Norges Bank's stress test in Financial Stability 2/10 compared with banks' projections[1]

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Norges Bank publishes the results of semiannual macro stress tests of banks' capital adequacy under different macroeconomic scenarios in the Financial Stability report. In autumn 2010 Finanstilsynet (Financial Supervisory Authority of Norway) asked seven Norwegian banks[7] to conduct similar stress tests based on the scenarios Norges Bank was to use in the November 2010 Financial Stability report (FS 2/10). A summary of these results was published in Finanstilsynet's Risk Outlook Report for 2011. This article highlights some of the similarities and differences between the banks' results and those of Norges Bank.

The financial crisis has illustrated how important it is to be aware of the financial system's vulnerability to different kinds of economic shocks. Stress testing is a quantitative method developed to shed light on this vulnerability. It estimates the impact on one or more banks' profits and financial strength of severe, though plausible, economic shocks.

Stress testing has been part of many banks' internal risk assessment since the early 1990s and was also adopted at an early stage by Norwegian banks. Stress testing requirements were included in the capital adequacy rules under the Basel II framework. Stress tests are for example used to estimate capital needs under Pillar 2. Over the past decade, stress testing has also increasingly been used by central banks and supervisory authorities to assess risk in the financial system as a whole[8], such as the Supervisory Capital Assessment Program (SCAP), conducted by the Federal Reserve in

2009, and the EU-wide stress test exercise carried out by the CEBS (Committee of European Banking Supervisors) in 2009 and 2010 (see Box 1). After the financial crisis, liquidity stress testing was introduced in addition to testing for solvency. Liquidity stress tests will not be discussed in this article.[9]

The authorities conduct stress testing in two different ways.[10] In one approach, stress testing is conducted by financial institutions based on a macro scenario specified by the authorities. This test is known as a bank stress test, or the "bottom-up" approach, referring to the way the test focuses on how the macro scenario affects risk in each of a bank's loans and then aggregates the overall impact on banks' profits and capital adequacy. Another approach is that often used by central banks, or the "top-down" approach, also referred to as macro stress testing. The main objective of macro stress testing is to assess systemic risk.

A macro stress test does not include detailed information on individual loans, and assessments of a bank's portfolio are primarily based on publicly available information.[11] Norges Bank's approach is a typical example (for a more detailed description, see Box 2).

Both methods have their strengths and weaknesses. The advantage of bank stress testing is that the individual bank is in the best position to assess risk in its own portfolio. The bank can, in principle, assess how the macro scenario affects the risk related to each exposure. As such, bank stress tests can provide a more complete picture of an individual bank's risk profile compared with macro stress tests. On the other hand, comparing bank stress test results across institutions is not straightforward. Differences in the results do not only reflect vulner-

Box 1 The Supervisory Capital Assessment Program (SCAP) 2009 and the EU-wide stress test 2010

The Supervisory Capital Assessment Program 2009 (SCAP)

In spring 2009, the US authorities conducted a stress test of the 19 largest US bank holding companies. The purpose of the stress test exercise was to assess whether banks had sufficient capital to absorb elevated loan losses in the event the economy, already in a recession, should deteriorate further. The sample covered around ¾ of bank holding companies' total assets.

Each SCAP bank was asked to conduct a stress test on the basis of two scenarios drawn up by the Federal Reserve. The scenarios comprised projections of key US economic data, including GDP, unemployment and house prices. The baseline scenario reflected the consensus expectation about the duration and depth of the recession, while the more adverse scenario was designed to reflect a further severe weakening of the US economy. The Federal Reserve estimated the probability of the alternative scenario occurring at 10–15%.

The results of the exercise showed that under the alternative scenario, 10 of 19 banks would need to increase common equity by a total of USD 75bn in order to satisfy the capital adequacy requirements under the SCAP.[1] Financial institutions were given six months to raise the necessary capital, and if capital was unavailable from private sources, the US authorities would provide funds to recapitalise SCAP banks to enable them to maintain normal lending.

The SCAP process went far in restoring confidence in the US banking sector and thus helped to stabilise the financial system.[2] Publishing bank-specific results provided the market with full information about banks' actual financial situation. This was important at a time when markets had reflected considerable uncertainty. By the end of November 2009, all banks that had been directed to raise additional capital had done so from private sources.

EU-wide stress test 2010

In 2009 and 2010, the Committee of European Banking Supervisors (CEBS)[3] conducted stress tests of the largest European banking groups. In 2011, a similar test was conducted by CEBS's successor, the European Banking Authority (EBA).

The objective of the EU-wide stress tests is to assess the resilience of European banks to adverse economic developments, while providing an overall assessment of risk in the EU financial system. The European financial sector is relatively heterogeneous, with regard to both bank structure and individual member states' regulatory environments. Thus, the use of common macroeconomic scenarios will facilitate comparison of stress test results across banks.

The CEBS designed the macroeconomic scenario in collaboration with the European Commission and the European Central Bank (ECB). The national supervisory authorities followed up the dialogue with banks. As in the SCAP, the scenarios proposed by the CEBS had a two-year time horizon, though were specified in considerably more detail. One reason is that the EU-wide stress test also focused on market risk and sovereign risk. Neither of the two stress tests focused directly on liquidity risk. Banks participating in the EU-wide stress test covered around 65% of the European banking market in terms of total assets.

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[1]   Tier 1 capital should equal at least 6% of risk-weighted assets, while Tier 1 common equity should equal at least 4% of risk-weighted assets.

[2]   Speech by Governor Daniel K. Tarullo at the Federal Reserve Board International Research Forum on Monetary Policy, Washington, D.C, 26 March 2010.

[3]   On 1 January 2011, the CEBS changed its name to the European Banking Authority (EBA).

The baseline scenario for the EU-wide stress test was based on the European Commission's projections from autumn 2009 and February 2010, which assumed a gradual recovery in Europe. Unemployment was expected to remain high. The adverse scenario comprised three main elements: a global expectation shock that would result in a double dip recession, an EU-specific yield-curve shock and country-specific shocks to reflect uncertain government finances. The reduction in output for the EU countries as a whole was about at the same level as the fall in output in the SCAP, about 3 percentage points lower than the baseline scenario over the two years.

