

A study of the interest rate structure of private sector¹⁾ assets and liabilities

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In connection with the interest rate turbulence in autumn 1992 and substantial changes in interest rate levels over the past few years, there has been greater interest in the degree to which private sector assets and liabilities have fixed or variable interest rates. A rise in interest rates quickly results in reduced disposable income if private sector net liabilities have predominantly variable interest rates. It is generally assumed that fixed interest rates are used far less in Norway than in other European countries, so that the Norwegian private sector would feel the consequences of a change in interest rates faster than private sectors in other countries. This article looks at the situation in more detail.

1. Introduction

A systematic and simplified analysis of how interest rates influence economic activity would be as follows: the central bank controls market rates by setting key interest rates. The banks and other financial institutions set deposit and lending rates with a certain spread towards market rates. Consequently the central bank also controls interest rates applicable to the private sector. In turn, deposit and lending rates influence both the private sector's financial decisions and economic activity.

It is, however, more complicated than this for several reasons. In practice the central bank can only influence the most short-term money market rates. Furthermore, the interest rates used by the various financial institutions can be linked to various interest rates in the money market or the capital market, entailing that the central bank influences deposit and lending rates in varying degrees. The relationship between market rates and the financial institutions' interest rates can also depend on other factors such as competitive conditions and the current phase of the business cycle. In addition, the various participants do not have the same access to the capital and money markets. For example, larger enterprises and municipalities can borrow directly from the certificate/commercial paper and bond markets, whereas smaller participants only have indirect access through financial institutions.

1) The private sector in this context comprises households, enterprises and municipalities.

The extent to which private sector interest-bearing net assets are positive or negative determines the effect that a change in interest rates has on disposable income²⁾. If asset and liability items have a fixed interest rate though, it would take some time before changes in interest rates would affect interest payments. Naturally, a change in interest rates also influences the value of financial assets and liabilities which do not directly bear interest, as well as influencing the value of fixed assets and economic activity in general. Our aim in this article is to illustrate how a change in Norwegian market rates would result in changes in interest expenses and income – in other words, changes in liquidity – for Norwegian households, enterprises and municipalities.

The problem is twofold. First, it is necessary to determine whether private sector assets and liabilities have fixed or variable interest rates. If the interest rate is fixed, any change in interest rate levels would only result in different terms of interest after interest rates were adjusted or when the liability (asset) is due to be refinanced (reinvested). The interest rate structure for private sector assets and liabilities is described in section 2. It is also important to assess which *market rates* are of the greatest importance to interest rates facing the private sector if interest rates

2) We have limited ourselves to looking at the direct effect of changes in interest rate terms on disposable income, and disregard here the indirect effects through activity levels in the economy.

are variable. The effect of a reduction in money market rates on household net interest expenses will, for example, depend on whether mortgage rates, if they are variable, are linked to money market interest rates or bond market yields. An analysis of covariance between different market rates and financial institutions' rates is used in an attempt to illustrate this in section 3. In section 4, we attempt to draw comparisons with other countries regarding the effect of changes in interest

rates on private sector net interest expenses. And finally, in section 5 we indicate some implications of the results for monetary policy effects.

2. Interest rate structure in Norway

First of all, the relationship between private sector *interest-bearing* assets and liabilities and total private sector financial assets and liabilities will be defined and described.

Table 1. Private sector financial assets distributed by financial instrument at 31 December 1993. In billions of NOK

Instrument	Private sector	Percentage	Households	Percentage	Enterprises	Percentage	Municipalities	Percentage
<i>Direct interest-bearing assets:</i>	<i>701.4</i>	<i>52.0</i>	<i>311.3</i>	<i>43.9</i>	<i>326.3</i>	<i>58.4</i>	<i>63.8</i>	<i>77.8</i>
Bank deposits	428.7	31.8	282.6	39.8	118.4	21.2	27.8	33.9
Bonds	63.6	4.7	10.3	1.5	47.4	8.5	5.8	7.1
Notes and certificates	10.8	0.8	0.3	0.0	10.6	1.9	0.0	0.0
Loans	177.7	13.2	9.9	1.4	138.4	24.8	29.3	35.7
Units in money market funds	20.6	1.5	8.2	1.2	11.5	2.1	0.9	1.1
<i>Non-direct interest-bearer assets:</i>	<i>648.8</i>	<i>48.1</i>	<i>397.9</i>	<i>56.1</i>	<i>232.3</i>	<i>41.6</i>	<i>18.5</i>	<i>22.6</i>
Notes and coin	35.3	2.6	31.4	4.4	3.7	0.7	0.1	0.1
Shares and units in unit trusts	185.3	13.7	64.6	9.1	113.8	20.4	6.9	8.4
Insurance claims	285.6	21.2	248.8	35.1	36.8	6.6	0.0	0.0
Other assets/direct investment	142.6	10.6	53.1	7.5	78.0	14.0	11.5	14.0
<i>Total</i>	<i>1350.1</i>	<i>100.0</i>	<i>709.2</i>	<i>100.0</i>	<i>558.9</i>	<i>100.0</i>	<i>82.0</i>	<i>100.0</i>

Table 2. Private sector financial liabilities distributed by financial instrument at 31 December 1993. In billions of NOK

Instrument	Private sector	Percentage	Households	Percentage	Enterprises	Percentage	Municipalities	Percentage
<i>Direct interest-bearing liabilities:</i>	<i>1239.9</i>	<i>66.6</i>	<i>510.4</i>	<i>92.5</i>	<i>583.0</i>	<i>51.2</i>	<i>146.5</i>	<i>85.3</i>
Loans	1103.9	59.3	510.3	92.5	501.6	44.1	92.0	53.6
Notes and certificates	5.2	0.3	0.0	0.0	3.9	0.3	1.3	0.8
Bonds	110.2	5.9	0.1	0.0	56.9	5.0	53.2	31.0
Units in money market funds	20.6	1.1	0.0	0.0	20.6	1.8	0.0	0.0
<i>Non-direct interest-bearing liabilities:</i>	<i>621.3</i>	<i>33.4</i>	<i>41.1</i>	<i>7.5</i>	<i>554.9</i>	<i>48.8</i>	<i>25.3</i>	<i>14.7</i>
Shares and units in unit trusts	290.7	15.6	0.0	0.0	287.4	25.3	3.3	1.9
Direct investment	134.7	7.2	0.0	0.0	134.7	11.8	0.0	0.0
Other liabilities	195.9	10.5	41.1	7.5	132.8	11.7	22.0	12.8
<i>Total</i>	<i>1861.2</i>	<i>100.0</i>	<i>551.6</i>	<i>100.0</i>	<i>1137.9</i>	<i>100.0</i>	<i>171.8</i>	<i>100.0</i>
Net assets	-511.1	-	157.6	-	-579.0	-	-89.8	-

Insurance claims on the Norwegian Public Service Pension Fund and the Norwegian National Insurance Fund are not registered in FINDATR. We have divided units in funds into units in money market funds (including bond funds) and units in unit trusts. Direct investment is state contributions of long-term capital to state enterprises in forms other than share capital and loan capital. Other assets/liabilities are residual items including tax claims/liabilities, accrued interest, trade credit and other items that do not naturally fall into any other category.

