STAFF MEMO

Norwegian banks' adjustment to stricter capital and liquidity regulation

NORGES BANK

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Capital and liquidity requirements for Norwegian banks are being gradually tightened. This paper presents the alternatives Norwegian banks have for complying with stricter capital regulation and the forthcoming LCR. Norwegian banks have so far primarily used retained earnings to strengthen their capital and this is also the likely future adjustment choice. The relationship between the level of bank equity and the cost of equity is important for banks' adjustment decisions. It may be reasonable to expect that large Norwegian banks in a steady state will have a cost of equity of about 10 percent and ROE of about 12 percent. We also look into Norwegian banks' current holdings of liquid assets, and strategies that may be used to comply with the LCR. Studies show that the impact on lending margins from complying with the LCR is low and negligible for Norway.

Contents

1. Introduction

The crisis that started in the financial sector in 2007-2008 led to recessions and increased unemployment in many countries. In Europe the euro crisis followed. The crisis triggered an overhaul of the regulation of the financial sector that is not yet completed. At the international level, regulatory reform has been coordinated by the G20 countries, and new standards (the Basel 2.5 rules followed by the Basel 3 rules) have been developed by the Basel Committee on Banking Supervision.

In Europe the crisis led to wide-reaching regulatory reforms of the financial sector. The European Commission (2014) cited over 40 reform initiatives that had been proposed during the five previous years. Some of them are still to be implemented. According to the Commission, the objectives of the reform initiatives have been to improve financial stability, financial integration within the EU, market integrity and confidence, as well as to improve the efficiency of the financial sector. As a member of the European Economic Area (EEA), Norway and Norwegian banks are adapting to the reforms in the EU.

The benefits of a stable financial system, trust in financial institutions and markets and increased financial integration are substantial. It is, however, difficult to make precise estimates of the benefits and costs of financial regulation.[1] This is particularly true for the transition period when a regulation is changed, but also for the new "normal" or "steady state" following the transition period. Authorities expect the net benefits to society to be positive even when one takes into account the increased costs. The benefit of improved banking regulation is often measured in terms of reduced loss of GDP due to fewer banking crises. The annual benefit is computed by multiplying the reduction in the annual probability of banking crises by the cost of crises. Several studies have estimated these costs to be considerable.[2] The Basel Committee (2010) estimated that a reduction of 1 percentage point of the annual crisis probability corresponded to an annual benefit of 0.19 percent of GDP if crises do not have a permanent effect on output. If the crisis is long lasting or the permanent effect is small the corresponding annual benefit is 0.63 percent. The benefit is 1.58 percent if the crisis has substantial permanent effects on output.

The regulatory reforms have been criticised by the industry on the grounds that they are costly for financial institutions and, consequently, that they will lead to reduced GDP growth. When estimating the costs of regulation it is common to perform a three-step analysis:

1. Determine how the regulation will influence banks' net income or profitability. Regulatory changes may influence a bank through reduced income or increased expenses.
2. Determine how much of the reduced net income, often expressed as "increased costs" or "opportunity cost", is passed on to bank's customers. For borrowers, the pass-on results in an increase in banks' lending rates.
3. Determine how increased lending rates will influence the real economy in terms of GDP growth.

Step 1 starts with the net income of a bank, which may be written as[3]

$$Er_E = [Lr_L + O - Dr_D - C - A](1 - s),\qquad(1)$$

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[1] There are several reasons for this. First, since there have been so many regulatory changes in the financial sector it is difficult to evaluate the effect of each change individually. It is also difficult to analyse the interaction between the regulatory changes. Second, the banking sector may not be explicitly included in the macroeconomic models used to predict GDP growth, which in many studies is the ultimate measure of benefits and costs. Third, securities markets changed their view of banks during and after the crisis, requiring lower risks in banks. This makes it difficult to disentangle how much of banks' adjustment is voluntary (induced by stricter requirements from investors) and how much is induced by regulatory tightening.
[2] Often cited studies on the cost of banking crises are Hoggarth et al. (2002), Boyd et al. (2005), Laeven and Valencia (2008), Reinhart and Rogoff (2008) and Chechetti et al. (2009).
[3] The notation is based on Elliot et al. (2012).

where

E	Equity
r_E	Return on equity, ROE
L	Loans made by the bank
r_L	Interest rate charged to customers
O	Other net income and expenses
D	Debt
r_D	Interest rate on debt
C	Credit losses
A	Administrative expenses
s	Effective tax rate

In a steady state, or over the long run, it is necessary that the interest income on loans covers costs and meets the required return on equity. In order to derive a steady-state loan pricing formula, equation (1) may be restated as

$$Lr_L(1 - s) \geq Er_E + [-O + Dr_D + C + A](1 - s).\qquad(2)$$

This pricing formula, often referred to as "cost-plus pricing" or "mark-up pricing", gives the lowest bound for the price of loans (or interest income Lr_L) that covers all costs including the required return to owners.

