

# An analysis of banks' problem loans

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**In this analysis, we look at the macroeconomic factors which function as driving forces behind developments in banks' problem loans. Problem loans include non-performing loans and other particularly doubtful loans. Since the beginning of the 1990s, problem loans as a share of total loans have declined sharply and are now at a historically low level. However, the volume of problem loans is highly sensitive to cyclical developments and will usually increase during economic downturns. We have analysed banks' problem loans in the household and the enterprise sector respectively, using two empirical models. The analysis reveals that the declining share of problem loans in recent years is primarily attributable to developments in real interest rates and unemployment. We also project banks' problem loans based on two macroeconomic scenarios: A baseline scenario and a stress scenario which illustrates a deteriorating macroeconomic situation.**

## 1 Introduction

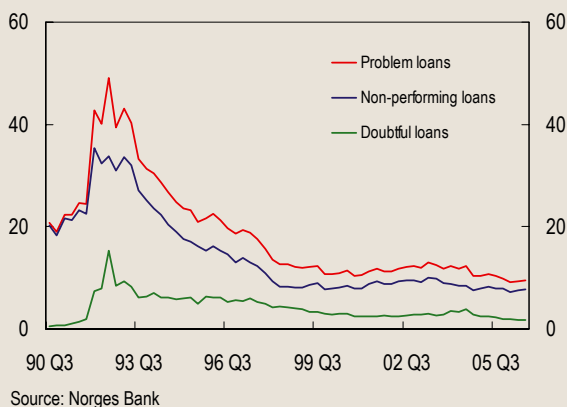
One of Norges Bank's key tasks is to monitor the financial system. The banks play a central part in the financial system as providers of credit and payment services. Norges Bank therefore closely monitors developments in the banking sector. Attention is particularly focused on developments which in the short or long term may weaken stability in the banking sector and prevent banks from discharging their responsibilities in a satisfactory manner. The experience of Norway and other countries shows that developments in problem loans along with losses on bank lending have a considerable impact on banks' ability to channel credit.<sup>2</sup>

Problem loans consist of both non-performing loans and non delinquent loans which the banks consider to be particularly doubtful.<sup>3</sup> Banks have to estimate their expected losses on problem loans if a borrower goes bankrupt or is, for other reasons, unable to service his debt. To a large extent, recorded losses consist of changes in these loss estimates<sup>4</sup>. There will thus be a close connection between banks' problem loans and recorded losses. However, recorded losses are also affected by unexpected losses and reversals of previously recorded losses, and the lag between developments in problem loans and recorded losses may vary.

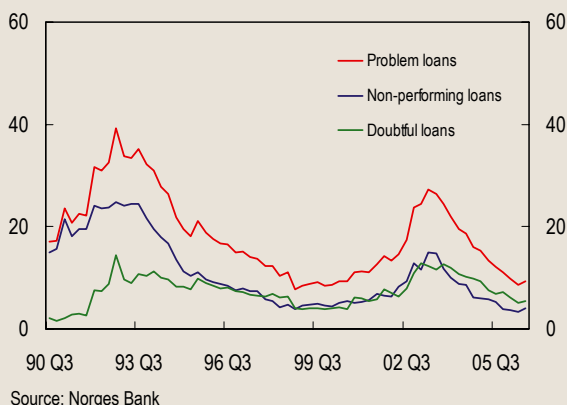
In this article, we look at the relationship between macroeconomic factors and banks' problem loans. Banks' problem loans serve as an important indicator of financial imbalances in the household and enterprise sectors. A high share of problem loans indicates that many borrowers are having problems in servicing their debt. This may result in higher loan losses for banks.

Developments in the volume of problem loans may

**Chart 1** Banks' problem loans, non-performing and doubtful loans. Household sector. Billions of 2003-NOK. 1990 Q3 – 2006 Q3



**Chart 2** Banks' problem loans, non-performing and doubtful loans. Enterprise sector. Billions of 2003-NOK. 1990 Q3 – 2006 Q3



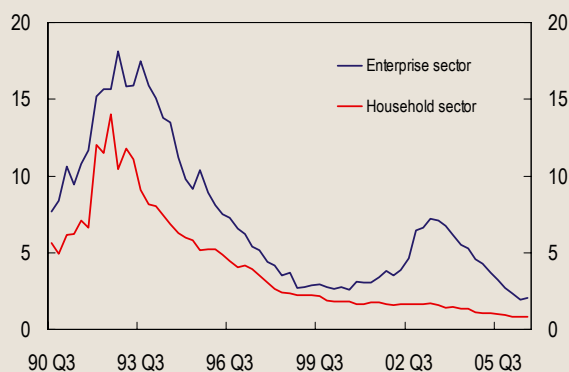
<sup>1</sup> We are grateful to Eivind Bernhardsen, Gunnar Bårdsen, Karsten Gerdrup, Dag Henning Jacobsen, Kai Larsen, Kjersti-Gro Lindquist, Bjørn Naug, Kjell Bjørn Nordal, Bent Vale and Birger Vikøren for their useful contributions and comments.

<sup>2</sup> Analyses of Crockett (1997), Gonzales-Hermosillo (1999) and the International Monetary Fund (1998), show that the number of non-performing bank loans increases considerably prior to financial crises.

<sup>3</sup> A loan shall be regarded as non-performing when interest and principal payments have not been paid when due. The bank shall then estimate how much it may lose on the loan. Doubtful loans are those where no formal default has occurred, but which the bank still considers to be doubtful. Figures for both non-performing and doubtful bank loans are published quarterly in Norges Bank's banking statistics. As of 1 January 2007, the banking statistics are published on Statistics Norway's website.

<sup>4</sup> Estimates of banks' expected losses on their problem loans were previously called specified and unspecified loan loss provisions in the previous Loan Loss Regulation of 1991. In December 2004, a new regulation regarding the accounting treatment of loans and guarantees (Loan Regulation) was issued. In the new regulation, specified loss provisions have been replaced by the terms "individual write-downs" and "group write-downs". The new Loan Regulation is generally more technically complicated than the original Loan Loss Regulation. Among other things, greater demands are placed on documentation of loss probability through objective indications of a fall in the value of loans. The transition to the new rules will primarily affect loan loss provisions, and thereby how book losses are recorded. Problem loan holdings will not be affected to any great extent.