Source: Norges Bank

Figures for private sector assets and liabilities are taken from Norges Bank's database FINDATR³. The private sector comprises *households* (wage-earners, pensioners and social security recipients, as well as quasi-corporate enterprises, the self-employed and organisations that naturally fall in to this category), *enterprises* (private non-financial and incorporated enterprises, state-owned enterprises and securities funds) and *municipalities* (municipalities, counties and municipal enterprises). The interest rate structure of interest-bearing items will be described in the section below.

Relationship between interest-bearing items and total financial assets and liabilities.

Direct interest-bearing assets are defined as bank deposits, bonds, certificates and notes, loans and units in money market and bond funds (cf. Table 1). These constitute well over half the private sector's total financial assets. Notes and coin, shares and units in unit trusts are clearly not interest-bearing, whereas insu-

rance claims and other assets can have some interest-bearing elements. Direct investment on the asset side is a small state enterprise claim on other state enterprises.

Insurance claims include both pension insurance and other insurance claims such as unsettled damages. Insurance companies will generally invest payments of insurance premiums in shares, bonds, property or use them as loans. The greater part of these underlying assets in insurance companies are directly interest-bearing. However, the relationship between the interest rate level and the value of pension insurance is not clear-cut as a rise in interest rates would under normal circumstances initially reduce the value of some of the underlying assets. Over time, an increase in interest rates would lead to higher yields on portfolios, which would eventually offset the fall in value. In other words, the effect of a change in interest rates on the value of pension insurance for policyholders depends on when the insurance is actually paid.

Loans, bonds, notes and certificates and securities fund liabilities in the form of units in money market/bond funds are *directly interest-bearing liabilities* and comprise 2/3 of total private sector financial liabilities. Shares

3) FINDATR contains reconciled, financial sector balance sheets, based on data from various sources. There may be some minor reconciliation discrepancies in the tables.

Table 3. Financial institutions' distribution of fixed and variable interest rates

	Total NOKbn	Percentage distribution by interest rate structure			
		Variable	Fixed <1 year	1 to 5 years	>5 years
Deposits in NOK					
– Postal Giro and Postbanken	55.4	100.0	0.0	0.0	0.0
– Commercial and savings banks	348.6	98.4	1.5	0.1	0.0
Loans in NOK					
– Commercial and savings banks	394.7	90.3	5.4	3.7	0.5
– Mortgage companies	55.9	0.0	38.4	54.5	7.1
– Finance companies	18.6	100.0	0.0	0.0	0.0
– Insurance companies	78.9	77.3	4.4	16.6	1.6
– Norwegian state banks	178.5	16.9	81.0	2.0	0.1
– Postal Giro and Postbanken	17.4	93.1	1.7	5.1	0.0

Fixed interest rates for less than three months are calculated as variable for commercial and savings banks, whereas for other financial institutions fixed interest rates for less than one year are calculated as variable. Information regarding deposits and borrowing from commercial and savings banks, mortgage companies and finance companies has been taken from annual reports from 1993. We studied annual reports from commercial and savings banks that covered a 77% share of total lending. The mortgage companies studied covered an 85% share of total lending and the finance companies studied covered 61%. The Postal Giro, Postbanken and insurance companies were contacted directly. Information regarding the latter companies is taken from July-August this year. The selected insurance companies covered 95% of total lending. Both direct contact and annual reports were used to gather information on state banks. Foreign business loans are all included in foreign currency, even though this item may include some NOK loans.

Source: Norges Bank

and units in unit trusts and direct investment are generally linked to equity financing of enterprises, but some are also related to municipal enterprises and securities funds. "Other liabilities" is the counterpart to "other assets" and contains the same instruments. These are defined as non-interest-bearing.

Before distributing interest-bearing items by interest rate structure, we have netted lending against loans within the same sector. We have also netted securities fund assets in the form of securities against liabilities in the form of units in funds. The purpose of this is to prevent enterprise balance sheets from being inflated by capital that is only channelled through securities funds. This does not influence balance sheets for other sectors, which have maintained the same assets and liabilities as previously, but the "detour" through securities funds used by the enterprise sector has been eliminated. The municipalities channel NOK 9.5bn in loans from the Norwegian State Housing Bank to households. The effect of this on the municipal sector's balance sheet has been removed.

Interest rate structure for private sector interest-bearing assets and liabilities.

It is primarily mortgage companies, insurance companies and state banks that have a size-

able share of their lending as fixed-rate loans (cf. Table 3). However, in terms of amount, fixed-rate loans account for a substantial proportion of lending by the commercial and savings banks. These loans amount to just under NOK 40bn. Some of the savings banks reported a relatively marked increase in fixed-rate loans in the first six months of this year. This is not shown in the tables, but as the savings banks had very few fixed-rate loans at the beginning of the year an increase in this percentage would not significantly change the overall picture. The politically-determined interest rates of the state banks of less than one year are counted as fixed, as they are generally changed only once a year, on a discretionary basis. Some rates in the State Housing Bank are adjusted at the beginning of the year based on the yield on five-year government bonds the previous year (October to September), and are also calculated as "fixed for less than one year". Fixed-rate arrangements for bank deposits are generally very limited.