Capital and liquidity regulation influences banks' net income in different ways. Banks must satisfy a set of minimum capital ratios. One of them is the common equity Tier 1 (CET1) ratio. The CET1 ratio (measured in percent) is related to risk-weighted assets (RWA), and measures common equity capital relative to RWA,

$$CET1\ ratio = \frac{Common\ equity\ capital}{RWA}.\qquad(3)$$

RWA is the sum of the banks' assets multiplied by the corresponding risk weights. Loans are the most significant risk-weighted assets in Norway, while there also are additions for market risk and operational risk. Common equity capital is largely equity as defined by International Financial Reporting Standards (IFRS), but with some deductions and adjustments.

More equity in a bank means that, in relative terms, the bank holds less debt. In this case, the pricing formula appears easy to apply. Replacing debt with equity leads to higher lending margins since the required expected return on equity is higher than the interest rate on debt ($r_E > r_D(1 - s)$). The fact that the other items in the equation may change at the same time as equity increases complicates the analysis. More equity may reduce both the required equity return (r_E) and the interest rate on debt (r_D). Banks may also reduce costs (A), making the necessary pass-on to banks' customers smaller than the initial cost differential between equity and debt should imply. The exact relationship between equity levels and the corresponding cost of capital is an unresolved question in financial economics. Competing explanations and theories provide different answers.[4] One issue that may confuse the discussion is the difference between an investor's required rate of return determining the cost of equity and (total) capital and banks'

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[4] The starting point for discussing optimal capital structure is usually Modigliani and Miller (1958). Under simplifying assumptions they find that the mix between debt and equity does not influence the cost of total capital. This conclusion may change when additional elements are included in the analysis. Tax deductibility of interest expenses favours debt and bankruptcy costs favours equity. According to the Trade-off Theory, the optimal equity ratio balances the expected cost of financial distress with the benefit of tax reduction due to debt financing. Another often cited theory is the Pecking Order Theory, see Myers (1984). According to this theory firms prefer to finance their activity from internal sources, such as retained earnings. When external finance is required, firms prefer debt to equity.

reported returns (book return or return on equity ROE). We devote Section 2 of this paper to a discussion of the relationship between equity and the cost of capital. We argue that in normal times it may be reasonable to expect that large Norwegian banks have a cost of equity of about 10 percent and book return ROE of about 12 percent. This is within the range for European banks used in other studies.[5] Looking at capital regulation alone, Elliot et al. (2012) estimate an increase in the lending margin of 0.09 percentage point (Step 2) for European banks. The Basel Committee (2010) estimated an increase in banks' lending margin of 0.13 percentage point.

Banks may improve their CET1 ratios without increasing equity. One alternative is to lend more to customers with lower risk weights, typically mortgage lending. If the low-risk loans have lower interest rates (r_L), interest income will be reduced. In Section 3 we present the adjustment alternatives and show how the largest Nordic banks have increased their CET1 ratios the recent years. The preferred method has been to retain earnings.

The quantitative funding ratios, the Net Stable Funding Ratio (NSFR) and the Liquidity Coverage Ratio (LCR)[6], will also influence banks' profitability. The LCR aims to strengthen bank's short term resilience to liquidity stress by requiring a buffer of high-quality liquid assets (HQLA). These assets are unencumbered and can easily be converted into cash. The LCR has two components,

$$LCR = \frac{Stock\ of\ HQLA}{Total\ net\ cash\ outflows} \ . \tag{4}$$

The numerator is the value of HQLA after haircuts. In this context, a haircut is the reduction in the face value of assets used when computing the LCR. The haircuts intend to reflect falling market prices during a stressed funding situation. The stock of HQLA is divided into several levels according to the degree of liquidity. The denominator is a measure of total net cash outflows as a result of expected outflows and inflows during a 30 days liquidity stress scenario. The minimum LCR requirement is 100 percent. The purpose of the NSFR is to reduce funding risk by fitting the banks stable funding to their long term assets and off-balance sheet structure. Compliance with this ratio increases banks robustness to difficulties in the funding markets.

The likely effect of holding more liquid assets with lower risk is that banks' income will be reduced (Lr_L or O in (1)). Banks' ability to comply with the LCR will depend on the availability of HQLA. For Norwegian banks it is important whether the LCR must be met for all significant currencies or just on an aggregated basis. There is not enough HQLA in NOK, and Norges Bank has recommended that an appropriate LCR for NOK is on the order of 60 percent.[7] In Section 4 we list the assets qualifying as HQLA and look further into Norwegian banks' holdings.

Banks have several alternatives for complying with the LCR. In Section 5 we discuss the actions Norwegian banks may take to comply with the LCR. In 2013, the European Banking Authority (EBA) completed an impact assessment of the LCR where several adjustment strategies were considered. EBA (2013) estimated a long run effect of the LCR for EU banks that corresponded to an increase in the lending margin of 0.07 percentage point.[8] The estimated long term cost impact was a reduction of 0.03 percentage point in yearly GDP growth for the EU.

