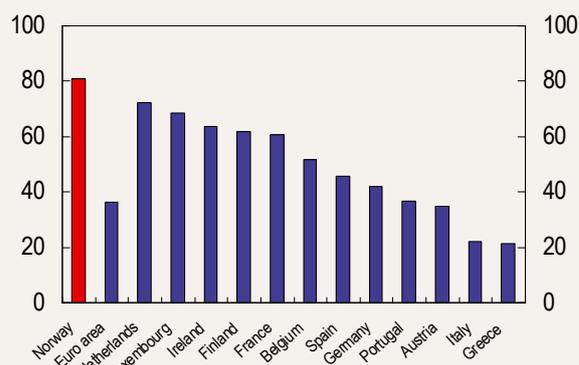
tax.⁴ In our calculation of the debt-to-income ratio (debt burden), households without income or with negative income are excluded. With zero income, the debt burden is not defined. In addition, some households may be recorded with negative income because of various tax deductions. This applies in particular to the self-employed. Since negative income has little relevance in our analysis, these households have been excluded from the data in some contexts. In the calculation of average debt by age, extreme observations (households with a debt burden of more than 20 000 per cent) have been removed. These households only account for a small share of households and total debt, but would have had a considerable impact on the average figures. Figures for financial assets are taken directly from tax return statistics. This does not include group insurance claims, however. For a complete definition of the concepts in the income and property statistics, see Statistics Norway (2004).

3 Share of indebted households

In macroeconomic analyses of the household debt situation, total household debt is usually assessed against total household income. However, this method overlooks differences between households with debt and households without debt, and may result in underestimation of financial institutions' credit risk⁵. Micro-level figures, on the other hand, enable us to distinguish between the two groups. According to the income and property statistics, 80 per cent of Norwegian households were indebted in 2003. This is a high percentage compared with other European countries. Chart 1 shows the share of mortgage-indebted households and the share with non-housing debt in a number of European countries.⁶ National figures, with the exception of figures for Norway, have not been adjusted for households with both mortgage debt and non-housing debt and are therefore overestimated to a certain extent. The high share of indebted households in Norway may be related to the high share of owner-occupiers⁷. The differences may also be attributable to differing levels of precision in statistical sources. The income and property survey in Norway obtains data on debt from tax statistics, while the European survey is based on interviews, where the possibility of checking information on debt is limited. In particular, under-reporting of debt other than mortgage debt may occur in surveys of this kind.⁸

The share of indebted households increases with income and is close to 95 per cent in the highest income deciles⁹ (see Chart 2). The share of indebted households

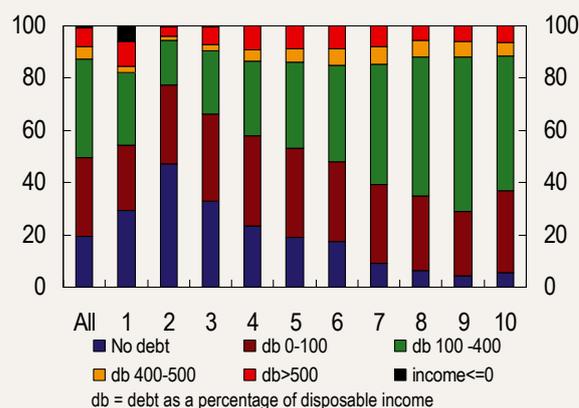
Chart 1 Indebted households as a percentage of total number of households in selected countries¹



¹ Figures for European countries for 2001 and for Norway for 2003. Figures for the various European countries have been calculated by totalling the share of households with mortgage loans and the share with other debt. The figures for the individual European countries have not been adjusted for share of households with both types of debt.

Sources: European Central Bank and Norges Bank

Chart 2 Households grouped according to debt burden (db) and after-tax income deciles. Per cent. 2003



Sources: Statistics Norway and Norges Bank

in the lower income deciles is nonetheless fairly high.

From a longer time perspective, the share of indebted households has increased somewhat since the end of the 1980s (see Chart 3). The increase is greatest in the low income deciles. In decile 1-3, there has been an increase of close to 25 percentage points, which is probably attributable to the liberalisation of the credit market in the 1980s and a change in attitudes to indebtedness. The low income groups were previously the most credit-rated groups. The removal of credit regulation has thus made credit available to larger population groups.

⁴ This is partly because Statistics Norway uses deciles for income after tax in its publications, and partly because deciles for income after tax have been used in previous Norges Bank analyses.

⁵ Financial institutions' credit risk is defined as the risk of loss due to the inability of a counterparty to meet its obligations, for example when a borrower does not pay interest and/or instalments (see Norges Bank (2005)).

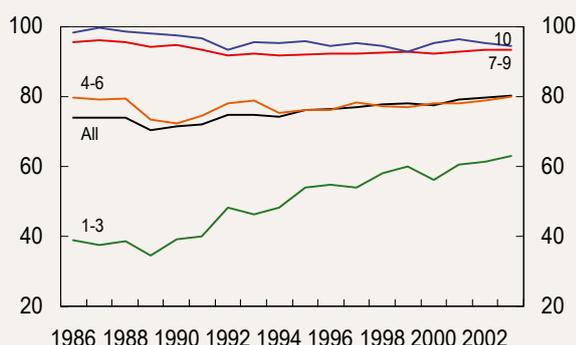
⁶ Figures for the EU are published by the ECB (2005b)

⁷ Statistics Norway estimates that about 80 per cent of Norwegian households are owner-occupiers (see article on housing construction on Statistics Norway's website www.ssb.no)*

⁸ For a similar discussion on UK data, see Redwood and Tudela (2004)

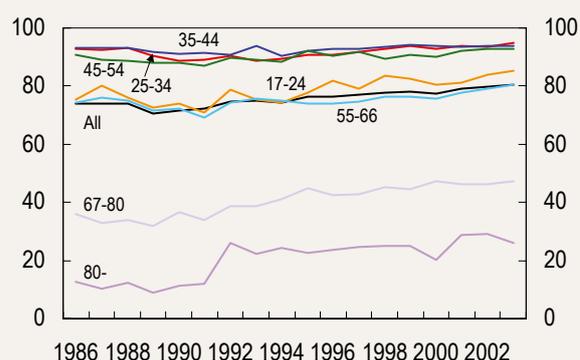
⁹ Deciles are estimated by ranking households according to an indicator and dividing them into ten groups of equal size. Each decile therefore comprises 10 per cent of households. In this case, all households, with or without debt, have been ranked according to income after tax and divided into ten groups. Income decile 1 comprises the ten per cent of households with the lowest income after tax. Reference will be made to these income deciles in the article.

Chart 3 Indebted households as a percentage of total number of households in the individual income group. Grouping by after-tax income deciles. 1986-2003



Sources: Statistics Norway and Norges Bank

Chart 4 Households with debt as a percentage of total number of households in the individual age group. 1986-2003



Sources: Statistics Norway and Norges Bank

In addition, more students are taking out student loans, and students are usually well represented in the low income deciles. The share of indebted households, on the other hand, has decreased somewhat in the higher income deciles (7-9 and 10). This may be because it was profitable for high-income households to have a high level of debt in the 1980s due to considerable tax deductions for debt interest. Changes in the tax system in 1992 reduced this advantage.

The share of indebted households also varies considerably across age groups¹⁰. It has become more common for households in older age groups, such as those over 66, to be indebted (see Chart 4). Growth in household debt has been strong since 2000. In this period, the share of indebted households has particularly increased in the youngest age groups (17-24) and in groups older than first-time homebuyers yet below retirement age (45-54 and 55-66). Higher debt frequency for the 17-24 age group is due to an increase in young people on student loans. For those between 45 and 66, the increase may be due to a behavioural change whereby it has become more common to raise new loans later in life. Because of the sharp rise in house prices in recent years, some households prefer to take out some of their housing wealth today. This has fuelled an increase in mortgage-secured loans. Recently, new loan products that facilitate mortgage equity withdrawal have become available from banks. In addition, the share of single-person households increased from 28 to 38 per cent from 1980 to 2001 according to Statistics Norway's figures. Higher house prices, combined with an increase in the number of single-person households, may also have induced borrowers to carry debt for longer than previously and later in the life cycle.

4 Demographics and other factors

Household debt is affected by demographics and other factors in addition to debt frequency. Total household

debt in a given year t , G_t , can be expressed as follows:

$$G_t = N_t \cdot \gamma_t \cdot g_t,$$

where N_t is the total number of households, γ_t is the share of indebted households and g_t is average debt for indebted households. Debt growth can be decomposed as follows:

$$\frac{G_{2003}}{G_{1986}} = \frac{N_{2003}}{N_{1986}} \cdot \frac{\gamma_{2003}}{\gamma_{1986}} \cdot \frac{g_{2003}}{g_{1986}}$$

The result of the decomposition is shown in Table 1. From 1986 to 2003, total debt expanded from NOK

Table 1 Decomposition of developments in total debt 1986-2003

Year	Total debt	Number of households	Debt frequency	Average debt
	G_t	N_t	γ_t	g_t
	Billions	1000	Per cent	NOK 1000
1986	372	1708	74.11	293.91
2003	1146	2137	80.39	666.95
2003/1986	3.08	1.25	1.08	2.271

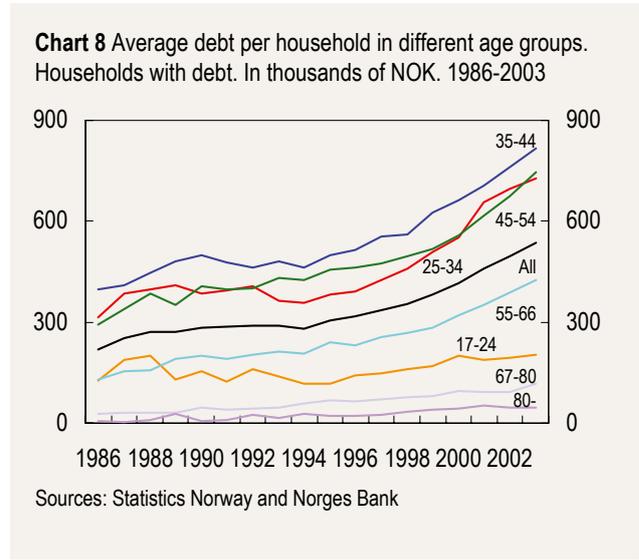
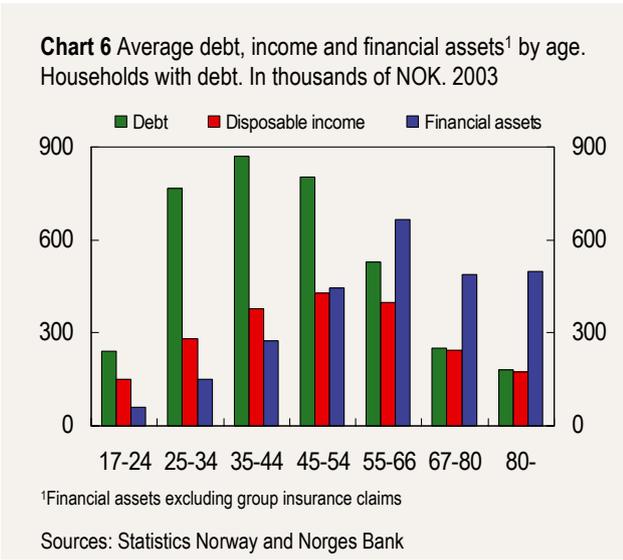
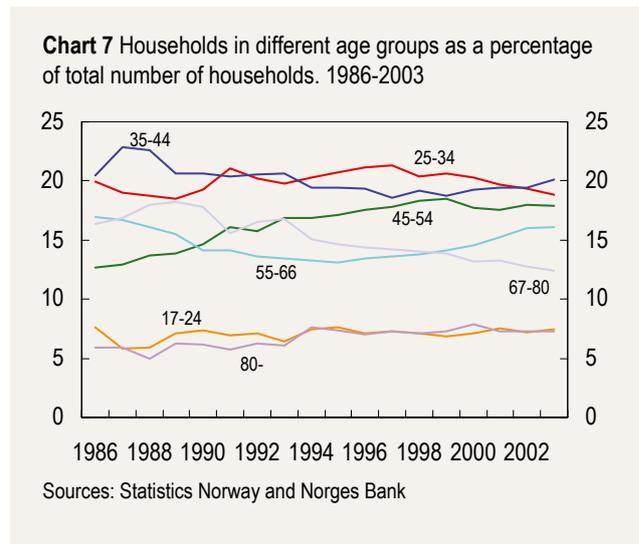
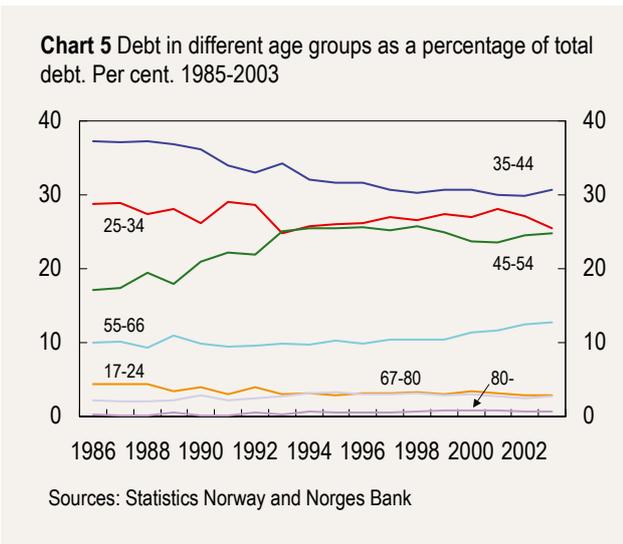
¹ General inflation in the period was 70 per cent.

Sources: Statistics Norway and Norges Bank

372 billion to NOK 1146 billion. In other words, the level of debt in 2003 was three times the level in 1986. The increase in average debt per household since 1986 has the largest effect. Average debt increased by 127 per cent. The increase in average debt partly reflects general inflation and higher house prices. The effect of the increase in the number of households is also relatively strong. From 1986 to 2003, the number of households increased from 1.7 to 2.1 million, i.e. by 25 per cent. The rise in debt frequency has a smaller, but positive effect.

The impact on total debt of the increase in the share of indebted households in some groups will depend on their average debt and the size of the groups. In spite of

¹⁰ Household age is defined as the age of the main earner, or, if the first criterion cannot be applied, the age of the oldest person in the household.



higher shares of indebted households in the age groups 17-24, 67-80 and over 80 and in the income decile 1-3, the debt of these groups is still low as a percentage of total debt (see Chart 5). The explanation lies in the low level of average debt in these age groups (see Chart 6).

Debt in the age group 45-54 has increased considerably as a percentage of total debt because of a sharp rise in the number of households in this group (see Chart 7). Average debt in this group is relatively high (see Chart 6) and has increased at the same pace as for all indebted households (see Chart 8). Although average debt in the age group 55-66 is lower than for young first-time homebuyers, it is still relatively high, and has increased more than average debt in the other age groups since 1986 (see Chart 8). In addition, the number of households in this age group has risen since 1995 (see Chart 7). All in all, this has contributed to an increase in debt in the age group 55-66 as a percentage of total debt.

As shown in Chart 7, there have been considerable changes in age composition in the period 1986-2003. These changes have influenced developments in total debt. The age groups with high average debt still

account for a large share of the population (25-34 and 35-44) or an increasing share (45-54). The age group with relatively high average debt (55-66) has expanded since 1995. In addition, the number of households raising loans has increased in two of these groups (45-54 and 55-66), as shown in Chart 4. Thus, a number of factors, including demographics, affect household debt: an increase in the number of households, a shift towards age groups with high average debt and a higher number of indebted households.

5 Distribution of household debt, income and assets

5.1 Household debt burden

The debt burden (debt as a percentage of disposable income) provides information about households' debt-servicing capacity. The debt burden, as calculated on the basis of macro-level figures, has increased sharply since 1999 and in 2005 exceeded the level prevailing in the late 1980s.¹¹ However, the indicator is based

¹¹ See Chart 2.12 in Norges Bank (2005)

on estimates of disposable income for all households, not only indebted households. The debt burden based on macro-level figures therefore does not provide an entirely accurate picture of household financial vulnerability. Micro-level figures make it possible to calculate the debt burden for each indebted household. It is then possible to see whether the increase in the debt burden is the result of a higher debt-to-income ratio than previously in each household, or whether the number of indebted households has increased.

A rule-of-thumb often used by banks is that households should not borrow more than three times their pre-tax income. If we use disposable income instead, this is equivalent to a debt burden in the interval 400-500 per cent, depending on the time period applied and tax percentage. For 2003, the limit can be interpreted as a debt burden of more than 400 per cent. The debt burden for most indebted households in 2003 was well below this limit (Chart 2). A relatively small share of households had a debt burden of more than 400 per cent. This share will vary not only with households' willingness to borrow, but also with the age structure of the population, income developments, house prices etc. In order to be able to compare the share of households with a high debt burden over time, we apply a stricter definition of the term high debt burden in the remainder of this article: a debt burden of more than 500 per cent. Chart 2 shows that seven per cent of households had a higher debt burden than 500 per cent in 2003. The share of households with a high debt burden is largest in the low- and middle-income groups (deciles 1-6). In isolation, this may indicate a high level of vulnerability to reduced income or higher interest expenses in these groups.