The results of the exercise showed that under the adverse scenario, 7 of 91 banks would need to increase Tier 1 capital by a total of EUR 3.5bn (USD 4.5bn) to keep their capital ratios above the threshold set out in this comparison.[4] Of the seven, five were Spanish savings banks, in addition to the German Hypo Real Estate Holding and the Agricultural Bank of Greece. The stress tests exceeded market expectations to a considerable extent, and the EU-wide stress test thereby helped to restore confidence in the European banking sector. Publishing bank-specific results provided the market with full information about banks' actual financial situation. Publishing banks' exposures to sovereign debt in particular helped to reduce market uncertainty and mitigate the fear of a new financial crisis.

The EU-wide stress test has subsequently been subject to substantial criticism, aimed in particular at the test's failure to foresee the problems that materialised in the Irish banking sector three months after the CEBS published the stress test results. However, the problems arising in Irish banks in autumn 2010 were not only due to the fear of loan losses, but were primarily related to liquidity problems at Irish banks because they were unable to compensate for the sharp drop in deposits by obtaining alternative funding. As mentioned above, the EU-wide stress test did not focus directly on liquidity risk. The European stress tests also had a relatively short perspective. The stress tests performed by the Central Bank of Ireland in March 2011 take into account lifetime losses on the largest Irish banks' loan portfolios and weaker economic developments over time, resulting in greater losses for Irish banks, but also greater credibility in the long run.

Although the Norwegian bank stress test has several similarities with the EU-wide stress test, there are also fundamental differences. As in the EU-wide stress test, the Norwegian bank stress test primarily focuses on credit risk, while focusing somewhat less on market risk. This reflects Norwegian banks' relatively low exposure to market risk. Nor does the Norwegian bank stress test explicitly test for sovereign risk, since Norwegian banks' exposure to sovereign debt is limited. As in the EU-wide stress test, liquidity risk is not directly stress tested, but indirectly, since bank funding costs are assumed to increase in the adverse scenario. The primary distinction between the Norwegian bank stress test and the EU-wide stress test relates to assumptions regarding credit growth and the length of the macroeconomic scenario. While the EU-wide stress test uses a two-year macroeconomic scenario and assumes zero credit growth in both scenarios, the Norwegian bank stress test uses a macroeconomic scenario that extends over 3½ years, with positive credit growth in both scenarios. This will affect the stress test results and how they are interpreted.

[4] Tier 1 capital should equal at least 6% of risk-weighted assets.

ability, but may also reflect banks' varying interpretations of the impact of the macro scenario and the use of different calculation methods. A macro stress test ensures consistency in the assessment of each of the banks. Moreover, risk assessment is conducted from an overall perspective, which may provide a more accurate picture of risk in the banking system as a whole.

This is the second time Finanstilsynet and Norges Bank have collaborated on a comparison of a macro stress test conducted by the central bank and similar analyses carried out by the banks based on the same assumptions. The first time was in summer 2005 when the IMF in cooperation with Norges Bank and Finanstilsynet conducted a thorough review of the Norwegian financial system.[12] Norges Bank's projections and the banks' projections were in close agreement, although overall loan losses were somewhat higher in the macro stress test than in the bank stress tests. The conclusion at that time was that the system was solid and well prepared to weather a major economic setback.

The main conclusions from 2005 have also been borne out this time. The stress tests have not revealed fundamental weaknesses in the Norwegian banking sector.

[12] See Hagen, Lund, Nordahl and Steffensen (2005).

However, there is a somewhat greater difference between Norges Bank's and the banks' projected loan losses than last time. This may reflect methods used by the banks this time that differ more widely from Norges Bank's methods.[13] Another explanation might be that the banks believe improved risk management will result in lower losses and revise down their loss expectations compared with previous experience.

1. Stress test autumn 2010: Assumptions and conduct of the exercise

Assumptions

The adverse scenario applied in the November 2010 Financial Stability report (FS 2/10) and sent to the banks was designed to reflect the most important risk factors in the report. It was also designed so that Norges Bank's stress test could be compared with the stress test organised by the CEBS for European banks in summer 2010.[14] The adverse scenario was therefore built on the assumption of a deterioration in output for Norway's trading partners approximately in line with the deterioration assumed for the euro area countries by the CEBS in summer 2010. The CEBS applied the assumption that GDP growth would be about 3 percentage points weaker over two years than in the baseline scenario. Norges Bank's adverse scenario extended over 3½ years, with a deviation in growth among trading partners of about 5½ percentage points for these years as a whole.

Weaker global growth could trigger a fall in oil prices as a result of reduced demand, an important channel into the Norwegian economy. In the adverse scenario, oil prices fall to about USD 50 per barrel. A fall in oil prices could in isolation lead to a depreciation of the krone. On the other hand, weaker GDP growth among trading partners than in Norway and substantial uncertainty abroad could support the krone. The exchange rate is therefore assumed to remain at about the same level as in the baseline scenario. The turbulence in global financial markets is assumed to spread to Norwegian markets, resulting in a one percentage point rise in money market rates.

In addition, the adverse scenario assumes weaker household expectations concerning their own financial position and the economy. Higher unemployment, weaker expectations and lower income than in the baseline scenario lead to a fall in house prices. Reduced investment and lower house prices also lead to lower household and corporate debt growth. The fall in the value of residential and commercial property, which reduces collateral values

and thereby debt-financed consumption and investment, amplifies the downturn in the real economy.

In addition to specifying developments in key variables in the Norwegian economy, the stress test guidelines applied parameters to growth in bank lending to the household and corporate sector and to developments in Norwegian and international equity markets. It was also assumed that commercial property prices would move in line with house prices. Banks with substantial lending to foreign customers were allowed to determine the adverse scenarios for the relevant foreign markets. The guidelines nonetheless state that the deviation between the baseline scenario and the adverse scenario for GDP growth in each country should be changed by as many percentage points as for Norway's trading partners as a whole. The calculations were not to take into account the impact of measures implemented by individual banks in response to the adverse scenario, but banks could make their own assumptions about changes in interest margins, provided the changes were specified and explained.

Conduct of the exercise

Finanstilsynet sent the macro scenarios to the seven banks at end-October 2010, with the deadline for submission set at 1 December.

The projection process varied somewhat across banks. In two banks, the results were discussed by the banks' executive boards before being submitted to Finanstilsynet.

In the adverse scenario sent to the banks by Norges Bank, the projection period was from 2010 to 2013. Since the banks only received these figures in October, however, the results for the first three quarters of 2010 were already available. Half of the banks therefore chose to conduct stress testing for the period 2011–2013.

