Further analysis of the stress tests in Financial Stability 2/11

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The results of macro stress tests are published twice a year in Norges Bank's Financial Stability report. The purpose is to assess the vulnerability of the banking system as a whole under different macroeconomic scenarios. This article describes how the adverse scenario in Financial Stability 2/11 is constructed and the sensitivity of the results to changes in key assumptions. The article focuses in particular on developments for Norwegian banks in recent years. Norwegian banks have over the past few years increasingly used IRB (internal ratings-based) models to calculate risk weights for their portfolios. This article shows the uncertainty related to the introduction of IRB models in macro stress test projections. The consequences of conducting the stress test at parent bank level at a time when banks' residential mortgage loans are being transferred to covered bond mortgage companies is also examined. To provide a more complete sector-wide picture of developments in the banking sector, a stress test is conducted of loan losses for consolidated parent banks and covered bond mortgage companies. The final section describes stress testing of the results for banks' securities holdings.

The purpose of Norges Bank's stress tests is to test the resilience of the Norwegian banking sector to negative events of low probability. Negative shocks that rarely occur at the same time may, for example, be combined. A stress test does not provide a set answer to the question of how the banking system will handle a severe crisis. Should banks risk falling below the minimum capital adequacy requirement, they can respond by raising capital or limiting lending. The stress test functions as a useful illustration of how important risk factors could influence bank earnings and loan losses.

The authorities conduct stress testing in two different ways.[2] In one approach, stress testing is conducted by financial institutions based on a macro scenario specified by the authorities. This method is known as the "bottom-up" approach, referring to the way the test focuses on how the macro scenario affects risk in each of a bank's exposures and then aggregates the overall impact on banks' profits and capital adequacy. Another approach, often used by central banks, is the "top-down" approach, also referred to as macro stress testing. This is the approach used by Norges Bank[3]. The macro stress test in *Financial Stability* 2/11 (FS 2/11) is based on the results from the macro model in Norges Bank's suite of models for stress-testing. Projections of high-risk debt to the household and corporate sectors are used to calculate loan losses given each bank's aggregate lending to the different sectors. An overall assessment of the bank's profit and loss account and balance sheet is also conducted to provide a basis for assessing the effect of an adverse scenario on banks' capital adequacy. The macro stress test ensures a consistent assessment of credit risk in the banking system by applying the same method of loan loss calculation in all banks.

Norges Bank does not publish data on individual banks. The purpose of Norges Bank's stress tests is to test the resilience of the Norwegian banking sector to highly negative events. Our analyses are based on aggregated information on the composition of banks' balance sheets. For example, Norges bank cannot assess the risk related to individual banks' exposures. Furthermore, if individual banks' results were to be published, a closer dialogue with banks would have to be maintained throughout the process. The results must therefore not be interpreted as stress tests of individual banks.

The stress tests in Financial Stability 2/11

In FS 2/11, Norges Bank conducted a stress test based on a severe international downturn. Growth among Norway's trading partners falls sharply and is assumed to be most pronounced in Europe. This has a substantial impact on the Norwegian economy as about 70 per cent of Norwegian exports go to Europe. The oil price falls to below USD 50,

[1] Thanks to Farooq Akram, Bjørn Bakke, Svein Nygård, Haakon Solheim, Ingvild Svendsen, Bjørne-Dyre Syvertsen, Cathrine B. Træe and other colleagues at Norges Bank for useful comments. The viewpoints expressed in this article are the authors' own and cannot be attributed to Norge Bank.

[2] See Havro, Johansen, Ruud and Træe (2011) for a comparison of Norges Bank's macro stress test and similar analyses conducted by banks under the same macro assumptions.

[3] For further information about Norges Bank's stress testing system, see Andersen, Berge, Bernhardsen, Lindquist and Vatne (2008).

resulting in lower investment in Norway. Because of widespread turbulence in the global economy, it is assumed that traditional "safe havens" are perceived as less safe than during previous turbulent periods. Only a moderate depreciation of the krone is therefore assumed, despite the steep fall in the oil price. This is a typical example of a stress test where shocks that rarely occur at the same time are combined. In addition, problems in the European banking sector are assumed to result in an increase in credit market premiums and higher bank funding costs. Credit growth declines both as a result of lower demand for credit and because banks restrict lending.

To illustrate the effect on both the economy and on banks' risk-weighted assets of the possibility that banks may have to tighten credit standards in a downturn, an alternative adverse scenario was constructed where the decline in credit growth is less pronounced. In this alternative scenario, growth in the economy picks up again more quickly than in the main adverse scenario. The alternative scenario builds on two important assumptions. First, it must be assumed that there is demand for credit, which will be uncertain in a situation involving a sharp decline in the global economy and a fall in oil prices. Second, banks maintain normal lending standards. A bank that is in danger of falling below the regulatory minimum capital adequacy requirement is not likely to maintain normal credit standards. How long it will take before a bank is forced to limit its lending in a period of contraction partly depends on how strongly capitalised it is in the first place. In the model calculations presented in FS 2/11, some banks fell below the minimum requirement in order to maintain lending volume. It is therefore likely that these banks would have responded by reducing lending. The result cannot therefore be interpreted to indicate that some banks failed the stress test. This illustrates that it is important from an economic point of view for banks' to be in a strong enough capital position to withstand a severe downturn without having to tighten lending.

The probability that a course of events such as in the adverse scenario would actually occur is low. Nonetheless, banks as a whole maintain capital levels above the regulatory minimum requirement in the main adverse scenario. The stress tests show that due to the increase in capital adequacy ratios since 2009 the Norwegian banking sector is better equipped to weather a severe international downturn.

Banks' Tier 1 capital ratios

A bank's Tier 1 capital ratio is an important measure of its solidity. The Tier 1 capital ratio mainly reflects the ratio of a bank's equity capital to risk-weighted assets.[4] The bank's total risk is reflected in the denominator, which is the sum of risk-weighted assets. The regulatory minimum requirement for the Tier 1 capital ratio is currently 4 per cent, with a proposed increase to 6 per cent under Basel III. In connection with measures to increase the resilience of the EU banking sector to future losses, the European Banking Authority (EBA) has proposed a temporary increase in the minimum Core Tier 1 capital ratio[5] to 9 per cent by the end of June 2012 for a number of European banks.