Tables 4-6 show the distribution of private sector fixed-rate deposits and fixed-rate loans from financial institutions by households, enterprises and municipalities. Other interest-bearing assets and liabilities are also shown. Bonds are distributed on the basis of the period of time before the first possible interest

Table 4. Interest rate structure for households. In billions of NOK

	Total NOKbn	Percentage distribution by interest rate structure Variable	Fixed <1 year	1 to 5 years	>5 years	Foreign currency	Non- distributed
<i>Assets</i>							
Bank deposits	282.6	97.7	1.5	0.1	0.0	0.6	0.1
Bonds	10.3	0.0	5.8	49.5	38.8	5.8	0.0
Notes and certificates	0.3	0.0	100.0	0.0	0.0	0.0	0.0
Loans and units in money market funds	18.1	0.0	0.0	0.0	0.0	0.0	100.0
Total interest-bearing assets	311.3	88.7	1.7	1.7	1.3	0.7	5.9
Of which:							
Interest-bearing assets in NOK	309.0	89.3	1.7	1.7	1.3	0.0	6.0
<i>Liabilities</i>							
Loans	510.3	63.6	24.8	6.1	0.4	2.4	2.8
Total interest-bearing liabilities	510.3	63.6	24.8	6.1	0.4	2.4	2.8
Of which:							
Interest-bearing liabilities in NOK	498.3	65.1	25.4	6.3	0.4	0.0	2.9
Distribution in NOK billions							
Net interest-bearing assets	-199.0	-48.3	-121.5	-25.9	2.2	-9.7	4.2
Net interest-bearing assets in NOK	-189.3	-48.3	-121.5	-25.9	2.2	0.0	4.2

Table 5. Interest rate structure for enterprises. In billions of NOK

	Total NOKbn	Percentage Variable	distribution by interest rate structure			Foreign currency	Non- distributed
			Fixed <1 year	1 to 5 years	>5 years		
<i>Assets</i>							
Bank deposits	118.4	81.2	0.8	0.1	0.0	12.1	5.9
Bonds	30.5	0.0	9.2	48.9	39.3	2.6	0.0
Notes and certificates	5.8	0.0	100.0	0.0	0.0	0.0	0.0
Loans and units in money market funds	58.3	0.0	0.0	0.0	0.0	0.0	100.0
Total interest-bearing assets	213.0	45.1	4.5	7.0	5.6	7.1	30.7
Of which:							
Interest-bearing assets in NOK	197.9	48.6	4.8	7.6	6.1	0.0	33.0
<i>Liabilities</i>							
Loans	410.0	29.8	14.0	5.0	1.2	41.3	8.7
Bonds	56.9	0.0	4.9	17.9	25.0	52.2	0.0
Notes and certificates	3.9	0.0	100.0	0.0	0.0	0.0	0.0
Total interest-bearing liabilities	470.8	26.0	13.6	6.6	4.0	42.2	7.6
Of which:							
Interest-bearing liabilities in NOK	271.9	45.0	23.5	11.4	7.0	0.0	13.2
Distribution in NOK billions							
Net interest-bearing assets	-257.8	-26.2	-54.4	-15.9	-7.0	-183.8	29.5
Net interest-bearing assets in NOK	-74.0	-26.2	-54.4	-15.9	-7.0	0.0	29.5

Table 6. Interest rate structure for municipalities. In billions of NOK

	Total	Percentage distribution by interest rate structure				Foreign currency	Non- distributed
	NOKbn	Variable	Fixed <1 year	1 to 5 years	>5 years		
<i>Assets</i>							
Bank deposits	27.8	94.2	0.0	0.0	0.0	5.8	0.0
Bonds	5.8	0.0	8.6	51.7	39.7	0.0	0.0
Loans and units in money market funds	3.4	0.0	0.0	0.0	0.0	0.0	100.0
Total interest-bearing assets	37.0	70.8	1.4	8.1	6.2	4.3	9.2
Of which:							
Interest-bearing assets in NOK	35.4	74.0	1.4	8.5	6.5	0.0	9.6
<i>Liabilities</i>							
Loans	65.2	55.4	11.2	16.7	1.4	4.3	11.0
Bonds	53.2	0.0	7.9	66.4	16.5	9.2	0.0
Notes and certificates	1.3	0.0	100.0	0.0	0.0	0.0	0.0
Total interest-bearing liabilities	119.7	30.2	10.7	38.6	8.1	6.4	6.0
Of which:							
Interest-bearing liabilities in NOK	112.0	32.2	11.4	41.3	8.7	0.0	6.4
Distribution in NOK billions							
Net interest-bearing assets	-82.7	-9.9	-12.3	-43.2	-7.4	-6.1	-3.8
Net interest-bearing assets in NOK	-76.6	-9.9	-12.3	-43.2	-7.4	0.0	-3.8

In order to establish the proportion of loans and deposits with fixed interest rates for commercial and savings banks, we contacted the companies accounting for the majority of fixed-rate loans. The distribution of interest rate structures for bond assets and liabilities is taken from the Norwegian Registry of Securities, and is based on holdings at the end of July. Foreign loans are included in foreign currency, even though a share may be in NOK.

Source: Norges Bank

rate adjustment. Even though a bond is sold (repurchased) before interest rates are adjusted, a change in interest rates would still have an impact on the holder's (issuer's) cashflow as the interest rate would then affect the bond's market value. We have classified interest rates on notes, bills and certificates as fixed, as they all have a maturity of less than one year. Money market/bond funds are interest-bearing, as the funds invest in interest-bearing instruments on behalf of the unit holders. A unit in such a fund normally consists of a stake in several different interest-bearing instruments. The unit holders do not receive interest on the invested amount, but the value of the units depends on the fund's yields. Because of this, money market/bond funds are not distributed on the basis of fixed-rate periods.

We see that the proportion of fixed interest rates on the *assets side* is relatively limited for the private sector. In percentage of total interest-bearing assets in NOK, total fixed-rate investments comprise around 5 per cent of total interest-bearing assets for the household sector, 19 per cent for the enterprise sector and 16 per cent for the municipal sector. For enterprises and municipalities, this share is primarily boosted by bond-holdings and short-term paper. Foreign currency and fixed-rate assets account for 25 per cent of total interest-bearing assets for enterprises. The interest on these items would not be affected by domestic interest rate changes⁴, until there

⁴ Given a stable exchange rate against European currencies, interest rates in Norway will be strongly influenced by interest rate levels in Europe. Nevertheless, if a substantial amount of foreign currency assets are in USD, it is still possible for

are interest rate adjustments or changes in interest rates on foreign currency assets. The equivalent percentage for households and municipalities is 5 per cent and 20 per cent respectively.

There is a greater degree of fixed interest rates on the *liabilities side*. In relation to total interest-bearing liabilities in NOK, fixed-rate loans account for 32 per cent for the household sector, 42 per cent for the enterprise sector and as much as 61 per cent for the municipal sector. The majority of municipal sector fixed-rate liabilities are fixed for more than one year, whereas a large number of household and enterprise sector fixed-rate liabilities are fixed for less than one year. For households, this share is primarily boosted by loans from the state banks.

Fixed-rate loans and foreign currency loans combined are the share of total interest-bearing liabilities which will not be affected by changes in domestic interest rates in the very short term. This share is 34 per cent for households, 66 per cent for enterprises and 64 per cent for municipalities. Based on the given assumptions, the interest rate for around 2/3 of enterprise and municipal sector liabilities will remain unaffected by a change in domestic interest rates until the interest rate on fixed-rate loans is adjusted. For households, the interest rate on 1/3 of liabilities would remain unaffected. As the next adjustment to interest rates is in less than one year for a substantial proportion of fixed-rate loans, changes in

domestic interest rates to change, for the exchange rate against European currencies to be stable and the interest on a large part of foreign currency assets to remain unchanged. This is perhaps particularly relevant to foreign currency liabilities.