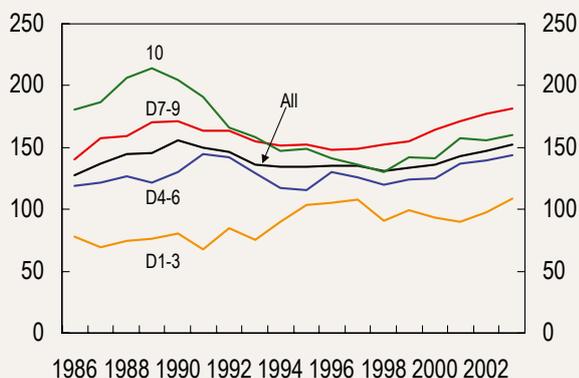
The median for the debt burden in different income groups among indebted households is shown in Chart 9. The debt burden for the median household shows a similar path to the macro figures, with a peak in the late 1980s and an increase since 1998. The debt burden

for those with the highest income (decile 10) has fallen considerably since the 1980s, probably as a result of changes in the tax system (see above). The households with the highest debt (decile 7-9 and decile 10) have the highest debt burden and have increased their debt burden most since 1998. For the high-income group (deciles 7-9), the debt burden has passed the peak reached in the late 1980s.

Since 2000, the average debt burden has increased in the age groups that have traditionally carried high debt (25-54) and relatively high debt (55-66). (See Chart 10.) The debt burden is highest in the younger age groups (25-34 and 35-44). This is because these households are first-time buyers. In the last few years up to 2002, the debt burden increased at a particularly rapid pace in the group 25-34, which comprises many first-time buyers. It is likely that house prices have contributed. The fact that it has become more common for households in higher age groups to incur debt is reflected in a higher debt burden for those over 55 than was usual in the 1980s.

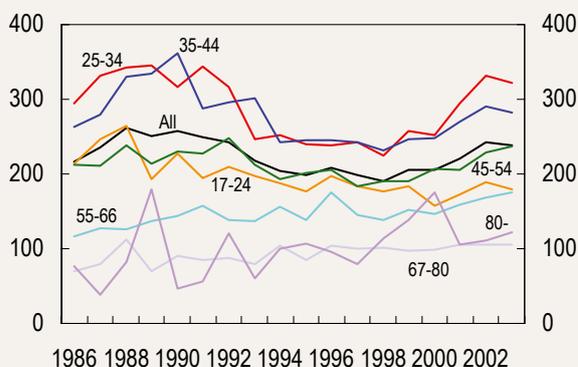
The planned introduction of tax on dividends has resulted in substantial payments of share dividends since 2000 (with the exception of 2001¹²). Dividend payments have boosted household income. Share dividends are concentrated on high-income households. Households in income decile 10 have since 1995 received over 90 per cent of total dividend payments. For indebted households in income decile 10, dividend payments increased from less than 4 to 10 per cent of disposable income from 1995 to 2003 (see Chart 11). A substantial share of the extraordinary dividend payments since 2000 have been reinvested in enterprises in the form of purchases of unlisted equities or lending from households to enterprises. To gain a more accurate picture of the household debt burden, household income should be stripped of reinvested extraordinary dividend payments. This has not been done here, however, because it is difficult to

Chart 9 Debt burden in different household groups, grouped by after-tax income deciles. Households with debt. Median. 1986-2003



Sources: Statistics Norway and Norges Bank

Chart 10 Debt burden by age. Indebted households¹. Average. 1986-2003

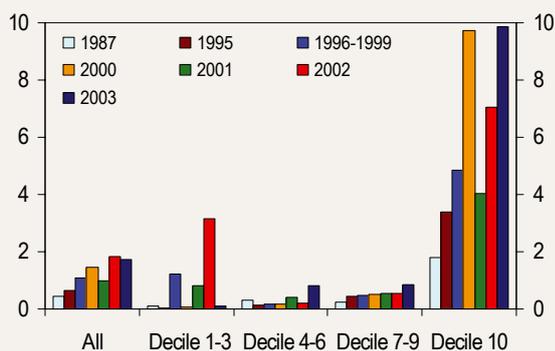


¹Households without income, with negative income and/or with a debt burden over 20 000 per cent are excluded

Sources: Statistics Norway and Norges Bank

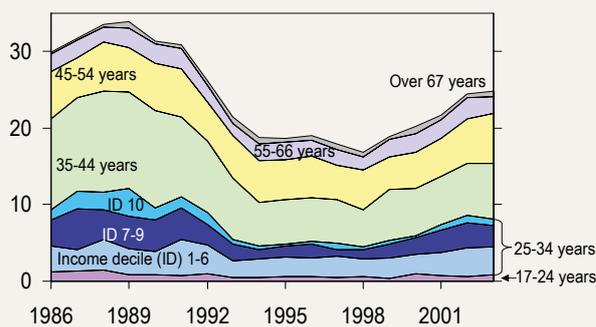
¹² Tax on dividends was introduced in September 2000, but was discontinued as from 2002. It was subsequently announced that a tax would be introduced on dividends received in 2006 (the 2005 accounting year).

Chart 11 Dividend payments as a percentage of disposable income. Indebted households, grouped by after-tax income deciles



Sources: Statistics Norway and Norges Bank

Chart 12 Debt as a percentage of total debt. Households with a debt burden of over 500 per cent, by age. In the group 25-34, also by after-tax income deciles. 1986-2003



Sources: Statistics Norway and Norges Bank

estimate how large a share of the dividend payments is motivated by enterprises' tax-related adjustments and therefore reinvested.¹³ Against the background of the increase in dividend payments to households in income deciles 4-10, the conclusion can be drawn that the debt burden in these groups (Chart 9) in the past few years has been underestimated to some extent.

5.2 Distribution of debt between different groups of households

Most of the debt is held by households with a debt burden lower than 500 per cent (see Table 2). The share of debt among households with a debt burden of over 500 per cent fell after the banking crisis in 1988-1992, which is favourable with regard to financial institutions' exposure to credit risk and hence to financial stabil-

ity. Developments have reversed since 1998, however, although the share of debt held by households with a debt burden of more than 500 per cent was still lower in 2003 than in the 1980s. The changes appear to have been driven by high-income groups (deciles 7-9), but the share of debt in middle-income households (deciles 1-6) has also increased and is substantial.

Since 1998, the share of households with a high debt burden (over 500 per cent) has increased, although it is still lower than in the 1980s. Households in the age group 25-34 account for most of the increase. Chart 12 shows debt for households with a debt burden of more than 500 per cent as a percentage of total debt in the sample as a whole. Households are grouped by age, and the age group 25-34 is in turn divided into income deciles. These households' share of total debt has increased since 1998 in most age groups, but the increase is greatest for those between 25 and 34, whose

Table 2 Debt as a percentage of total debt by debt burden and income¹. Income deciles for income after tax. 1986-2003

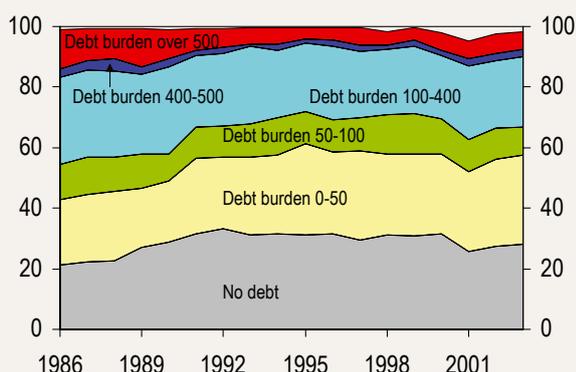
Debt burden	<400			400-500			>500			
	1-6	7-9	10	1-6	7-9	10	1-6	7-9	10	Sum db>500
1986	15.2	28.7	15.4	2.3	3.6	2.6	7.4	8.6	14.1	30.0
1987	14.5	28.2	14.7	2.2	3.9	2.9	7.5	10.4	13.9	31.8
1988	13.5	26.7	13.8	2.4	5.0	2.1	9.0	9.2	15.3	33.5
1989	12.1	27.0	15.4	1.8	4.0	2.5	8.3	11.2	14.5	34.0
1990	12.6	26.7	14.8	2.9	5.4	3.0	7.9	10.6	12.9	31.3
1991	13.9	27.3	16.5	2.3	4.7	2.2	9.0	10.2	11.7	30.8
1992	15.6	29.6	16.1	2.6	5.0	2.8	9.8	8.2	8.1	26.1
1993	17.6	32.9	18.5	2.5	3.6	2.2	8.3	6.5	6.6	21.4
1994	16.9	35.0	19.4	2.6	3.7	2.3	7.3	4.8	6.7	18.7
1995	17.1	35.0	19.7	3.2	3.1	1.3	8.6	5.2	4.8	18.6
1996	18.2	33.8	19.1	3.1	3.6	2.3	7.9	6.3	4.8	19.0
1997	18.8	34.7	18.8	3.1	3.6	1.9	7.6	5.1	5.3	17.9
1998	18.8	35.5	18.7	3.0	3.6	1.9	7.5	5.3	4.1	16.9
1999	18.4	34.3	17.9	3.1	4.3	2.3	8.1	5.2	5.6	18.9
2000	17.2	33.5	18.8	3.4	4.2	2.2	8.3	6.6	5.3	20.2
2001	16.5	31.4	17.8	3.4	5.0	2.5	8.8	7.7	5.2	21.6
2002	15.9	30.0	17.0	3.3	5.6	2.5	9.5	9.0	5.9	24.4
2003	15.3	29.9	16.8	3.5	5.6	2.5	10.2	8.3	6.3	24.8

¹ The shares do not add up to 100 because debt in zero-income households and in households with negative income has been removed.

Sources: Statistics Norway and Norges Bank

¹³ Norges Bank (2005), p. 19, uses estimates for reinvested extraordinary share dividends for the total household sector in order to assess developments in household balance sheets. These cannot, however, simply be transferred to the micro level.

Chart 13 Financial assets¹ as a percentage of total financial assets². Households grouped by debt burden. 1986-2003



¹Financial assets excluding group insurance claims

² The shares do not add up to 100 because debt in zero-income households and in households with negative income has been excluded

Sources: Statistics Norway and Norges Bank

share has almost doubled. The entry of these groups into the housing market in a period of sharply rising house prices is probably the main reason for the current developments. When selling a house and purchasing another, the other age groups benefit from the increase in the value of their home, which means that their debt rises somewhat less than for the youngest age groups.

We also see that in the age group 25-34, the high-income deciles (7-9) account for the largest increase. Even though the increase in debt has to a certain extent been driven by young people with high incomes, others have joined them in acquiring more debt. Young low and middle-income households have followed their lead. The fall in interest rates by more than 4 percentage point in 2003 has enabled households to service larger

debts than previously. At the same time, these households are more vulnerable to an interest rate increase or a reduction in income.

A substantial portion of total debt is held by low- and middle-income households (deciles 1-6, see Table 2), edging up since the 1980s to approximately 30 per cent in 2003. A characteristic trait of Norwegian households seems to be that debt is not restricted to high-income households. This is related to the high share of owner-occupier households. Analyses for European countries and the US find that mortgage debt is most common among high-income households.¹⁴ This contributes in isolation to moderating credit risk, since these households have good prospects of meeting their debt-servicing obligations. Comparisons across countries are difficult, however, because debt is categorised differently. Non-mortgage debt also appears to be more evenly spread among income groups in Europe and the US. However, it is not possible to distinguish between mortgage debt and other debt in Norwegian data.

So far, we have seen that debt burdens can be high not only for high-income households but also for low- and middle-income households. Whether a high debt burden is the result of a low income or high debt may have implications for financial institutions' exposure to credit risk. In Table 3, indebted households are ranked by size of debt and divided into 10 deciles. The 10 per cent of households with the highest debt (debt decile 10) account for over 40 per cent of total debt. As we see, all income deciles are represented in debt decile 10. This means that some low- or middle-income households hold debt that is very high in nominal kroner. Higher interest rates and hence increased interest expenses may dispose of a relatively large share of their income.

Table 3 Debt as a percentage of total debt by debt and income deciles. Income deciles for income after tax. 1986-2003

Debt decile	1-6				7-9				10			
	1-3	4-6	7-9	10	1-3	4-6	7-9	10	1-3	4-6	7-9	10
1986	2.0	3.9	3.7	0.5	2.2	13.0	22.5	6.5	1.0	4.4	14.8	25.5
1987	2.1	4.0	3.4	0.6	1.5	12.4	23.3	6.6	1.0	4.7	16.2	24.2
1988	2.2	3.9	3.5	0.6	1.9	13.0	22.8	6.6	0.9	4.6	14.9	25.2
1989	1.8	3.4	2.9	0.5	1.9	12.4	24.7	6.3	1.4	3.1	15.2	26.5
1990	2.1	3.5	3.2	0.5	2.1	12.6	23.9	6.7	1.9	2.9	15.7	25.0
1991	2.3	3.4	3.1	0.6	2.2	14.0	22.7	6.9	0.8	3.5	17.1	23.6
1992	3.0	4.0	3.2	0.7	2.7	14.2	23.9	6.0	1.2	4.1	16.5	20.6
1993	2.7	4.4	3.4	0.7	2.4	13.1	24.5	6.5	1.6	4.9	15.1	20.8
1994	2.8	3.9	3.1	0.6	3.0	12.8	24.0	6.9	1.8	3.9	16.4	20.8
1995	3.3	4.0	3.1	0.7	3.2	12.2	23.9	6.7	1.5	5.6	16.4	19.4
1996	3.4	4.2	3.3	0.8	3.4	13.1	22.9	6.7	1.8	4.2	17.5	18.8
1997	3.3	4.4	3.3	0.7	3.5	13.0	22.8	6.5	1.7	4.1	17.3	19.4
1998	3.6	4.3	3.2	0.7	3.4	12.8	23.5	6.7	1.8	4.3	17.7	18.1
1999	4.0	4.0	3.4	0.8	3.4	13.5	23.2	6.1	1.6	3.9	17.3	19.0
2000	3.3	4.1	3.2	0.7	3.1	13.5	23.5	6.5	1.6	3.7	17.7	19.1
2001	3.4	4.3	3.4	0.8	3.3	13.1	23.7	6.5	1.6	4.4	17.2	18.3
2002	3.7	4.1	3.3	0.7	3.2	13.6	23.6	6.5	1.8	3.6	17.7	18.3
2003	3.7	4.1	3.3	0.7	3.2	13.5	23.9	6.2	2.4	3.8	16.7	18.7

Sources: Statistics Norway and Norges Bank

¹⁴ European Central Bank (2005b) and Aizcorbe, Kennickell and Moore (2003)

5.3 Financial assets

Income is the first buffer if households' interest expenses rise. Financial assets are the next buffer. Macroeconomic figures show that households accumulate not only debt, but also financial assets.¹⁵ Naturally, debt and assets are unevenly distributed across households. Indebted households are not necessarily those with increasing financial assets. In order to examine this, microdata is required. The income and property statistics do not include group insurance claims, which are the largest single component of household financial assets and where the increase has been greatest over the past three years.¹⁶ Insurance claims are illiquid, however, and cannot be used if payment problems should arise. For this reason, the financial asset figures in the income and property statistics are suitable for determining household vulnerability in the event of an interest rate increase or a reduction in income.

Over half of financial assets in 2003 were held by households without debt or with a very low debt burden (below 50 per cent, see Chart 13). This type of household's share of total financial assets has increased considerably since the 1980s. Households with a high debt burden (over 500 per cent) have a very low share. The share of total financial assets held by the most vulnerable households has been halved since the 1980s. Microdata therefore indicate that financial assets have primarily been accumulated in households without debt or with a low debt burden, and that the increase in financial assets cannot to any great extent be regarded as a buffer against higher interest expenses or a reduction in income.

The rise in debt has its corollary in an increase in household housing wealth. Housing wealth is less liquid than financial wealth. If debt-servicing problems force large groups of households to sell their houses at the same time, house prices and housing wealth could decline. Housing wealth is a relatively volatile component of total household assets because of the possibility of changes in house prices. A complete analysis of household vulnerability should include both financial assets and housing wealth. The income and property statistics, however, only contain the value of a house as assessed for tax purposes, which is considerably below market value. The data are therefore not suitable for an analysis of households' financial position where housing wealth is included.

6 Conclusion

Household debt has risen considerably since the end of the 1980s. Empirical analyses show that debt growth is related to developments in house prices. Microdata for households show that the increase in debt reflects higher average debt per household, a larger number of households and a larger number of indebted households.

Most households have a moderate or low debt-to-income ratio. However, a limited number of households

have incurred a high level of risk by having a high debt burden (above 500 per cent). Households with a high debt burden held a smaller share of total debt in 2003 than in the late 1980s. The increase in debt in recent years for households with a high debt burden is related to strong debt growth among young households (25-34), who are often first-time home buyers. Among these, high-income households have probably contributed most, although low- and middle-income households have also contributed to the rise in debt.

Households' financial adjustment in the 1980s, in the years following the liberalisation of the credit market, was not sustainable. After the banking crisis in 1988-1992, debt among households with a high debt burden was reduced as a percentage of total debt. These developments have been reversed since 1998.

The accumulation of financial assets cannot to any great extent be regarded as a buffer against an increase in debt. Financial assets have increased primarily among households without debt or with a low debt burden.

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¹⁵ See Norges Bank's Financial Stability reports since 2003, section 2.2

¹⁶ See Norges Bank (2005), Chart 2.6

Statistics on foreign exchange transactions – new insight into foreign exchange markets

Erik Meyer and Janett Skjelvik, senior economists in Norges Bank's Statistics Department*

Norges Bank has published new statistics on the purchase and sale of NOK for foreign currency. The statistics provide information about activity in the market for NOK, and will be an important aid in monitoring and identifying mechanisms in the NOK market. The statistics on foreign exchange transactions show that the average daily turnover in NOK of reporting banks in the period October 2005 - January 2006 was over NOK 63 billion. Foreign banks dominate trading in the spot and swap markets, while non-financial enterprises are the largest operators in forward markets. NOK/EUR trading makes up the bulk of spot transactions, while NOK/USD trading dominates swap transactions. The currency distribution in forward transactions is more even.