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[5] Elliot et al. (2012) assume 12 percent ROE for European banks, 7 percent for Japanese banks and 12 percent for US banks. IIF (2010a) used 10 percent ROE for European banks, 5 percent for Japanese banks and 12.5 percent for US banks. The Basel Committee (2010) assumed 14.8 percent ROE for banks.
[6] In this paper we mainly discuss the LCR, since the exact definition of the NSFR within the EU is not yet determined.
[7] See *Financial Stability Report* 2014, Norges Bank.
[8] Elliot et al. (2012) estimated an increase in lending margin for European banks of 0.08 percentage point due to the LCR and 0.1 percentage point due to the NSFR.

It is most meaningful to estimate the reduction in GDP growth (Step 3) when several regulatory changes are considered. The Basel Committee (2010) estimates a reduction in European GDP growth of 0.08 percentage point. The increase in interest margin was 0.66 percentage point. Some studies have estimated the joint effect of several regulatory changes, and the general impression is that the cost in terms of reduced GDP growth is not very high.[9]

2. The level of bank capital and the cost of capital

Cost of capital and two measures of return – investment and book return

The cost of capital for a bank is the price, in terms of expected return, that equity and debt investors jointly require to finance the bank's assets and activities. The actual performance of banks may be measured as market return or book return. While market return[10] measures the realised profitability for an investor buying a stock or bond at the beginning of the period and selling it at the end of the period, book return measures earnings over the period relative to the book value at the start of the period. Book return is influenced by accounting standards and may deviate from market return.

Both investment and book return are measures of banks' performance and receive attention from analysts, the financial press and authorities concerned with the profitability and soundness of banks. Equity analysts make predictions for banks' earnings per share (EPS) for the near future. EPS is closely related to book return on equity (ROE). Banks' management teams aim at reaching the "consensus EPS estimate". Before the financial crisis many banks reported ROE of around 20 percent (Chart 1 and 2) and it has been argued that such a high ROE is not sustainable after the crisis. Many Norwegian banks' have reported high book returns after the financial crisis, though not as high as the pre-crisis level.

Chart 1. Norwegian banks'[1)] ROE. Percent. Annual data. 1988 – 2013

Chart 2. Nordic bank groups' ROE. Percent. Annual data. 1999 – 2013
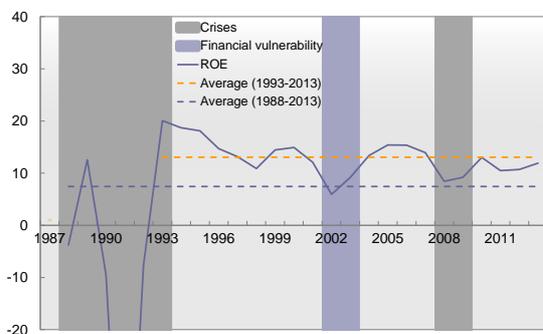
1) All banks and mortgage companies excluding branches of foreign banks.
Source: Norges Bank, Finanstilsynet
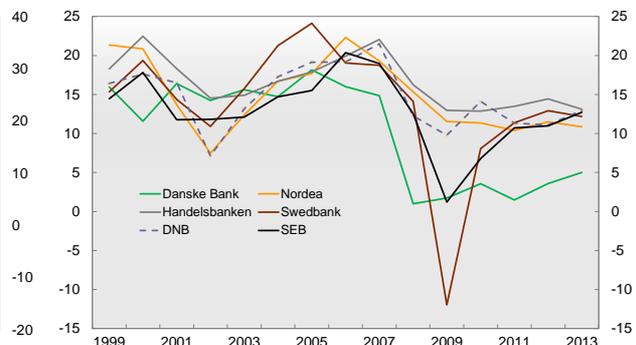
Source: SNL, annual reports

Investment returns, or stock returns, are more frequently negative than book returns. Stock returns may exceed 100 percent in a single year (Chart 3 and 4). The high volatility of stock return makes it more difficult to use historical averages as a basis for predicting future yearly stock returns (Chart 5).

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[9] IIF (2010a) stands out as the study with the highest reduction in yearly GDP growth for Europe, 0.4 percentage point.
[10] We use the term market return and investment return interchangeably.