Table 7. Interest rate structure for interest-bearing assets and liabilities in NOK for the private sector as a whole

	Total NOKbn	Percentage distribution Variable	Percentage distribution by interest rate structure			Foreign currency	Non- distributed
			Fixed <1 year	1 to 5 years	>5 years		
Interest-bearing assets	561.3	71.0	2.7	4.2	3.3	3.4	15.5
Interest-bearing liabilities	1100.8	43.8	18.5	9.8	2.8	19.9	5.2
Interest-bearing assets in NOK	542.3	73.4	2.8	4.3	3.4	0.0	16.1
Interest-bearing liabilities in NOK	882.2	54.7	23.1	12.3	3.5	0.0	6.5
Distribution in NOK billions							
Net interest-bearing assets	-539.5	-84.4	-188.2	-85.0	-12.2	-199.6	29.9
Net interest-bearing assets in NOK	-339.9	-84.4	-188.2	-85.0	-12.2	0.0	29.9

Source: Norges Bank

interest rates can have a relatively swift impact on this share of private sector loans.

As shown in Table 7, the private sector has net interest-bearing liabilities amounting to nearly NOK 540bn, of which nearly NOK 340bn bears interest in NOK. Just under $\frac{1}{4}$ of net liabilities in NOK have variable interest rates. Even though interest-bearing assets are less than interest-bearing liabilities, a larger proportion of assets have variable interest, so that net interest-bearing liabilities with variable interest rates are relatively low. However, interest rates on $\frac{1}{4}$ of net liabilities could change within a year. Should interest rate levels fall, a substantial proportion of reductions in private sector interest payments would take place within a year. The banks' average lending rate has fallen by 5–6 percentage points in less than two years. If we assume that all deposit and borrowing rates move in parallel, a reduction in interest rates of this magnitude would reduce total private sector net annual interest payments by approximately NOK 15bn in one year. The interest rate on $\frac{1}{4}$ of net interest-bearing liabilities in NOK may not be changed until one year has passed.

As mentioned, the purpose of Tables 4–7 is only to provide information on the effects a change in interest rates would have on net interest payments. Regarding balance sheet items that we have not defined as directly interest-bearing, the items "other assets and liabilities" are approximately equal in size, and are both of a relatively short-term nature. As an approximation, it is therefore not unreasonable to disregard the effect that a change in interest rates would have on these items. A reduction in interest rates normally increases the value of shareholdings, but much of this will be captured by looking at the effect that a change in interest rates has on the enterprise sector's net interest-bearing liabilities as households mainly purchase shares from the enterprise sector. The effect of an interest rate reduction on insurance claims is uncertain, but normally the direct effect on the value of private pension insurance would be positive in the short term, whereas in the long term the reduction in yields would offset the increase in value.

3. The importance of various market rates to financial institutions' variable interest rates

In this section we will look more closely at the relationship between various market rates and deposit and lending terms of financial institutions. Our aim is to pinpoint which market rates financial institutions use to adjust interest rates, and thereby to achieve a greater understanding of why a change in interest rates results in altered terms for customers with variable-rate deposits and loans⁵. It would be natural to expect that there is positive covariance between deposit and lending rates and market rates as the money and bond markets function as a marginal investment or borrowing source for most financial institutions. As loans with variable interest rates are primarily offered by banks and insurance companies, we will concentrate on these institutions in this section, which account for 60 per cent of total financial institution lending in domestic currency (NOK) to the private sector. The interest rate on private institutions' deposits and loans at fixed rates is closely linked to the yield on bonds with an equivalent adjustment period. The state banks are in a special situation as the interest rate for a large proportion of total loans is politically determined. As noted, exceptions to this are some State Housing Bank loans, as well as the Government Industrial and Regional Development Fund (SND) and the Municipal Bank which set their own rates. At the start of this year, the SND and the Municipal Bank had around NOK 30bn with variable interest rates and well over NOK 4bn with fixed interest rates. The interest rate on variable-rate loans is linked to borrowing costs for these banks. Based on the approved changes in funding arrangements in the SND, both the SND's and the Municipal Bank's variable interest rates will shadow relatively short-term rates. Finance companies are not included as there was insufficient interest rate data.

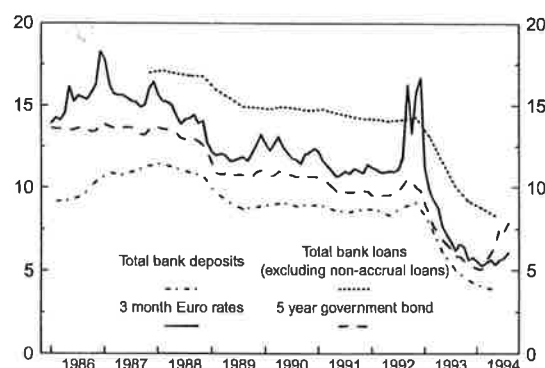
Correlation coefficients are used to measure covariance between various interest rate

⁵ Gunvald Grønvik (1994) studies how the banks adapted under various regulatory regimes, on the basis of various assumptions about their behaviour. As part of this work, he estimated the relationship between 3-month money market rates and bank rates. He finds reasons for various adjustments related to interest rate increases and declines. This is not studied here. The covariance is otherwise very similar.

series. If two variables, for example two interest rates, systematically deviate from their average at the same time and in the same direction, there would be a *positive* covariance. The larger the correlation coefficient is, the stronger the covariance. If the deviation is systematically in the opposite direction, the correlation is *negative*. The correlation coefficient can vary between 1 and -1, where a correlation coefficient of zero means that there is no systematic covariance between the two interest rate series. Correlation coefficients do not contain information about causal relationships, but it is natural to assume that it is market rates that cause a change in financial institutions' interest rates, and not vice versa. This is not formally tested here.

One problem that can arise with such calculations is that all market rates have such strong covariance that it is difficult to determine differences between the various rates (cf. Chart 1 which shows that various Norwegian market rates and bank rates have moved in parallel). Calculated covariance (measured by correlation coefficients) between market rate *levels* and bank deposit and lending rates is often very high for all interest rates. These correlations are high even with a lag of up to seven months. In other words, interest rates at the end of a quarter do not only have pronounced covariance with, for example, the 12-month rate at the end of the same quarter, but also with the level of the 12-month rate up to seven months earlier. This

Chart 1. Market rates and deposit and lending rates in banks



The strong covariance between market rates reflects that there has been a substantial move in general interest rate levels over the past few years, but no considerable shifts in the yield curve until this year. When interest rate levels were high towards the end of the 1980s, all interest rates were high, and when they then fell prior to 1994, all interest rates also fell. To a large extent, this overshadows variations in interest rates between the various terms over time. However, it is difficult to pinpoint which market rates financial institutions use to set interest rates by using simple correlation coefficients on this basis.