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1 Introduction

1.1 Purpose and application

The statistics on foreign exchange transactions are based on daily transaction data on the purchase and sale of NOK for foreign exchange from the largest banks. The transactions are classified according to counterparty sector, type of contract (instrument) and maturity. The foreign exchange statistics strengthen the information used as a basis for monetary policy by relating activities in the foreign exchange market to developments in the krone exchange rate. The new statistics provide up-to-date information on the customer groups that have been active and what types of contract they have used. Through contact with market participants, Norges Bank will be able to identify the causes of the shifts captured by the statistics. In the future the underlying data will also contribute to research on exchange rate theory. In the surveillance of financial stability, statistics provide

a new source of information on turnover and maturity distribution in the currency hedging market for NOK.

Norges Bank's statistics on foreign exchange transactions have features in common with Sveriges Riksbank's system for collecting transaction data from the foreign exchange market. The Riksbank publishes its turnover statistics on a monthly basis, while the Norwegian statistics are published weekly.¹ Norges Bank's statistics have a more detailed breakdown into customer categories and contract types. Norges Bank has based its breakdown by customer and type of contract on the results of recent research on order flow analyses (see Section 1.2). We are not aware of other central banks that collect microdata from the foreign exchange market with the same frequency and degree of detail.

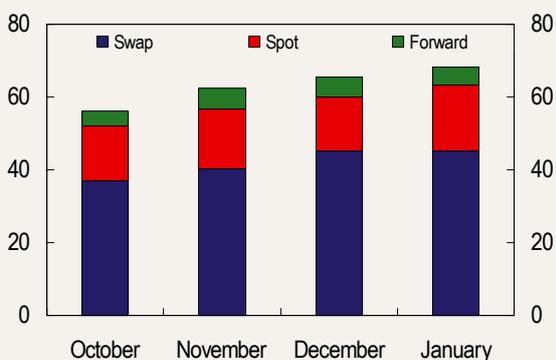
The collection of data for the new foreign exchange transaction statistics started in October 2005. The figures for the period to end-January 2006 show that the average daily turnover of NOK (volume) in the foreign exchange market was over NOK 63 billion for the reporting banks.

The highest turnover was in January 2006, when sales and purchases of NOK averaged NOK 68 billion per day. Swap transactions dominated trading, with a share of 66 per cent of turnover throughout the period October-January, while spot and forward transactions accounted for 26 per cent and 8 per cent respectively. Swap trading is characterised by large volumes, but relatively few trades. Swaps only accounted for 5 per cent of total transactions of all types of contracts. The shares for spot and forward contracts were 79 per cent and 16 per cent, respectively.

1.2 Theoretical and empirical background

The foreign exchange transaction statistics are based on an analytical model called order flow analysis. Order flows are defined as the difference between the value of

Chart 1 Average daily turnover of NOK in the foreign exchange market, by type of contract. October 2005 – January 2006. In billions of NOK

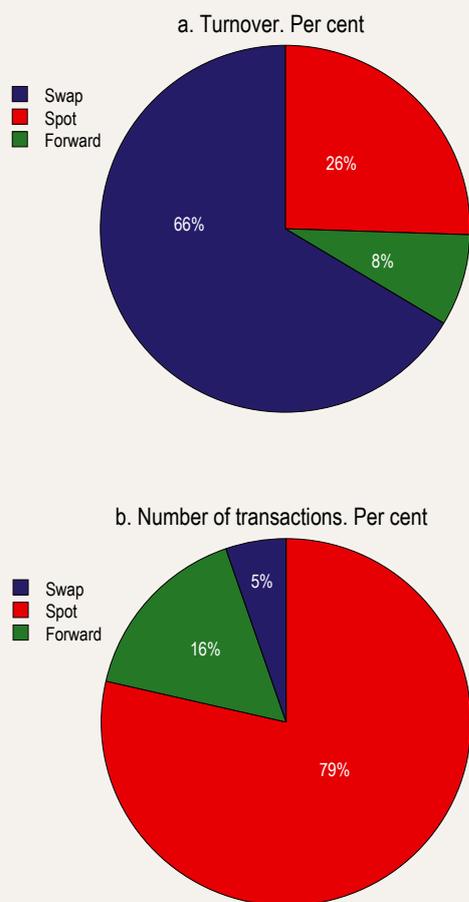


Source: Norges Bank

*With thanks to our colleagues at Norges Bank for their useful comments.

¹ See <http://www.norges-bank.no/front/statistikk/no/vhandel/> and the box on page 83.

Chart 2 Turnover of NOK and number of foreign exchange market transactions, by type of contract. October 2005 – January 2006. Percentage



buy and sell orders initiated by customers in a period, i.e. customers' net foreign exchange purchases. Order flow analysis has proved useful in explaining developments in a number of asset prices, including exchange rates.

Exchange rates can be influenced through two information channels – a direct channel and an indirect channel (Evans 2005). The direct channel consists of publicly available information. For example, information on developments in GDP, the CPI, credit or employment can provide unambiguous, simultaneous information to the market makers, and can influence the exchange rate immediately. In traditional macroeconomic models of the exchange rate, it is assumed that all market makers receive the same information simultaneously and have identical expectations of future economic developments.

The indirect channel functions through information that is not generally known (private information). Examples of private information are micro-level knowledge of earnings, buy and sell orders and internal financial analyses that lead to different expectations

with respect to exchange rate developments. Private information reaches the individual market-maker via customer order flows. The order flows provide signals about the direction and strength of any exchange rate adjustments. It can take time for exchange rates to reflect these signals: the information has to be interpreted, the signals have to be distinguished from noise and the information has to be disseminated to the market as a whole via interbank trading. The order flows and the trading process form an integral part of the determination and development of spot prices (Lyons 2001).²

Models that take account of order flows to explain exchange rate developments are often called micro-based models. Micro-based models make it possible for exchange rate effects to come through both the direct and the indirect channel. Love and Payne (2002) and Evans and Lyons (2003) find evidence that both channels play a part. In practice, models based on order flow analysis are often used in combination with fundamental and technical analyses. A number of empirical studies show that order flow analyses have good explanatory power in the short and medium term, in contrast to fundamental analyses. Evans and Lyons (2005) show that micro-based models also have better forecasting power than both standard macro-models and random walk models with a horizon of from 1 day to 1 month.

Order flow analyses based on daily transaction data have not previously been carried out for large parts of the Norwegian krone market. In general, customer trades are only observable for the individual bank, and a number of these have so far used their own data in order flow analyses. The information in foreign exchange transaction statistics obtained by grouping microdata from a number of banks may therefore make an important contribution to the development of order flow analyses in the future.

2 Description of the statistics

The foreign exchange statistics provide information about the reporting banks' purchase and sale of NOK for foreign exchange, the counterparties in the transactions and the types of contract used. The reporting banks are all the Nordic banks that set prices in NOK. A considerable part of the NOK trading of the reporting banks takes place abroad, through a head office or branches. This applies in particular to interbank trading, options trading and trading with large customers. In order to capture the total activity of the reporting banks, the rule is that all trading in NOK that takes place through the banking section of the conglomerate is reported, irrespective of where in the world the trading takes place.

It is difficult to quantify the total NOK turnover in the foreign exchange market. The Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity conducted by the Bank for International Settlements (BIS) measured daily turnover in April

² Here the causality direction is from order flow to exchange rate. In other contexts causality will go the other way, from exchange rate to order flows, for example trading based on technical analyses.

Definitions and classifications in statistics and classifications used in the article.

Contract type/instrument classification and maturity distribution:

(Indicates type of transaction and the duration of the contract from the time it is made to the expiry date.)

Spot: Agreement on purchase or sale of foreign exchange where the contract matures two banking days after the contract is made.

Forward: A forward contract is an agreement to buy or sell foreign exchange for future delivery either less than or more than two banking days after the contract is made. The amount, exchange rate and delivery date are agreed when the contract is made and cannot be changed during the contract period.

Maturities in the statistics:

- 0 to 1 day
- 3 days to 3 months
- 3 months to 6 months
- 6 months to 12 months
- 12 months to 2 years
- Over 2 years

Swap Agreement to buy/sell foreign exchange (the short leg) made simultaneously with an agreement to sell/buy back the foreign exchange (the long leg) at a predetermined future date at a rate that is fixed today. In order to avoid double counting, only the long leg is reported to the foreign exchange statistics. This is in line with the recording method used in the BIS Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity and the market standard.

Maturities in the statistics:

- 0 to 2 days
- 3 days to 3 months
- 3 months to 6 months
- 6 months to 12 months
- 12 months to 2 years
- Over 2 years

Options: Agreements that give the owner a right, but not an obligation, to buy (call option) or sell (put option) a particular quantity of an underlying object at a given price (the contract price) on or by a specified date.

Option classification in the statistics:

- Put – option to sell
- Call – option to buy
- Other – residual item

Counterparty classification:

(The reporting institution's counterparty in a contract)

Customer classification in the statistics:

- Other reporting banks
- Other foreign banks
- Other Norwegian banks
- Other Norwegian financial sector customers
- Oil companies
- Norwegian non-financial customers other than oil companies
- Other foreign financial sector customers
- Foreign non-financial customers
- Norges Bank (central bank of Norway)

Customer classification in the article:

- Financial customers: Norwegian banks other than the reporting banks, other Norwegian financial sector customers, other foreign financial sector customers and Norges Bank
- Non-financial customers: Norwegian non-financial customers excluding oil companies, foreign non-financial customers and oil companies
- Norwegian customers: Norwegian banks other than reporting banks, other Norwegian financial sector customers, Norwegian non-financial customers excl. oil companies, oil companies and Norges Bank
- Foreign customers: other foreign financial sector customers and foreign non-financial sector customers

Currency distribution:

- EUR/NOK – purchase/sale of euros for Norwegian kroner
- USD/NOK – purchase/sale of US dollars for Norwegian kroner
- OTHERS/NOK – purchase/sale of other currencies for Norwegian kroner

Excerpts from the foreign exchange statistics as they are published on Norges Bank's website

Tabell 1. Valutatransaksjoner. Spot og forward
Table 1. Foreign exchange transactions. Spot and forward

Millioner kroner/Million NOK

		2 006				
		Uke 7	Uke 8	Uke 9	Uke 10	
		13.02-19.02	20.02-26.02	27.02-05.03	06.03-12.03	
Netto valutakjøp		Net foreign exchange purchase				
Instrument	Spot	-624	4 878	7 236	6 325	
	Forward	3 377	-3 967	-2 683	-8 436	
	Totalt	2 753	911	4 554	-2 111	
Motpartinndeling med fokus på finansielle og utenlandske kunder <i>Counterparty category with focus on financial and non-financial clients</i>	Rapportørbanker	<i>Reporting banks</i>	-95	-441	367	346
	Utenlandske banker	<i>Foreign banks</i>	-4 497	4 117	7 354	3 324
	Finansielle kunder	<i>Financial clients</i>	1 596	-988	-458	-1 446
	Ikke-finansielle kunder	<i>Non-financial clients</i>	6 559	-1 012	-1 605	-3 185
	Norges Bank	<i>Central Bank of Norway</i>	-810	-765	-1 105	-1 150
	Totalt		2 753	911	4 554	-2 111
Motpartinndeling med fokus på norske og utenlandske kunder <i>Counterparty category with focus on Norwegian and foreign clients</i>	Rapportørbanker	<i>Reporting banks</i>	-95	-441	367	346
	Utenlandske banker	<i>Foreign banks</i>	-4 497	4 117	7 354	3 324
	Norske kunder	<i>Norwegian clients</i>	7 806	-884	-3 077	-4 756
	Utenlandske kunder	<i>Foreign clients</i>	350	-1 115	1 014	125
	Norges Bank	<i>Central Bank of Norway</i>	-810	-765	-1 105	-1 150
	Totalt		2 753	911	4 554	-2 111
Valutakjøp		Foreign exchange purchases				
Instrument	Spot	40 368	32 295	45 663	53 484	
	Forward	15 900	10 484	12 411	15 141	
	Totalt	56 268	42 780	58 074	68 626	
Motpartinndeling med fokus på finansielle og ikke-finansielle kunder <i>Counterparty category with focus on financial and non-financial clients</i>	Rapportørbanker	<i>Reporting banks</i>	6 648	5 535	7 580	10 858
	Utenlandske banker	<i>Foreign banks</i>	23 866	18 137	30 810	31 500
	Finansielle kunder	<i>Financial clients</i>	10 025	9 882	5 661	9 176
	Ikke-finansielle kunder	<i>Non-financial clients</i>	15 729	9 225	14 023	17 092
	Norges Bank	<i>Central Bank of Norway</i>				
	Totalt		56 268	42 780	58 074	68 626
Motpartinndeling med fokus på norske og utenlandske kunder <i>Counterparty category with focus on Norwegian and foreign clients</i>	Rapportørbanker	<i>Reporting banks</i>	6 648	5 535	7 580	10 858
	Utenlandske banker	<i>Foreign banks</i>	23 866	18 137	30 810	31 500
	Norske kunder	<i>Norwegian clients</i>	21 463	16 429	14 838	22 045
	Utenlandske kunder	<i>Foreign clients</i>	4 291	2 678	4 845	4 223
	Norges Bank	<i>Central Bank of Norway</i>				
	Totalt		56 268	42 780	58 074	68 626
Valutasalg		Foreign exchange sales				
Instrument	Spot	40 992	27 417	38 426	47 159	
	Forward	12 523	14 451	15 093	23 577	
	Totalt	53 515	41 868	53 520	70 737	
Motpartinndeling med fokus på finansielle og ikke-finansielle kunder <i>Counterparty category with focus on financial and non-financial clients</i>	Rapportørbanker	<i>Reporting banks</i>	6 743	5 976	7 213	10 512
	Utenlandske banker	<i>Foreign banks</i>	28 363	14 020	23 455	28 176
	Finansielle kunder	<i>Financial clients</i>	8 429	10 870	6 119	10 622
	Ikke-finansielle kunder	<i>Non-financial clients</i>	9 170	10 237	15 628	20 276
	Norges Bank	<i>Central Bank of Norway</i>	810	765	1 105	1 150
	Totalt		53 515	41 868	53 520	70 737
Motpartinndeling med fokus på norske og utenlandske kunder <i>Counterparty category with focus on Norwegian and foreign clients</i>	Rapportørbanker	<i>Reporting banks</i>	6 743	5 976	7 213	10 512
	Utenlandske banker	<i>Foreign banks</i>	28 363	14 020	23 455	28 176
	Norske kunder	<i>Norwegian clients</i>	13 657	17 314	17 915	26 800
	Utenlandske kunder	<i>Foreign clients</i>	3 942	3 793	3 831	4 098
	Norges Bank	<i>Central Bank of Norway</i>	810	765	1 105	1 150
	Totalt		53 515	41 868	53 520	70 737
Netto valutakjøp akkumulert		Net foreign exchange purchase accumulated				
Instrument	Spot	7 584	12 462	19 698	26 023	
	Forward	7 231	3 264	581	-7 855	
	Totalt	14 815	15 726	20 280	18 169	
Motpartinndeling med fokus på finansielle og ikke-finansielle kunder <i>Counterparty category with focus on financial and non-financial clients</i>	Rapportørbanker	<i>Reporting banks</i>	6 131	5 690	6 057	6 403
	Utenlandske banker	<i>Foreign banks</i>	4 623	8 740	16 094	19 418
	Finansielle kunder	<i>Financial clients</i>	4 570	3 582	3 124	1 678
	Ikke-finansielle kunder	<i>Non-financial clients</i>	36 693	35 681	34 076	30 891
	Norges Bank	<i>Central Bank of Norway</i>	-37 201	-37 966	-39 071	-40 221
	Totalt		14 815	15 726	20 280	18 169
Motpartinndeling med fokus på norske og utenlandske kunder <i>Counterparty category with focus on Norwegian and foreign clients</i>	Rapportørbanker	<i>Reporting banks</i>	6 131	5 690	6 057	6 403
	Utenlandske banker	<i>Foreign banks</i>	4 623	8 740	16 094	19 418
	Norske kunder	<i>Norwegian clients</i>	38 986	38 102	35 025	30 269
	Utenlandske kunder	<i>Foreign clients</i>	2 277	1 162	2 176	2 301
	Norges Bank	<i>Central Bank of Norway</i>	-37 201	-37 966	-39 071	-40 221
	Totalt		14 815	15 726	20 280	18 169
Antall handler		Number of transactions				
Instrument	Spot	13 655	13 549	16 124	14 216	
	Forward	3 135	2 013	4 051	2 732	
	Totalt	16 790	15 562	20 175	16 948	

2004 of NOK in the foreign exchange market at just over NOK 91 billion. The foreign exchange transaction statistics for the period October 2005 – January 2006 cover 69 per cent of this daily turnover. No adjustment is made here for double counting of figures due to the fact that the reporting banks trade with one another. The main reasons that the foreign exchange trade statistics do not have higher coverage are that the statistics only cover some foreign banks, and that not all reporting banks have complete consolidated reporting.

Individual transactions are not reported to Norges Bank. All trading in the course of a day is aggregated under the following classifications: buying and selling, currency, counterparty sectors and type of contract. Forwards and swaps are also divided up into six different maturity bands. For example, all spot NOK/EUR transactions that a reporting bank has with all foreign banks in the course of a day will be aggregated. In addition, the number of transactions is reported for each combination of these classifications. The number of transactions provides information about market liquidity and can explain volatility. Reporting takes place daily, by the end of the following business day at the latest.