Banks' Tier 1 capital ratios – IRB models for calculating risk weights

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 the sum of risk-weighted assets more closely with the actual risk profile of banks' loan portfolios.[6] In a macro stress test, which does not include full details of banks' individual exposures, it is uncertain to what extent the wider introduction of IRB models in the projection period will have an effect on banks' Tier 1 capital adequacy.

Implementing IRB models in one or more of a bank's portfolios usually results in a non-recurring effect on the bank's risk-weighted assets, reflecting the transition from standardised risk weights to risk weights calculated internally by the bank. In the event of a fall in risk-weighted assets, a bank's Tier 1 capital ratio will in isolation increase. To avoid an excessive reduction in banks' Tier 1 capital when IRB models are introduced, risk-weighted assets should not be reduced by more than 20 per cent relative to the Basel I level.

The banks[7] included in the stress test in FS 2/11 have been using IRB models approved by the supervisory authorities since 2007. The effect of the introduction of IRB models on banks' Tier 1 capital ratios has varied across banks. DNB Bank, for example, began to use IRB models in much of its corporate portfolio from the fourth quarter of 2010. Combined with increased equity capital, this led to a substantial rise in banks' Tier 1 capital adequacy ratios (see Chart 1). Overall, risk-weighted assets for the stress test banks fell by 9.9 per cent in the fourth quarter of 2010, even though the banks' total assets only fell by 0.5 per cent. As a result, Tier 1 capital adequacy ratios were 1.3 percentage points above the level previously projected in the baseline scenario in *Financial Stability* 2/10.

[4] Tier 1 capital is equity capital plus hybrid capital minus deductions.

[5] Core Tier 1 capital is equity capital minus deductions.

[6] 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 of management and control at the bank.

[7] The banks stress-tested in FS 2/11 are DNB Bank, Nordea Bank Norge, SpareBank 1 SR-Bank, Sparebanken Vest, Sparebank 1 SMN and SpareBank 1 Nord-Norge

Several of the banks reported that they would be using IRB models more widely in their loan portfolios. Chart 2 shows the uncertainty related to the introduction of IRB models in the projection period. Under the assumption that risk-weighted assets fall to the same extent in the fourth quarter of 2011 as in the fourth quarter of 2010, Tier 1 capital ratios will increase considerably. If a similar fall occurs at end-2012, Tier 1 capital adequacy ratios in the adverse scenario will be above 8 per cent in 2014, against 6.7 per cent in the adverse scenario in FS 2/11.

Covered bond mortgage companies

Since Norges Bank began conducting stress tests in 2004, the focus has been on banks' profits and capital adequacy at parent bank level. Mortgage companies have not been included in the stress tests. This section of the article examines the assumptions concerning transfers of residential mortgage loans from parent bank to mortgage company that formed the basis of the stress test at parent bank level in FS 2/11.

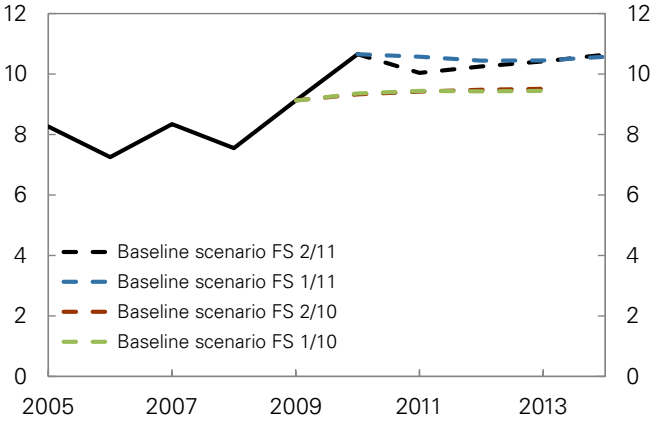
Differences in developments between parent bank and banking group have historically been small, but have increased in importance over the past few years after banks were permitted to issue covered bonds (OMF) in 2007 (see Bakke, Rakkestad and Dahl (2010)). As banks have to a great extent transferred residential mortgage portfolios to covered bond mortgage companies, the share of loans secured on dwellings has fallen sharply at parent bank level. This is reflected in the volume of lending to the household sector (see Chart 3). This tendency was amplified after the introduction of the swap arrangement in autumn 2008.

The stress test in FS 2/11 was based on the assumption that mortgage companies' share of total lending to households[8] increases by 5 percentage points per year, with a corresponding fall for parent banks. This is equivalent to the average observed over the past year. At the end of the third quarter of 2011, Norwegian banks and mortgage companies had provided about NOK 1947 billion in loans to households. Of these loans, 43 per cent were transferred to mortgage companies. Assuming that the mortgage company share grows at a constant rate of 5 percentage points per year, this share will reach 60 per cent by the end of 2014.

The rise in the share of loans to households held by mortgage companies has varied considerably since 2007. The stress test in FS 2/11 was based on the assumption of a positive increase in the share held by mortgage companies. Although the share of residential mortgage loans held by mortgage companies is likely to stabilise over time, there is considerable uncertainty here. Chart 4 shows developments in parent bank Tier 1 capital ratios if the share held

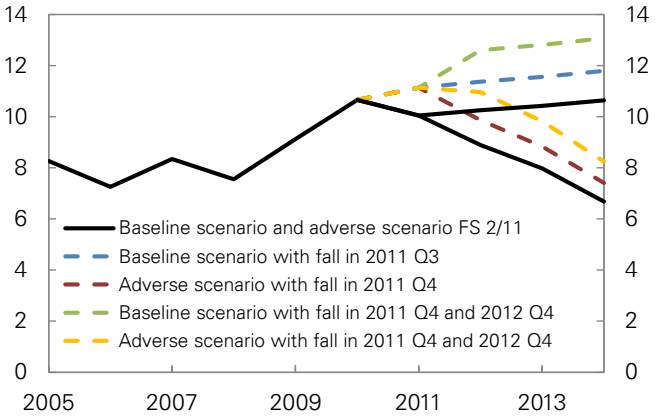
[8] Total lending to households is defined here as total loans to households held by banks and mortgage companies.