Source: Norges Bank

also applies to bond yields and money market rates, which all display strong covariance with bank rates.

However, the correlation between *changes* in the different market rates is considerably lower than between the different market rate levels, cf. Table 8. In other words, a change in

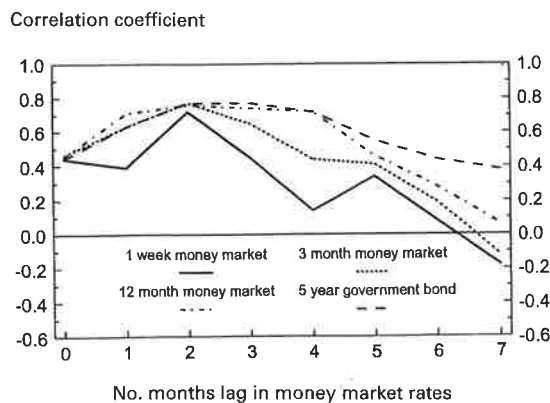
Table 8. Correlation between changes in interest rates from 1987 to 1994. Monthly data

	Norges Bank Overnight loans	Money market rates					Government bonds	
		1 week	1 month	3 months	6 months	12 months	5 years	10 years
Overnight loans	1.00	0.86	0.70	0.59	0.45	0.33	0.25	0.14
1 week		1.00	0.58	0.36	0.19	0.05	0.01	-0.08
1 month			1.00	0.93	0.77	0.57	0.27	0.16
3 months				1.00	0.94	0.80	0.46	0.36
6 months					1.00	0.95	0.62	0.56
12 months						1.00	0.73	0.69
5 years							1.00	0.96
10 years								1.00

Changes in Norges Bank's overnight lending rates have pronounced covariance with changes in 1-week money market rates, but the covariance falls steadily with increasing maturity. This is in accordance with the assumption that money market rates are most closely linked to Norges Bank's administered interest rates. The correlation coefficients between changes in 1-week to 3-month money market rates and changes in government bond yields are all somewhere between -0.08 and 0.46, which is low in relation to the correlations for interest rate levels. Calculations are based on effective Euro-krone yields and a series of weighted, representative government bonds.

Source: Norges Bank

Chart 2. Private banks. Total lending. Simple correlation coefficients between changes in lending rates and changes in various market rates. From Q1 1988 to Q2 1994



The correlation between changes in bank interest rates and changes in market rates is strongest when there is approximately a 2-month lag between a change in market rates and a change in bank rates. The covariance between changes in bank lending rates and changes in government bond yields appears just as strong as the covariance between bank rates and short-term interest rates.

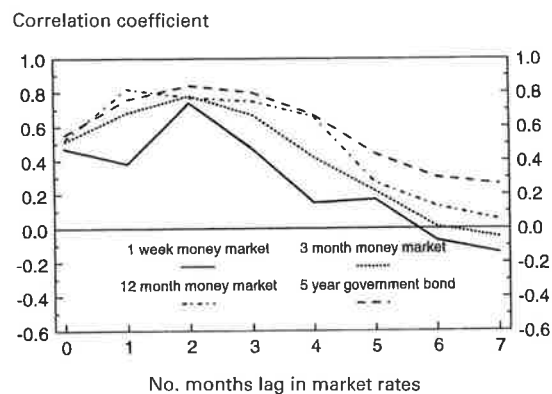
Source: Norges Bank

one market rate does not exactly coincide in time with a change in another market rate, even though both move with general rate levels over time. This means that any covariance between changes in deposit and lending rates and changes in long-term market rates *cannot* be explained by the longest market rates reflecting changes in short-term rates.

Charts 2–4 show the correlation coefficients between changes in Euro-krone rates with maturities of 1 week, 3 months and twelve months respectively, and the yield on 5-year government bonds on the one hand, and changes in private bank deposit and lend-

⁶ We have used the effective annual rates at the end of the quarter for the various financial institutions. These are then used to calculate any changes within the quarter. Market rates are the average monthly rates calculated as effective annual rates, and the change is the difference between the monthly average of the last month and three months previously. Varying starting dates have been used, and we have also made calculations for the banks which exclude observations after the second quarter of 1992, so that the interest rate turbulence in autumn 1992 does not influence the estimated cor-

Chart 3. Private banks. Total deposits. Simple correlation coefficients between deposit rates (cross-section of private banks) and changes in various market rates. From Q1 1987 to Q2 1994



The correlation between changes in bank deposit rates and changes in market rates is also strongest when there is a time lag of two months between a change in market rates and a change in bank rates.

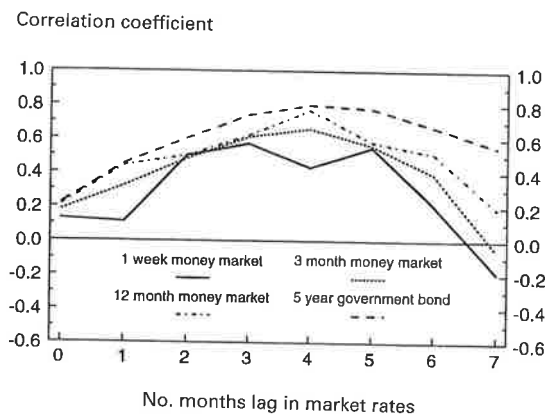
Source: Norges Bank

ing rates and insurance company lending rates on the other⁶. The covariance between the change in market rates and the change in deposit and lending rates is most pronounced when there is a slight lag between a change in market rates and any consequent changes in financial institutions' rates. For example, the change in bank rates in the first quarter has less covariance with the change in the 1-month rate in December to March (the same quarter) than the change in the 1-month rate from November to February (one month lag).

When comparing a change in market rates with a change in bank rates in the same peri-

relations. These adjustments do not change the overall impression provided by the figures. The calculations include most markets rates where there was data available, and where interest rate series for total deposits and lending are split up into various products (sight deposits, time deposits, short-term loans, long-term loans etc.). Results for the different products vary, but on the whole they coincide with the results shown in the charts. The correlation coefficients for market rates that are not included in the charts on the whole coincide with market rates that are included according to maturity.