The breakdown by customer provides us with a good basis for studying the behaviour of different categories of customer in the market. On the basis of order flow theory, emphasis is placed on the distinction between financial and non-financial customers. The transactions of these two customer groups may reflect different motives relating to the function of the enterprises. The transactions of non-financial enterprises are more strongly related to exports/imports of goods and services and fixed investment, while the transactions of financial enterprises are more strongly linked to financial investments.

Since Norway is a relatively small, open economy, it is also interesting to distinguish between Norwegian and foreign customers. Foreign customers have dominated the NOK market for a long time. Periods of different behaviour among domestic and foreign customers may reflect both asymmetric information and different expectations about economic developments.

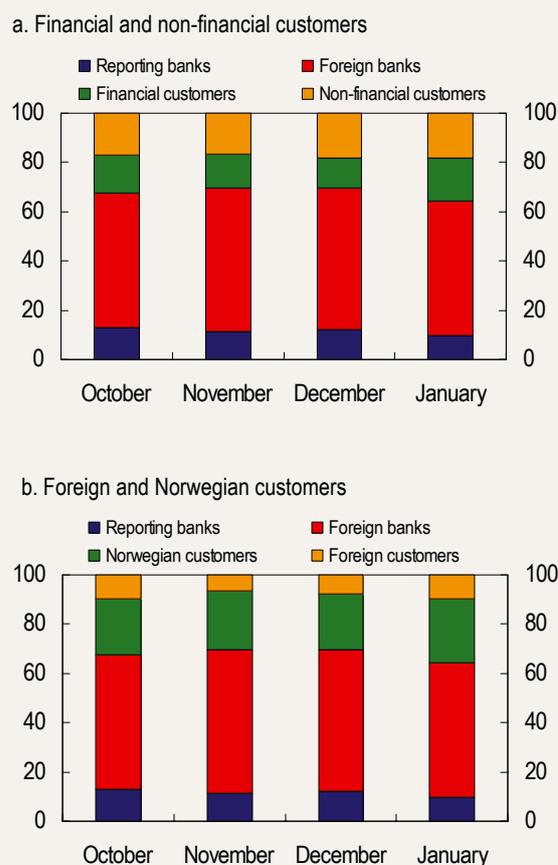
3 Use of the statistics

3.1 Market structure analysis

Customer groups

In order to provide a picture of the activity of different participants in the NOK market, in Chart 3 we show turnover distributed among the different customer groups in the statistics. In Chart 3a, the focus is on the distinction between financial and non-financial customers, whereas in Chart 3b it is on foreign and Norwegian customers. Both foreign banks and reporting banks are placed in separate customer groups, although these

Chart 3 Turnover of NOK in the foreign exchange market, by customer group¹. October 2005 – January 2006. Percentage



¹Reporting banks' turnover is not adjusted for double counting.

Source: Norges Bank

counterparty sectors can be regarded as financial customers. The charts show that transactions with foreign banks constitute the bulk of trading in NOK: foreign banks were counterparties in a full 56 per cent of transactions. Foreign financial customers probably dominate the transactions of the foreign banks, including different types of fund.

The trading of financial customers accounted for 15 per cent of turnover, while non-financial customers accounted for 18 per cent. Financial customers consist of Norwegian banks excluding the reporting banks, other Norwegian financial sector customers, foreign customers in the financial sector excluding banks, and Norges Bank. Non-financial customers comprise Norwegian and foreign non-financial customers and oil companies. The chart shows that Norwegian customers (incl. Norges Bank) have a larger share of turnover in relation to the reporting banks than foreign customers excluding foreign banks.

In the period October 2005 to January 2006, oil companies' purchase and sale of NOK accounted for 1.6 per cent of total turnover; NOK purchases alone accounted for 1.2 per cent. The explanation for this relatively

low share may be that the period falls between two oil tax payments. Oil taxes are payable on 1 October and 1 April each year. This means that the oil companies must buy NOK before these two due dates, but there is a growing tendency for them to spread their NOK purchases over the year. In isolation, the payment of oil taxes may contribute to a strengthening of the krone exchange rate, but the effect is counteracted by Norges Bank's purchases of foreign exchange for the Government Pension Fund – Global (former Petroleum Fund). Norges Bank's foreign exchange purchases amounted to just over 0.6 per cent of total turnover in the period, against the oil companies' net sales of 0.9 per cent of total turnover.

Contract type

It is important to distinguish between spots, forward and swaps, as they have different functions and are used to different degrees by the different customer groups. There may be many reasons for spot transactions, such as purchase of goods and services, investment in securities or pure speculation. Forwards are used extensively by non-financial enterprises to hedge against exchange rate movements for future payments

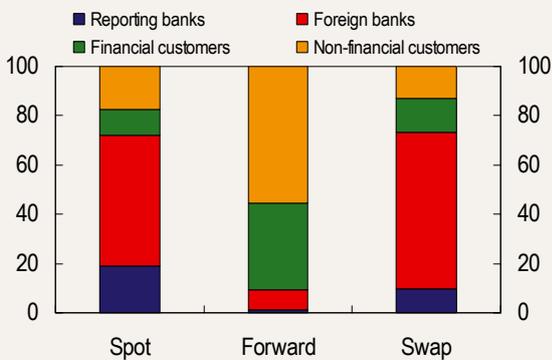
to/from other countries. Swaps are used most in the interbank market, and play an important part in liquidity management. Swap transactions have no direct effect on the krone exchange rate, but may affect it indirectly through liquidity effects. For swaps, only the “long leg” is reported, in line with the triennial BIS survey. Swaps are agreements to buy/sell foreign exchange made simultaneously with an agreement to sell/buy back the foreign exchange at a predetermined future date at a rate that is fixed today. The “long leg” is the re-sale (buy-back) of the foreign exchange.

Chart 4 shows turnover in NOK by type of contract and counterparty sector. Forward contracts are used most by non-financial customers. This category accounted for just 56 per cent of the turnover of forward contracts in the period. Non-financial customers' forward contract trading was the same size as their spot trading, at 26 per cent of this group's turnover. Swap turnover dominates the trading of all customer groups. The swap turnover of foreign banks accounted for 75 per cent of their total turnover, and 63 per cent of total swap turnover.

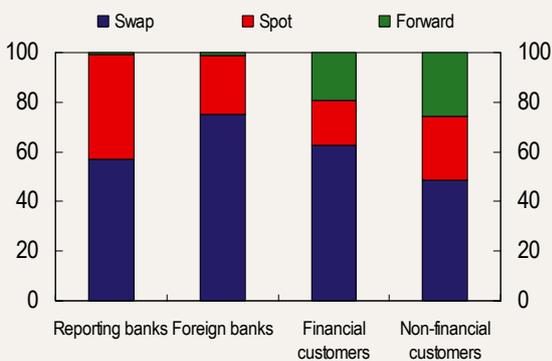
The reporting banks' option transactions with various customer groups are also reported to the foreign exchange trading statistics. Large option maturities can contribute to exchange rate movements. The Norwegian foreign exchange options market has grown rapidly in recent years, but is still relatively small and transparent. All data collected is therefore only used internally in Norges Bank at present.

Chart 4 Turnover of NOK in the foreign exchange market, by type of contract and by customer group. October 2005 – January 2006. Percentage

a. Type of contract by customer group



b. Customer group by type of contract

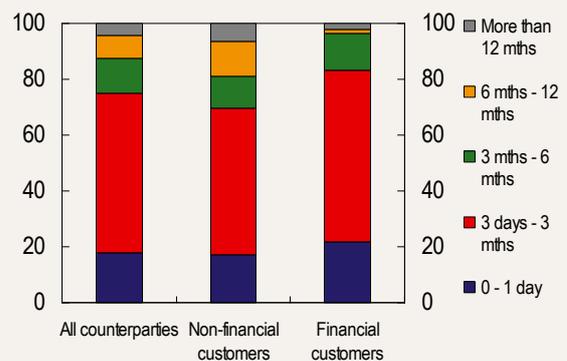


Source: Norges Bank

Maturity

The maturity distribution in the foreign exchange transaction statistics provides an overview of the hedging behaviour of customer groups. Chart 5 shows the distribution of maturities for forward contracts entered into in the period October 2005 – January 2006. Short maturities dominate the trading. Over 75 per cent of contracts had maturities of less than 3 months, while almost 88 per cent had maturities of less than 6 months.

Chart 5 Turnover of NOK in the forward market, by maturity. October 2005 – January 2006. Percentage



Source: Norges Bank

It is primarily non-financial customers that have entered into contracts with maturities of over six months. Over 19 per cent of the forward contracts of this group had maturities of over 6 months, and a third of these 19 per cent had maturities of over 12 months.

Currency pairs

In spot transactions, forwards and swaps viewed as a whole, USD is the currency for which NOK is traded most. Chart 6 shows that 63 per cent of the transactions in the period in question were for USD. The currency share varies across contract types. USD were only involved in 14 per cent of spot transactions, as opposed to no less than 84 per cent of swap transactions. In the spot market, trading of NOK for euro dominated with a share of 71 per cent. In the forward market, there is a more even distribution among USD, EUR and other currencies.

The differences in currency shares among the different types of contract reflects the use of the electronic trading system Reuters. Reuters quotes continuous two-way prices for EUR/ NOK in the spot market and for USD/NOK in the swap market.³ As a result, NOK is mainly traded for EUR in the spot market, while in the swap market it is mainly traded for USD.

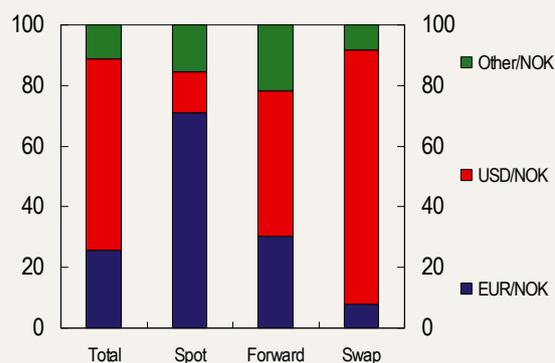
3.2 Order flow analyses

The results of a number of studies show that information from order flows makes an important contribution to explaining exchange rate developments (see Lyons (2001) and Rime (2001)). In the event of pressure to buy a currency, a market with private information will conclude that some customers have received positive signals about the value of the currency, and will want to adjust the price/exchange rate accordingly. It is trading with potentially better informed operators that causes market makers to adjust their expectations and prices.

The same surveys show that not all customer groups' orders contain the same amount of information. The price impact of financial customers' orders is considerably larger than the price impact of non-financial customers' orders. This may be because customer groups have different roles (Lyons 2001). Bjønnes et al. (2005) show that it is financial customers that drive exchange rate developments. Foreign exchange banks offer short-term liquidity, while non-financial customers are important suppliers of liquidity (clear the market) in the slightly longer term.

Chart 7 shows that there is a relatively high positive correlation between the order flows of financial customers and developments in the krone exchange rate. A possible explanation may be that a large portion of financial customers' transactions are associated with portfolio investments in other markets. The equity market is particularly important, with high volatility and wide price variations. The potential return is normally greater in

Chart 6 Turnover of NOK in the foreign exchange market, by currency pairs. October 2005 – January 2006. Percentage



Source: Norges Bank

Chart 7 Financial customers' net purchases of NOK (spot and forward) from reporting banks, and krone exchange rate developments. Daily figures over the period 3 October 2005 - 17 February 2006 In billions of NOK and as an index



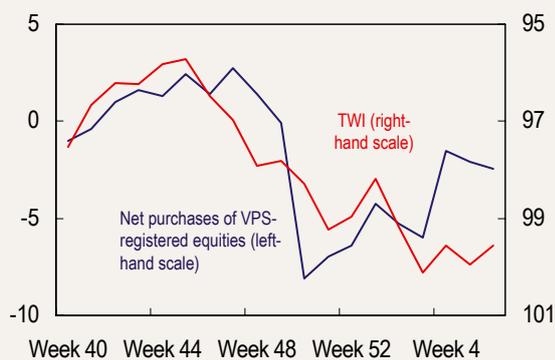
¹Financial customers include foreign banks and reporting banks

the equity market than in the foreign exchange market. It may therefore be more important to find the right time to enter the equity market than to wait for a favourable exchange rate. Financial customers may therefore be willing to buy foreign exchange at a high price, which will drive the exchange rate up, as investors in the equity market do not normally hedge their foreign exchange positions. Investors are uncertain in advance of when they will enter and exit the exchange rate market, and they may consider the exchange rate risk to be relatively small compared to the total risk (Bjønnes et al. 2005). Chart 8 shows that in the period from Week 40 2005 to Week 6 2006 there was a high correlation between foreigners' net purchases of VPS-registered equities and movements in the krone exchange rate.

Chart 3 shows that a considerable share of trading in the market takes place between reporting banks and foreign banks. This interbank trading reduces and distributes exchange rate risk. As a rule, banks are only intermediaries in the transactions and do not usually take large overnight positions (short-term suppliers of

³ Two-way prices means that prices are quoted for both purchase and sale of the currency.

Chart 8 Foreigners' net purchases of VPS-registered equities, and krone exchange rate developments. Weekly figures over the period 3 October 2005 -10 February 2006 In billions of NOK and as an index



Sources: Norwegian Central Securities Depository and Norges Bank

Chart 9 Non-financial customers¹ net purchases of NOK (spot and forward) from reporting banks, and krone exchange rate developments. Daily figures over the period 3 October 2005 - 17 February 2006 In billions of NOK and as an index



¹ Non-financial customers comprise Norwegian and foreign non-financial customers and oil companies

Source: Norges Bank

liquidity). If banks have outstanding positions after interbank transactions, they will try to transfer the position and the risk to their customers by compensating them with a risk premium. Suppose the bank has an uncovered currency position, and wants to buy foreign exchange and sell NOK. In order to "tempt" customers to buy NOK, the price must be reduced. The krone will depreciate, and the customer's order flow shows purchase of NOK. This may be an explanation for the negative correlation in Chart 9 between non-financial customers' order flows and the trade-weighted exchange rate index (TWI).

According to the order flow theory, the reason that non-financial customers are banks' counterparties to a greater extent than financial customers when they want to cover their positions is related to the customer groups' motives for trading. Non-financial customers will trade foreign exchange more as a result of trade in goods and services with foreign countries or because of

Chart 10 All customers' net purchases of NOK spot from reporting banks, and krone exchange rate developments. Daily figures over the period 3 October 2005 - 17 February 2006 In billions of NOK and as an index



Source: Norges Bank

direct investment abroad. In contrast to many other asset prices, prices for most commodities change slowly. The exchange rate will be of relatively greater importance to non-financial customers, and they will want to wait until the exchange rate is sufficiently attractive before they trade.

In addition to looking at the relationship between exchange rate movements and customer behaviour, it is also interesting to look at the impact of individual events on the statistics. These may be the publication of new information or of statistics that the market perceives as potentially important for developments in the exchange rate.⁴ Chart 10 shows customers' net spot purchases of NOK, the krone exchange rate and some dates for the publication of new information.

At Norges Bank's monetary policy meeting on 2 November it was decided to raise the key rate by 0.25 percentage point. Both the decision to raise the interest rate and the communication from Norges Bank were as expected by the market, and caused only a limited impact on the krone exchange rate and order flows. On 25 January 2006 it was decided at the monetary policy meeting to keep the key rate unchanged. This was in line with market expectations, but there were also expectations of a signal that the interest rate would be increased at the next monetary policy meeting on 16 March. These expectations were not fulfilled, and in the days following the monetary policy meeting on 25 January, the krone exchange rate weakened, and customer groups as a whole had net spot sales of NOK. Figures for retail turnover for October were published on 29 November 2005. Surprisingly weak retail trade figures led to large net sales of NOK and a weakening of the krone in the days following. The CPI published for December and January was in both cases lower than the market expected, and the krone depreciated. At the same time, the foreign exchange trade statistics showed net sales of NOK for all customer groups combined.

⁴ See the discussion of the direct channel in 1.2.

4 Summary

The use of banks' order flows in analytical work is a relatively new approach to explaining developments in exchange rates. Up to the present, order flow research has yielded promising results, and foreign exchange transaction statistics will contribute to further empirical research in this field. With the aid of daily data we will be able to study how individual events influence market participants, and in the event of changes in the krone exchange rate we will quickly see which customer groups have been most active. When we look at spot and forward transactions combined, we see a positive correlation between financial customers' net krone purchases and the TWI, while there is a negative correlation between non-financial customers' net krone purchases and the TWI.

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Evaluation of Norges Bank's projections for 2005

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In 2005, the rise in consumer prices adjusted for taxes and excluding energy products (CPI-ATE) was noticeably lower than projected in 2004. The deviation between the projections and actual developments is primarily ascribable to a stronger-than-expected exchange rate and lower-than-projected wage growth. After surprisingly low inflation at the beginning of the year, the projections published throughout 2005 were closely in line with actual price developments. Capacity utilisation in the Norwegian economy, as measured by the output gap, was somewhat lower than previously projected, but the deviation is small compared to the considerable degree of uncertainty surrounding this projection.

1 Introduction

This article evaluates the projections for economic developments in 2005 as presented in *Inflation Report 1/04* and subsequent reports. First, we look at developments in output and inflation through 2005. We then analyse in greater detail the deviations between the projections and actual developments. Finally, we compare our projections with those of other institutions, both for 2005 and over a somewhat longer time horizon.

The operational objective of monetary policy is low and stable inflation with an annual rise in consumer prices of close to 2.5 per cent over time. Norges Bank operates a flexible inflation-targeting regime so that weight is given to both variability in inflation and variability in output and employment. Monetary policy affects the economy with a lag and policy must therefore be forward-looking. Thus, projections for inflation and future economic development are an important basis for monetary policy decisions. Norges Bank continuously works to improve the basis for the projections. Analysing deviations between actual developments and projections is part of this work.