Chart 1 Banks'[1)] Tier 1 capital ratios in baseline scenario. Per cent. Annual figures. 2005–2014[2)]



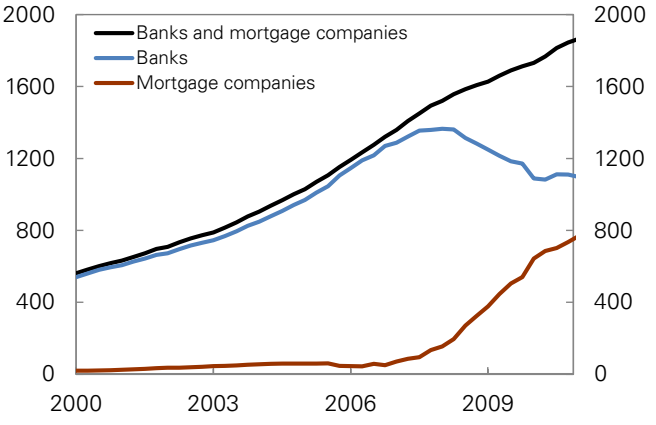
[1] DnB Bank, Nordea Bank Norge, SpareBank 1 SR-Bank, Sparebanken Vest, SpareBank 1 SMN and SpareBank 1 Nord-Norge.
[2] Projections for 2011–2014.
Sources: Finanstilsynet and Norges Bank.

Chart 2 Banks'[1)] Tier 1 capital ratios with fall in risk-weighted assets. Per cent. Annual figures. 2005–2014[2)]



[1] DNB Bank, Nordea Bank Norge, SpareBank 1 SR-Bank, Sparebanken Vest, SpareBank 1 SMN and SpareBank 1 Nord-Norge.
[2] Projections for 2011–2014.
Sources: Statistics Norway and Norges Bank.

Chart 3 Lending to households. Banks and mortgage companies. In billions of NOK. Quarterly figures. 2000 Q1–2011 Q3



Sources: Statistics Norway and Norges Bank.

by mortgage companies remains at the current level. In this scenario, Tier 1 capital ratios fall somewhat more than in the published stress test, but are still on the whole above the 6 per cent requirement in the adverse scenario.

Stress test of loan losses for consolidated parent bank and covered bond mortgage company

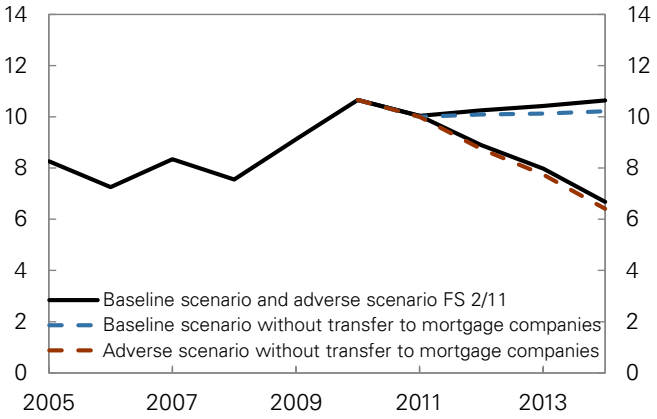
Norges Bank's stress tests are based on banks' accounts as recorded in ORBOF (banking and financial accounting statistics). The ORBOF figures apply to Norwegian financial enterprises. ORBOF includes accounts for parent banks and mortgage companies, but does not provide complete accounts for financial institutions at group level. However, in the light of the increased importance of covered bond mortgage companies, it is important to view parent bank and covered bond mortgage company as a whole. In order to obtain a more accurate picture of developments in the banking sector, we therefore conduct a stress test of bank loan losses where we add together the accounts of the parent bank and associated residential and commercial mortgage companies[9] that issue covered bonds.

Consolidation is applied to the most important items on banks' balance sheets.[10] Consolidation eliminations for the profit and loss account have been excluded for the time being. This means that income and expenses may be somewhat exaggerated historically and in the projection period since intragroup transactions cannot be excluded. Since the focus is on growth in bank lending, loans transferred or mediated to part-owned covered bond mortgage companies are taken into account in the consolidation, even though mortgage companies are not in legal terms part of the banking group.

This stress test focuses on overall loan losses as they appear on the consolidated bank's balance sheet. The parent bank is not necessarily obliged to absorb losses incurred by the covered bond mortgage company.[11] The stress test will thereby overestimate the burden on the banks. On the other hand, loans on mortgage companies' balance sheets are on average less risky. Only residential mortgage loans with a loan-to-value ratio of up to 75 per cent are included in covered bond mortgage companies' collateral pool. The transfer of residential mortgage loans to mortgage companies thereby increases the average risk related to loans on the parent bank's balance sheet, which is reflected in lower average risk weights for residential mortgage loans in covered bond mortgage companies compared with the parent bank. It can therefore reasonably be assumed that the parent bank will have to absorb a larger share of the losses resulting from large residential mortgage defaults. Higher credit risk on parent banks' balance sheets will be countered by an increase in the Tier 1 capital requirement.

Charts 5 to 7 show developments in the consolidated

Chart 4 Banks'[1)] Tier 1 capital ratios under different assumptions about credit growth to households. Per cent. Annual figures. 2005–2014[2)]

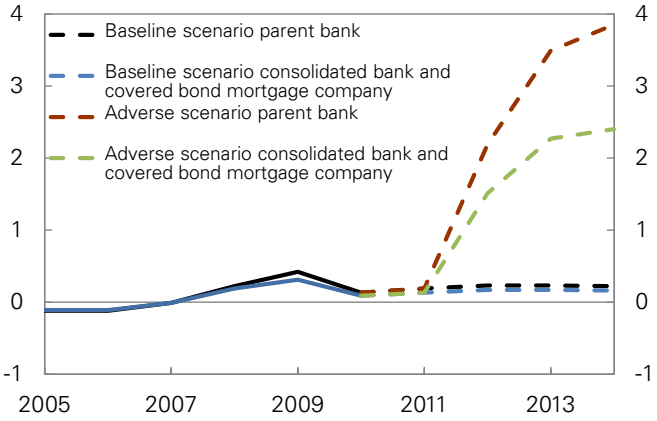


[1] DnB Bank, Nordea Bank Norge, SpareBank 1 SR-Bank, Sparebanken Vest, SpareBank 1 SMN and SpareBank 1 Nord-Norge.