Chart 3. Stock return Norwegian banks. Percent. Annual data. 1996 – 2013
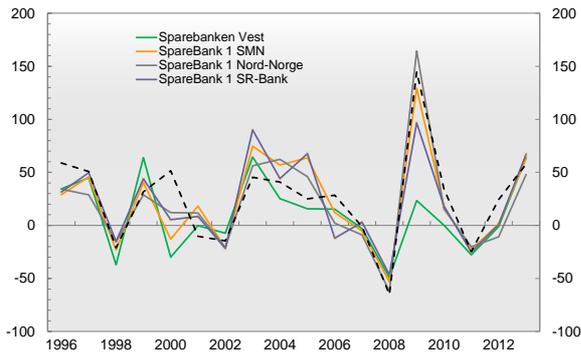
Source: Bloomberg

Chart 4. Stock return large Nordic banking groups. Percent. Annual data. 1999 – 2013

Source: Bloomberg

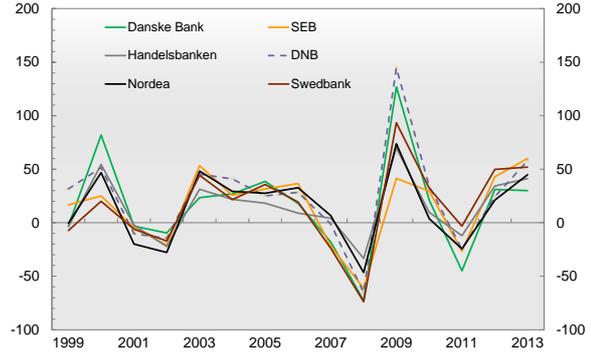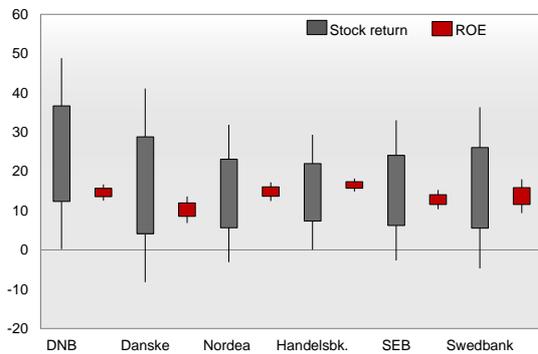Chart 5. Confidence intervals for average stock return and ROE. Percent. 95 and 67 percent intervals. Annual 1999-2013.

Source: Norges Bank

The cost-of-capital controversy

One of the regulatory responses to the financial crisis was to require banks to hold more equity as a buffer against future losses. The banking industry has argued that this will increase its cost of capital. Banks in countries with high capital requirements have also argued that differences in minimum regulatory capital put them at a competitive disadvantage compared to banks in countries with lower capital requirements.

Following the increases in regulatory capital a discussion broke out about whether higher equity levels lead to increased cost of capital. Discussants often refer to whether the Modigliani and Miller (MM) theorem holds.[11] The MM theorem is well-known in corporate finance and is often used as a reference point when discussing the consequences of changing firms' financing mix between debt and equity.

The main arguments in the discussion may be summarised by looking at the equation relating the cost of capital to the cost of equity, the cost of debt and the equity ratio (w),

$$cost\ of\ capital = cost\ of\ equity\ \cdot w + cost\ of\ debt\ \cdot (1 - w). \qquad (5)$$

In this equation, the cost of equity is typically higher than the cost of debt. What is often referred to as the MM argument, is that the left hand side of this equation does not change if the equity ratio w changes. If the equity ratio is increased, the volatility of equity is reduced and so is the cost of equity. The cost of debt will either remain unchanged or decrease because more capital is available to protect debtholders against losses. Even though the individual elements of the right hand side of the equation will change, the

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[11] Modigliani and Miller (1958).

sum of the elements will not. Banks argue that the left hand side of the equation does change when the equity ratio is increased. In other words, the cost of capital is not fixed. Increasing the equity ratio will raise the cost of capital because "cheap" debt is replaced by "expensive" equity. Banks argue that even though the cost of equity and debt is reduced somewhat when the equity ratio increases, this reduction will not be large enough to avoid an increase in the cost of capital.

A partial Modigliani-Miller effect?

Even though the cost of equity does not fall enough to offset the higher portion of equity, it may have some curbing effect on the increased cost of capital. Chart 6 shows a stylised example of the cost of capital when the equity ratio at the outset is 5 percent and the cost of capital is 5.25 percent. With an unchanged cost of equity and debt, an increase in the equity ratio to 10 percent increases the cost of capital by 0.25 percentage point to 5.5 percent. In order to compensate for the increased share of equity the cost of equity needs to fall from 10 to 7.5 percent (Chart 7). If the cost of equity falls by half of this to 8.75 percent (a "MM effect" of 50 percent), the increase in total funding costs would be 0.13 percentage point to 5.38 percent (Chart 6). The increase in the cost of capital will be lower if the cost of debt is reduced when equity increases. It is plausible that the cost of debt may fall due to the reduced credit risk for better capitalised banks.