Norges Bank makes its projections at parent bank level. This means that mortgage companies are not included in projections of bank developments. The difference between parent bank and banking group has become more important in recent years, as an increasing portion of banks' residential loan portfolios have been transferred to mortgage companies.

In the bank stress test, six of the seven banks reported results for both the parent bank and for the group as a whole. In the comparison we have therefore chosen to focus on the six banks for which figures are available at parent bank level.[15] Norges Bank's results will deviate somewhat from those presented in the November *Financial Stability* report, as a slightly different aggregate is used here.

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[13] See "Recognised loan losses" and Box 2.

[14] See Box 1.

[15] The six banks are Nordea Bank Norge, SpareBank 1 SR-Bank, Sparebanken Vest, SpareBank 1 SMN, SpareBank 1 Nord-Norge and Bank 1 Oslo. Norges Bank's stress test does not normally include Bank 1 Oslo, but includes DnB NOR.

# Box 2 Macro stress-testing: Norges Bank's approach

Norges Bank has an extensive suite of models for stress-testing. The model system structure is similar to that of most central banks that perform stress tests. Nevertheless, it is important to emphasise that a uniform model system for analyses of this type is yet to be developed and practice therefore varies considerably across countries. A full evaluation of Norges Bank's stress-testing work, conducted in autumn 2010,[1] concluded that Norges Bank's approach is consistent with international best practice.

Norges Bank's model system comprises a small macro model, models for assessing corporate and household credit risk and a system for projecting banks' financial statements.[2]

- The macro model is used to project financial variables given the projections in the most recent *Monetary Policy Report* and to generate an adverse scenario that then plays out in the three micro models (see Chart 1). The model contains variables for financial stability, such as house prices, household and corporate credit growth and problem loans in banks. Projections from the macro model determine developments in corporate and household credit growth, lending rates, deposits, labour costs and bank loan losses.

- The household and corporate sector model analyses credit risk within these markets. Adverse scenario analyses project components of households' margins using results from the macro model to determine how vulnerable households are to a deterioration in the economic situation. The corporate sector model is used to conduct a sector breakdown of losses in non-financial corporations. This is important as banks vary in their exposures to the various industries and may be affected differently by specific shocks.

- The bank model is based on projections from the macro model and risk developments in the corporate sector model and uses these data to project banks' profits and capital adequacy. The model contains a number of estimated equations; fee income is projected using GDP and the yield differential between five-year government bonds and three-month money market rates.[3] Behavioural relationships are captured by including correlations between such variables as credit growth, interest rates and problem loans in the macro model.

The *Financial Stability* reports, published twice a year, include Norges Bank's projections of financial statements for the six largest Norwegian banks[4] over three to four years.

Chart 1 Norges Bank's system for macro stresstesting of banks' capital adequacy

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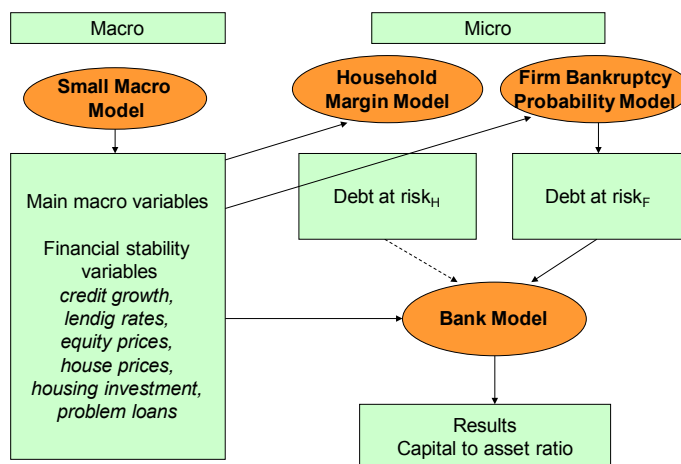
[1] See Kwast et al. (2010).

[2] See Andersen, H. et al. (2008a).

[3] See Andersen, H. et al. (2008b).

[4] DnB NOR, Nordea Bank Norge, Bank, SpareBank 1 SR-Bank, Sparebanken Vest, SpareBank 1 SMN and SpareBank 1 Nord-Norge. Foreign branches are excluded, since they do not calculate capital adequacy in Norway.

At the beginning of February, Norges Bank visited a number of the banks to discuss the results. Finanstilsynet gave a brief summary of the banks' results in the *Risk Outlook Report* for 2011, published in March 2011.

2. Recognised loan losses

Since the main focus of stress testing is credit risk, loan losses are the main driver of the impact on banks' profits and capital adequacy. The banks' approach to loss calculation was not subject to guidelines. The outcome of the stress test is influenced both by calculation methods and any additional assumptions included by banks. The impact of the adverse scenario on different sectors and large customers may therefore vary across banks. Nor were guidelines laid down for the banks' treatment of large customers. Banks were asked to provide a qualitative assessment of how their largest customers were affected by the adverse scenario. None of the banks expected their large customers to experience problems under the adverse scenario.

The banks have used various methods to project recognised loan losses. Some have compared the adverse scenario with previous downturns, supplemented by judgement. Some have applied regressions using historical data, and others seem to have used IRB (Internal Ratings-Based approach) models more directly.[16] Several of the banks have calculated losses for each year at sector-level and not by aggregating expected losses on loans to individual customers.

All the participating banks have their own IRB models. These models include estimates for probability of default (PD), loss given default (LGD) and exposure at default (EAD). These estimates could not be used to any great extent directly in the projections of recognised loan losses. This is primarily because banks' IRB models are designed to calculate banks' capital and must satisfy the requirements under the capital adequacy framework. Since PD in the IRB models is intended to reflect average default probability over time, the resulting PD estimates are lower than actual defaults in downturns and higher in upturns. Combined with the requirement for LGDs to reflect actual loss ratios in downturns, this entails that regulatory expected loss (EL) will be less cyclical than the actual recognised losses observed through the business cycle.

Chart 1 shows the spread of loss projections for the six banks. The spread indicates that the assumptions on which banks' loss projections are based have a significant impact on the outcome of the stress test. The chart shows that the spread across banks also increases historically in a stress situation.

[16]   For further discussion of IRB models, see Box 3.