**Chart 3** Problem loans as a share of total loans to the enterprise and household sector, respectively. Per cent. 1990 Q3 – 2006 Q3



Source: Norges Bank

primarily be directly related to borrowers' capacity and incentive to service debt. Relevant macroeconomic variables that affect the capacity and incentive to service debt may thus be included as explanatory variables in empirical models for banks' problem loans.

In general, a certain proportion of banks' loans will over time be non-performing and later be lost because borrowers cannot repay the loan as agreed. However, the volume of problem loans is sensitive to cyclical developments and will normally be higher in periods of contraction and lower in periods of expansion. Charts 1 and 2 show developments in problem loans in the household and the enterprise sector, respectively. In both sectors, the volume of problem loans peaked during the banking crisis, before falling sharply in the latter half of the 1990s. In recent years, the level of economic activity has been high and the volume of problem loans has thus been low. In addition, debt growth has been high in both sectors, resulting in a historically low level of problem loans as a share of total loans (see Chart 3).

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

- What are the most important macroeconomic explanatory factors for developments in banks' problem loans?
- How quickly and strongly do problem loans react to changes in these factors?
- What has driven developments in problem loans in recent years?
- How are problem loans expected to develop over the next few years?

In the next section, we discuss factors that may affect banks' problem loans. Section 3 presents two empiri-

cal models for problem loans in the household and the enterprise sector, respectively. In Section 4, we take a closer look at the contributions of each of the explanatory factors over the past few years. We further present projections of problem loans based on expected macroeconomic developments as outlined in *Inflation Report* 3/06. We also present projections based on a stress scenario which illustrates a deteriorating macroeconomic situation. Section 5 concludes.

## 2 What influences banks' problem loans?

Factors that determine developments in banks' non-performing loans and losses have previously been the subject of a number of analyses<sup>5</sup>. Several of the analyses<sup>6</sup> have been based on an expression which indicates the expected level of non-performing loans:

$$(1) \quad NPL = \sum_{i=1, \dots, n} p_i L_i$$

where  $NPL$  = non-performing loans;  $p_i$  = the probability that borrower  $i$  will default on his loan;  $L_i$  = the borrower's debt  $i$ ;  $i = 1, \dots, n$  denotes the borrower.

According to relation (1), non-performing loans may be analysed based on the probability of the borrower defaulting on his loan and the size of the individual loan. However, we do not observe the probability of default for the individual borrower,  $p_i$ , but we may assume that this depends on the borrower's capacity and incentive to service his debt as agreed, i.e. in accordance with his contract with the bank.

*Debt-servicing capacity* depends on developments in borrowers' income, debt-servicing costs and other costs. Banks provide loans based on borrowers' expected future income and expenditure flows. If developments in these variables deviate from expected developments, the borrower's debt-servicing capacity may be reduced. In periods of weak cyclical developments, when unemployment is rising and corporate earnings are deteriorating, there may be an increase in both non-performing loans and banks' losses.

*The incentive to service debt* will normally depend on how the loan agreement is formulated, along with developments in collateral values and interest rate levels. Other studies have looked at how debt servicing is affected by borrowers' opportunity to submit false reports of their earnings, the bank's threat to foreclose the entire loan in the event of default, and the significance of the collateral.<sup>7</sup>

<sup>5</sup> Bernhardsen (2001) uses developments in real prices for resale homes and risk-weighted debt as explanatory factors for financial institutions' losses on loans to enterprises. According to Frøyland og Larsen (2002), factors like debt burden, real housing wealth, nominal lending rates and unemployment rates are key driving forces behind financial institutions' losses on loans to households. Eitheim and Gulbrandsen (2001) model total loan losses for financial institutions where interest expenses in relation to income, as well as real interest rates after tax and unemployment are explanatory factors. Benito et al. (2001) model default in the UK household sector as a function of income gearing, the unemployment rate, loan-to-value ratio on dwellings for first-time buyers and undrawn equity in houses. They also find that debt at risk in the enterprise sector depends on enterprises' debt in relation to nominal GDP, the output gap, short-term real interest rates and real wages. Pesola (2005) models banks' losses for four Nordic countries. The analysis shows that the decisive factors for banks' losses are financial vulnerability, represented by debt burden, macroeconomic shocks, represented by unexpected GDP growth, and changes in the real interest rate. Rinaldi and Sanchis-Areallano (2006) look at default in the household sector by using panel data estimation on seven euro area countries. The analysis shows that debt-to-income ratio, inflation, lending rates, financial wealth and housing wealth are important driving forces behind default developments.

<sup>6</sup> For instance Benito et al. (2001), Frøyland and Larsen (2002) and Pesola (2005).

<sup>7</sup> For a review of theoretical models on the relationship between lender and borrower and contract terms, see for example chapter 4 in Freixas and Rochet (1997).

### Households' capacity and incentive to service debt

Households' debt-servicing capacity generally depends on developments in their income, debt, borrowing rate and collateral values. Higher incomes are expected to contribute to reducing the volume of problem loans. However, incomes may be unevenly distributed across households. When unemployment is rising, many households may experience a substantial reduction in income. Thus, we expect that higher unemployment will lead to a higher volume of problem loans. When interest rates and/or debt are rising, a larger share of borrowers' current income will be used to service debt. In isolation, this will contribute to increasing the number of borrowers with debt-servicing problems and we expect the volume of problem loans to rise. It is reasonable to assume that an increase in the collateral value provides borrowers with greater opportunities to cope with a strained financial situation. Borrowers may achieve more favourable interest rate terms on their loans or possibly a deferral of principal payments. The volume of problem loans is therefore expected to decrease if house prices increase.

In general, households have a high incentive to service their debt, regardless of the collateral value. A large share of household debt is secured on dwellings. If the bank wishes to recover the collateral, households risk having to move. Moving costs can be substantial. Furthermore, in the event of a forced sale, prices for the collateral may be lower than the normal market value. In addition, households with defaulted debt may have negative credit information registered with credit information agencies, which may make it difficult to raise new loans. Even when the collateral value is lower than the debt, households will still have a high incentive to service their debt as most households will end up having outstanding debt after the collateral has been recovered.