Chart 6. Equity levels and cost of capital. Percent. Borrowing rate is 5 and cost of equity is 10
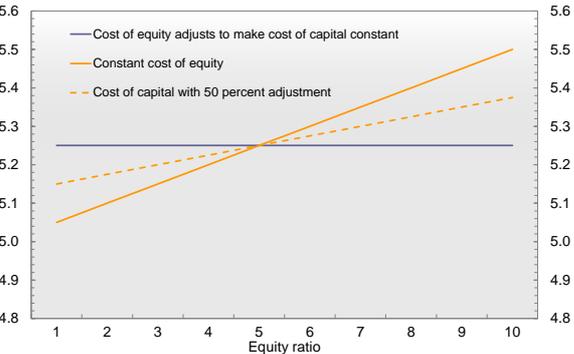
Chart 7. Equity levels, cost of equity and beta. Cost of equity and equity ratio in percent. Borrowing rate is 5 and cost of equity is 10
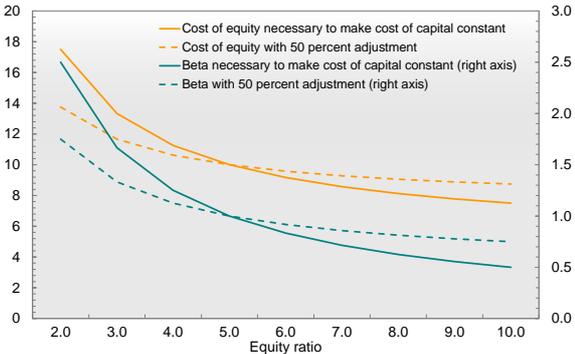
Source: Norges Bank

Source: Norges Bank

Several studies[12] have tried to estimate the change in the cost of equity due to stricter capital regulation by applying the capital asset pricing model (CAPM). According to the CAPM the cost of equity is determined by the equation

$$cost\ of\ equity = risk\ free\ interest\ rate\ + risk\ premium \cdot \beta \ , \qquad (6)$$

where the risk premium is the expected return on a broad market portfolio of stocks in excess of the risk free interest rate. Beta measures how the return on the bank's stock varies with the return on the broad market portfolio.

The studies cited estimate how much banks' betas will be reduced due to increased regulatory capital, and compares this reduction with the reduction necessary to leave the cost of capital unchanged (Figure 8 illustrates the necessary beta reduction). They find that the estimated reduction is about 40-70 percent of the necessary reduction (a "MM effect" of 40-70 percent).

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[12] Kashyap et al. (2010), Miles et al. (2011) and ECB (2011).

What long-run level of ROE will investors accept?

The stylised example in Chart 8 shows that ROE will fall considerably if equity levels increase, provided that there is no change in revenue generated by the bank or in the average interest paid on debt financing. It is therefore not sustainable for the bank to maintain the old ROE. Increasing the ROE may be achieved by increasing the total revenue generated by the bank's activities. This may be done by increasing income and by reducing costs.

Chart 8. ROE, equity levels and lending margins. Percent. Borrowing rate is 5

Increasing the interest margin by 20 or 80 bp increases ROE from 13 to, respectively, 15 and 21

ROE with interest margin 1.6
ROE with interest margin 1.0
ROE with interest margin 0.8

Doubling the equity ratio from 5 to 10 reduces ROE from 21 to 13

Equity ratio

Source: Norges Bank
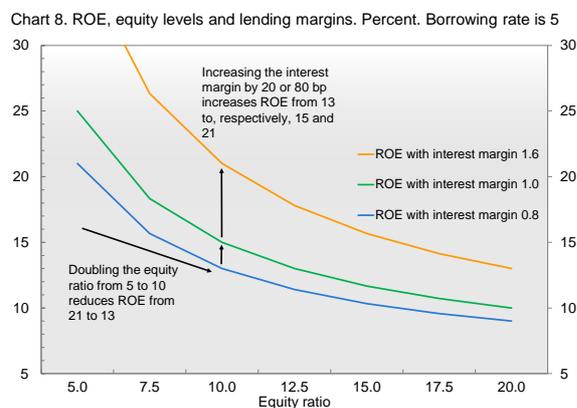
Is the lower ROE sufficient for investors? In other words, does the new level of ROE support the cash flow payments (dividends) necessary to provide shareholders with the long run required cost of equity? If not, banks are not sustainable unless they take actions to improve earnings.

No or a partial MM effect means that investors will require a higher ROE than what will follow mechanically from a mere deleveraging of banks. Banks will then need to improve earnings in order to be viable in the long run. Banks' actions should, however, not increase the return risk for investors. Such an increase in risk will lead to an increase in investors' expected stock return.

An observable measure that relates accounting numbers to the cost of equity is the price/earnings (PE) ratio. The PE ratio is equal to the stock price divided by EPS. In a steady state the PE ratio is equal to the inverse of the cost of equity, [13]

$$\begin{pmatrix} Steady\ state \\ price/earnings \\ ratio \end{pmatrix} = \frac{1}{Cost\ of\ equity}. \qquad (7)$$

PE ratios of 5, 10 or 15 correspond to a cost of equity of 20, 10 and 6.7 percent, respectively. The average PE ratio for the six large Nordic banking groups after 1999 has been 12.2 (see Chart 9), which translates to a cost of equity of 8.2 percent. The average for DNB was 8.7 (11.5 percent).