Chart 1 Banks'[1] loan losses as percentage of gross lending to customers. Adverse scenario. Bank stress test. Annual figures. 2003–2013[2]
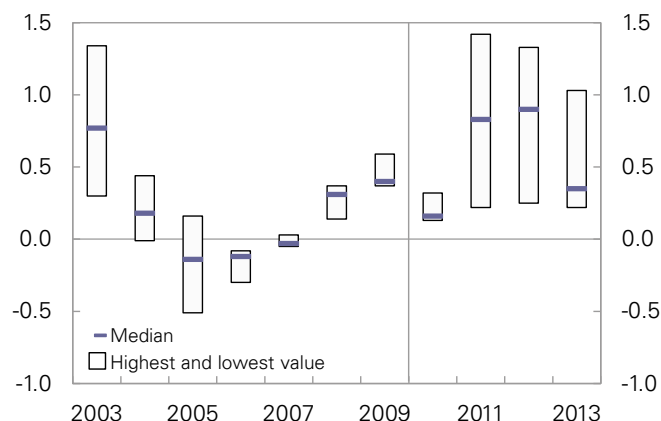
[1] Nordea Bank Norge, SpareBank 1 SR-Bank, Sparebanken Vest, SpareBank 1 SMN, SpareBank 1 Nord-Norge and Bank 1 Oslo
[2] Projections for 2010–2013
Sources: Finanstilsynet, Statistics Norway and Norges Bank

Chart 2 Banks'[1] loan losses as percentage of gross lending to customers. Macro stress test and bank stress test. Per cent. Annual figures. 1990–2013[2]
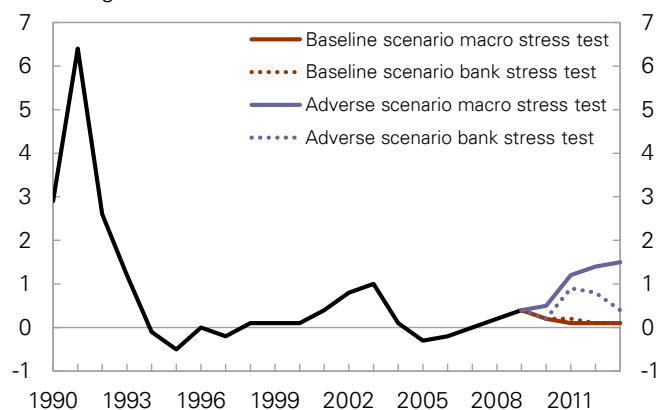

[1] Nordea Bank Norge, SpareBank 1 SR-Bank, Sparebanken Vest, SpareBank 1 SMN, SpareBank 1 Nord-Norge and Bank 1 Oslo
[2] Projections for 2010–2013
Sources: Finanstilsynet, Statistics Norway and Norges Bank

In spite of differences across banks, losses typically occur in the first part of the projection period, when GDP growth is lowest. In Norges Bank's projections, banks' losses increase in the adverse scenario throughout the projection period (see Chart 2). Norges Bank does not calculate the losses directly, but projects the share of problem loans[17] in banks' portfolios. Losses are then determined from the share of problem loans recognised by banks as losses (loss ratio). The loss ratio is determined by banks' collateral and equity ratios in enterprises and households. In practice, the loss ratio applied in the adverse scenario is consistent with historical loss ratios.

[17]   Problem loans are the sum of non-performing and particularly doubtful loans.

Box 3 Use of the IRB approach in bank stress-testing

Following the introduction of Basel II, banks may seek approval to use internal models to estimate loan portfolio credit risk. This is called the internal ratings-based (IRB) approach. The purpose of this approach is to align capital requirements more closely with the actual risk profile of banks' loan portfolios. Approval to apply the IRB approach is granted by the supervisory authorities, provided that the models meet the requirements set out in the international capital adequacy framework, which contains specific requirements related to model quality, estimates and not least standards to management and control at the bank.

Banks applying the IRB approach estimate expected losses on and capital requirements for a loan exposure on the basis of the following risk parameters: probability of default (PD), loss given default (LGD), exposure at default (EAD) and maturity (M). Capital requirements may be calculated using either the foundation approach or the advanced approach. Banks applying the foundation approach estimate PD only. The remaining parameters are determined in advance by the supervisory authorities. Banks using the advanced approach are required to apply own-estimates of PD, LGD, EAD and M.

When calculating capital requirements, banks must take into account market and operational risk in addition to credit risk. Aggregated across IRB banks in Norway, the minimum capital requirement for credit risk is around 90% of the total minimum capital requirement.[1]Banks corporate portfolios account for most of the minimum requirement for credit risk.

The banks in this sample[2] have applied IRB models approved by the supervisory authorities since 2007 and the share of their total portfolios covered by IRB is fairly similar. For their corporate portfolios, all use the foundation IRB approach. With own-estimates of PD and LGD of 45% determined by regulators, the average risk weight in banks corporate portfolios at end-2010 was in the area of 88–119%. By comparison, both Basel I and the current standardised approach for banks without IRB approval have a fixed risk weight for all corporate exposures of 100%.

One of the reasons for allowing internal ratings in Basel II was to make capital requirements more risk-sensitive. However, this would also make the capital requirement more cyclically sensitive. To dampen cyclicality, the rules were expanded to include the requirement that PD estimates should represent a long-term average based on long time series, that internal estimates of LGD should represent loan-loss ratios in a downturn and, not least, Pillar 2 requirements for banks to hold a capital buffer that takes downturns into account.

Changes in credit quality in a stressed situation will affect banks' capital adequacy through two channels: loss estimates that affect profits and thereby capital adequacy, and changes in risk-weighted assets as a consequence of migration. Migration means that when a borrower's loan becomes more (less) risky, the loan's risk weights will increase (decrease). Thus, risk-weighted assets increase (decrease) and capital adequacy decreases (increases). Since the IRB parameters must follow capital adequacy rules, they cannot in general be applied directly in projections of future recognised impairment losses, even though data included in banks' total IRB systems may be included. Consequently, the IRB parameters only have direct significance for the migration channel. The results reported by the banks in this stress test, which primarily indicated increased risk in corporate portfolios, showed that migration in corporate portfolios led to an increase in volume-weighted risk weights of just under 10% from 2010 to 2013, but with some variation across banks.

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[1] Minimum requirements for Norwegian banking groups as at 2010 Q4. The minimum requirement is without regard to the transitional arrangements from Basel I to Basel II.

[2] Nordea Bank Norge, SpareBank 1 SR-Bank, Sparebanken Vest, SpareBank 1 SMN, SpareBank 1 Nord-Norge and Bank 1 Oslo.