[2] Projections for 2011–2014.

Sources: Statistics Norway and Norges Bank.

Chart 5 Banks' loan losses as a percentage of gross lending. Parent bank[1)] and consolidated bank and covered bond mortgage company[2)]. Per cent. Annual figures. 2005–2014[3)]



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

[2] DNB Boligkreditt, DNB Næringskreditt, Nordea Eiendomskreditt, SpareBank 1 Boligkreditt, SpareBank 1 Næringskreditt and Sparebanken Vest Boligkreditt.

[3] Projections for 2011–2014.

Sources: Statistics Norway and Norges Bank.

[9] The associated covered bond mortgage companies are DNB Boligkreditt, DNB Næringskreditt, Nordea Eiendomskreditt, Sparebank 1 Boligkreditt, Sparebank 1 Næringskreditt and Sparebanken Vest Boligkreditt

[10] In a consolidated balance sheet for a parent bank and a covered bond mortgage company, intragroup debt and debit items, covered bonds transferred from mortgage company to parent bank and equity injections from parent bank to covered bond mortgage company are eliminated.

[11] Banks and covered bond mortgage companies normally enter into an agreement which directly or indirectly directs the bank to absorb all or part of the losses incurred by a covered bond mortgage company.

banking entity compared with the developments at parent bank level published in the stress test in FS 2/11. The adverse scenario is the same as that applied in the report. For the stress test at parent bank level, it was assumed that banks' share of total loans to households held by banks and mortgage companies fell by 5 percentage points each year. For the consolidated banking entity, growth in credit to households tracks total household credit growth in the economy. The loss ratio, i.e. the share of non-performing loans that will have to be written off, is assumed to be somewhat lower for loans held by mortgage companies than for parent banks as a whole.[12] This is because mortgage company loans are generally highly collateralised.

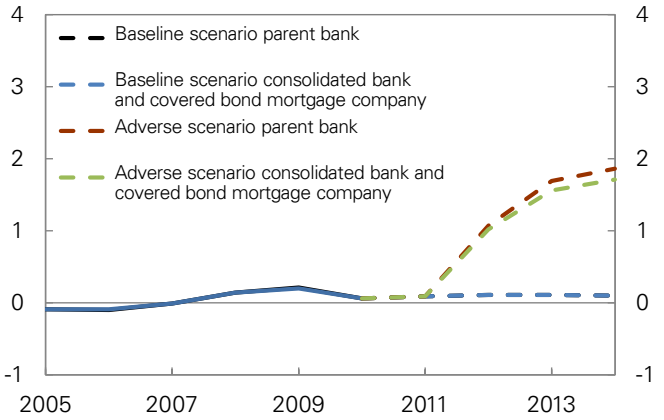
Loan losses as a share of gross lending are considerably lower for consolidated banks than for parent banks under the adverse scenario (see Chart 5). This is due to the higher concentration of loans to the corporate sector in parent banks. Corporate lending as a share of gross lending totalled 54 per cent for the stress test banks at parent bank level as at the third quarter of 2011, compared with 37 per cent for consolidated parent banks and covered bond mortgage companies. As corporate loans are on average more exposed to risk, a higher concentration will result in higher loan losses as a share of gross lending in a stress situation. Loan losses as a share of average total assets (ATA) are on the other hand approximately equal (see Chart 6). This is because the share of loans to the retail market on the parent bank's balance sheet is smaller compared with the consolidated bank.

Overall, the consolidated banking entity's profits are somewhat weaker in both the baseline and the adverse scenario (see Chart 7). This is primarily due to somewhat lower net interest income and commission income as a share of ATA.

Banks' securities holdings

Capital markets are important for the largest banks, in terms of both funding and investment. Banks' holdings of securities have risen as a share of total assets. Variability in income from securities has also increased. During the financial crisis 2008-2009, a number of banks posted losses on securities. In an international context, attention has turned increasingly to losses related to securities. The most recent European Banking Authority stress tests have focused on banks' exposure to European government bonds. This kind of exposure is limited for Norwegian banks. However, a sovereign default in the euro zone, for example, is likely to have a considerable impact on other financial assets due to increasingly interwoven financial markets, and Norwegian banks could then also be affected. In the stress test in FS 2/11, financial instruments that are subject to market fluctuations (measured at fair value[13]) were exposed to greater shocks than in previous reports. The following section reviews the

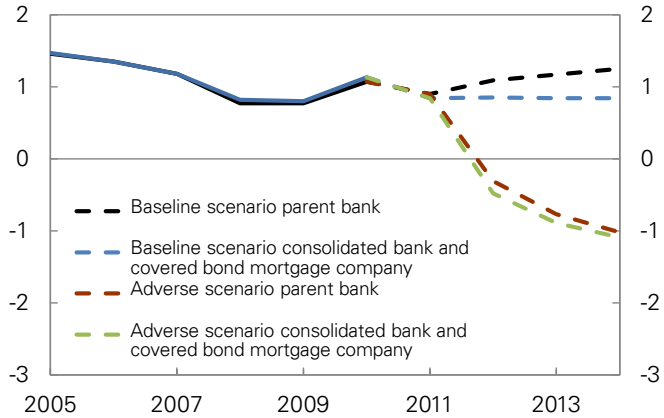
Chart 6 Banks' loan losses as a percentage of average total assets. Parent bank[1)] and consolidated bank and covered bond mortgage company[2)]. Per cent. Annual figures. 2005–2014[3)]



[1] DnB Bank, Nordea Bank Norge, SpareBank 1 SR-Bank, Sparebanken Vest, SpareBank 1 SMN and SpareBank 1 Nord-Norge.
[2] DNB Boligkreditt, DNB Næringskreditt, Nordea Eiendomskreditt , SpareBank 1 Boligkreditt, SpareBank 1 Næringskreditt and Sparebanken Vest Boligkreditt.
[3] Projections for 2011–2014.