### Enterprises' capacity and incentive to service debt

Enterprises' capacity to service debt generally depends on their income and costs, borrowing rates and the size of the debt. Developments in corporate earnings will to a large extent follow business cycles. Unemployment is an indicator of the level of activity in the economy. If unemployment is low, domestic demand will be relatively high. This normally leads to solid corporate earnings and increased debt-servicing capacity. Therefore, lower unemployment is expected to lead to a reduction in problem loans. Oil prices also constitute an important cyclical variable in the Norwegian economy. This is primarily an important factor for the activity and investment level in the petroleum sector, but it also has spillover effects for suppliers to this industry. Norway's terms of trade also depends on oil prices. An increase in oil prices is expected to reduce the volume of problem loans. Developments in earnings for internationally exposed enterprises are affected by their competitiveness relative to foreign enterprises and by activity levels abroad in general. Deteriorating competitiveness and/or

declining foreign demand are expected to lead to an increase in problem loans. Furthermore, a rise in costs is expected to increase the volume of problem loans. The real interest rate plays an important role in enterprises' debt-servicing capacity. When interest rates and/or debt are rising, a larger share of borrowers' current income will be used for interest payments. In isolation, this will contribute to increasing the number of borrowers with debt-servicing problems and we expect the volume of problem loans to rise.

Enterprises' incentive to service debt will generally depend on collateral values and interest rate levels. If a limited company defaults on its loan and subsequently goes bankrupt, creditors will recover outstanding claims by liquidating any collateral. However, any outstanding debt will be cancelled if the enterprise has limited liability. For enterprises, the loss of the collateral and other assets would be a cost in the event of default. Therefore, an increase in collateral values is expected to reduce the volume of problem loans. Default costs may also be incurred in the form of difficulty in raising new loans, higher risk premiums on borrowing rates and increased collateral requirements for future loans. Stiglitz and Weiss (1983) and Boot and Thakor (1994) consider such possible changes in borrowing terms resulting from default. Stiglitz and Weiss (1981) show that interest rates indirectly influence enterprises' incentive to service debt. When lending rates are higher, borrowers may tend to choose more risky investment projects, which increases the probability of default.

Based on the discussion above, we may conclude that the volume of problem loans will increase with the size of debt, the lending rate and costs and decrease with collateral values and income (see relation (2)).<sup>8</sup>

$$(2) \quad PL = f(L, r, C, CV, I, Z)$$

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where  $PL$  = problem loans;  $L$  = debt/loan measured in NOK;  $r$  = borrowing rate;  $C$  = borrower's costs;  $CV$  = collateral value;  $I$  = borrower's income;  $Z$  = vector with other relevant factors. The sign under each variable indicates whether we expect an increase or a decrease in the volume of problem loans if the variable increases.

## 3 Empirical models for banks' problem loans

In this section, we present two empirical models for banks' problem loans – one for the household sector and one for the enterprise sector. The theoretical discussion in Section 2 provides a basis for specifying general empirical models where relevant explanatory factors are included. We then reduce and simplify the models by omitting insignificant variables and imposing empirically valid restrictions.

<sup>8</sup> It should be mentioned that banks can also probably influence the volume of problem loans by using more or less resources on reviewing such loans. If banks' influence has changed structurally over time, and not just over the business cycle, this may constitute a problem for the empirical modelling. Changes over the business cycle will probably be captured by the cyclical variables in the model.

### 3.1 The household sector

Using the discussion in Section 2 as a starting point, we have the following set of possible explanatory variables in a general model for problem loans in the household sector:

- Household real gross debt (measured by banks' lending to households)
- Real house prices
- Unemployment
- Real disposable income (less reinvested dividends in the years 2000–2005)<sup>9</sup>
- Real interest rates

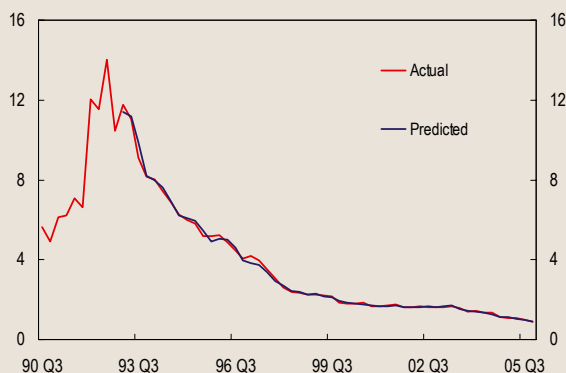
The preferred model is specified in Box 1. The model is an equilibrium correction model of the logarithm of the share of problem loans<sup>10</sup> in the household sector. The model is estimated over the period 1993 Q1–2005 Q4. The model includes the effects of household real disposable income, real house prices, unemployment and real interest rates. The expression in square brackets shows

the long-term relationship between the share of problem loans and the model's four explanatory variables. If the share of problem loans lies above (below) the estimated long-term relationship in quarter  $t$ , the share of problem loans will gradually fall (rise) before returning to the long-term relationship. Due to lags in the adjustment process, it takes approximately 3 years before the share of problem loans is back to its long-term level (all else being equal). Charts 4 and 5 show that the model fits well over the estimation period.

#### How do shifts in explanatory variables affect the share of problem loans?

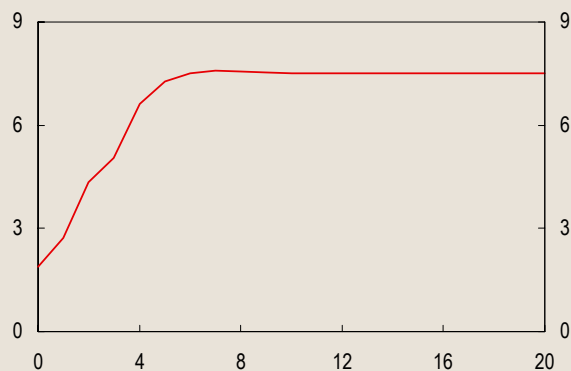
According to the model, the share of problem loans will be reduced by 1.2 per cent in the long run if real disposable income increases by 1 per cent. The adjustment is relatively quick, and the full effect is achieved after about 4 quarters. The rapid adjustment is probably related to the importance of households' income flows for their *capacity* to service debt.