Chart 4. Life insurance. Total loans. Simple correlation coefficients between changes in lending rates (cross-section of life insurance companies) and changes in various market rates. From Q1 1987 to Q2 1994



Life insurance lending rates reflect changes in market rates with a somewhat longer time lag than bank deposit and lending rates. The correlation coefficient is roughly 0.2 for changes in the same period, and increases to 0.75-0.80 for 12-month money market rates and 5-year government bonds with a five-month lag.

Source: Norges Bank

od, the correlation coefficients between the change in bank deposit and lending rates and market rates are in the area of 0.5, increasing to around 0.75 to 0.85 when bank rates have an approximate 2-month lag in relation to market rates. The correlation coefficients fall to around zero when there is a six to seven month lag. This indicates that if a change in market rates causes a change in deposit and lending rates, the effect on banks is greatest after two to four months. Life insurance company rates follow the same pattern, but the lag in relation to market rates appears to be longer. We have also made similar calculations for Postbanken's deposit and lending rates, but the data used covers a shorter period. The time-lag for Postbanken is two to five months for deposits and three to five months for lending. Postbanken's deposit rates show lower covariance with markets rates than the other banks, whereas Postbanken's lending rates

have the same level of covariance as the other banks and life insurance companies.

There could be several reasons why it takes a number of months for changes in market rates to result in a change in financial institutions' interest rate terms. First of all, financial institutions are in most cases obligated to notify existing customers some time before there is a change in interest rates. Furthermore, it is possible that financial institutions prefer to wait a while before adjusting interest rates in order to establish whether the change is permanent. Some financial institutions wait to see what their competitors do before changing their interest rate terms, and this can further postpone the change in interest rate terms. If the latter argument is applied, it may indicate that banks are leaders in the market and that Postbanken and life insurance companies wait to see what the banks do before changing their interest rates. The reason that a change in market rates has a faster impact on bank interest rate terms may simply be that money market financing and investment are more important for the banks than Postbanken and life insurance companies. In the period covered by the calculations, bank financing was to a great extent based on short-term loans from the money market, even though the deposit ratio has gradually increased since the last part of the 1980s. Postbanken has been able to finance its lending by using customer deposits.

It is perhaps somewhat surprising that changes in 12-month and 5-year rates have such pronounced covariance with deposit and lending rates. It is usually assumed that 3-month money market rates have the strongest influence on bank deposit and lending terms. Interest rates with a maturity of less than three months are assumed to be influenced by short-term liquidity, whereas the longer-term interest rates are not so important to the banks' marginal financing.

During spring and early summer this year, there was a marked increase in government bond yields without an equivalent increase in money market rates, cf. Chart 1. Previously, bond yields in Norway have on the whole been lower than money market rates. This has meant that until now, interest rate formation was different from that in Germany, for exam-

ple, where short-term and long-term rates have moved more independently of each other, cf. Chart 5.

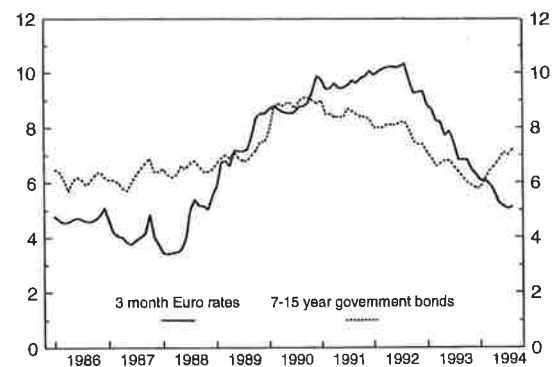
As we only have data for financial institutions' deposit and lending rates up to end-June this year, the observed covariance between bank interest rates and market rates may not fully capture the new information contained in the shift in the yield curve this year. The reason is that changes in market rates appear to affect deposit and lending rates only after a certain time-lag. However, observations made in the summer support the hypothesis that money market rates have the greatest influence on bank rates as bank rates have continued to fall three to four months after bond yields began to rise.

The interest rate series we have used for the banks (and life insurance companies) are weighted, average interest rates, where we have weighted the various deposit and lending products (cf. footnote 5) and combined various companies. As a result, the interest rate series could be less volatile than the underlying interest rates for individual institutions. The correlation with long-term rates, which have been relatively stable in relation to money market rates for most of the period covered, may be greater than if we had looked at individual underlying series.

Another factor that could be of importance is the competitive situation for the various financial institutions. Mortgage company lending to the private sector, with interest rates linked to bond yields, is more than NOK 73bn. Life insurance company lending amounts to NOK 75bn, which could alternatively be invested in bonds. The competitive situation may therefore indicate that banks must also take account of more long-term rates when setting interest rate terms.

In recent years, menu costs have received some attention in economic literature about price rigidities. Menu costs include costs associated with price changes (the menu). In the case of financial institutions, this would comprise the cost of printing and sending out letters to notify customers of interest rate changes, as well as administrative costs in connection with changes in computing interest and evaluating current commitments. For a bank with 500 000 customers, four interest

Chart 5. Effective yields in Germany



Whereas Norwegian government bond yields have moved in parallel with money market rates until this year (cf. Chart 1), historically German bond yields have not moved in step with German short-term interest rates.

rate adjustments a year would cost NOK 6m in postage alone. If deposit and lending rates do not deviate too much from market rates compared with the optimal level, this cost would be substantial in relation to the costs incurred by not changing interest rates.

If it is further assumed that long-term rates contain information regarding future short-term rates, it is not given that a change in short-term rates alone is sufficient to trigger changes in interest rate terms for financial institutions, even though short-term rates represent marginal borrowing costs. The cost of raising interest rates, only to lower them again if short-term rates fall, can be greater than the advantage. This would be an obvious calculation for the banks to make, if short-term rates were to increase without any increase in long-term rates. Moreover, there is no reason to increase interest rates if there is a rise in long-term rates with no equivalent rise in short-term rates. As such, the hypothesis is consistent with the observations made this spring and summer. In the same way that menu costs are of great importance to financial institutions, the forward-rate structure – if it is assumed to contain information about future short-term rates – is also important in terms of the extent to which financial institutions should change their rates, and by how much. This could be one of the reasons for the surprisingly high correlation between the change

in the 12-month and 5-year rates and the change in deposit and lending rates.

At this point we are unable to draw any clear conclusions as to which market rates are of the greatest significance to variable rates for the private sector. On the other hand, the hypothesis that short-term market rates are the most important factor for financial institutions' interest rate determination still appears to be reasonable. However, longer-term rates also appear to have some bearing on variable rates set by financial institutions.

4. *The private sector's sensitivity to changes in market rates in Norway compared with other countries*

Thus far we have described how the private sector in Norway is exposed to changes in interest rates. Changes in interest rates have a negative effect on disposable income for households, enterprises and municipalities as all sectors still had net interest-bearing liabilities at the end of 1993. However, since a large part of the private sector's interest-bearing assets carry variable interest rates, the immediate effect of changes in interest rates is lessened, but the effect is amplified with a sustained increase in interest rates as fixed-rate liabilities are gradually refinanced.