Sources: Statistics Norway and Norges Bank.

Chart 7 Banks' pre-tax profits as a percentage of average total assets. Parent bank[1)] and consolidated bank and covered bond mortgage company[2)]. Per cent. Annual figures. 2005–2014[3)]



[1] DnB Bank, Nordea Bank Norge, SpareBank 1 SR-Bank, Sparebanken Vest, SpareBank 1 SMN and SpareBank 1 Nord-Norge.
[2] DNB Boligkreditt, DNB Næringskreditt, Nordea Eiendomskreditt , SpareBank 1 Boligkreditt, SpareBank 1 Næringskreditt and Sparebanken Vest Boligkreditt.
[3] Projections for 2011–2014.

Sources: Statistics Norway and Norges Bank.

[12] The baseline scenario in FS 2/11 is based on the assumption that the loss ratio remains at 10 per cent, while it rises to 40 per cent in the adverse scenario. This is in line with the loss ratio during the banking crisis in 1988–1993. As the loss ratio is determined by the value of banks' collateral and equity ratios in the enterprise and household sectors, a somewhat lower loss ratio is assumed for loans in covered bond mortgage companies . In the baseline scenario, the loss ratio remains at 7.5 per cent, while it rises to 20 per cent in the adverse scenario.

[13] Fair value refers to the value of a financial instrument if it were sold. For more information on fair value accounting, see Berg (2009).

assumptions applied in assessing the effect of a fall in value for banks' holdings of equities, bonds and other financial instruments. In the stress tests, it is assumed that no securities are reclassified to held-to-maturity.[14]

Equities make up the smallest share of financial assets in a bank's portfolio (see Chart 8).[15] However, income from equities nonetheless varies in line with income from larger items, such as bonds (see Charts 9 and 10). In the projections, it was assumed that banks achieve a return on the book value of their equity holdings equal to the return on Oslo Børs (the Oslo stock exchange). Chart 9 shows actual gains/losses on equities over a period compared with the book value of equities at the beginning of the period multiplied by the return on Oslo Børs. The correlation between the two series is high. It would appear that the assumption is reasonable. Whether a bank has large individual positions in companies or is concentrated in particular industries is not taken into account, but this is probably less important since equity markets tend to be highly correlated in periods of wide fluctuations. The historical relationship between macro variables and the return on Oslo Børs is used to make an assumption about developments in equity markets. The macro variables are projected in the model. This provides a projection of developments in equity markets that is consistent with developments in the rest of the adverse scenario.

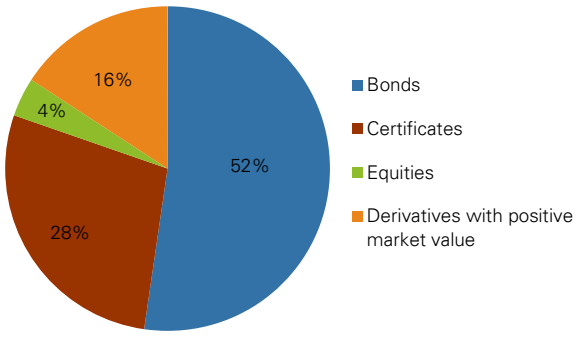
The stress test in FS 2/11 is based on a steep fall in oil prices and generally weak economic growth. Oslo Børs falls by about 30 per cent in the first year. The fair value of banks' equity holdings has increased in recent years and the developments therefore result in a loss of about 0.25 per cent of average total assets for the six stress test banks as a whole.

Bonds make up the largest share of financial assets measured at fair value (see Chart 8). Types of bond and maturities vary widely and the portfolio composition varies across banks. A large proportion of the bonds are covered bonds used by banks in the swap arrangement with Norges Bank. Even though a bank has exchanged these securities, the risk remains with the bank. Covered bonds are therefore included in the stress test. Since the exact composition and maturity of the bond portfolio is not known, an average change in yield is assumed for the portfolio in the adverse scenario with an assumed duration equal to 2. The change in value is then calculated using the book value of bonds. Chart 10 shows both the historical gains/losses on bonds given this assumption and the actual historical gains/losses. As shown by the chart, the assumption is relatively accurate.

[14] When a bank reclassifies its portfolio from "measured at fair value" to "held-to-maturity", the value of the instruments can be recognised at amortised cost instead of market value.

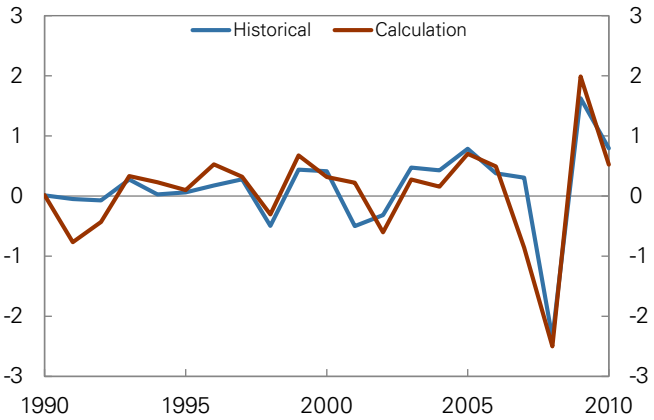
[15] The equity share may not exceed four per cent of total assets cf. Section 24 of the Commercial Banks Act and Section 24 of the Savings Banks Act.