**Chart 4** Problem loans as a share of total loans to the household sector. Actual and predicted. Per cent. 1990 Q3 – 2005 Q4



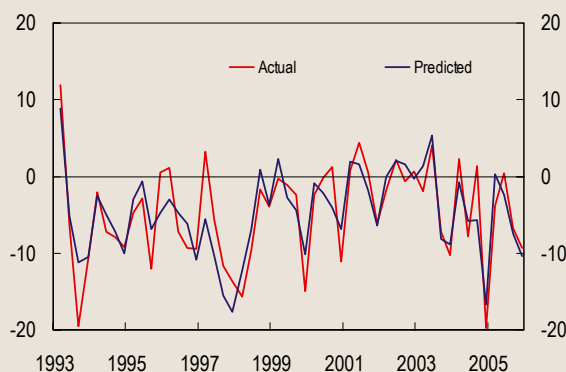
Source: Norges Bank

**Chart 7** Change in the share of problem loans when banks' real lending rate increases permanently by one percentage point. Household sector. Percentage change over time. Quarterly figures



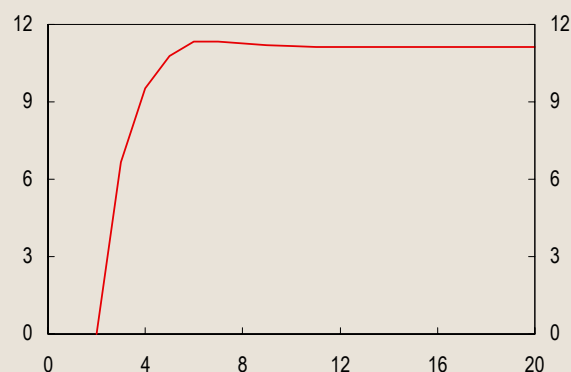
Source: Norges Bank

**Chart 5** Quarterly change in the share of problem loans. Household sector. Actual and predicted. Per cent. 1993 Q1 – 2005 Q4



Source: Norges Bank

**Chart 6** Change in the share of problem loans when unemployment increases permanently from 3 to 4 per cent. Household sector. Percentage change over time. Quarterly figures



Source: Norges Bank

9 In the period 2000–2005, disposable income is marked by extraordinarily high dividends as a result of the planned changes in the taxation of share dividends. A large portion of the dividend payments is probably reinvested in enterprises in the form of loans or share capital. Therefore, estimated reinvested dividends have been deducted from disposable income for the period 2000–2005.

10 In order to arrive at an appropriate model specification for banks' problem loans in the household sector, modelling problem loans as a share of total loans proved to be useful. See Box 1 for further details.

A rise in the unemployment rate from 3 to 4 per cent will increase the share of problem loans by just over 11 per cent (see Chart 6). This effect would only appear after 3 quarters. Households that are affected by a rise in unemployment will normally attempt to solve debt-servicing problems by using financial reserves and/or reducing consumption. In addition, they may apply for a payment deferral and an interest-only period. This may delay the effect on problem loans.

An increase in real house prices of 1 per cent will reduce the share of problem loans by 1.2 per cent. The adjustment takes place even more quickly than with income changes, and the full effect is reached after 3–4 quarters.

An increase in real interest rates of one percentage point will increase the share of problem loans by just over 7 per cent in the long run (see Chart 7). The effect comes gradually, and the full effect is reached after approximately 6 quarters.

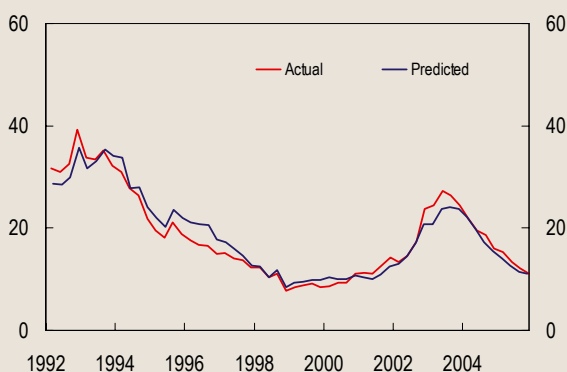
### 3.2 The enterprise sector

Using the discussion in Section 2 as a starting point, we have the following set of possible explanatory variables in a general model for problem loans in the enterprise sector:

- Enterprises' real gross debt (measured by banks' lending to private non-financial enterprises)
- Real commercial property prices
- Domestic demand (represented by the unemployment rate)
- Real oil prices
- Competitiveness (measured by the real exchange rate<sup>11</sup>)
- Foreign demand (represented by the output gap in OECD countries)
- Real unit labour costs
- Real material input costs
- Real interest rates

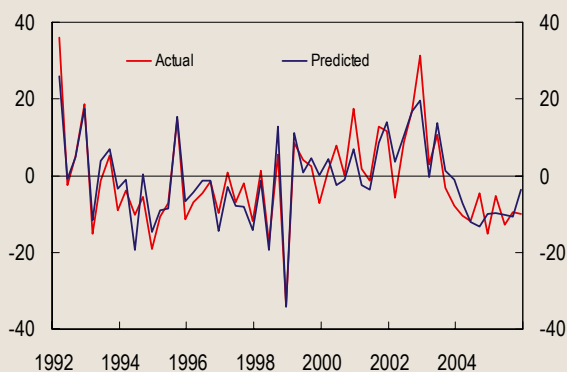
Some of the explanatory variables proved not to be significant. Multicollinearity, i.e. high correlation between the explanatory variables, may be a problem in the general model. If this is the case, it may be difficult to identify effects on problem loans of all the variables included in the general model. In that event, the coefficients in front of the remaining variables will represent gross coefficients and capture effects of other factors that have been excluded. Real commercial property prices had insignificant t-values in the model. As commercial property prices largely vary in step with cyclical developments, there may be problems with high correlations between commercial property prices and other cyclical variables in the model. Nor were foreign demand or cost variables statistically significant. Borrowing in the enterprise sector will normally be based on an estimate for expected cost developments in the individual enterprise.