In the baseline scenario, the loss ratio remains at 10%, while it rises to 40% in the adverse scenario. This is in line with loss ratios during the banking crisis in 1988–1993.

3. Income and operating costs

Even though the main focus of the stress test is bank credit risk, the objective was to conduct an overall assessment of the banks' profits. Both the banks and Norges Bank have therefore performed assessments of the banks' income and operating costs.

The largest income item for banks is interest income. Net interest income is affected by interest margins. Over time, banks' interest margins have been reduced, due to both lower costs and stronger competition. However, it is conceivable that banks in a downturn may choose to increase interest margins to bolster earnings. Moreover, banks have over time shown a greater willingness to adjust lending rates to the risk each customer represents. One possible effect of a stress situation is that banks increase average lending margins owing to the increase in risk on customers' loans. On the other hand, competition considerations can curb the increase in interest margins.

In Norges Bank's stress test, the same interest margins are included in the baseline scenario and the adverse scenario to prevent assumptions concerning interest margins from overly affecting the results. There are also only moderate differences between the baseline and adverse scenarios in the banks' stress tests. However, there are some differences across banks. Some banks assume that interest margins will continue to fall in the baseline scenario but remain stable at the current level in the adverse scenario. Others assume that increased competition will result in lower margins in both scenarios. Overall, this results in a somewhat less favourable assessment of banks' net interest income in both the baseline and the adverse scenario (see Chart 3). In addition, several banks include actual negative developments in 2010 in their own calculations, which also contributes to weaker net interest income in the bank stress test.

Banks' market revenues are also intended to be neutral in Norges Bank's projections. Market revenues in both the baseline and the adverse scenario are assumed to be equal to the average for the past seven years (excluding extreme observations) (see Chart 4).

No guidelines were imposed on banks' projections of market revenues other than that they should be consistent with the macro scenarios. In sum, the banks' assumptions result in a somewhat more pronounced fall in market revenues in the adverse scenario than in the baseline

Chart 3 Banks'[1] net interest income. Bank stress test and macro stress test. In billions of NOK. Annual figures. 2000–2013[2]
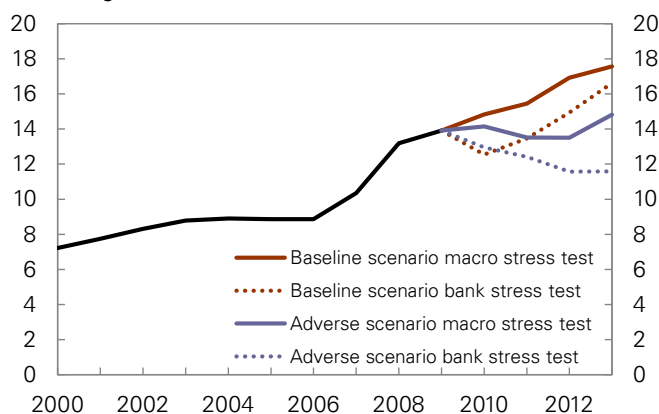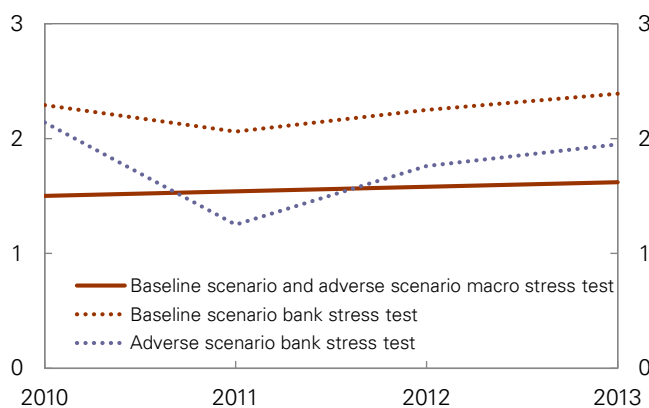
1 Nordea Bank Norge, SpareBank 1 SR-Bank, Sparebanken Vest, SpareBank 1 SMN, SpareBank 1 Nord-Norge and Bank 1 Oslo
2 Projections for 2010–2013
Sources: Finanstilsynet, Statistics Norway and Norges Bank

Chart 4 Banks'[1] market revenue. Bank stress test and macro stress test. In billions of NOK. Annual figures. 2010–2013[2]

1 Nordea Bank Norge, SpareBank 1 SR-Bank, Sparebanken Vest, SpareBank 1 SMN, SpareBank 1 Nord-Norge and Bank 1 Oslo
2 Projections for 2010–2013
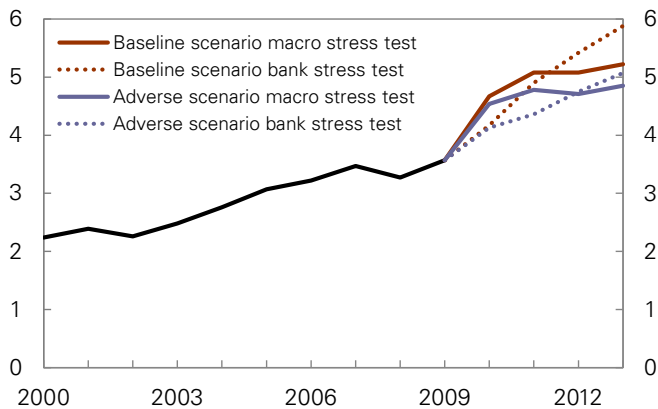Sources: Finanstilsynet, Statistics Norway and Norges Bank

scenario, primarily as a result of an expected loss on equities. For securities other than equities, the banks assumed moderate losses in both scenarios. It is, however, important to note that Norwegian banks' equity holdings are fairly small[18] and that this portfolio has historically been relatively stable.

Developments in fee income in an adverse scenario are uncertain. In crisis periods, very large banks can experience higher demand for market transactions, and thereby

18 One reason for low equity holdings is the provisions in Section 24 of the Commercial Banks Act and Section 24 of the Savings Banks Act which state that the book value of a commercial bank's shares and holdings must not exceed 4% of the bank's total assets.