Chart 8 Banks'[1)] financial assets measured at fair value. By type. Percentage of portfolio. Annual figures. 2010



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

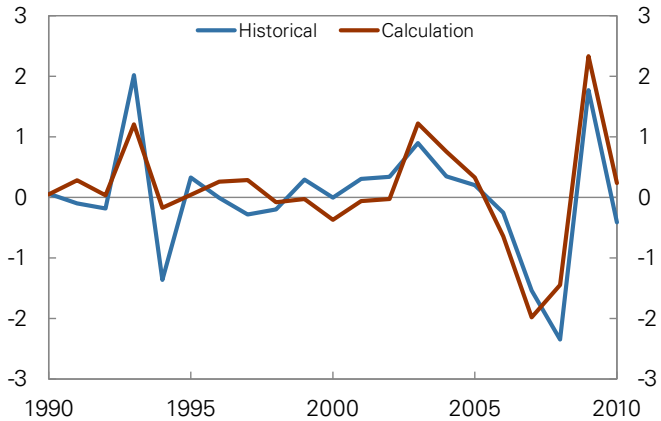
Chart 9 Banks'[1)] historical return on equities and the return on Oslo Børs scaled with banks' equity holdings. In billions of NOK. Annual figures. 1990–2010



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

Sources: Statistics Norway, Oslo Børs and Norges Bank.

Chart 10 Banks'[1)] historical return on bonds and the change in yield[2)] scaled with banks' holding of bonds measured at fair value. In billions of NOK. Annual figures. 1990–2010



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

[2] From 1990–2000 for sovereign bonds. From 2001 for bonds issued by banks.

Sources: Statistics Norway, DNB Markets and Norges Bank.

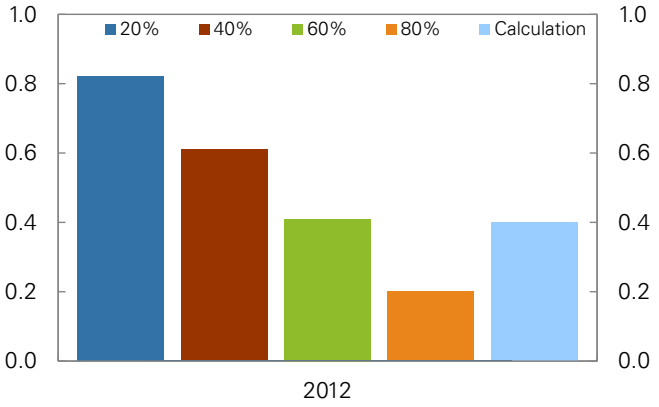
In FS 2/11, the change in yield for bonds is assumed to be 1 per cent (100 basis points). This entails a considerable shock since the key policy rate falls in the adverse scenario. For securities such as covered bonds, this constitutes a large premium as the risk related to these securities is assessed as relatively low in the bond market.[16]

The remaining financial assets, except derivatives, are grouped into one item, which mainly comprises foreign exchange. It is difficult to find projection variables for this part of the portfolio. It is for example difficult to project income from foreign exchange trading in the event of a krone depreciation. Historical income is therefore applied to give an indication of the degree of risk related to these activities. In the stress test, this item for the first quarter of 2012 is set equal to the lowest quarterly observation over the past ten years for the respective banks. For the rest of the period, the starting point is the average quarterly return for the past six years, excluding the four highest observations, which thereafter rises in pace with inflation.

The impact gains/losses on financial assets have on banks' profits largely depends on the extent to which banks hedge their securities positions (see Chart 11). In order to take account of hedging in connection with for example market-making, historical data for the relative size and correlation between the derivatives position and the remaining financial assets are used to calculate a hedge ratio. The average correlation is a negative 0.6, significantly lower than zero, indicating that the banks are engaged in hedging activities. The hedge ratio used in the stress test in FS 2/11 is about 60 per cent. This means that 60 per cent of the fall in the value of equities, bonds and other financial instruments will be counteracted by positive developments in the value of derivatives.[17]

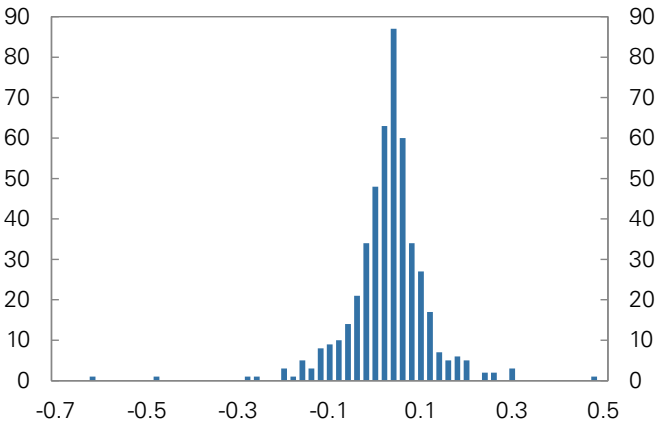
A potential hazard relating to the assumption of hedging is that counterparties may default. This is particularly hazardous in the case of hedging using unsecured bilateral contracts.[18] A lower-than-expected hedge ratio will result in higher losses (see Chart 11). Should the hedge ratio fall from 60 per cent to 20 per cent, losses on securities at market value would amount to 0.8 per cent of ATA. Foreign banks are typical counterparties for many of the transactions performed by Norwegian banks. Given that many foreign banks are heavily exposed to European sovereign debt, this may be a relevant source of risk in the adverse scenario. Since the underlying analysis does not provide an indication of the proportion of counterparties that can be expected to default in a crisis situation, this has not been taken into account.

Chart 11 Banks'[1)] losses on financial assets as a percentage of average total assets for different hedge ratios. Per cent. Annual figures. 2012[2)]



[1] DNB Bank, Nordea Bank Norge, SpareBank 1 SR-Bank, Sparebanken Vest, SpareBank 1 SMN and SpareBank 1 Nord-Norge.
[2] Projections for 2012.
Sources: Statistics Norway and Norges Bank.

Chart 12 Banks'[1)] profit/loss on financial assets as a percentage of average total assets.[2)] Per cent. Annual figures. 1992–2011



[1] DNB Bank, Nordea Bank Norge, SpareBank 1 SR-Bank, Sparebanken Vest, SpareBank 1 SMN and SpareBank 1 Nord-Norge.
[2] Negative numbers indicate losses, while positive numbers indicate profit.
Sources: Statistics Norway and Norges Bank.

Net gains/losses on financial assets are obtained by adding together the results for equities, bonds, derivatives and other financial instruments. In the adverse alternative in FS 2/11, losses on financial instruments come to about 0.4 per cent of ATA in the first projection year (see Chart 11).