It is important to evaluate previous projections with a view to further developing analysis and projection work. This holds true whether the projections prove to be close to or far from the mark in retrospect. If the projections are not in line with actual developments, this does not necessarily mean the analysis underlying the forecasts was wrong. Conversely, a projection may be on the mark even though it is based on an analysis that proved to be of inferior quality.

When evaluating the projections, it may be useful to distinguish between the various causes of projection errors.

Uncertainty about the current situation

There is considerable uncertainty surrounding the actual state of the economy when projections are made. Such uncertainty is due in part to the fact that it takes some

time before statistics are published, and in part to the fact that statistics are often subject to considerable revision at a later date. Norges Bank's view of the current situation is summarised in the estimate of the output gap. The output gap is the difference between the economy's actual output level and the output level that is consistent with stable inflation over time. The output gap is thus an expression of inflationary pressures in the Norwegian economy. The output gap is not an observable variable, which implies that historic values must also be estimated. Our estimate of the output gap is based on technical calculations and our assessment of various indicators. The estimate of the output gap may change if national accounts figures are revised or if more information emerges and new methods are developed that provide a basis for reassessing potential output and capacity utilisation in the economy.

Random disturbances and errors in assumptions

The projections are based on several exogenous assumptions. If these assumptions develop differently than we had expected, this may lead to projection errors. Among the most important assumptions are developments in GDP growth, inflation and interest rate developments among our trading partners. The price of oil and developments in petroleum investment are other important assumptions in addition to the activity level in the central and local government sectors.

Up to *Inflation Report 3/05*, Norges Bank's projections were also based on technical assumptions regarding developments in interest rates and the krone exchange rate, based on developments in forward rates. In the first two *Inflation Reports* in 2005, forward rates were adjusted upwards somewhat towards the end of the projection period. Analyses indicated that long-term interest rates might be pushed down by temporary conditions and did not therefore reflect actual expectations concerning the future interest rate level.²

Since *Inflation Report 3/05*, Norges Bank has based

¹ Thanks to Anne Berit Christiansen and Kåre Hagelund for useful comments and suggestions. I would also like to thank other colleagues at Norges Bank.

its projections on the Bank's own forecast for developments in interest rates ahead. Consequently, the interest rate path can no longer be viewed as an independent projection but is instead the result of a simultaneous process with the projections for capacity utilisation and inflation. The interest rate path should provide a reasonable balance between the considerations Norges Bank is to emphasise in interest rate setting, and thus becomes both a reaction to and a basis for the other projections.

Random events can also affect the economic variables that we forecast. Such random disturbances will naturally be unexpected and therefore lead to projection errors. One example is the introduction of new VAT rates, which had some bearing on price developments in 2005. Another example is regulatory changes that probably led to a considerable drop in sickness absence through 2004, which increased the supply of labour.

The functioning of the economy

The projections are based on our understanding of the functioning of the economy, which is based on theory and empirical analyses of history. Structural changes in the economy's functioning can be difficult to capture and take into account before they occur. Moreover, even though we are aware of emerging structural changes, it can be difficult to assess their implications. Further, it is often difficult to determine the duration of various changes that arise. An example of this is the shift in trade towards low-cost countries which has led to a steady fall in prices for imported consumer goods in recent years. Initially, Norges Bank considered the shift in trade to be a transitory phenomenon affecting only certain groups of goods, but evidence suggests that this trend may persist for some time and affect a wider range of goods.

2 Inflation and output through 2005

The economic recovery that has marked the Norwegian economy since the beginning of 2003 continued in 2005. As estimated by Norges Bank, the output gap was probably positive at the beginning of 2006. Low interest rates, increased petroleum investment, strong international growth and an improvement in the terms of trade have been the main driving forces behind the upturn. Low interest rates contributed to high growth in private consumption and residential investment. Growth gradually became more broad-based, and in 2005 exports and mainland business investment expanded at a brisk pace.

Compared with previous upturns, however, it took longer for employment to pick up. A sharp drop in sickness absence throughout 2004 led to a relatively rapid increase in the number of person-hours worked (see Chart 1). Enterprises may thus have increased their supply of labour without having to hire new staff. The supply of additional resources as a result of lower sickness absence, combined with low wage and price inflation, is one of the main reasons why Norges Bank assumes that potential growth in the Norwegian economy was somewhat higher than normal in both 2004 and 2005. As a result, the economy has been able to grow at a faster pace without giving rise to bottlenecks and cost inflation. Towards the end of 2005, employment also picked up as a result of continued strong growth in output and demand.

While capacity utilisation in the economy recovered from the relatively moderate cyclical trough in 2003, inflation also picked up from its very low level in 2004 (see Chart 2). Consumer price inflation adjusted for taxes and excluding energy products (CPI-ATE) was 1.0 per cent in 2005. Through 2005, the decline in prices for imported consumer goods varied between -0.5 and -1.5 per cent. A higher rise in prices for domestically produced goods and services contributed to a sharper

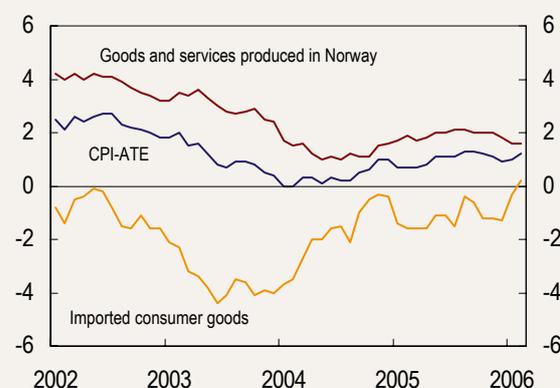
Chart 1 Employment and person-hours worked. Percentage deviation from trend¹⁾. 2000 Q1 – 2005 Q4



¹⁾ Trend calculated using HP filter. See Staff Memo 2005/2 (www.norges-bank.no) for further details.

Sources: Statistics Norway and Norges Bank

Chart 2 CPI-ATE¹⁾. Total and by supplier sector²⁾. 12-month change. Per cent. Jan 2002 - Feb 2006

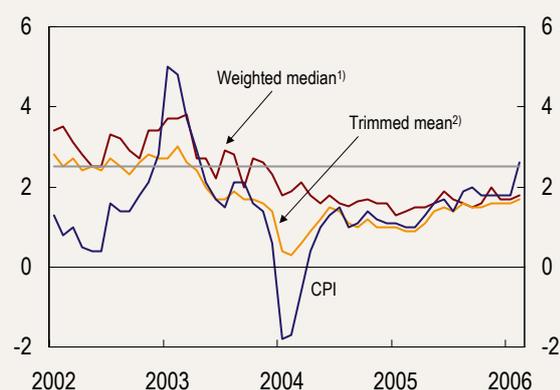


¹⁾ CPI-ATE: CPI adjusted for tax changes and excluding energy products. A further adjustment is made for the estimated effect of reduced maximum day-care rates from January 2006.

²⁾ Norges Bank's calculations.

² See box in *Inflation Report* 1/05.

Chart 3 CPI and indicators of underlying inflation. 12-month change. Per cent. Jan 2002 – Feb 2006



¹ Estimated on the basis of 146 sub-groups of the CPI.
² Price changes accounting for 20 per cent of the weighting base are eliminated.

Source: Statistics Norway

rise in consumer prices during the first six months. Towards the end of the year, however, both lower domestic inflation and an accelerating fall in prices for imported consumer goods pushed down CPI-ATE inflation. Other measures of underlying inflation showed somewhat stronger inflation than the CPI-ATE for 2005 as a whole (see Chart 3). The difference was, however, less pronounced than in the two previous years. Partly owing to increased VAT rates and high energy prices, CPI inflation has picked up.

3 Deviations between projections and actual developments

Table 1 shows central assumptions and projections for 2005 in the *Inflation Reports* published since autumn 2003. In the box entitled “Changes in the Projections” (pp. 101-102), a more detailed account is given of the

changes made to the projections in the various *Inflation Reports*.

The output gap

Estimates of the output gap in Norway in 2005 have not been substantially changed, in view of the considerable uncertainty surrounding this variable. Norges Bank’s current assessment is that the output gap was close to a normal level in 2005 as a whole, but positive towards the end of the year. Even though this is somewhat lower than projected in the *Inflation Reports*, the projections have been based throughout on the assumption that the output gap would gradually close and become positive in 2005.

The estimate for the output gap further ahead reflects a combination of three uncertain variables:

- Estimated current output gap or the current economic situation.
- Projected potential growth in the economy; i.e. how much output can rise without increasing pressures in the real economy
- Projected economic growth ahead

In the following section, we examine how these variables have influenced the assessment of capacity utilisation in 2005.

More idle resources in 2003 and 2004

Norges Bank uses a wide range of indicators to form a picture of the current economic situation. A correct assessment of the state of the economy at the time projections are prepared is essential to their quality.

The projections for 2005, made in 2003 and 2004, were based on a picture of the current situation in which idle capacity in the economy was relatively limited. In retrospect, the level of idle capacity seems to have been

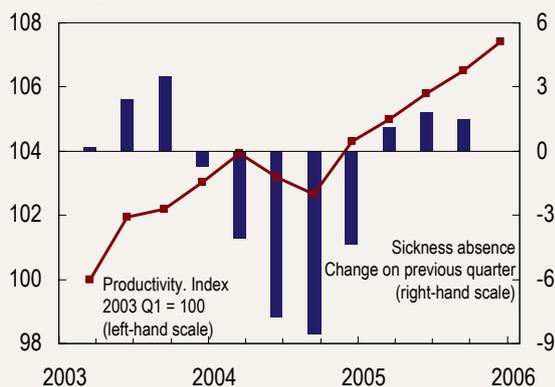
Table 1 Central assumptions and projections of some key macroeconomic variables for Norway’s economy in 2005, and actual developments. Percentage change from previous year unless otherwise specified.

	IR 3/03IR	IR 1/04	IR 2/04	IR 3/04	IR 1/05	IR 2/05	IR 3/05	
Interest rate ¹ (level, per cent)	4.2	2.6	3.2	2.3	2.3	2.2	2.2	2.2
Exchange rate I-44	96.1	99.0	95.2	93.3	93.3	92.0	91.8	91.9
GDP trading partners	2 ³ / ₄	2 ¹ / ₂	2 ¹ / ₂	2 ¹ / ₂	2 ¹ / ₄	2	2 ¹ / ₄	2.4
International prices	3 ³ / ₄	-1 ¹ / ₂	-1 ¹ / ₄	1 ¹ / ₄	-3 ³ / ₄	-1 ¹ / ₂	-1	-0.9
Brent Blend oil price	23.4	28.9	33.1	46.0	50.6	54.3	55.0	54.5
Petroleum investment	-5	3	5	15	25	25	20	15.7
Mainland GDP	2 ³ / ₄	3 ¹ / ₄	3	3 ¹ / ₂	4	3 ³ / ₄	3 ³ / ₄	3.7
Potential growth	2 ¹ / ₂	2 ¹ / ₂	2 ¹ / ₂	2 ¹ / ₂	2 ¹ / ₂	2 ¹ / ₂	2 ³ / ₄	2 ³ / ₄
Unemployment (LFS)	4 ¹ / ₂	4 ¹ / ₄	4	4	4	4 ¹ / ₄	4 ¹ / ₂	4.6
Annual wages	4 ³ / ₄	4 ³ / ₄	4 ¹ / ₂	4 ¹ / ₂	4	3 ¹ / ₂	3 ¹ / ₂	3 ¹ / ₄
CPI	2	2 ¹ / ₄	1 ³ / ₄	2 ¹ / ₄	1 ¹ / ₄	1 ¹ / ₄	1 ¹ / ₂	1.5
CPI-ATE	2 ¹ / ₄	2 ¹ / ₄	1 ¹ / ₂	1 ¹ / ₂	1	1	1	1.0
Output gap	1 ¹ / ₂	1 ¹ / ₄	1 ¹ / ₄	3 ³ / ₄	3 ³ / ₄	1 ¹ / ₂	1 ¹ / ₄	0

¹ Three-month money market rate.

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

Chart 4 Productivity and change in sickness absence. Seasonally adjusted. 2003 Q1 – 2005 Q4



Sources: Statistics Norway and Norges Bank

higher than we assumed at that time. The output gaps in 2003 and 2004 are now estimated at $-1\frac{1}{2}$ and -1 per cent, respectively, whereas at the beginning of 2004 we estimated them to be $-1\frac{1}{2}$ and $-1\frac{1}{4}$ per cent respectively. One of the reasons for the downward adjustment is that revised national accounts figures show that labour utilisation edged down somewhat more in the last downturn than provisional figures indicated. Other indicators also point to a higher level of idle capacity. This applies in particular to domestic inflation. Whereas output growth in 2004 was somewhat higher than projected in the last *Report* of 2003, domestic inflation was $1\frac{1}{4}$ percentage points lower.

Further into the upturn, employment growth also remained relatively low. An important reason may be the considerable decrease in sickness absence (see Chart 4). A persistent decline in sickness absence will lead to a sustained increase in available person-hours. Combined with efficiency measures, this probably contributed to fairly high economic growth without resulting in constraints on the supply of labour or productive capital. Potential growth in the Norwegian economy is now estimated to have been half a percentage point higher than normal in 2004.

Norges Bank continuously seeks to improve its analysis of the current situation. To this end, we make greater use of information from our regional network directly in our assessment of the output gap. One important advantage of the network is that the analysis is completed shortly after the responses have been received. The information from the network also gives us a different approach to measuring the output gap, in addition to the analysis of statistics, which involve a lag and are subsequently revised. On the other hand, it can be difficult to interpret information from the network, but we gain more experience as the time series become longer.

High potential growth in 2005

Norges Bank usually assumes that annual growth in potential output is $2\frac{1}{2}$ per cent. This means that if GDP growth is close to $2\frac{1}{2}$ per cent, the output gap will not change in relation to the previous year. Potential growth for 2005 was adjusted upwards to $2\frac{3}{4}$ percentage points in the last *Inflation Report* in 2005.

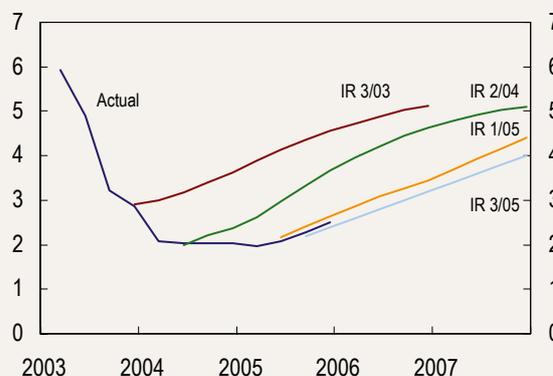
The reason for this adjustment is that increased labour migration from the new EU countries may have reduced pressures on the real economy in Norway. A substantial share of foreign workers accept short-term contracts in Norway without being employed in a Norwegian enterprise. In the statistics, this will appear as an increase in service imports. Increased service mobility may have contributed to curbing costs, even though demand growth has been high.

Both the reduction in sickness absence and the rise in inward labour migration are examples of how changes in legislation lead to structural changes in the economy. The impact of such structural changes is often difficult to estimate in advance.

Growth in 2005 slightly higher than initially projected

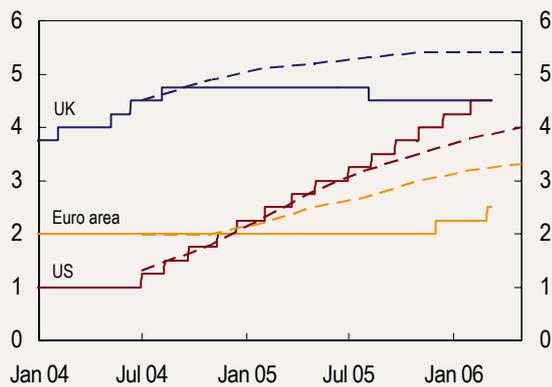
The downward revisions of past output gap estimates have, to some extent, been offset by higher growth in 2004 and 2005 than projected at the end of 2003 and the beginning of 2004. When growth in the Norwegian economy rapidly slowed towards the end of 2002, and the inflation outlook was adjusted downwards, the interest rate was lowered considerably. In spring 2004, the interest rate was reduced to 1.75 per cent, and at the same time, Norges Bank estimated GDP mainland growth at 3 per cent in 2005. This projection was based on the assumption that interest rates would rise in tandem with market expectations as implied by forward interest rates (see Chart 5). However, actual interest rates were lower than assumed, and this may have con-

Chart 5 3-month money market rate and interest rate assumptions in selected *Inflation Reports*. 2003 Q1 – 2007 Q4



Source: Norges Bank

Chart 6 Interest rate expectations. Actual and expected key rate¹⁾ at 24 June 04. 2 Jan 04 – 10 Mar 06



¹⁾ Broken lines show expectations in IR 2/04. Based on FRAs and futures contracts adjusted for the estimated difference between 3-month money market rates and the key rate.

Sources: Reuters and Norges Bank

tributed to somewhat higher-than-projected economic growth.

Another reason for higher-than-projected growth at the beginning of 2004 is that we at that time assumed that developments in petroleum investment would be relatively moderate. As from the last *Inflation Report* in 2004, however, it became clear that petroleum investment would also show strong growth in 2005. The upswing in petroleum investment has translated into increased imports, but it has also generated a considerable impetus to growth in the Norwegian economy.

Growth in petroleum investment may, in part, be attributed to substantially higher oil prices than assumed in the first *Inflation Reports* in 2004. High economic growth in many regions of the world and a sharp increase in China's oil imports led to high growth in demand and rising oil prices through 2004.

Overall, output and inflation among our trading partners have developed in line with projections in 2005.