One observable measure that theoretically relates ROE to the cost of equity is the price/book (PB) ratio. The PB ratio is equal to the stock price divided by the book value of equity per share. In a steady state the PB ratio is equal to ROE divided by the cost of equity,

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[13] The price/earnings and price/book ratios are frequently used when evaluating and pricing stocks. A description of these multiples may, e.g., be found in Chapter 5 in Brealey et al. (2008). Note that the PE ratio in (7) implies that the return on any retained earnings is equal to the cost of equity.

$$\begin{pmatrix} Steady\ state \\ price/book \\ ratio \end{pmatrix} = \frac{ROE}{Cost\ of\ equity}.$$ (8)

With an assumption about ROE and the PB ratio, the cost of equity may be deduced. The deduced cost of equity may then be compared to historical average stock return or to the cost of equity implied by asset pricing models to see if it is "reasonable".
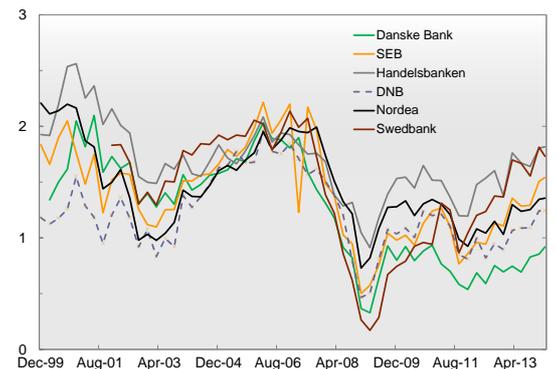
Since the end of 1999, DNB has had the lowest average PB-ratio, 1.2, and Handelsbanken has had the highest, 1.7 (see Chart 10). The average PB-ratio for all large Nordic banks has been 1.4.

Chart 9. PE ratio. Quarterly data. 1999 – 2013
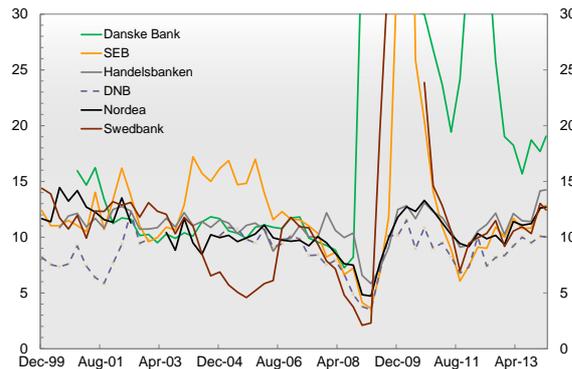
Source: Bloomberg

Chart 10. PB ratio. Quarterly data. 1999 – 2013

Source: Norges Bank

As we have seen, short-term book and investment returns vary over time and are therefore difficult to estimate. Short-term returns are influenced by temporary imbalances and non-recurring events. The profitability that return is expected to revert to over time may be viewed as the steady-state return, which coincides with the average return over a long time period. Averaging returns over long time periods ensures that periods with extraordinary high profits are offset against periods of very low or negative profits. The average ROE for Norwegian banks after the banking crisis in the beginning of the 1990s was 13.1 percent (Table 1). If the banking crisis is included, the average ROE drops by almost 5 percentage points to 7.4 percent. For the past 13 years, the average ROE has been somewhat lower, at 11.5 percent. Table 1 show that the long-run equity premium on Oslo Børs is 5.7 percent. For the years 1999-2013 the average realised equity premium was 8.8 percent, which was considerably lower than the equity premium for banks.

The steady-state return level may, however, change. It is claimed that the stricter banking regulation being introduced put pressure on banks' profitability and this regulatory tightening could cause a reduction in the steady-state return. As discussed in Section 1, any estimate of the effect of regulation on banks' earnings and profitability is surrounded by great uncertainty and may only be viewed as indicative. Another caveat when computing expected return levels based on historical data is that the bank structure, bank behaviour and banks' book ratios change over time. For instance, during the period 1994-2013 Norwegian banks' equity ratio ranged from 5 to 8 percent with an average of 7 percent. With these caveats in mind, we use the PB ratio to derive the steady-state cost of equity and ROE for large Norwegian banks. This may done by applying two approaches: i) start by finding the ROE and use an average PB ratio to derive the cost of equity, and ii) start by finding the cost of equity and use the PB ratio to derive the ROE. The chosen representative PB ratio is 1.2, which is similar to the average ratio for DNB over the years 1999-2013 (see Chart 10). The range for the cost of equity resulting from making assumptions that either favour a high or low ROE for the two approaches described above is 8.6-10.9 percent. (see Appendix 1) The range for ROE is 10.3-13.1 percent. The point estimates emerging from averaging over the various results are a cost of equity of about 10 percent and a ROE of about 12 percent.