Total losses for the six stress test banks are higher than observed in the period for which statistics are available. It is nonetheless important to emphasise that four of the six banks have experienced one or more quarters of higher losses on securities portfolios as a share of total

[16] For example the change in the interest rate premium (spread against swap rates) for covered bonds in 2008 was about half a per cent. In comparison, the change was 1.84 per cent for corporate bonds. (Source: DNB Markets)

[17] Note that the opposite may also occur. Banks sell a derivative and hedge by buying/selling the underlying instrument. Some of these types of activity are implicitly captured in our assumptions.

[18] According to the International Swaps and Derivatives Association (ISDA), about 2/3 of OTC derivative transactions are collateralised. But the frequency of central counterparty clearing varies and there will be some intraday risk. For more information on counterparty risk, see Molland (2011).

assets than is the case under the adverse scenario. Chart 12 shows the historical distribution. The unweighted average of losses in the first quarter of 2012 is about 0.25 per cent of ATA for the six banks. In spite of high losses on securities portfolios from a historical perspective in the adverse scenario in FS 2/11, the most important source of losses for banks in the adverse scenario is loan losses.

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Table 1 Stress scenarios in the three previous Financial Stability Reports

	FS 2/10	FS 1/11	FS 2/11
Risk factors	Turbulence in international financial markets, more expensive funding	Lower economic activity internationally	Lower economic activity among trading partners
	Lower growth abroad, high government debt	Market confidence in some European countries' capacity to service government debt evaporates	Fall in oil prices owing to low demand
	High household debt	Renewed turbulence in international money and credit markets	Increased turbulence in international money and credit markets
		Persistently high commodity prices and rising inflation	
		High household debt level in Norway	
Adverse scenario	Weak growth abroad results in low oil prices, about USD 50 pb. Real exchange rate still remains close to benchmark scenario. Exports fall and unemployment rises. Household expectations weaken.	Turmoil linked to government finances in some European countries spreads to the rest of Europe via exposures in the European financial sector. Renewed turbulence in international money and credit markets. The oil price increases to about USD 140 per barrel. Household expectations weaken.	Sharp fall in GDP among trading partners. The fall is most pronounced in Europe. The oil price falls to under USD 50 per barrel. The exchange rate follows the baseline scenario. There is a pronounced fall in asset prices. Extra losses in shipping and commercial real estate.
Shock variables	GDP among trading partners	GDP among trading partners	GDP among trading partners
	Household expectations	Household expectations	Household expectations
	GDP	GDP	GDP
	Oil price	Oil price	Oil price
	Real exchange rate on par with benchmark scenario	Interest rate margin and premium in international and Norwegian money markets	Exchange rate equal to the baseline scenario from Monetary Policy Report 3/2011
	Premiums in international and Norwegian money markets		Increased premiums in international and Norwegian money markets

Table 2 Stress test Financial Stability 2/2011

	Baseline scenario[1]				Adverse scenario			
Macroeconomic scenario. Percentage change from previous year unless stated otherwise	2011	2012	2013	2014	2011	2012	2013	2014
Mainland GDP	2¾	3¾	3¼	3	2¾	-2¼	½	2¾
CPI	1½	1½	2	2¼	1½	1¼	½	1
Annual wage growth	4¼	4¼	4½	4¾	4¼	4	2½	1½
Registered unemployment (rate, level)	2¾	2½	2½	2½	2¾	2½	4	4½
Exchange rate (Level. Import-weighted 44 countries)	88	88½	89¼	89¾	88	88½	89¼	89¾
Oil price, USD per barrel (level)	110	97	94	94	110	46	47½	51¾
3-month money market rate, NIBOR (level)	3	3	3½	4	3	3	2	2
Bank lending rates (level)	4¾	5	5¼	5¾	4¾	5¼	4¼	4
House prices	9	8½	7½	4¾	9	-5¼	-11¾	-9
Credit to households [3]	7½	9	9	8½	7½	5	3	½
Credit to non-financial enterprises[3]	2	6¼	7¼	7½	2	-5¾	-10¼	-6¾
Banks'[2] profits and losses								
Problem loans households[4] (percentage share of lending to the sector)	1	¾	¾	¾	1	1	1¼	1¾
Problem loans non-financial enterprises[4] (percentage share of lending to the sector)	3	3	3	2¾	3	4¾	10	11
Problem loans total[4] (percentage of gross lending)	1½	1½	1½	1½	1½	2¼	3½	4
Loan losses (percentage of gross lending)	¼	¼	¼	¼	¼	2¼	3½	3¾
Pre-tax losses (percentage of average total assets)	1	1	1¼	1¼	1	-¼	-¾	-1
Net interest income (percentage of average total assets)	1¼	1½	1¾	1¾	1¼	1¾	1½	1½
Tier 1 capital (percentage of risk-weighted assets)	10	10¼	10½	10½	10	9	8	6¾

[1] Baseline scenario for CPI, annual wage growth, registered unemployment, oil prices, exchange rate and mainland GDP are from Monetary Policy Report 3/2011

[2] Norway's five largest banks and Nordea Bank Norge

[3] Change in stock measured at year-end

[4] Non-performing loans and other loans that banks regard as particularly doubtful. All banks excluding branches of foreign banks in Norway

Sources: Statistics Norway, Technical Calculation Committee for Wage Settlements, Thomson Reuters, Association of Real Estate Agency Firms, ECON Pöyry, Finn.no, Association of Real Estate Agents, Finanstilsynet (Financial Supervisory Authority of Norway) and Norges Bank