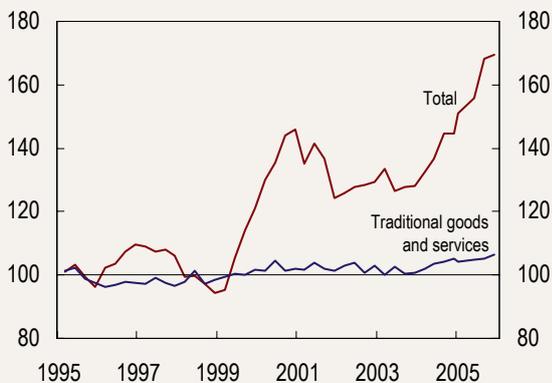
The rise in oil prices has so far had limited effects on inflation and global economic activity.³ This may be related to the fact that the increase in oil prices is largely the result of demand growth. Most previous oil price increases have been the result of reductions in supply. Moreover, industrial nations are less dependent on oil than previously. This is due to technological progress and the relatively larger share of services in GDP in these countries.

Low international interest rates have also contributed to maintaining high growth in most countries. As in Norway, interest rates internationally have risen at a slower pace than market participants had previously expected (see Chart 6). Idle resources in the global economy may also have limited the effect of higher oil prices on other prices or on wage growth. Globalisation in the form of intensified international competition and relocation of production to low cost countries may partly have offset the impulses from increased oil prices. Without the surprising surge in oil prices, GDP growth internationally might have been somewhat stronger than we had assumed.

Global economic growth has also resulted in higher prices for non-oil commodities, in particular metals and energy-intensive products. Increased trade has given rise to higher demand in the transport sector and higher shipping freight rates. This has improved our terms of trade with our trading partners (see Chart 7). Improved terms of trade imply an increase in the price of exports relative to imports. Relatively high export prices have boosted earnings in the exposed sector, in spite of the appreciation of the krone.

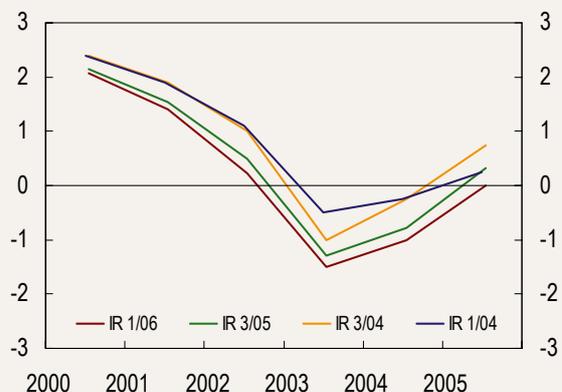
Overall, Norges Bank's previous projections for capacity utilisation in 2005 were slightly higher than our current estimate. This is primarily because the basis for the projections, the level of the output gap in 2003 and 2004, later proved to be somewhat more negative than we previously assumed (see Chart 8). The devia-

Chart 7 Terms of trade. Index 1995=100. 1995 Q1 – 2005 Q4



Sources: Statistics Norway and Norges Bank

Chart 8 Estimates for output gap in various *Inflation Reports*. Per cent. 2000–2005



Source: Norges Bank

³ See box in *Inflation Report* 3/05.

tions are relatively small, in view of the considerable uncertainty surrounding the projections for the output gap. We still assume that capacity utilisation increased through 2005 and that the economy entered a moderate expansionary phase in the latter half of 2005. However, Norges Bank's output gap estimates in 2005 may still be changed as a result of revisions of national accounts figures or new assessments.

Inflation in 2005 lower than projected in 2004

Actual inflation measured by the CPI-ATE was 1 per cent in 2005. At the beginning of 2004, Norges Bank projected that CPI-ATE inflation would be 2¹/₄ per cent. At the same time the output gap was estimated at 1/4 per cent and was thus very close to the current estimate. The relatively large deviation between actual and projected inflation (see Chart 9) can only to a limited extent be attributed to changes in capacity utilisation, since pressures in the real economy in 2005 were approximately as projected at the beginning of 2004. The delayed effects of a narrower-than-expected output gap in 2003 and 2004 may, on the other hand, have contributed to some extent.

The deviation between projected and actual inflation in 2005 may primarily be attributed to the following:

- the krone exchange rate was stronger than initially assumed
- prices for imported consumer goods fell more than expected, and
- wage growth was lower than projected

Higher-than-assumed krone exchange rate

The krone appreciated throughout 2004 and 2005 and was, on average, almost 8 per cent stronger in 2005 than assumed in the March 2004 *Inflation Report* (see Chart 10). Early in 2004, we expected that the substantial

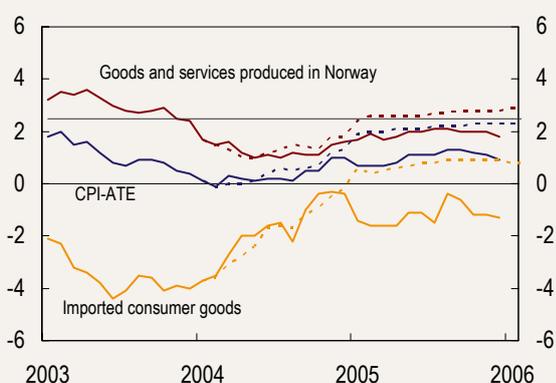
depreciation of the krone through 2003 would gradually push up prices for imported consumer goods. Instead, the krone appreciated and had the opposite effect. The krone may have appreciated partly because interest rates among a number of our trading partners were not raised as quickly as indicated by market expectations at the beginning of 2004. The rise in oil prices may also have contributed to the appreciation of the krone, even though empirical analyses show that the relationship between the krone exchange rate and oil prices varies over time.

External price impulses broadly in line with projections....

Independently of the movements in the krone exchange rate, international prices for consumer goods that we import have fallen in recent years. This is primarily due to the growing share of imported consumer goods from low-cost countries in Asia and central and eastern Europe. Clothing and shoes are goods that are influenced by this shift in imports. Moreover, strong international competition and efficiency measures in production have led to a fall in prices for a number of other goods, such as audiovisual equipment.

Since the beginning of 2004, Norges Bank has estimated a variable in order to capture these external price impulses to imported consumer goods (IPC). As a result of improved access to data from a number of emerging economies, this indicator was revised and broadened towards the end of 2005.⁴ The new calculations show that imported price impulses since 2001 have fallen more than we previously expected. This is particularly because the shift has affected a wider range of goods than we were able to capture using the previous data. In 2005, the decline in prices abated slightly, probably due to higher prices for oil and non-oil commodities. Partly for this reason, projections in the March 2004 *Inflation Report* for external price impulses in 2005 were only about 1/2 percentage point too high.

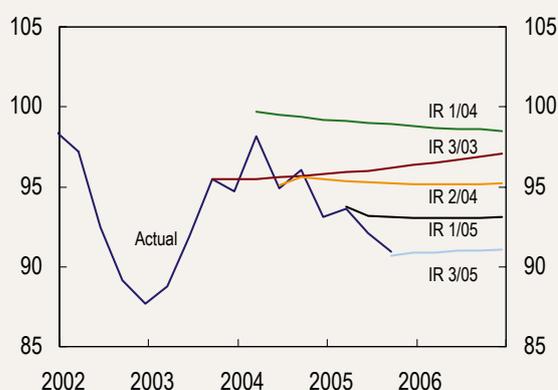
Chart 9 CPI-ATE¹⁾. Total and by supplier sector. Historical developments and projections (broken line) from IR 1/04. 12-month change. Per cent. Jan 2003 - Dec 2005



¹⁾ CPI-ATE: CPI adjusted for tax changes and excluding energy products.
²⁾ Norges Bank's calculations.

Sources: Statistics Norway and Norges Bank

Chart 10 Exchange rate (I-44) and assumptions in *Inflation Reports*. 2003 Q1 – 2006 Q4



Source: Norges Bank

⁴ See box in *Inflation Report* 3/05.

...but nevertheless a sharper fall in prices for imported consumer goods

Since 2001, a model using the variable IPC and the exchange rate as explanatory factors has been able to explain most of the developments in prices for imported consumer goods in Norway⁵ (see Chart 11). The chart also shows this relationship weakened at the beginning of 2005, when prices for imported consumer goods dropped far more than the model could account for.

Changes in indirect taxes and unusually high sales activity around the turn of the year 2004/2005 could be possible explanations. When calculating the CPI-ATE, full adjustment is made for tax changes from the time they are introduced. Low inflation at the beginning of 2005 may in part be attributed to the fact that actual retail prices were not fully adjusted following the increase in VAT. Furthermore, a poor season for winter clothing and other seasonal products may have led to larger price discounts than usual at the beginning of the year. Developments at the beginning of 2006 nonetheless indicate that movements in prices for imported consumer goods are again more in accordance with the model.

In January 2005, the 12-month rise in the CPI-ATE was only 0.7 per cent as a result of a sharper fall in prices for imported consumer goods. Surprisingly low inflation at the beginning of the year also influenced our projections for the year as a whole. Developments in the first quarter largely determine the path for the remainder of the year, both because several components are measured in this quarter, and because many prices are adjusted in January and February (see Chart 12). Simulations using Norges Bank's aggregated macroeconomic model⁶ indicate that weak developments in the first quarter of 2005 cannot be explained by the output gap or the exchange rate.⁷

Lower-than-projected wage growth

In the March 2004 *Inflation Report*, wage growth in

2005 was projected to be 4³/₄ per cent. Provisional figures from the Technical Reporting Committee on Wage Settlements indicate that wage growth in 2005 reached 3¹/₄ per cent. The substantial fall in prices for imported consumer goods at the beginning of 2005 contributed to clearly lower-than-projected consumer price inflation prior to the wage settlement. Because of low inflation, relatively moderate nominal wage increases still resulted in growth in purchasing power.

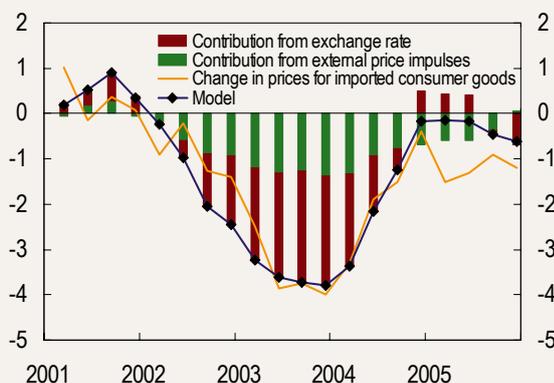
Real wage growth was also lower than previously projected. The wage projection was based on the assumption that employment growth would rapidly pick up later in 2005, and contribute to bringing average unemployment down to 4 per cent (see Chart 13). Measured in number of persons, however, employment growth was more sluggish than in previous cyclical upturns (see Chart 14). Two factors in particular might explain the sluggish rise in employment:

- First, the decline in sickness absence through 2004 provided companies with an added supply of labour. As a result, output could be increased without the need to hire new staff.
- Second, the supply of foreign labour increased markedly after EEA enlargement in May 2004. In many cases, foreign workers will not be captured in employment statistics, even though they contribute to increasing the supply of available labour. The relatively low wage level among foreign workers may also have contributed to curbing wage growth, especially in the construction industry, where activity has been very high.

Competition in the product market approximately as expected

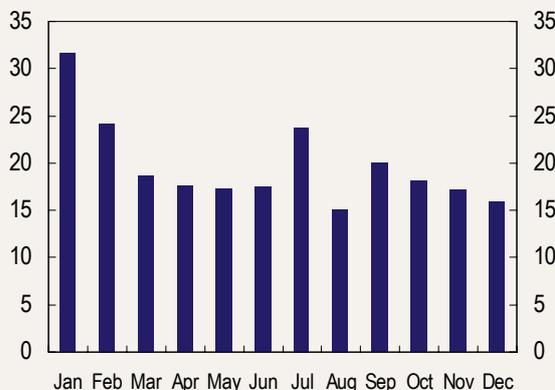
Following the contractionary phase in 2003, it gradually became clear that competition in several markets was intensifying, leading to rationalisation and cost

Chart 11 Change in prices for imported consumer goods and estimated effects of external prices and exchange rate movements. Contribution in percentage points to 4-quarter change. 2001 Q1 – 2005 Q4



Sources: Statistics Norway and Norges Bank

Chart 12 Share of price observations that change in different months (weighted). Excluding sales



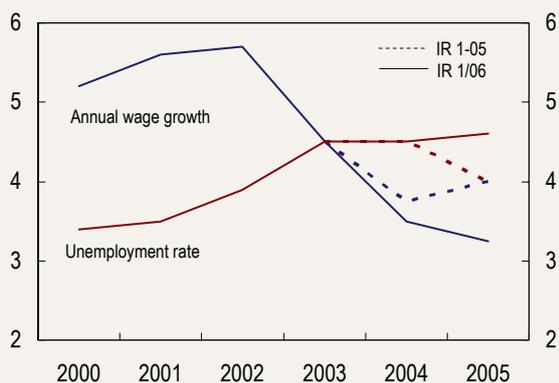
Sources: Statistics Norway and Norges Bank

⁵ See box in the *Inflation Report* 1/04.

⁶ See *Norges Bank's Staff Memo* 2004/3.

⁷ The price equation in the model must receive a considerable negative shock in order to drop to actual inflation at the beginning of 2005. Impulses to individual equations in a model as aggregated as this one are difficult to interpret, but may point to an unexpected shock on the supply side of the economy related to productivity or margins.

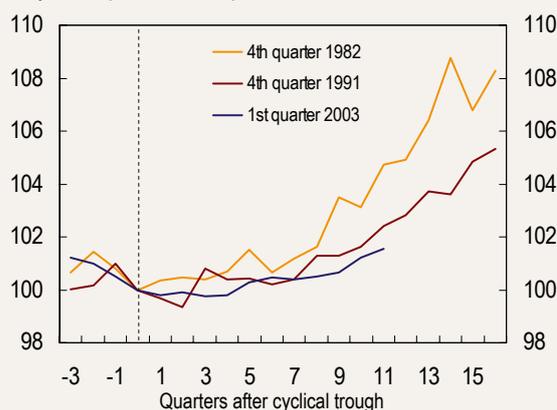
Chart 13 Estimated annual wage growth¹⁾ and LFS unemployment. Per cent. 2000 – 2005



¹⁾ Average for all groups. Including costs associated with increase in number of vacation days.

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

Chart 14 Number employed. Developments after the start of a cyclical upturn. Index, quarter 0 = 100



Sources: Statistics Norway and Norges Bank

cuts. In addition, new operators, for example in the air travel industry and the grocery trade, contributed to increased competition and substantially lower prices for some goods and services. In the March 2004 *Inflation Report*, we assumed this would have an impact on price developments throughout 2004, but that the situation would normalise in 2005, in step with the economic recovery. This analysis still seems to be broadly in line with actual developments. A pronounced deceleration in the rise in food prices towards the end of 2005 and the beginning of 2006 may, however, be an indication of stronger competition in the grocery sector although other factors, such as new data collection methods, may have influenced these developments.

Norges Bank's analytical tools do not provide a basis for accurately calculating the effects on inflation of changes in competitive conditions. A model of domestic inflation (see Appendix 1) can to a great extent explain price developments in 2005 using developments in wage and price inflation the previous year. The model is not as accurate with respect to actual inflation in 2003 and 2004. Prices that dropped considerably in 2004, such as air travel and some groceries, have also moved on a more normal path through 2005.

CPI-ATE broadly in line with the projections published in 2005

Following surprisingly low inflation at the beginning of 2005, the CPI-ATE projection was adjusted downwards to 1 per cent in the March 2005 *Inflation Report* and subsequent reports. This proved to be a fairly accurate forecast of actual developments. The CPI-ATE rose by 1.0 per cent from 2004 to 2005. Projections published through 2005 were based on assumptions concerning interest rate and exchange rate developments, which also proved to be accurate in relation to actual developments.

Even though the projection for annual average infla-

tion was accurate, there was a deviation between the observed and projected year-on-year rise in prices towards the end of the year. In the second half of 2005, the year-on-year rise in the CPI-ATE fluctuated between 1 and 1½ per cent, before it unexpectedly fell to 0.9 per cent in December. If inflation is adjusted for the estimated direct effect of the interest rate reductions on house rents, inflation may be estimated at 1.1 per cent in December. Both a slower rise in prices for domestic goods and prices, and prices for imported consumer goods pushed down CPI-ATE inflation.

Decomposition of the projection error

In Table 2, the deviation between the forecast for the CPI-ATE presented in *Inflation Report 1/04* and *Inflation Report 1/05* and actual developments has been quantified in the light of various underlying causes. The decomposition shows that approximately 0.4 percentage point of the projection error from the first *Inflation Report* in 2004 is the result of a stronger-than-expected krone exchange rate.

Approximately 0.4 percentage point of the projection error is related to an excessively high estimate for wage growth in 2005. Due to an unexpected supply of labour, as a result of lower sickness absence and inflows of foreign labour, the labour market was less tight than expected. The model for domestic inflation (see Appendix 1) is part of the basis for the decomposition in Table 2. In this model, wage growth is exogenous, with no feed-through from inflation to wage growth. Surprisingly low inflation at the beginning of 2005 probably contributed to moderation in the wage settlement by influencing the social partners' inflation expectations. Nonetheless, in the table, this indirect effect of low inflation is placed under wages. If we had given more weight to indirect effects in the decomposition, the unexplained share of the projection error might have been greater. At the same time, an excessively high

estimate of wage growth would explain a smaller share of the forecast error in the CPI-ATE.