Chart 5 Banks'[1] fee income. Bank stress test and macro stress test. In billions of NOK. Annual figures. 2000–2013[2]

- Baseline scenario macro stress test
- Baseline scenario bank stress test
- Adverse scenario macro stress test
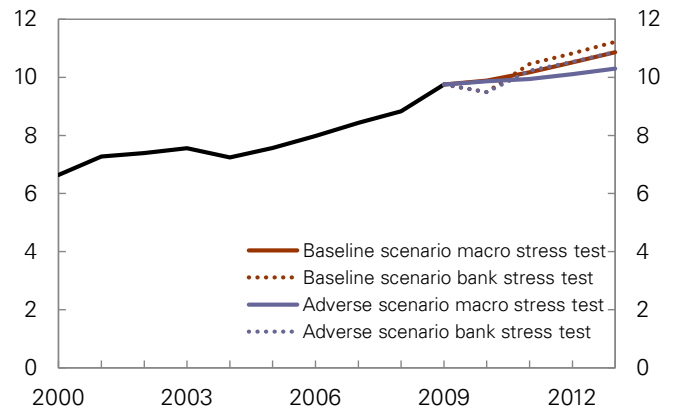- Adverse scenario bank stress test

[1] Nordea Bank Norge, SpareBank 1 SR-Bank, Sparebanken Vest, SpareBank 1 SMN, SpareBank 1 Nord-Norge and Bank 1 Oslo
[2] Projections for 2010–2013

Sources: Finanstilsynet, Statistics Norway and Norges Bank

Chart 6 Banks'[1] operating costs. Bank stress test and macro stress test. In billions of NOK. Annual figures. 2000–2013[2]

- Baseline scenario macro stress test
- Baseline scenario bank stress test
- Adverse scenario macro stress test
- Adverse scenario bank stress test

[1] Nordea Bank Norge, SpareBank 1 SR-Bank, Sparebanken Vest, SpareBank 1 SMN, SpareBank 1 Nord-Norge and Bank 1 Oslo
[2] Projections for 2010–2013

Sources: Finanstilsynet, Statistics Norway and Norges Bank

higher fee income. However, the projections from both Norges Bank and the six banks assumed that fee income would be lower in the adverse scenario than in the baseline scenario (see Chart 5).
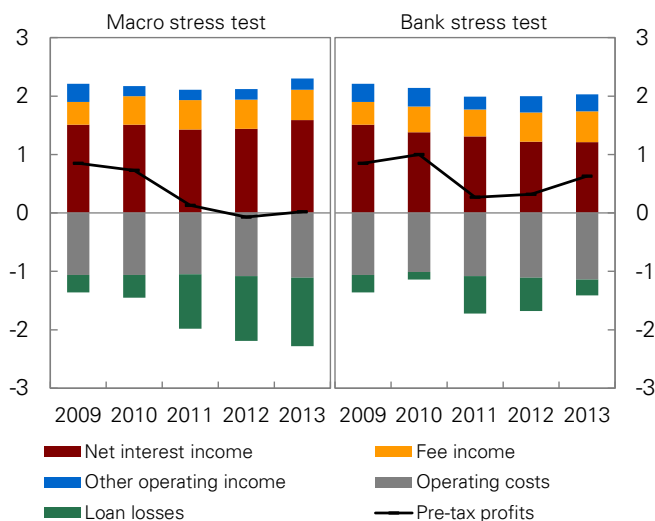
With regard to costs, there were only small differences between Norges Bank and the banks. Norges Bank uses the schematic assumption that costs increase in pace with wage growth. The banks' projections were based on a fairly similar assumption (see Chart 6). None of the banks assumed that the effect of a downturn could be counteracted by implementing large cost reductions.

4. Effects on banks' overall profits

As mentioned above, loan losses are the main driver of weak bank profits in the adverse scenario (see Chart 7). Higher loan losses lead to markedly lower profits (see Chart 8). In the macro stress test, however, increased interest income contributes to balancing banks' accounts in 2013. In the banks' projections, losses are highest in 2011.

In the baseline scenario, both stress tests showed that loan losses would be low and stable. Nonetheless, profits in the baseline scenario are assessed to be somewhat lower in the bank stress test than in the macro stress test,

Chart 7 Banks'[1] pre-tax profits as a percentage of average total assets. Adverse scenario. Macro stress test and bank stress test. Annual figures. 2009–2013[2]

- Net interest income
- Other operating income
- Loan losses
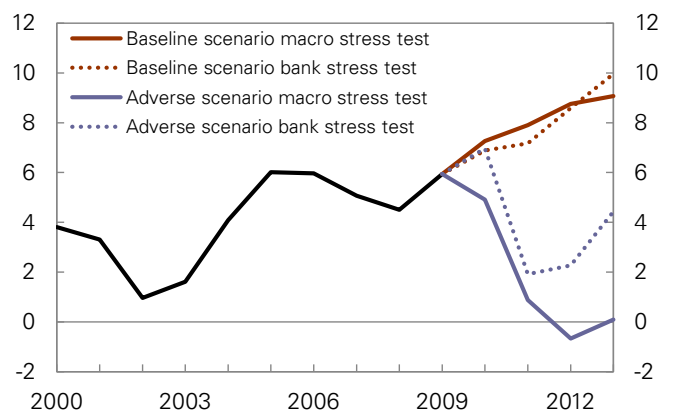- Fee income
- Operating costs
- Pre-tax profits

[1] Nordea Bank Norge, SpareBank 1 SR-Bank, Sparebanken Vest, SpareBank 1 SMN, SpareBank 1 Nord-Norge and Bank 1 Oslo
[2] Projections for 2010–2013

Sources: Finanstilsynet, Statistics Norway and Norges Bank

Chart 8 Banks'[1] post-tax profits. Bank stress test and macro stress test. In billions of NOK. Annual figures. 2000–2013[2]

- Baseline scenario macro stress test
- Baseline scenario bank stress test
- Adverse scenario macro stress test
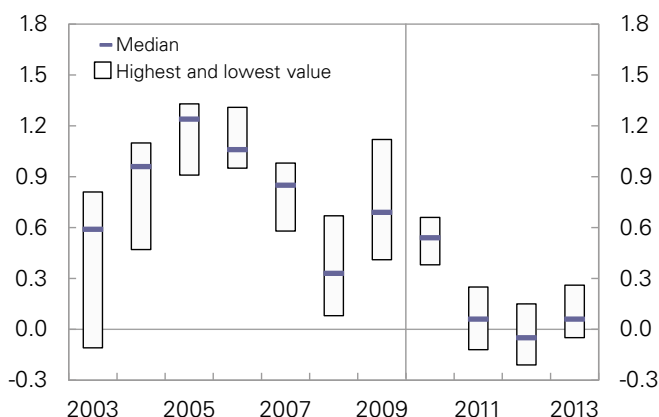- Adverse scenario bank stress test