Table 1 Average[1] historical stock and book return. Percent

Book return (ROE)	
Norwegian banks[2]	
• Long period (1988-2013)	7.4
• Long period excluding banking crisis (1993-2013)	13.1
• Recent period (2001-2013)	11.5
DNB ASA, recent period (2001-2013)	14.5
SPBK1 SR-Bank, recent period (2001-2013)	14.7
SPBK1 Midt-Norge, recent period (2001-2013)	14.4
SPBK1 Nord Norge, recent period (2001-2013)	12.2
Stock return (equity premium)	
Oslo Børs	
Very long period (1900-2005)	5.7
Recent period (1999-2013)	8.8
Norwegian bank index, recent period (1999-2013)	18.8
DNB, recent period (1999-2013)	19.6
[1] Arithmetic average of annual return.	
[2] All banks added together.	
Source: Norges Bank, Bloomberg, SNL Financial, Dimson et al. (2006)	

# Greater effect of bail-in rules than regulatory capital?

One of the aims of the regulatory response to the financial crisis has been to reduce the problem of too-big-to-fail (TBTF) banks and implicit government guarantees. Implicit government guarantees lead to artificial low debt costs for banks, since debt investors expects to be repaid in full even if the bank faces problems. Under the new bail-in rules debt investors will need to sustain a loss when the bank needs to be recapitalised. The cost of debt is therefore expected to rise, but perhaps not before bond investors see that debt actually will be bailed in. Since debt is the most important funding source for banks, an increase in the cost of debt will potentially influence banks' cost of capital more than what will ensue from the increase in equity and regulatory capital.

3. Banks' adjustment to stricter capital requirements

Adjustments already made

The minimum capital requirement for Norwegian banks was 9 percent in 2012. For systemically important banks (SIB) this will be raised to 13 percent in the middle of 2016, including a countercyclical capital buffer of 1 percentage point (see Chart 11). During this four-year transition period the SIBs must increase their CET1 ratio by on average 1 percentage point each year to keep up with increased requirements. At the end of 2013 all banks had a CET1 ratio of more than 11 percent, while the required level increased to 10 percent six months later (see Chart 12).

Chart 11. Common Equity Tier 1 requirements in the new regulatory framework. Percent. 1 July 2013 – 1 July 2016
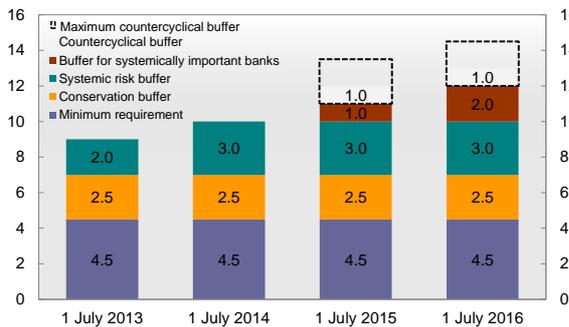
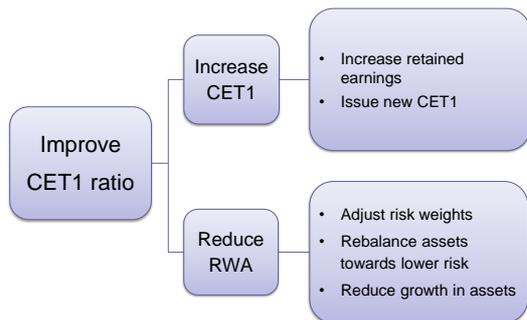Sources: Ministry of Finance and Norges Bank

Chart 12. Common Equity Tier 1 for the six largest banks in Norway. Percent. December 2011 – December 2013
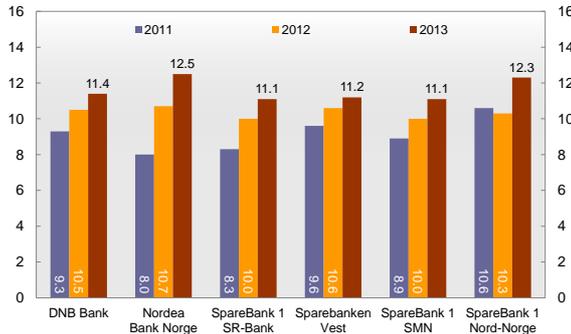
Source: Banks' financial reports

Banks can increase their CET1 by increasing the numerator or decreasing the denominator of the ratio. Norwegian banks have mainly raised their CET1 by increasing the numerator (see Chart 14). From 2009 to 2013, CET1 improved by 5.4 percentage points, of which increased capital contributed by about 5 percentage points.[14] Also the largest Nordic banks have primarily increased CET1 by increasing capital (see Chart 15).