The decomposition cannot fully explain the deviation between the projection presented in *Inflation Report 1/04* and actual developments. 0.2 percentage point of the deviation cannot be related to errors in other projections or assumptions. As shown in Chart 11, we cannot explain

Table 2 Decomposition of the deviation between actual and projected inflation in 2005 presented in *Inflation Report 1/04* and *1/05*.

	IR 1/04	IR 1/05
Deviation between actual and projected CPI-ATE inflation. In percentage points	-1 ¹ / ₄	-0.1
<i>Decomposition of deviation</i>		
Stronger exchange rate	-0.4	0
Lower external price impulses	-0.1	0
Lower wage growth	-0.4	-0.1
Interest rate's direct effect on house rents	-0.2	0
Other factors / unexplained ¹	-0.2	0

¹ Primarily relating to the fall in prices for imported consumer goods in 2005.

the low rise in prices for imported consumer goods using our existing analytical tools. A possible explanation is that the shift in imports towards low-cost countries has been stronger than we are able to capture using the variable for imported price impulses. It is also possible that high productivity growth in retail trade has provided a basis for reduced margins and lower retail prices.

4 Alternative projections and other institutions' projections

As a part of the evaluation, Norges Bank's projections are compared with projections using alternative models and those made by other institutions.

Other institutions' projections

Projections made by other institutions can be used as a basis for evaluating Norges Bank's projections. Charts 15 and 16 show developments in Norges Bank's and some other institutions' projections for CPI-ATE inflation and mainland GDP in 2005, from 2003 to date. Such projections are difficult to compare. The projections are not revised continuously, and will therefore be based on various statistical sources. There may also be differences in the assumptions for the projections.

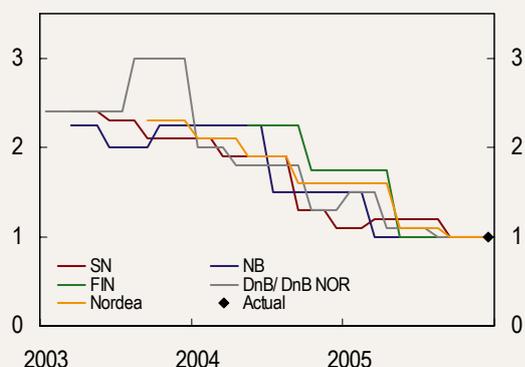
Through most of 2004, none of the institutions predicted that CPI-ATE inflation would reach 1.0 per cent in 2005. In the early phases of the economic upturn, all institutions underestimated mainland GDP growth in 2005. Norges Bank was one of the first to revise up its growth projections.

Alternative models

When making inflation projections, the results of "naïve" projection methods are also assessed. A simple time series model (ARIMA) that captures trend growth and seasonal variations in the CPI-ATE has often proved to predict price developments fairly accurately in the short term. Such a model does not contain information on the driving forces behind inflation developments, and it will not be accurate in the long term. It is possible to calculate confidence intervals that illustrate the uncertainty surrounding the projections. These are based on the historical variation in the time series.

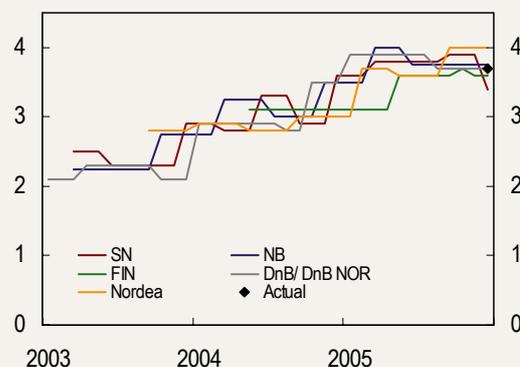
Chart 17 compares CPI-ATE predictions from a simple ARIMA model with projections from *Inflation Report 1/05*, and actual developments through 2005. Both the projections in *Inflation Report 1/05* and the ARIMA forecasts were based on information available up to the CPI-ATE for February. In the first months, Norges Bank's projections were fairly similar to the ARIMA forecasts, but Norges Bank expected inflation to increase somewhat more through summer and

Chart 15 CPI-ATE. Projections for 2005 published at different times. Annual rise. Per cent



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

Chart 16 Mainland GDP. Projections for 2005 published at different times. Per cent



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

autumn. The projections in *Inflation Report 1/05* predicted actual developments more accurately than the ARIMA forecasts through most of the year. The average absolute deviation is approximately twice as large for the ARIMA forecasts as for the projections in *Inflation Report 1/05*.

“Naïve” models can be valuable as a crosscheck of the projections in the short term. In the longer term, it will be more appropriate to compare the projections with models that also include other explanatory factors. In Chart 18, the projections from *Inflation Report 1/04* are compared with forecasts based on the macroeconomic model we now utilise in our projection work. All exogenous and endogenous variables, with the exception of the CPI-ATE, are set at their actual values. This model had not yet been developed when *Inflation Report 1/04* was published. In the simulation, the model predicts actual CPI-ATE developments fairly accurately, both in 2004 and 2005. This result partly depends on when the simulation is started; in the chart, the starting-point is the second quarter of 2004.

How accurate are the forecasts of other inflation-targeting central banks?

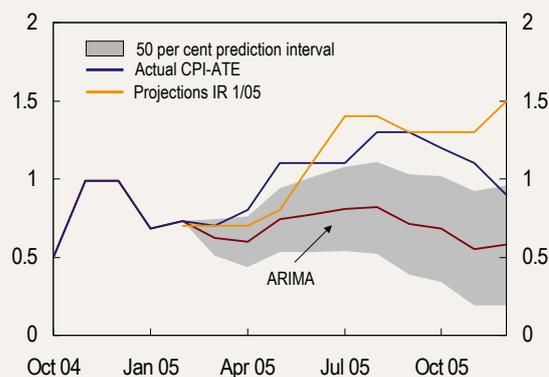
Table 3 shows the deviations between actual inflation and projections from six central banks that operate an inflation-targeting regime. The projections are taken from the last inflation reports in each year. The figures for the average deviation between projected and actual inflation for the years prior to 2005 indicate that Norges Bank’s projections are somewhat less accurate than the others in the table. Nevertheless, it appears that other small, open economies such as Sweden and Australia have also had difficulty in forecasting inflation.

With respect to the forecasts for 2005 presented a year earlier, Norges Bank’s projection errors are approximately on a par with the average for other central banks. The deviation between inflation in 2005 and the projection presented two years earlier is, however, greater than the deviations of other central banks. This must be viewed in conjunction with the surprisingly low inflation rate in 2004.

Conclusion

In 2005, the output gap was slightly lower than previously projected by Norges Bank. Downward adjustments of the output gap level in the years prior to 2005 were, to a certain extent, offset by stronger growth through the year, partly reflecting higher-than-expected oil investment. CPI-ATE inflation was, however, clearly

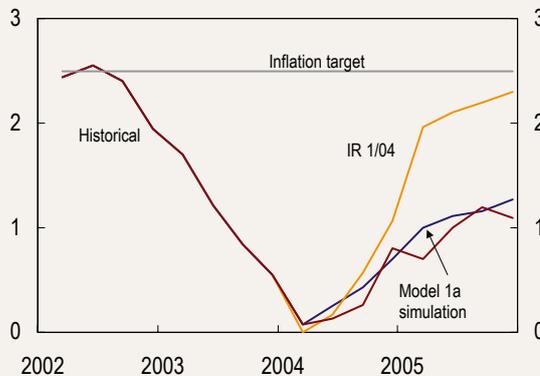
Chart 17 CPI-ATE¹⁾. Projections in IR 1/05, ARIMA projections and actual price movements. 12-month change. Per cent. Oct 2004 – Dec 2005



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

Sources: Statistics Norway and Norges Bank

Chart 18 CPI-ATE¹⁾. Projections in IR 1/04, macromodel 1a-based simulation and actual developments. Per cent. 2002 Q1 – 2005 Q4



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

Sources: Statistics Norway and Norges Bank

Table 3. Deviation between actual and projected inflation for a selection of inflation-targeting central banks.

	Average deviation from projection until 2004 ¹		Deviation from projections for 2005	
	Projection one year ahead	Projection two years ahead	One year ahead	Two years ahead
Australia	1.1	0.9	0.2	0.2
Euro area	0.3	0.5	0.2	0.6
New Zealand	0.4	0.7	0.2	0.5
United Kingdom	0.3	0.3	0.6	0.2
Sweden	0.7	1.0	0.7	1.2
Norway	0.8	1.1	0.5	1.3

¹ The average has been calculated for the period 1998-2004. For the euro area and Norway, the period is 2001-2004.

Sources: Inflation reports from the Reserve Bank of Australia, the European Central Bank, the Reserve Bank of New Zealand, the Bank of England, Sveriges Riksbank and Norges Bank.

lower than Norges Bank had projected. Other institutions' inflation forecasts were also too high for a long period. An unexpected fall in prices for imported consumer goods, despite higher oil prices, relatively low wage growth and a appreciation of the krone have all pushed down inflation.

Norway's small, open economy is particularly vulnerable to external impulses. In recent years, developments in the economy have reflected the impact of increasing globalisation. In Norway, we have felt the effects in the form of falling import prices, an increase in the supply of foreign labour and higher oil prices. In 2005, the analysis of external price impulses from imported consumer goods was improved and expanded.⁸ We now assume that the decline in external price impulses will persist for longer than we had previously expected. We have also attempted to analyse the increase in the use of foreign labour in Norway.

Projection work carried out in recent years has shown that the description of the current situation and short-term developments is very important to the quality of the projections. We are now focusing more attention on methods to improve our projections of developments in key variables in the short term. The framework for incorporating information from our regional network into our assessment of capacity utilisation and the current situation is also gradually improving.

Appendix 1. A model for the rise in prices for domestically produced goods and services

The model used as a basis for the decomposition in Table 2 in this article can theoretically be interpreted in the light of inflation models of imperfect competition à la de Brouwer and Ericsson (1998) and Kolsrud and Nymoén (1998). In the long term, prices for domestically produced goods and services, p^d_t , reflect the level of total unit labour costs. In our model, these costs are expressed through $(w-z)_t$, where w_t represents total labour costs and z_t the productivity level in period t . In the short term, inflation is determined by the rise in unit labour costs and inflation in the previous period. Furthermore, any deviation from the long-term equilibrium between the price and unit cost will gradually be corrected by means of the equilibrium adjustment expression $(p^d - (w-z))_{t-1}$. All variables are expressed as logarithms, and Δ is a difference operator. The model is expressed by:

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

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

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

References

- “Modelling Inflation in Australia”, *Journal of Business & Economic Statistics*, American Statistical Association, 16(4), pages 433–449
- Kolsrud, D. & R. Nymoén (1998): “Unemployment and the Open Economy Wage-Price Spiral”, *Journal of Economic Studies*, 25, 450–467

Appendix 2. Overview of projections from 1995–2005

In addition to studying the projections for a single year, it is important to look at the projections over time to determine whether systematic errors occur. Charts 19-21 provide a comparison of realised variables for the period 1995-2005 and projections from Statistics Norway (SN), the Ministry of Finance (Fin) and Norges Bank published at the end of the year preceding the projection year. All of the institutions have had a tendency to underestimate mainland GDP growth in the 1990s. Wage growth has also been consistently underestimated until the past few years, when projections have been somewhat more accurate. In recent years, CPI-ATE inflation has been lower than projected.

Table 4 shows the average error, the average absolute error (AAE) and the relative root mean square error (RRMSE). These are measures of the accuracy of our projections for the period as a whole. AAE provides an indication of the average actual forecast error in percentage points over the years, without the forecast errors with opposite signs offsetting each other. RRMSE penalises large forecast errors more heavily than smaller ones, and indicates the magnitude of the errors in relation to actual growth. This makes it possible to compare the size of the forecast errors across different variables. The table provides a summary of the measures of the forecast errors. There is little difference in forecast error between the three institutions.

Table 4. Average error, average absolute error (AAE) and the relative root mean square error (RRMSE). Projections by Statistics Norway (SN), the Ministry of Finance (FIN) and Norges Bank (NB). 1995–2005

	SN	FIN	NB
Growth in mainland GDP			
Average error	-1.18	-0.96	-0.96
AAE	1.20	1.13	1.04
RRMSE	0.48	0.39	0.41
Annual wage growth			
Average error	-0.61	-0.83	0.03
AAE	0.95	1.15	0.85
RRMSE	0.23	0.27	0.21
Rise in consumer prices			
Average error	0.22	0.36	0.31
AAE	0.55	0.65	0.54
RRMSE	1.26	1.58	1.75

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

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

² RRMSE (relative root mean square error) is defined as

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

where y_n represents the actual growth rate and \hat{y}_n is the projected growth rate.

⁸ See box in *Inflation Report 3/05*.

Chart 19-21 Growth projections from Statistics Norway, Ministry of Finance and Norges Bank, and actual growth. Last projections published previous year. Per cent. 1995 to 2005

Statistics Norway Ministry of Finance Norges Bank Actual growth

■ ■ ■ —■—

Chart 19 Mainland GDP

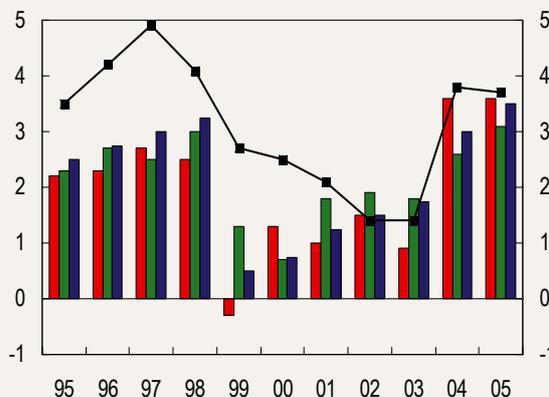
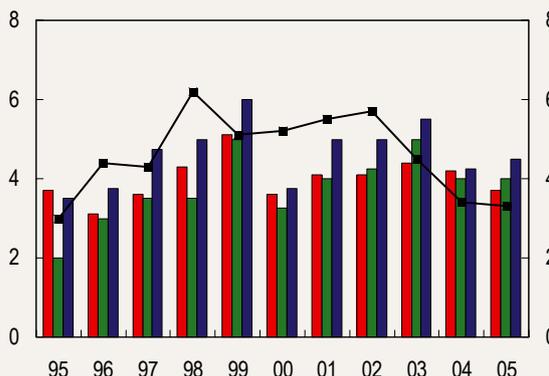
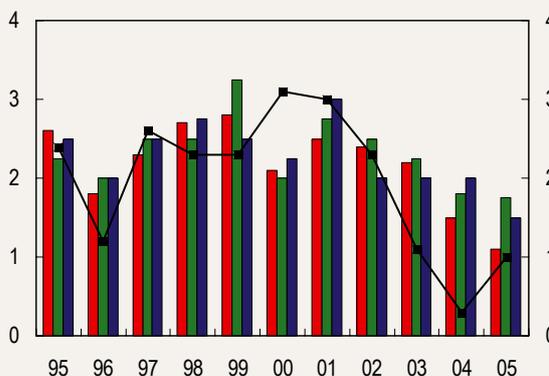


Chart 20 Annual wage growth¹⁾



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

Chart 21 Consumer price inflation¹⁾



¹⁾ Projected and actual CPI developments to 2001. Projected and actual developments in CPI-ATE since 2002.

Changes in the projections

Inflation Report 1/04

The international economy had entered a clearly expansionary phase concentrated in the US, Asia and Eastern Europe. The projections for growth in 2005 among Norway's trading partners were adjusted downwards from 2³/₄ per cent in *Inflation Report 3/03* to 2¹/₂ per cent in *Inflation Report 1/04*. We had envisaged a steadier cyclical profile in other countries.

In Norway, further interest rate reductions had been implemented since autumn 2003, and the krone had depreciated. At the same time, it was quite clear that the downturn had come to a halt and economic growth had been solid for several consecutive quarters. With low interest rates as an important driving force, the household sector in particular had contributed to the change, with solid growth in private consumption and residential property investment.

On the basis of an overall assessment of developments in output, employment and inflation, the estimate of the output gap in 2002 and 2003 was adjusted downwards in this Report. At the same time, potential growth in the Norwegian economy was projected to be somewhat higher than usual in 2004. Many companies had undertaken extensive rationalisation, and in the short term it appeared that output could be increased without a corresponding increase in employment. This upward adjustment allowed relatively strong economic growth without giving rise to higher capacity utilisation. In 2005, projected mainland GDP growth was 3¹/₄ per cent, half a percentage point higher than in the previous Report. Due to lower initial levels for the output gap and higher potential growth in 2004, the output gap for 2005 was nonetheless adjusted downwards somewhat.

The projections for inflation and wage growth for 2005 remained unchanged in relation to the previous Report. On the other hand, the 2004 projection for CPI-ATE inflation was revised downwards considerably after an unexpected decline at the beginning of 2004. We assumed that competition within industries such as air travel, telecommunications services and the grocery trade would normalise and that inflation would reach a higher level again in 2005. However, the risk that continued strong competition in several industries could also curb inflation further ahead was emphasised.

In relation to previous projections, it was now assumed that the rise in prices for imported consumer goods measured in foreign currency would fall again in 2005, but that the decline in the krone exchange rate through 2003 would push up prices for imported consumer goods measured in NOK.

Wage growth in 2005 was projected at 4³/₄ per cent,

the same growth rate as in the last Report in 2003. We expected employment growth to pick up later in 2004 and into 2005, and that this in turn would contribute to accelerating wage growth and rising inflation.