[1] Nordea Bank Norge, SpareBank 1 SR-Bank, Sparebanken Vest, SpareBank 1 SMN, SpareBank 1 Nord-Norge and Bank 1 Oslo
[2] Projections for 2010–2013

Sources: Finanstilsynet, Statistics Norway and Norges Bank

Chart 9 Banks'[1] post-tax profits. Adverse scenario. Macro stress test. Percentage of average total assets. Annual figures. 2003–2013[2]

¹ Nordea Bank Norge, SpareBank 1 SR-Bank, Sparebanken Vest, SpareBank 1 SMN, SpareBank 1 Nord-Norge and Bank 1 Oslo
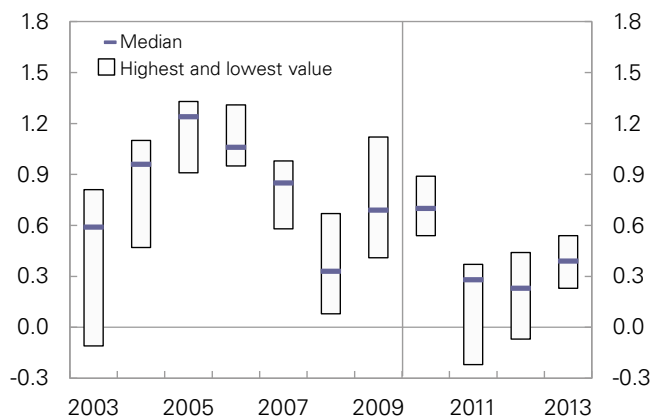² Projections for 2010–2013
Sources: Finanstilsynet, Statistics Norway and Norges Bank

Chart 10 Banks'[1] post-tax profits. Adverse scenario. Bank stress test. Percentage of average total assets. Annual figures. 2003–2013[2]

¹ Nordea Bank Norge, SpareBank 1 SR-Bank, Sparebanken Vest, SpareBank 1 SMN, SpareBank 1 Nord-Norge and Bank 1 Oslo
² Projections for 2010–2013
Sources: Finanstilsynet, Statistics Norway and Norges Bank

primarily owing to weaker net interest income developments.

The macroeconomic assumptions in the adverse scenario will affect each bank differently. The banks have different loan distributions, different standards of risk management and a different starting-point when the stress situation occurs. In the macro stress test, the spread in bank profits is relatively constant through the projection period (see Chart 9). Several banks show negative profits in 2012 and for at least one of the banks, profits are negative throughout the period from 2011 to 2013.

The spread across banks is wider in the bank stress test (see Chart 10). In their own calculations, the banks also capture assessments of their own risk management and they have a more detailed picture of their loan customers. Even though the banks overall show positive profits throughout the projection period, the spread shows negative profits for at least one bank in both 2011 and 2012.

5. Tier 1 capital adequacy

The objective of this kind of stress test is to test whether bank capital adequacy is sufficiently sound in the event of major economic shocks. In sum, bank capital adequacy falls in the bank stress test at the beginning of the projection period, but edges up again closer to 2013 (see Chart 11). In Norges Bank's projection, capital adequacy falls throughout the period. Neither in Norges Bank's nor in the banks' own analyses are the banks anywhere near breaching the current regulatory requirement of 4%. They are also well above the Basel Committee's proposed new requirement of 6%. There are, however, considerable

Chart 11 Banks'[1] Tier 1 capital ratios. Bank stress test and macro stress test. Per cent. Annual figures. 2007–2013[2]
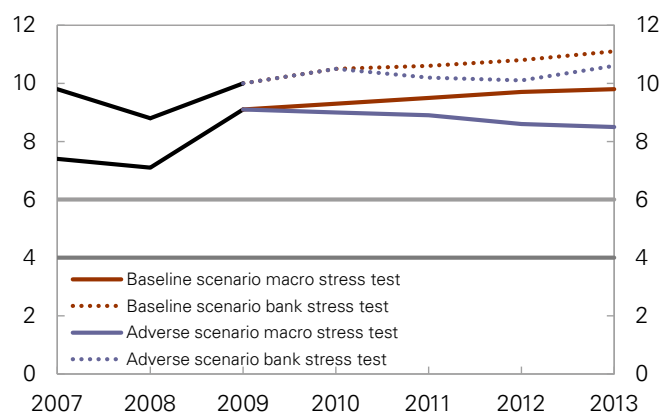
Baseline scenario macro stress test
Baseline scenario bank stress test
Adverse scenario macro stress test
Adverse scenario bank stress test

¹ Nordea Bank Norge, SpareBank 1 SR-Bank, Sparebanken Vest, SpareBank 1 SMN, SpareBank 1 Nord-Norge and Bank 1 Oslo
² The bank stress test is without regard to the floor in the transitional rule from Basel I to Basel II
³ Projections for 2010–2013
Sources: Finanstilsynet, Statistics Norway and Norges Bank

Chart 12 Banks' [1] Tier 1 capital ratios. Adverse scenario. Bank stress test. Per cent. Annual figures. 2007–2013[2]
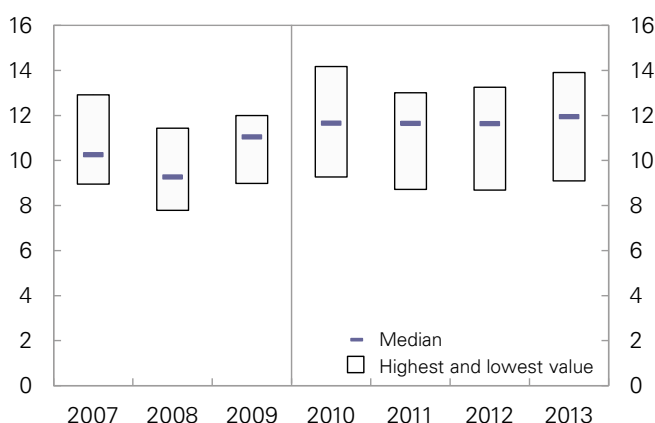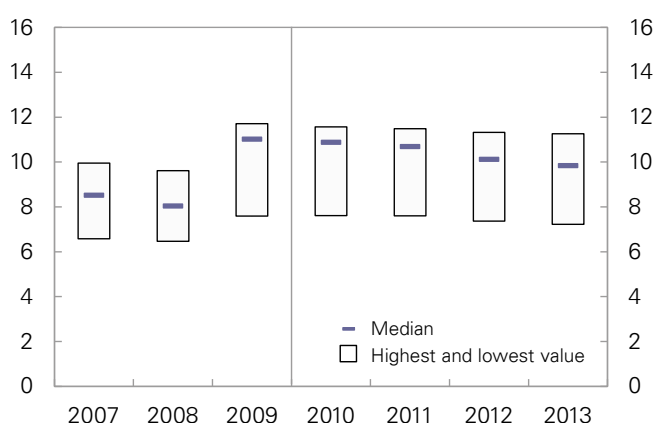