**Chart 8** Problem loans in the enterprise sector. Actual and predicted. Billions of 2003-NOK. 1992 Q1 – 2005 Q4



Source: Norges Bank

**Chart 9** Quarterly change in problem loans. Enterprise sector. Actual and predicted. Per cent. 1992 Q1 – 2005 Q4



Source: Norges Bank

One possible reason why the cost variables do not have significant effects in the model may be that actual cost developments have not diverged markedly from expected changes at the aggregated level.

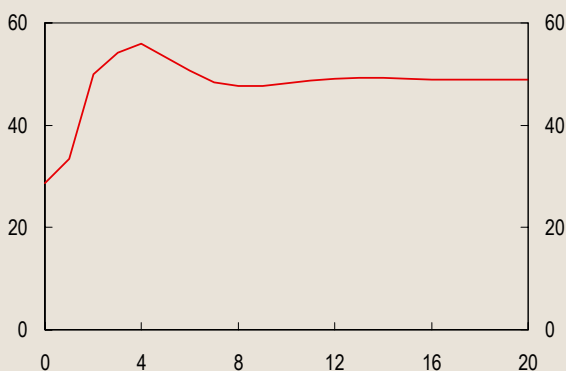
In the final empirical model, the remaining effects are those of unemployment, real oil prices, real interest rates, enterprises' real gross debt and competitiveness.

The preferred model is specified in Box 2. The model is an equilibrium correction model of the logarithm of problem loans at constant 2003-NOK. The estimation period runs from 1992 Q1 up to 2005 Q4. The expression in square brackets shows the long-term relationship between problem loans and the explanatory variables. If the volume of problem loans lies above (below) the estimated long-term relationship in quarter  $t$ , the volume of problem loans will gradually fall (rise) before returning to the long-term relationship. Due to lags in the adjustment process, it takes approximately 3 years before the volume of problem loans is back to its long term level (all else being equal). Charts 8 and 9 show the model's fit over the estimation period.

<sup>11</sup> The real exchange rate is defined as relative labour costs, calculated in a common currency. Jacobsen and Kloster (2005) also use the real exchange rate, defined in the same way, as a measure of competitiveness in their analysis of bankruptcies in the enterprise sector.

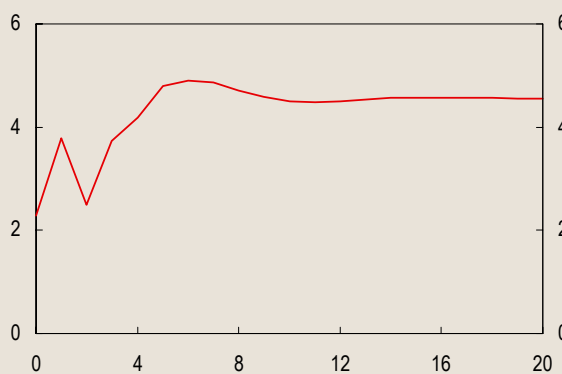


**Chart 10** Change in problem loans when unemployment increases permanently from 3 to 4 per cent. Enterprise sector. Percentage change over time. Quarterly figures



Source: Norges Bank

**Chart 11** Change in problem loans when banks' real lending rate increases permanently by one percentage point. Enterprise sector. Percentage change over time. Quarterly figures



Source: Norges Bank

### How do shifts in explanatory variables affect developments in problem loans?

The unemployment rate is included in the model as a proxy for of domestic demand. According to the model, a negative shift in demand will increase banks' volume of problem loans. Problem loans react relatively strongly and quickly to changes in unemployment. For example, a rise in unemployment from 3 to 4 per cent would in isolation increase problem loans by just under 50 per cent in the long run (see Chart 10). This indicates that the business cycle is crucial for developments in problem loans.

According to the model, a rise in real interest rates, i.e. debt-servicing costs, would lead to an increasing volume of problem loans. An increase in real interest rates of one percentage point will increase the volume of problem loans by just over 4.6 per cent in the long run (see Chart 11). The full effect will unwind after about 2½ years.

Strong wage growth in the internationally exposed sector, or an appreciation of the krone exchange rate, will imply a deterioration of Norway's competitiveness in relation to our trading partners. The model implies that problem loans will increase by approximately 0.7 per cent in the long run if competitiveness deteriorates by 1 per cent. The adjustment takes place relatively slowly and the full effect is reached after 3½ years.

Fluctuations in real oil prices also have an impact on problem loans. According to the model, a rise in real oil prices of 1 per cent will lead to a reduction in problem loans of about 0.5 per cent in the long run. The full effect of a change in oil prices unwinds after about 3 years.

The volume of problem loans increases when banks' lending increases. In the short term, an increase in loans to enterprises of 1 per cent will lead to an increase in problem loans of 1.7 per cent. Thus, problem loans increase more than loans in the short run. This may capture the fact that the volume of problem loans is larger among newer than among older loans. One reason may be that

the bankruptcy frequency generally is higher among new enterprises than among established enterprises.<sup>12</sup> However, in the long run an increase in loans of 1 per cent will entail a similar increase in problem loans.<sup>13</sup> This indicates that a considerable share of new problem loans is considered "healthy" after a short period, or that banks recognise loan losses. In both cases, the loan will be removed from the problem loan holdings.

## 4 What drives developments in problem loans?

In this section, we take a closer look at the driving forces behind developments in problem loans in recent years. We then present projections of problem loans in both sectors based on expected macroeconomic developments as described in *Inflation Report 3/06*. Finally, we present projections of problem loans in a stress scenario, based on a deteriorating macroeconomic situation.