Table 3 Stress test Financial Stability 1/2011

	Baseline scenario[1]				Adverse scenario 1				Adverse scenario 2			
Macroeconomic scenario. Percentage change from previous year unless stated otherwise	2011	2012	2013	2014	2011	2012	2013	2014	2011	2012	2013	2014
Mainland GDP	3¼	3¾	3¼	3	¼	½	2	2½	-½	-½	1¾	3¼
CPI	1½	1¾	2¼	2½	1½	1¾	1¾	1¾	1½	1¾	1¼	1
Annual wage growth	4	4½	4¾	4¾	4	3¾	2½	2½	4	3½	1½	1½
Registered unemployment (rate, level)	2¾	2½	2½	2½	2¾	3½	4¼	4¼	2¾	3¾	4¾	5
Exchange rate (Level. Import-weighted 44 countries)	88¾	89¼	89½	90¼	88½	86¾	86½	87	88½	87¼	87	87¾
Oil price, USD per barrel (level)	112	112	108	108	143	136	134	118	143	136	134	118
3-month money market rate, NIBOR (level)	2¾	4	4¾	5	2¾	3	3¾	4¼	2¾	2¾	3¼	3¾
Bank lending rates (level)	4¾	5½	6¼	6¾	4¾	4¾	5¼	6	4¾	4½	5	5¼
House prices	7¾	5¼	4¼	3½	-¾	-6	-5	0	-8	-15¼	-12¾	1½
Credit to households[3]	7¾	7¾	7¼	7	6¼	4¾	2½	2	5¼	2¼	-1¾	-2¼
Credit to non-financial enterprises[3]	7	9¾	9½	9	4¼	3¼	1¼	-1¼	2½	¼	-1¾	-2¼
Banks'[2] profits and losses												
Problem loans households[4] (percentage share of lending to the sector)	1.1	1.0	0.8	0.8	1.2	1.2	1.4	1.6	1.3	1.6	2.1	2.6
Problem loans non-financial enterprises[4] (percentage share of lending to the sector)	2.9	2.4	2.3	2.3	2.7	3.6	5.3	5.7	2.7	4.2	6.7	7.1
Problem loans total[4] (percentage of gross lending)	1.7	1.4	1.3	1.3	1.7	2.0	2.6	2.9	1.8	2.4	3.6	4.0
Loan losses (percentage of gross lending)	0.1	0.1	0.1	0.1	1.1	1.3	1.6	1.4	1.6	2.0	2.7	2.3
Pre-tax losses (percentage of average total assets)	1.0	1.2	1.3	1.5	0.4	0.3	0.3	0.5	0.2	0.0	-0.2	0.0
Net interest income (percentage of average total assets)	1.3	1.4	1.6	1.7	1.2	1.2	1.4	1.5	1.2	1.2	1.4	1.5
Tier 1 capital (percentage of risk-weighted assets)	10.6	10.4	10.5	10.6	10.3	10.0	9.9	10.1	10.0	9.5	9.1	9.0

[1] Baseline scenario for CPI, annual wage growth, registered unemployment, oil prices, exchange rate and mainland GDP are from Monetary Policy Report 1/2011

[2] Norway's five largest banks and Nordea Bank Norge

[3] Change in stock measured at year-end

[4] Non-performing loans and other loans that banks regard as particularly doubtful. All banks excluding branches of foreign banks in Norway

Sources: Statistics Norway, Technical Calculation Committee for Wage Settlements, Thomson Reuters, Association of Real Estate Agency Firms, ECON Pöyry, Finn.no, Association of Real Estate Agents, Finanstilsynet (Financial Supervisory Authority of Norway) and Norges Bank

Table 4 Stress test Financial Stability 2/2010

Macroeconomic scenario. Percentage change from previous year unless stated otherwise. (Baseline scenario[1] in parentheses)	2010		2011		2012		2013	
Mainland GDP	1¼	(1¾)	-¼	(3)	1¾	(3)	2¼	(2¾)
CPI	2¼	(2¼)	¾	(1¼)	1¼	(2)	1½	(2¼)
Annual wage growth	3¼	(3½)	3½	(3¾)	3¼	(4¼)	3	(4½)
Registered unemployment (rate, level)	3	(3)	3	(2¾)	3½	(2½)	3½	(2½)
Exchange rate (Level. Import-weighted 44 countries)	90¾	(90¼)	91½	(90¾)	91¼	(90½)	91¾	(91½)
Oil price, USD per barrel (level)	64	(79)	50	(85)	50	(88)	52	(88)
3-month money market rate, NIBOR (level)	3	(2½)	2½	(2¾)	2	(3½)	2	(4½)
Bank lending rates (level)	4¾	(4½)	4½	(4½)	3¾	(5)	3¾	(6)
House prices	6	(7¾)	-10	(4¾)	-4	(4)	2½	(3¾)
Credit to households[2]	6¼	(6¾)	3¾	(7)	2½	(6¾)	2¼	(6½)
Credit to non-financial enterprises[2]	2¼	(2½)	-1½	(4½)	0	(6)	½	(6)
Banks'[3] profits and losses								
Problem loans households[4] (percentage share of lending to the sector)	1.3	(1.3)	1.5	(1.2)	1.4	(0.9)	1.3	(0.8)
Problem loans non-financial enterprises[4] (percentage share of lending to the sector)	4.0	(3.4)	4.6	(3)	6.1	(3.0)	6.6	(3.0)
Problem loans total[4] (percentage of gross lending)	2.2	(2.0)	2.5	(1.8)	2.9	(1.6)	2.9	(1.5)
Loan losses (percentage of gross lending)	0.6	(0.2)	1.3	(0.2)	1.6	(0.1)	1.6	(0.1)
Pre-tax losses (percentage of average total assets)	0.6	(0.9)	0.1	(0.9)	-0.1	(1.0)	0.2	(0.9)
Net interest income (percentage of average total assets)	1.2	(1.2)	1.0	(1.2)	1.0	(1.3)	1.3	(1.2)
Tier 1 capital (percentage of risk-weighted assets)	9.0	(9.3)	8.9	(9.4)	8.6	(9.5)	8.6	(9.5)

[1] Benchmark scenarios for CPI, annual wage growth, registered unemployment, oil price, exchange rate and mainland GDP are from Monetary Policy Report 3/2010

[2] Change in stock measured at end-year

[3] Norway's five largest banks and Nordea Bank Norge

[4] Non-performing loans and other loans that banks regard as particularly doubtful. All banks excluding branches of foreign banks in Norway

Sources: Statistics Norway, Technical Reporting Committee on Income Settlements, Thomson Reuters, Association of Real Estate Agency Firms, ECON Pöyry, Finn.no, Association of Real Estate Agents and Norges Bank