Inflation Report 2/04

The international recovery continued and broadened. Stronger growth abroad than predicted in *Inflation Report 1/04* contributed to increased prices for oil and non-oil commodities. The Norwegian economy had emerged from the economic downturn, and inflation had developed as forecast in the previous *Inflation Report*. Projected CPI-ATE inflation for 2005 was nonetheless revised downwards by ³/₄ percentage point to 1¹/₂ per cent. Several factors contributed to this considerable downward adjustment. The krone had appreciated, and the forward rates underlying the projections in this Report, were slightly higher than in the previous Report. The strong krone led us to expect a weaker rise in prices for imported consumer goods, even though increased prices for oil and non-oil commodities in isolation continued to have the opposite effect. Somewhat higher interest rates also resulted in slightly lower projections for mainland growth for 2005, but the projection for the output gap remained at ¹/₄ per cent, due to an upward revision of the growth projection the previous year. Low inflation in 2004 was expected to result in a more moderate wage settlement in 2005, which, in turn, would curb inflation that year.

The editorial of the Report referred to the forward rates underlying the projections in the Report, and stated that: "...the interest rate should be kept unchanged for a longer period than indicated by market expectations. The prospect of continued low inflation in Norway also implies that we should not be the frontrunner when interest rates are increased in other countries."

Inflation Report 3/04

Global growth seemed likely to be the strongest for several decades. Despite the fact that solid demand growth had led to a sharp increase in prices for a number of commodities, consumer price inflation remained low in most regions of the world. Intensified international competition, strong productivity growth and idle capacity could explain low inflation. Improved credibility regarding inflation-targeting in many regions of the world was also highlighted as a possible cause.

Production developments in Norway's economy were broadly in line with projections in *Inflation Report 2/04*, as was inflation. Employment growth, however, had not picked up as markedly as expected in the previous Reports. Projected mainland GDP growth in 2005 was increased to 3¹/₂ per cent in this Report due to slightly lower forward rates and pros-

pects of higher growth in investment in residential property and petroleum extraction. This revised projection for output growth was fully reflected in the estimate for the output gap, which was now expected to reach $\frac{3}{4}$ per cent in 2005.

Despite a revised growth projection and pressures in the economy, projected inflation remained unchanged. This was particularly because it did not seem likely that pressures in the economy would result in higher wage growth. Prices for domestically produced goods and services had risen more slowly than expected in the previous Report, and we assumed increased competition would continue to curb inflation in the period ahead. The krone had appreciated somewhat.

Inflation Report 1/05

Towards the end of 2004, economic growth was slightly weaker in some regions of the world than assumed in the previous *Inflation Report*. Oil prices were again considerably higher than expected, but the effect on economic activity and prices still seemed to be very limited compared with what might have been expected from calculations based on previous upswings in oil prices. Idle capacity in many economies and lower oil intensity may have been important reasons for this.

In Norway, output was also slightly weaker than expected in 2004. Combined with a downward revision of the output gap in 2003, this resulted in an output gap estimate for 2004 that was half a percentage point lower than in the previous Report, i.e. $-\frac{3}{4}$ per cent. Projected growth for 2005, however, was revised upwards to 4 per cent. Our assessment of capacity utilisation this year thus remained unchanged at $\frac{3}{4}$ per cent, as in the previous Report.

At the beginning of 2005, the fall in prices for imported consumer goods was clearly sharper than assumed, whereas domestic goods and services developed in line with expectations. It was uncertain how much of the unexpected fall in prices could be attributed to abnormal seasonal variations, and how much, if any, could be attributed to weaker developments in underlying prices. Nevertheless, projected CPI-ATE inflation for 2005 was reduced by half a percentage point to 1 per cent.

Sickness absence had declined markedly through 2004. This probably provided scope for a relatively sharp increase in output without a corresponding rise in employment. In the context of low inflation, even a moderate wage settlement – in view of labour market tightness – would result in relatively high wage growth.

Inflation Report 2/05

For our trading partners, it seemed likely that GDP growth in 2005 would be slightly weaker than previously projected, especially because of a downward

revision of the growth projection for Sweden. Even though oil prices had risen to new heights, external price impulses, measured in foreign currency, were assumed to be lower than in the previous Report. This change was the result of weak developments through spring, and a tendency towards a stronger shift in imports than previously assumed.

Output developments in Norway's economy were broadly in line with the projections in the previous Report, but employment had not increased as expected. Delayed effects of the decline in sickness absence through 2004 and the increased use of foreign labour that is not captured in the Labour Force Survey (LFS) may be the underlying cause of the deviation between actual developments and previous projections. In this report, we expected that increased use of foreign labour through service imports would replace some domestic output, resulting in mainland GDP growth of $\frac{3}{4}$ per cent this year, $\frac{1}{4}$ percentage point lower than projected in the previous Report.

The wage settlement had resulted in lower wage growth than previously assumed, and it appeared that wage growth for 2005 would reach $3\frac{1}{2}$ per cent, half a percentage point lower than projected in *Inflation Report 1/05*. Inflation had, in turn, been slightly stronger in the first part of the year than we had previously expected. First and foremost, prices for domestic goods and services rose slightly more than expected. Since the projection for wage growth was revised downwards at the same time, no changes were made to the projection for CPI-ATE inflation, which remained at 1 per cent.

Inflation Report 3/05

Internationally, inflation had increased slightly in recent months as a result of high oil prices. For the time being, we saw no indication that high energy prices would influence other prices, or that employees would receive compensation in the form of higher wage growth.

In Norway, consumer prices had developed in line with the projections in the previous Report, but the CPI-ATE was influenced by relatively large fluctuations in prices for imported consumer goods through summer and autumn.

Output also developed in line with previous projections, but once again it became clear that employment was not rising as much as we had projected. The deviation between LFS unemployment and registered unemployment was increasing. In view of moderate employment growth, we changed the projection for potential growth in 2005 from $2\frac{1}{2}$ to $2\frac{3}{4}$ per cent. Since the projection for GDP mainland growth remained unchanged at $\frac{3}{4}$ per cent, this implied a downward revision of the gap in 2005 to $\frac{1}{4}$ per cent.

Tables

1. Norges Bank. Balance sheet. In millions of NOK
2. Norges Bank. Investments for Government Pension Fund - Global. In millions of NOK
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Norges Bank publishes more detailed and updated statistics on the Internet (www.norges-bank.no). The advance release calendar on the website shows when new figures for the statistics in question will be released.

Standard symbols:

- . Category not applicable
- .. Data not available
- ... Data not yet available
- Nil
- 0 } Less than half the
- 0.0 } final digit shown

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

	31.12.2004	31.12.2005	31.03.2006	30.04.2006
Financial assets	1 287 865	1 744 576	1 783 446	1 815 109
International reserves	268 360	318 163	297 095	302 410
Investments for the Government Pension Fund - Global	1 015 471	1 397 896	1 483 619	1 457 949
Other assets	4 034	28 517	2 732	54 750
Liabilities and capital	1 287 865	1 744 576	1 783 446	1 815 109
Foreign liabilities	51 167	63 333	69 182	86 420
Deposits Government Pension Fund - Global	1 015 471	1 397 896	1 483 619	1 457 949
Notes and coins in circulation	47 595	51 910	47 410	47 925
Other domestic liabilities	126 330	162 815	116 908	165 241
Capital	47 302	68 622	66 327	57 574

Source: Norges Bank

Table 2. Norges Bank. Investments for Government Pension Fund - Global. In millions of NOK

	31.12.2003	31.12.2004	31.12.2005	31.03.2006
Total investments	844 587	1 015 471	1 397 896	1 483 619
Fixed income securities	482 341	631 256	682 024	785 047
Equities	354 317	407 673	576 683	603 624
Lending (reverse repos etc.)	287 042	380 117	558 979	556 186
Borrowing (repos etc.)	-298 603	-406 194	-438 717	-456 642
Other investments	19 489	2 619	18 927	-4 596

Source: Norges Bank

Table 3. Banks. Balance sheet. In millions of NOK

	31.12.2004	31.12.2005	28.02.2006	31.03.2006
Financial assets	1 805 276	2 137 696	2 245 540	2 297 520
Cash and deposits	87 227	128 597	143 304	153 940
Bonds and notes	147 597	162 837	182 703	183 933
Loans to the general public	1 303 655	1 542 685	1 590 744	1 613 000
Other loans	155 110	191 168	195 600	203 986
Other assets	111 688	112 409	133 189	142 662
Liabilities and capital	1 805 276	2 137 686	2 245 541	2 297 521
Deposits from the general public	844 782	928 042	960 348	970 048
Other deposits from residents	83 408	108 502	97 412	96 105
Deposits from non-residents	209 277	309 878	356 523	384 381
Bonds and notes	422 410	499 899	520 538	531 201
Other liabilities	134 799	169 237	182 597	185 581
Capital and profit / loss	110 600	122 127	128 123	130 205

Source: Norges Bank

Table 4. Banks. Loans and deposits by public sectors. In millions of NOK

	31.12.2004	31.12.2005	28.02.2006	31.03.2006
Loans to:	1 303 655	1 542 685	1 590 744	1 613 000
Local government (incl. municipal enterprises)	2 832	2 562	3 267	2 961
Non-financial enterprises	362 765	436 977	458 956	466 091
Households	938 058	1 103 147	1 128 521	1 143 948
Deposits from:	844 782	928 042	960 348	970 048
Local government (incl. municipal enterprises)	34 731	37 661	36 350	36 950
Non-financial enterprises	268 049	314 773	327 331	338 578
Households	542 002	575 608	596 666	594 520

Source: Norges Bank

Table 5. Profit/loss and capital adequacy. Per cent of average total assets

	2003	2004	2005 Q 4	2006 Q 1
Interest income	5.8	4.2	4.4	4.5
Interest expenses	3.9	2.4	2.7	3
Net interest income	1.9	1.8	1.7	1.5
Operating profit before losses	1.2	1.1	1.2	1.1
Losses on loans and guarantees	0.4	0.1	-0.1	-0.0
Ordinary operating profit (before taxes)	0.7	1.1	1.3	1.2
Capital adequacy	12.4	12.2	11.9	11.6
- of which core capital	9.7	9.8	9.5	9.2

Source: Norges Bank

Table 6. Banks. Average interest rates on NOK loans and deposits. Per cent per annum

	30.06.2005	30.09.2005	31.12.2005	31.03.2006
1. Loans (1)	3.81	3.93	4.00	4.08
2. Deposits (2)	1.30	1.48	1.62	1.78
Interest margin (1 - 2)	2.51	2.45	2.38	2.29

Source: Norges Bank

Table 7. Securities registered with the Norwegian Central Securities Depository (VPS), by issuing sector. Nominal values. In millions of NOK

	Interest-bearing securities		Equities	
	31.12.2005	31.03.2006	31.12.2005	31.03.2006
Total	718 550	742 318	134 050	139 497
Central government	207 622	211 696	0	0
Banks	245 637	255 874	32 282	32 198
Other financial institutions	67 489	65 749	20 224	20 220
Public non-financial enterprises	29 773	32 923	17 522	17 522
Private non-financial enterprises	62 818	64 396	52 718	57 165
Other resident sectors	71 428	69 151	197	197
Non-residents	33 784	42 529	11 107	12 195

Sources: Norwegian Central Securities Depository and Norges Bank

Table 8. Securities registered with the Norwegian Central Securities Depository (VPS), by holding sector. Estimated market values. In millions of NOK

	Interest-bearing securities		Equities	
	31.12.2005	31.03.2006	31.12.2005	31.03.2006
Total	747 764	768 437	1 529 404	1 830 968
Central government	46 137	47 099	466 511	563 662
Banks	105 117	112 442	13 728	31 677
Insurance companies	288 338	289 397	42 334	47 520
Mutual funds	95 637	98 250	55 723	62 074
Other financial enterprises	8 534	6 791	27 366	28 894
Private non-financial enterprises	36 408	36 723	266 592	308 472
Households	35 610	37 537	77 094	83 683
Other resident sectors	42 659	44 176	17 647	22 576
Non-residents	89 326	96 022	562 410	682 409

Sources: Norwegian Central Securities Depository and Norges Bank

Table 9. Credit indicators and money supply. In billions of NOK and per cent

	Stock	Growth last 12 months. Per cent		
	30.04.2006	28.02.2006	31.03.2006	30.04.2006
C2, credit from domestic sources	2 365	13.7	13.9	13.7
C2, households	1 440	13.3	13.4	13.0
C2, non-financial enterprises	749	16.7	16.8	17.0
C2, local government	177	6.2	6.8	6.1
Total credit from domestic and foreign sources, C3 ¹	2 715	12.3	...	...
Narrow money M0	63	12.5	9.5	8.0
Broad money M2	1 052	9.6	9.3	9.9
M2, households	599	5.2	5.4	5.1
M2, non-financial enterprises	321	21.4	22.5	28.3

¹ C3 as at 28.02.2006

Source: Norges Bank

Table 10. Household financial balance. In billions of NOK

	2003	2004	2004 Q 4	2005 Q 4
Currency and deposits	26.4	28.0	4.5	-7.1
Equities and primary capital certificates	28.7	39.8	8.7	4.4
Mutual fund shares	4.1	1.1	-0.3	30.2
Insurance technical reserves	54.1	48.0	12.0	16.9
Other assets	36.2	27.4	5.0	11.7
Investments in financial assets	149.6	144.4	29.9	56.0
Loans from banks	92.3	113.8	34.6	29.5
Other loans	18.2	17.7	4.6	21.6
Other liabilities	-0.3	3.5	5.2	2.5
Change in liabilities	110.3	135.0	44.4	53.7
Net financial investments	39.4	9.4	-14.5	2.3

Source: Norges Bank

Table 11. Consumer price indices. 12-month growth. Per cent

	2005:12	2006:02	2006:03	2006:04
Norway (CPI)	1.8	2.6	2.4	2.7
Norway, adjusted for tax and excluding energy products	0.9	1.0	0.9	0.8
US	3.4	3.6	...	...
Euro area	2.2	2.3	...	...
Germany	2.1	2.1	...	...
UK	2.2	2.4	...	...
Sweden	0.9	0.6	...	...

Sources: Statistics Norway and IMF

Tables previously published in *Economic Bulletin*

The Statistical Annex in *Economic Bulletin* has been reduced with effect from no. 1/06. The following is a list of tables published up to and including no. 4/05, with website references.

Financial institution balance sheets

<http://www.norges-bank.no/english/balance/>

1. Norges Bank. Balance sheet

<http://www.norges-bank.no/front/statistikk/en/>

2. Norges Bank. Specification of international reserves
3. State lending institutions. Balance sheet
4. Banks. Balance sheet
5. Banks. Loans and deposits by sector
6. Mortgage companies. Balance sheet
7. Finance companies. Balance sheet

http://www.ssb.no/emner/10/13/10/forsikring_en/

8. Life insurance companies. Main assets
9. Non-life insurance companies. Main assets

<http://www.norges-bank.no/front/statistikk/en/>

- 10a. Mutual funds' assets. Market value
- 10b. Mutual funds' assets under management by holding sector. Market value

Securities statistics

<http://www.norges-bank.no/front/statistikk/en/>

11. Shareholding registered with the Norwegian Central Securities Depository (VPS), by holding sector. Market value
12. Share capital and primary capital certificates registered with the Norwegian Central Securities Depository, by issuing sector. Nominal value
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 sector. Market value
14. Bondholdings in NOK registered with the Norwegian Central Securities Depository, by holding sector. Market value
15. Bondholdings in NOK registered with the Norwegian Central Securities Depository, by issuing sector. Nominal value
16. Net purchases and net sales (-) in the primary and secondary markets for NOK-denominated bonds registered with the Norwegian Central Securities Depository, by purchasing, selling and issuing sector. Market value
17. NOK-denominated short-term paper registered with the Norwegian Central Securities Depository, by holding sector. Market value
18. Outstanding short-term paper, by issuing sector. Nominal value

Credit and liquidity trends

<http://www.norges-bank.no/front/statistikk/en/>

19. Credit indicator and money supply
20. Domestic credit supply to the general public, by source
21. Composition of money supply
22. Household financial balance. Financial investments and holdings, by financial instrument

<http://www.norges-bank.no/cgi-bin/pml.cgi>

23. Money market liquidity

Interest rate statistics

http://www.norges-bank.no/english/statistics/interest_rates/interest_rates.html

24. Nominal NOK interest rates

Not published on Norges Bank's website

25. Short-term interest rates for key currencies in the Euro-market

http://www.norges-bank.no/english/statistics/interest_rates/interest_rates.html

26. Yields on Norwegian bonds

Not published on Norges Bank's website

27. Yields on government bonds in key currencies

<http://www.norges-bank.no/front/statistikk/en/>

28. Banks. Average interest rates and commissions on utilised loans in NOK to the general public at end of quarter
29. Banks. Average interest rates on deposits in NOK from the general public at end of quarter
30. Life insurance companies. Average interest rates by type of loan at end of quarter
31. Mortgage companies. Average interest rates, incl. commissions on loans to private sector at end of quarter

Profit/loss and capital adequacy data

http://www.norges-bank.no/english/financial_stability/

32. Profit/loss and capital adequacy: banks
33. Profit/loss and capital adequacy: finance companies
34. Profit/loss and capital adequacy: mortgage companies

Exchange rates

<http://www.norges-bank.no/english/statistics/exchange/>

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

Not published on Norges Bank's website

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

Balance of payments

http://www.ssb.no/english/subjects/09/03/ur_en/

37. Balance of payments

http://www.ssb.no/english/subjects/09/04/finansutland_en/

38. Norway's foreign assets and liabilities

International capital markets

http://www.bis.org/publ/qtrpdf/r_qt0512.htm

39. Changes in banks' international assets
40. Banks' international claims by currency

Foreign currency trading

<http://www.norges-bank.no/front/statistikk/en/vhandel/>

41. Foreign exchange banks. Foreign exchange purchased/sold forward with settlement in NOK

The underlying data is no longer available

42. Banks' foreign exchange position

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