### Contributions from each of the explanatory factors

Banks' problem loans rose sharply in 2002 and 2003. Problems in the enterprise sector were the main factor behind this increase. However, the trend was reversed through 2004 and 2005, and problem loans in both the enterprise and household sectors are now at a historically low level. By using the models for problem loans, we can take a closer look at the contributions of each of the explanatory factors in recent years. We have decomposed the two models for the period from 2002 Q1 – 2005 Q4.<sup>14</sup>

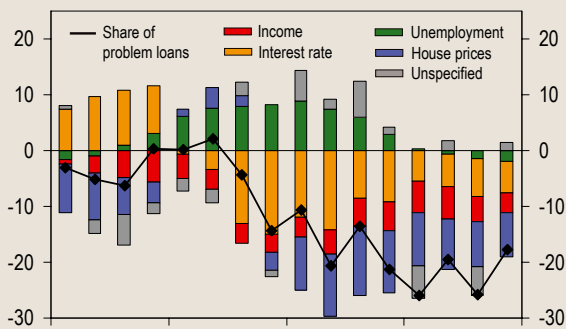
There has been a steady decline in the share of problem loans in the household sector in the period over which the model is estimated. As a result of the rising volume of problem loans during 2002 and 2003, the virtually continuous decline in the share of problem loans since the beginning of 1990s levelled off somewhat. Decomposition of the share of

<sup>12</sup> See for instance Eklund et al. (2001).

<sup>13</sup> The long-term homogeneity between banks' lending and problem loans is a tested restriction which was not rejected by data.

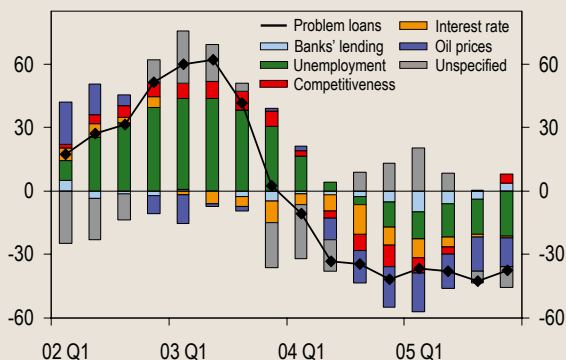
<sup>14</sup> The decomposition method is described in Jacobsen and Naug (2004).

**Chart 12** Annual percentage change in the share of problem loans and calculated contributions from explanatory variables. Households. Percentage points. Real terms. Quarterly figures. 2002 Q1 – 2005 Q4



Source: Norges Bank

**Chart 13** Annual percentage change in problem loans and calculated contributions from explanatory variables. Enterprises. Percentage points. Real terms. Quarterly figures. 2002 Q1 – 2005 Q4



Source: Norges Bank

problem loans (see Chart 12) shows that this was largely attributable to negative contributions from high real interest rates in 2002, along with rising unemployment in the period from 2001 to the end of 2003. However, as from 2004, the share of problem loans fell again. This was particularly due to lower real interest rates from 2003 onwards. In addition, the negative contributions from high unemployment were reversed as unemployment gradually fell. Real income and real house prices have contributed to a reduction in problem loans for virtually the entire period. This effect has to some extent become more pronounced in the past two years.

Problem loans in the enterprise sector increased strongly through 2002 and 2003. Chart 13 shows that the increase in unemployment, i.e. weaker domestic demand, was the primary cause of this increase, but low oil prices and weakened competitiveness also contributed to some extent. In the period 2004–2005 problem loans were sharply reduced. Lower unemployment has made an increasing contribution to this development. The decline in interest rates in the period 2002–2004 also made a contribution. Enterprises experienced a

sharp reduction in their financing costs and thereby an increase in profitability. Oil prices are also seen to have been an important factor behind the decline in problem loans in the period 2004–2005. Oil prices rose sharply during this period, from about USD 30 per barrel at the beginning of 2004 to USD 60 per barrel at end-2005. High activity in the petroleum sector has made a positive contribution to the mainland business sector (see Section 3).

### Future developments in problem loans

We have made projections of banks' problem loans by assuming that the model's explanatory variables move in line with the baseline scenario in *Inflation Report 3/06*. Given these assumptions, Chart 14 shows developments in problem loans up to and including 2010.

Problem loans in the household sector accounted for 0.8 per cent of total loans to this sector at the end of the third quarter of 2006. Projections from the fourth quarter of 2006 onwards show that the share of problem loans in the household sector will be reduced further over the next two years. Continued very low and somewhat declining unemployment, along with continued high increases in real house prices over the next few years, will be contributing factors (see Chart 15). In 2009 and 2010, the share of problem loans will rise slightly as a result of higher real interest rates and somewhat higher unemployment. The positive contribution from real house prices will also be gradually reduced later in the projection period as the rise in house prices slows. Problem loans in the household sector are estimated to account for approximately 0.6 per cent of total loans to the sector in 2010.

Problem loans in the enterprise sector accounted for just over 2 per cent of total loans to this sector in the third quarter of 2006. Projections from the fourth quarter of 2006 onwards show that the volume of problem loans will increase as from 2007, but at a slower pace towards the end of the projection period (see Chart 16). Strong lending growth, somewhat higher unemployment and rising real interest rates will contribute to pushing up the volume of problem loans. Due to strong growth in lending to the enterprise sector, problem loans as a share of total loans are not expected to increase until 2008. Problem loans in the enterprise sector are estimated to account for approximately 3.5 per cent of total loans to the sector in 2010.

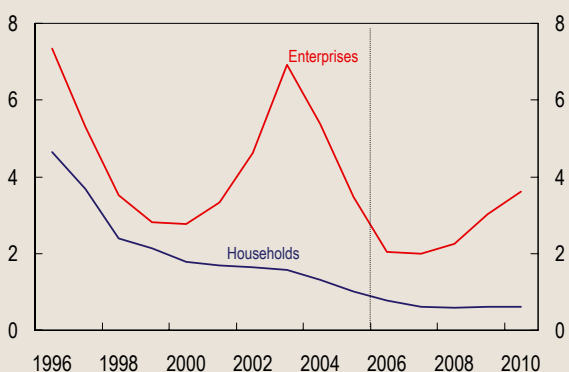
### Problem loans in a stress scenario

We have made projections of banks' problem loans based on a stress scenario designed to illustrate a deteriorating macroeconomic situation. Although this scenario is unlikely, it is useful to test such stress scenarios in order to assess how vulnerable households and enterprises are to changes in macroeconomic conditions.