Table 9 presents a comparison of interest rate structures for private sector *indebtedness to banks* in selected countries. More precisely, the table shows the percentage of liabilities that are linked to long-term rates, either by fixed interest rates or adjustable interest rates that are influenced by long-term rates. In Norway's case, it is reasonable to assume that money market rates are most important to interest rates for variable-rate loans and it would therefore be correct to use Norway's share of fixed-rate loans in the comparison. The Norwegian private sector is not significantly different regarding fixed-rate liabilities. The fixed-rate share is not as high as in Germany, France, Spain and the Netherlands, but is higher than in the UK. For Norway we have shown both the fixed-rate share of liabilities in NOK, and *total interest-bearing liabilities in NOK*, i.e. including bonds, notes and certificates.

Differences in interest rate structure in the various countries is in part related to institutional conditions. In countries where financial institutions often have fixed-rate funding, for example because bond-issuing enterprises are dominant, fixed-rate loans are more common. The number of institutions with long-term financing will also be related to how well developed the capital market is, which in turn will be influenced by how variable inflation and interest rate levels have been in the past. Interest rate structures are also affected by regulations and the existence of public financial institutions. In Norway, for example, interest rates for the bond market and private banks were regulated until the start of the 1980s. This could well have limited both the supply of and demand for fixed-rate loans.

Fixed-rate loans in Norway are influenced by the treatment of the state banks. Loans from the state banks account for a substantial portion of fixed-rate loans with an adjustment period of less than one year. If only liabilities with *more than one year* to run until interest rates are adjusted are defined as fixed, the Norwegian household share falls from about $\frac{1}{3}$ to $\frac{1}{15}$. The share falls from $\frac{3}{10}$ to $\frac{1}{10}$ for enterprises. However, when evaluating sensitivity to changes in market rates, state banks should also be included in the fixed-rate figures. In the following we will therefore look at total fixed-rate loans, including fixed terms of less than one year.

Norway is not significantly different from most other countries regarding the enterprise sector and the proportion of fixed-rate liabilities, with perhaps the exception of Germany, the Netherlands and Sweden, which all have a high share of fixed-rate liabilities. The adjustments are relatively short for Norwegian households, even though they are longer than in the UK. Whereas it appears to be normal that the household sector has a higher proportion of fixed-rate loans than the enterprise sector in a number of countries, the opposite seems to be the case in the UK. The interest rate structure is more or less the same for households and enterprises in Norway.

While Table 9 shows the private sector's interest rate structure on the liability side, the total effect of a change in interest rates on income also depends on the size of net inter-

Table 9. Proportion of liabilities with long-term interest rates in selected countries (proportion of financing at fixed rates or with interest rates linked to long-term market rates)

Country	Proportion of total bank loans with fixed rates ¹⁾	Proportion of household mortgage debt with fixed rates ²⁾	Proportion of company debt with fixed rates ³⁾
Germany	>1/2	nearly all	>1/2
Netherlands	>1/2	3/4	>1/2
France	>1/2	9/10	1/3
Spain	>1/2	small	
Australia	1/20	very small	>1/3
Sweden		7/10	>1/2
Italy	<1/2	1/2	<1/3
Canada	1/2	most	<1/3
USA	>1/3	8/10	<1/3
Japan	<1/4	most	<1/2
United Kingdom	1/20	1/10	<1/3
Norway ⁴⁾ (loans in NOK)	1/3	1/3	1/3
Norway ⁴⁾ (total interest-bearing liabilities in NOK)	a good 1/3	1/3	2/5

1) For Germany two-thirds and the Netherlands three-quarters of long-term lending; for France includes fixed-rate loans with residual maturity of more than three months and variable-rate loans with a review period in excess of one year; for Italy and Spain, total fixed interest rate lending; for the United States, fixed-rate loans with a remaining maturity of more than one year and loans at rates adjusted with a frequency of less than one year; for Canada, total mortgages; for Japan, long-term prime rate related lending; for the United Kingdom, fixed-rate mortgages. The bank-concept varies between countries.

2) For Canada includes mortgages at rates adjusted annually

3) Excluding equity and trade credit. For United States, Canada and the United Kingdom, includes total bonds issued, a proportion of which may be at floating rates and, except in the case of the United Kingdom, total mortgages. In these countries the proportion of long-term fixed rate debt of smaller enterprises is much smaller. For Norway, only includes non-financial company debt.

4) For Norway, only fixed-term rates are included; loans with variable rates linked to capital market rates are not included in the fixed rate portion, as in other countries in the table. Figures in Norway are sensitive to loans from state banks which comprise 70% of private sector debt, classified as "fixed with a fixed term of less than one year". If only liabilities with fixed term rates exceeding one year were included, the fixed-rate share (loans in NOK) would be reduced to as little as 1/10 for the private sector as a whole, 1/5 for households and 1/10 for enterprises.

Source: BIS, "National differences in interest rate transmission", Basle 1994. The BIS has based the paper on information from the various central banks and on estimates. Own estimates for Norway.

est-bearing assets and the private sector's fixed interest period on the asset side. Table 10 shows how vulnerable household and enterprise sectors are to interest rate changes in the various countries, in terms of their net interest-bearing asset position. The Norwegian enterprise sector is more or less in line with the other countries regarding net interest-bearing liabilities (this includes foreign currency in Norway) in per cent of GDP. Enterprises in Germany, the US and the UK have lower interest-bearing liabilities in per cent of GDP than Norway, whereas in Sweden and Japan net interest-bearing liabilities are higher.

Norwegian households, however, do differ in this comparison. Only households in the UK, Sweden and Norway have net interest-bearing liabilities, and liabilities as a share of

disposable income are clearly highest in Norway. An increase in interest rates would have a *positive* effect on household net interest income in countries other than Norway, Sweden and the UK. However, when looking at *total* assets and liabilities, the net asset position for households in Norway differs less from that in other countries, but there are still some differences in the interest-bearing items that we are primarily interested in here.

The magnitude of the household sector's net assets (both including and excluding non-interest-bearing items) is probably closely associated with the extent of home-ownership. A high proportion of owner-occupied dwellings is assumed to result in a low net asset position for households in Norway. As an interest rate increase would have a negative effect on cash flow and presumably a negative

Table 10. Household and enterprise net interest-bearing asset and liability positions in selected countries in 1992¹⁾

Country	Net interest-bearing ³⁾ assets of households ⁴⁾ as % of disposable income	Net interest-bearing ³⁾ liabilities of enter- prises ⁵⁾ as % of GDP
Sweden	-26	68
United Kingdom	-2	17
Australia	0	42
USA	13	29
Canada	28	44
Germany	46	22
France	49	48
Spain	62	37
Italy	134	39
Japan	136	81
Norway ²⁾	-50	35

1) The end of 1993 for Norway, 1991 for Sweden, Canada, Germany and Japan.