[1] Nordea Bank Norge, SpareBank 1 SR-Bank, Sparebanken Vest, SpareBank 1 SMN, SpareBank 1 Nord-Norge and Bank 1 Oslo

[2] The bank stress test is without regard to the floor in the transitional rule from Basel I to Basel II

[3] Projections for 2010–2013

Sources: Finanstilsynet, Statistics Norway and Norges Bank

Chart 13 Banks' [1] Tier 1 capital ratios. Adverse scenario. Macro stress test. Per cent. Annual figures. 2007–2013[2]

[1] Nordea Bank Norge, SpareBank 1 SR-Bank, Sparebanken Vest, SpareBank 1 SMN, SpareBank 1 Nord-Norge and Bank 1 Oslo

[2] Projections for 2010–2013

Sources: Finanstilsynet, Statistics Norway and Norges Bank

differences in capital adequacy across banks, both in the bank stress test (see Chart 12) and the macro stress test (see Chart 13).

The biggest difference between the banks and Norges Bank is, however, not due to the projections, but to initial Tier 1 capital ratios. In this stress test, the banks were instructed to calculate risk in their loans without regard to the floor in the transitional rule from Basel I to Basel II[19], while Norges Bank has taken the transitional rule into account. This means that the banks can set the level of risk-weighted assets lower and that capital adequacy is thereby higher than in Norges Bank's projections.

Given that profits are barely negative in the projection period, higher risk weights will provide the most important contribution to the fall in capital adequacy in the adverse scenario. When bank exposures become more risky, risk weights increase, which in turn leads to a rise in risk-weighted assets. The macro stress test assumes that risk-weighted assets increase by 2.5% each year in addition to changes in credit growth. The banks also report generally higher risk weights in the adverse scenario, in pace with growth in the share of doubtful loans.

Differences in profits explains some of the divergence between the banks' and Norges Bank's projections of capital adequacy,[20] particularly towards the end of the

projection period. Another element is that credit growth for parent banks is assumed to be somewhat lower in the banks' projections.[21] As a result, the banks' estimates of parent banks' capital adequacy are somewhat higher than Norges Bank's estimates.

6. What conclusions can be drawn?

The adverse scenario used in this exercise is relatively mild compared with many earlier scenarios presented by Norges Bank and banks have increased their capital adequacy ratios markedly after the financial crisis. It was thus not likely that banks' capital adequacy would approach a critical threshold in this scenario. This was confirmed in both Norges Bank's and the banks' projections.

The most pronounced difference between Norges Bank and the banks is that Norges Bank assumes that loan losses will increase as long as the output gap is negative, while the banks assume that the losses will be taken early in the downturn. At the same time, both Norges Bank and the banks expect the number of problem customers to increase through the period. The banks' implicit assumption is thus that the risk of loan losses gradually declines as economic growth picks up.

[19] Under the transitional rule, the capital requirement for 2010 and 2011 may at most be reduced to 80% of the capital requirement under Basel I. The capital requirement is defined here as the minimum capital adequacy requirement (8%) multiplied by risk weights for credit risk, market risk and operational risk.

[20] Moreover, Norges Bank assumes that 50% of positive profits are paid out as share dividends, while several banks assume a lower percentage. This means that the banks assume that more capital is retained to strengthen equity capital.

[21] In principle, bank stress tests were to assume the same rate of credit growth as the macro stress test. However, this only applies at group level. Credit growth will be lower in a bank's parent bank because some of the credit growth occurs in mortgage companies. In this test, capital adequacy in parent banks will therefore show somewhat more positive developments in the bank stress test than in the macro stress test as credit growth is lower in the banks' projections.

Norges Bank's macro analysis shows weaker bank profits than the banks' own calculations in the adverse scenario. While bank profits are negative in 2012 and 2013 in Norges Bank's calculations, profits in the banks' own projections remain generally positive throughout the projection period.

This result is consistent with the result of a similar comparison conducted by Danmarks Nationalbank in 2009.[22] The banks' own stress tests were compared with the central bank's macro stress test of 14 of Denmark's largest banks. Danmarks Nationalbank projected higher losses in the adverse scenario than the Danish banks. The Norwegian IMF stress test conducted in 2005 also found that the results of the bank stress test were overall somewhat stronger than the result of the macro stress test under the same macro scenario.

There may be a number of reasons for banks' more favourable projections under the adverse scenario. Banks' projected losses are largely based on historical losses. Several banks point out, however, that improved credit management has resulted in higher credit quality in bank portfolios and that projections based on historical losses overestimate future losses. Some of the banks have corrected for this by revising down their loss estimates. Norges Bank has not revised its loss estimates in the same way in order to take improved risk management into account. One reason for this is that Norges Bank has not yet tested whether improved risk management would actually produce better results if an actual systemic shock should occur. Another aspect is that Norges Bank bases its models on developments in the banking sector as a whole, while banks rely on their own experience.

The difference cannot be attributed entirely to these factors. Interpretations and assessments vary widely across the banks. It is very difficult to calculate future losses, whether by constructing macro models or assessing the individual positions. Losses are an accounting variable, and the point in time when a loss is recognised in the accounts may depend on a number of different factors, several of which are independent of macroeconomic developments.

It may be important to use several approaches to assess vulnerability in the banking system. By conducting both types of stress test, and by allowing the banks some independence to decide on the relevant assumptions, a more detailed picture of what can happen in a stress situation unfolds. We are then better equipped to understand vulnerabilities in financial institutions and to provide a realistic assessment of the consequences should the Norwegian financial system again face major challenges.

[22] Danmarks Nationalbank (2009).

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