In this stress scenario, the key policy rate increases faster than in the baseline scenario, to about 8 per



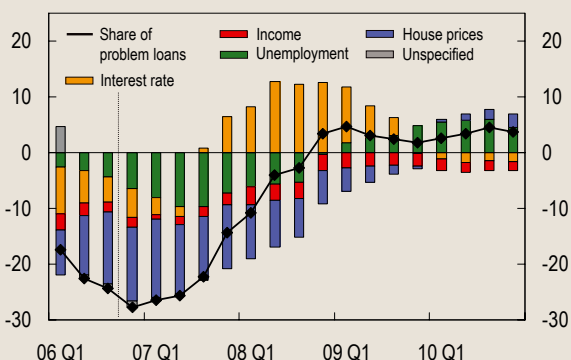
**Chart 14** Banks' problem loans to households and enterprises. Percentage of total lending to each sector. 1996 – 2010<sup>1)</sup>



<sup>1)</sup> Projections based on baseline scenario for 2006 – 2010 in *Inflation Report 3/06*.

Source: Norges Bank

**Chart 15** Annual percentage change in the share of problem loans and calculated contributions from explanatory variables. Households. Percentage points. Real terms. Quarterly figures. Projections for 2006 Q4 – 2010 Q4. Baseline scenario



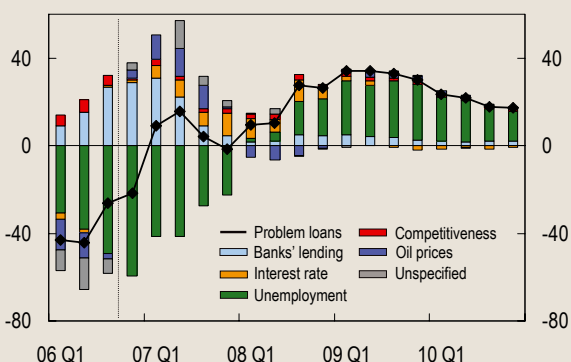
Source: Norges Bank

cent in 2009, before declining slightly. This implies that banks' lending rates to households and enterprises will increase to approximately 9 and 9.5 per cent, respectively. Unemployment increases faster than in the baseline scenario, and stands at about 4.5 per cent of the labour force in 2010. Household disposable income increases appreciably more slowly than in the baseline scenario. In 2009 and 2010, growth in real disposable income is assumed to be close to zero. House prices fall by about 30 per cent from the current level in the course of 2–3 years. Oil prices are assumed to fall by about 25 per cent in the same 2–3 year period. The real exchange rate appreciates slightly compared with the baseline scenario. The reason for such a development might be a sharp rise in inflation coupled with a gradual but pronounced decline in economic growth, both globally and domestically. This will increase banks' problem loans sharply in both sectors compared with the baseline scenario (see Chart 17).

Problem loans in the household sector will increase from the current very low level, particularly as a result of a sharp rise in real interest rates and a fall in house prices in 2007 and 2008 (see Chart 18). Somewhat later in the projection period, higher unemployment and falling household real disposable income also contribute to increasing the share of problem loans. In the stress scenario, problem loans in the household sector are estimated to be just over 1.5 per cent of total loans to the sector at end-2010.

Problem loans in the enterprise sector will increase sharply. In 2007, higher real interest rates, lower oil prices and continued high lending growth will be the primary factors contributing to the increase in problem loans (see Chart 19). Lending growth will be rapidly reduced as the economic outlook deteriorates. Increasing unemployment will make a negative contribution from 2008. Problem loans in the enterprise sector are estimated to account for just over 8 per cent of total loans to the sector in 2010.

**Chart 16** Annual percentage change in the share of problem loans and calculated contributions from explanatory variables. Enterprises. Percentage points. Real terms. Quarterly figures. Projections for 2006 Q4 – 2010 Q4. Baseline scenario



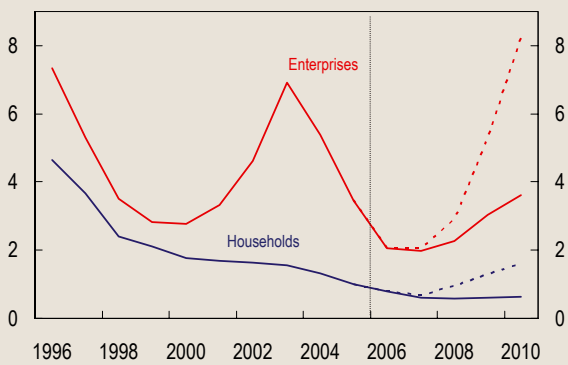
Source: Norges Bank

Weaker macroeconomic developments, as illustrated in this stress scenario, will influence the financial position of both households and enterprises. In both sectors, an increasing number of borrowers will have problems in servicing their debt. For banks, the consequences will depend on the volume of problem loans that are actually not repaid and to what extent these loans are secured. House prices fall sharply in the stress scenario. This will obviously constitute a risk for banks, as a large share of banks' lending is secured on property. A prolonged cyclical downturn will increase banks' vulnerability more than a temporary slowdown.

The experience of 2002–2003 showed that banks' problem loans and recorded losses rose somewhat, but that neither financial strength nor capital adequacy were severely weakened. Banks' solid capital adequacy and financial strength at present imply that there is a high probability that banks can cope with a similar downturn without creating problems for the banking sector.



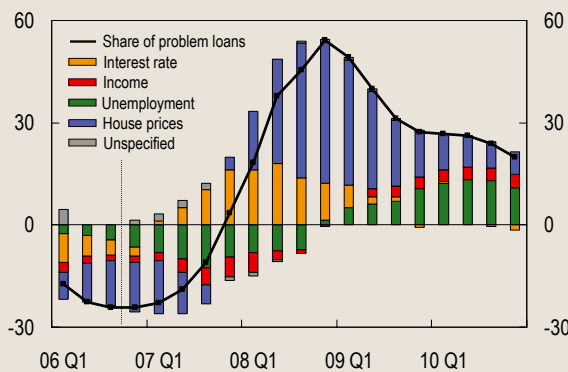
**Chart 17** Banks' problem loans to households and enterprises. Percentage of total loans to each sector. 1996 – 2010<sup>1)</sup>



<sup>1)</sup> Projections based on a baseline and a stress scenario respectively for 2006 – 2010. Baseline shown with solid line. Stress scenario shown with dashed line.