2) Foreign currency assets and liabilities have also been included here for Norway, but may not always be relevant. The Norwegian business sector's net interest-bearing liabilities, excluding foreign currency assets and liabilities, amounted to a good NOK 74bn, or a good 10% of GDP. Households account for a very small share of foreign currency liabilities.

3) Net deposits, credits, bonds and money market instruments.

4) For the United Kingdom, Canada and Japan, including unincorporated businesses.

5) For the United Kingdom, Canada and Japan, non-financial corporate businesses; for the United States, non-farm corporate businesses; for Norway, non-financial enterprises.

Source: BIS, "National differences in interest rate transmission", Basle, March 1994. Own calculations for Norway.

effect on the value of homes as well, the impact of a rise in interest rates on the Norwegian household sector's consumption would probably be considerable in contrast to most other countries. However, any clear conclusions about the differences in the various countries regarding this point would require an identification of the total wealth effects of an interest rate change on the household sector's balance sheet.

An increase in interest rates would have a negative effect on the enterprise sector's net interest expenses in all the selected countries, but the effect of a rise in money market rates would be less in countries with a high proportion of fixed or long-term interest rates, as these would be linked to bond yields. In Norway, a large proportion of variable interest rates on assets would partly offset the imme-

diate effect of a change in interest rates on interest-bearing liabilities. For example, only ¼ of household *net* interest-bearing liabilities have variable interest rates (cf. Table 4). Enterprises have relatively few interest-bearing liabilities in NOK, of which only ⅓ have variable rates (cf. Table 5). The largest share of enterprises' net interest-bearing liabilities is in foreign currency. It is impossible to comment on any interest-rate or foreign currency hedging of these liabilities.

One important factor is that the net figures in Table 10 may conceal substantial differences in the distribution of financial wealth. There are presumably large groups with net interest-bearing liabilities in every country, and these groups often have the highest propensity to consume. Similarly, there are probably considerable variations in the financial position of the enterprise sector in each country. Another point is that the size of the private sector's financial wealth is often related to the public sector's financial position. In those countries where an increase in interest rates has a positive effect on household income, public sector finances are often very vulnerable to a rise in interest rates, cf. Italy in the table above.

In short, the Norwegian private sector as a whole does not appear to be more exposed to changes in short-term rates than in the other countries being compared, when only looking at fixed-rate interest periods on the liabilities side. Furthermore, a large part of the Norwegian private sector's liabilities are in the form of loans from state banks, which reduces the relationship between changes in market rates and the private sector's interest rate terms. However, the household sector in Norway does seem to be more vulnerable than in other countries, partly due to the relatively high proportion of variable-rate liabilities, but also because the sector has substantial net interest-bearing liabilities. As a considerable proportion of the Norwegian enterprise sector's net interest-bearing liabilities are in foreign currency, changes in interest rates *abroad* have an equally if not greater net effect on interest expenses than changes in *domestic* interest rates.

5. Monetary policy effects

Monetary policy in Norway is oriented towards maintaining a stable krone exchange rate against European currencies. Interventions may be used in the short term to stabilise the value of the Norwegian krone, but over a somewhat longer time horizon money market rates have to be adjusted to maintain a stable exchange rate. In this way, movements in Norwegian interest rate levels depend on interest rate levels in other European countries. Monetary policy therefore influences the domestic economy through changes in interest rates that ensure stability in the exchange rate. However, changes in the exchange rate between European currencies in the ERM and other currencies such as the US dollar, the yen and the Swedish krona will also influence the effective krone exchange rate. This study of private sector interest rate terms may provide a rough basis for evaluating the effects of changes in money market rates.

A more thorough analysis of how monetary policy affects the real economy would, in addition to what has been done here, require an analysis of the relationship between Norges Bank's management of the most short-term rates and the level of market-determined rates. Moreover, it would also be necessary to analyse interest-rate sensitivity (and sensitivity to exchange rate changes) in household and enterprise behaviour. In addition to looking at the effect on net interest-bearing assets, as discussed in this article, it would also be necessary to examine the effect on the value of other assets and liabilities on the private sector balance sheet, including fixed assets. Uncertainty regarding these relationships leads to uncertainty as to how monetary policy affects the sector.

Some cautious conclusions on the effect of monetary policy that can be drawn from what has been discussed here, are that an increase in money market rates starts to affect financial institutions' interest rate terms after an estimated period of two to three months. Once a change in domestic interest rates has affected financial institutions' interest rates, households and enterprises will quickly feel the effect in net interest expenses. The total effect on net interest expenses depends on any

changes in the state banks' interest rate terms and the enterprise sector's foreign currency debt. The municipalities are not affected to any significant degree until about one year later.

The household sector's relatively high proportion of fixed-rate liabilities with a short adjustment period, combined with a substantial net liability position for interest-bearing items in NOK, entails that a fall in interest rates would have a clear and swift effect on demand, as experienced in 1993 and 1994. A reduction in interest rates results not only in lower net interest expenses but also in increased housing wealth, which in turn amplifies the effect on demand.

The sensitivity of household sector disposable income to changes in short-term interest rates also entails that maintaining high money market rates over a longer period to defend the exchange rate can have a more pronounced impact on the real economy in Norway than in other countries. In countries where households have a larger proportion of fixed-rate terms, or assets and liabilities are linked to long-term rates, short-term adjustments to money market rates will have little effect on domestic demand.

The effect of a general change in European interest rates on private sector disposable income varies from country to country in Europe, depending on differences in interest rate structure and financial sector balance sheets. One special feature of Norway, in this connection, is the substantial net interest-bearing liabilities of the household sector. Whereas a rise in interest rates has a net positive effect on household income in most countries, it has a strong negative impact in Norway if the effect on non-interest-bearing items is disregarded. However, the effect has weakened over time, as households have gradually reduced their net liabilities. Even with annual financial saving of around 3–5 per cent of disposable income, it will still take some years before Norwegian households are in the same position as households in other countries.

The financing structure of households and enterprises varies considerably from country to country. Greater financial integration in Europe entails greater choice for households

and enterprises. This may mean that the differences will narrow over time, and that long-term financing will become more important in Norway. This could be a favourable development for Norway, as it may entail that money market rates could be adjusted more easily to ensure exchange market stability without having any significant impact on domestic demand.

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