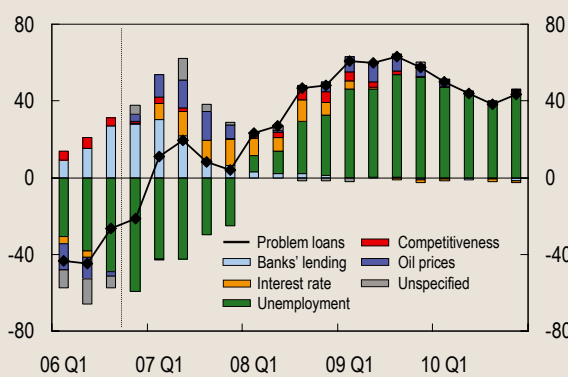
Source: Norges Bank

**Chart 18** Annual percentage change in the share of problem loans and calculated contributions from explanatory variables. Households. Percentage points. Real terms. Quarterly figures. Projections for 2006 Q4 – 2010 Q4. Stress scenario



Source: Norges Bank

**Chart 19** Annual percentage change in the share of problem loans and calculated contributions from explanatory variables. Enterprises. Percentage points. Real terms. Quarterly figures. Projections for 2006 Q4 – 2010 Q4. Stress scenario



Source: Norges Bank

## 5 Conclusion

This article has presented two empirical models for banks' problem loans in the household and the enterprise sector, respectively. The model for problem loans in the household sector includes the effects of real disposable income, real house prices, unemployment and real interest rates. In the model for problem loans in the enterprise sector, we find effects of domestic demand, real oil prices, real interest rates, enterprises' real gross debt and competitiveness.

In the period 2002–2003, problem loans rose sharply. We find that the rise in problem loans is largely attributable to negative contributions from high real interest rates and low domestic demand. However, as from 2004, the negative trend was reversed. Falling real interest rates and a strong rise in house prices in recent years have made positive contributions to a further reduction in problem loans in the household sector. The reduction in problem loans in the enterprise sector is largely driven by higher domestic demand, lower real interest rates and high oil prices.

We have made projections of problem loans for the period 2006 Q4 – 2010 Q4 based on two different scenarios: A baseline scenario based on expected macroeconomic developments as outlined in *Inflation Report 3/06* and a stress scenario which illustrates a deteriorating macroeconomic situation. In the baseline scenario, the share of problem loans in the household sector falls further in 2007 and 2008 as a result of continued low and falling unemployment and a strong rise in real house prices. The share of problem loans for households increases slightly towards the end of the projection period due to rising real interest rates and somewhat higher unemployment. Banks' problem loans in the enterprise sector increase as from 2007, but growth slows towards the end of the projection period. Strong lending growth, higher unemployment and rising real interest rates contribute to pushing up the volume of problem loans among enterprises.

Weaker macroeconomic developments, as illustrated in the stress scenario, will erode the debt-servicing capacity of households and enterprises. Banks' share of problem loans rises markedly compared with the baseline scenario. Lower house prices, higher real interest rates and higher unemployment make a significant contribution to the rise. The significance this will have for banks depends on the volume of problem loans that are actually not repaid. A prolonged cyclical downturn will increase banks' vulnerability more than a temporary slowdown. Banks' solid capital adequacy and financial strength imply that there is a high probability that banks can cope with a similar downturn as in 2002–2003 without creating problems for the banking sector.

## References

- Benito, A., J. Whitley and G. Young (2001): "Analysing corporate and household sector balance sheets". *Financial Stability Review*: December 2001, pp. 160–174, Bank of England
- Bernhardsen, E. (2001): "A model of bankruptcy prediction", *Working Paper* 2001/10, Norges Bank
- Boot, A.W.A. and A.V. Thakor (1994): "Moral hazard and secured lending in an infinitely repeated credit market game". *International Economic Review* 35, pp. 899–920
- Bårdsen, G. and P.G. Fisher (1999): "Economic theory and econometric dynamics in modelling wages and prices in the United Kingdom". *Empirical Economics* 24, pp. 483–507
- Crockett, A. (1997): "Why is financial stability a goal of public policy?" *Federal Reserve Bank of Kansas City's Symposium "Maintaining financial stability in a global economy"*. Jackson Hole, Wyoming, pp. 28–30 August
- Eklund, T., K. Larsen and E. Bernhardsen (2001): "Model for analysing credit risk in the enterprise sector". *Economic Bulletin* 3/2001, pp. 99–106, Norges Bank
- Eitrheim, Ø. and B. Gulbrandsen (2001): "A model based approach to analysing financial stability". In *BIS Papers* No. 1: Marrying the macro- and micro-prudential dimension of financial stability, pp. 311–330
- Freixas, X. and J.-C. Rochet (1997): *Microeconomics of Banking*. Cambridge: MIT Press
- Frøyland, E. and K. Larsen (2002): "How vulnerable are financial institutions to macroeconomic changes? An analysis based on stress testing". *Economic Bulletin* 3/2002, pp. 92–98, Norges Bank
- Gonzalez-Hermosillo, B. (1999): "Determinants of ex-ante banking system distress: a macro-micro empirical exploration of some recent episodes". *IMF Working Paper*, Washington DC
- International Monetary Fund (1998): "Chapter IV: Financial crises: characteristics and vulnerability". *World Economic Outlook*, Washington DC
- Jacobsen, D.-H. and B. Naug (2004): "What influences the growth of household debt?" *Economic Bulletin* 3/2004, pp. 103–110, Norges Bank
- Jacobsen, D.-H. and T. B. Kloster (2005): "What influences the number of bankruptcies?" *Economic Bulletin* 2/2005, pp. 133–144, Norges Bank
- Pesola, J. (2005): "Banking fragility and distress: An economic study of macroeconomic determinants". Discussion Paper 13, Bank of Finland
- Rinaldi, L. and A. Sanchis-Arellano (2006): "Household debt sustainability. What explains household non-performing loans? An empirical analysis". Working paper no. 570, European Central Bank
- Stiglitz, J. E. and A. Weiss (1981): "Credit rationing in markets with imperfect information", *The American Economic Review* no. 71, pp. 393–410
- Stiglitz, J. E. and A. Weiss (1983): "Incentive effects of terminations: Applications to the credit and labour market". *The American Economic Review* 73, pp. 912–927