Chart 13. Overview of adjustment options – CET1

Source: Norges Bank

Chart 14. Contribution to changes in CET1 for the six largest banks in Norway. Percent. December 2009 – December 2013
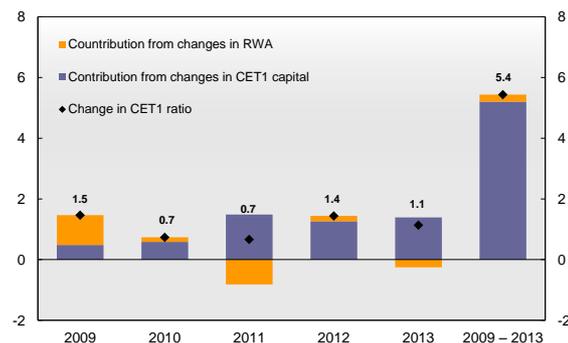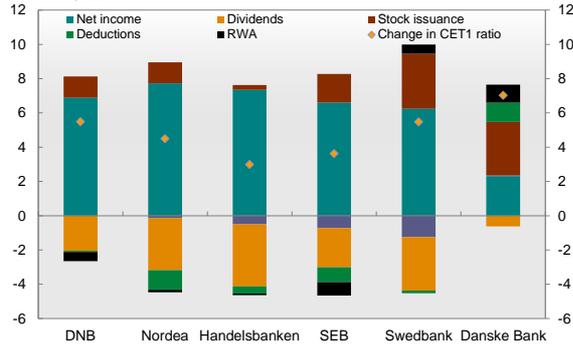

Sources: Banking groups' annual reports and Norges Bank

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[14] Further analysis is provided in Winje and Turtveit (2014).

Chart 15. Decomposition of change in CET1 for large Nordic banks.[1]
Percentage points. December 2007 – December 2013

1) Based on consolidated group statements.
Source: Banks' financial statements

# Trade-offs when improving the CET1 ratio

Solid profitability and a relatively long implementation period for stricter capital regulation have enabled banks to build capital by retaining earnings. The potential for increasing capital through retained earnings is determined by ROE. Banks must balance the use of ROE between paying dividend, increasing lending and increasing CET1. Without dividend payments and if lending growth is equal to ROE, CET1 will not change (see Chart 16 for a stylised example). In this case, lower lending growth than ROE will increase the equity ratio.

Chart 16. Year end equity ratio for combinations of lending growth, ROE and payout ratio.[1] Percent
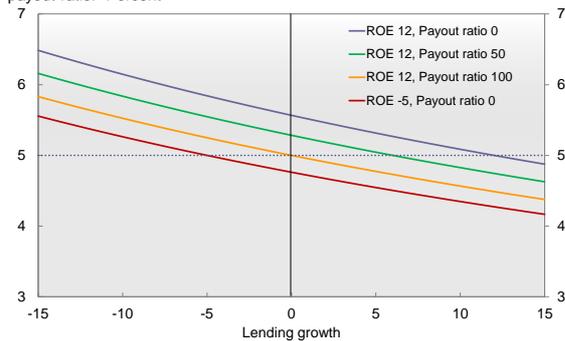
1) The equity ratio at the beginning of the period is 5 percent.
Source: Norges Bank

Chart 17. Combinations of lending growth to corporate and household sectors leaving RWA unchanged.[1] Percent
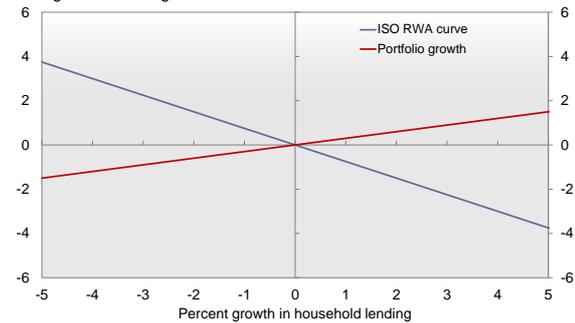
1) Risk weight for household and corporate loans are, respectivele 0.4 and 0.8. At the beginning of the period household and corporate loans are, respectively 0,6 and 0.4.
Source: Norges Bank

It is also clear from Chart 16 that negative growth, i.e., a shrinking of a bank's balance sheet, increases the equity ratio. It is also possible to reduce RWA without shrinking the balance sheet by increasing the portfolio of loans with low risk weights and reducing the portfolio of high risk weights (see Chart 17).

Issuing new equity is an alternative financing source to retained earnings. Since 2007, the largest banks in Scandinavia have issued NOK 100 billion in new ordinary equity (see Table 2). Banks in Norway and Sweden issued the most equity in 2009, while Danish banks issued the most in 2011. 2009 was also the year US banks issued the most equity (see Chart 18). European banks issued the most in 2008, but have also issued relatively high volumes during subsequent years.

Table 2. Public equity offerings in Scandinavia.[1] Billion NOK. 2008-2013

Bank	Amount	Year
DNB	14.0	2009
Danske Bank	28.1	2011/12
Nordea	22.8	2009
Swedbank	12.4	2009/11
SEB	12.3	2009
Other banks	10.4	
-of which Norwegian	5.8	
-of which Danish	4.6	
Total	100.0	

1) Offered and completed public equity issues. The numbers include ordinary equity. Private placements and hybrid capital are not included. The sample consists of banks covered by SNL Financial.
Source: SNL Financial

Chart 18. Public equity offerings in European and US banks.[1] Index (euro), value is 100 in 2009.[1] 2006 - 2013
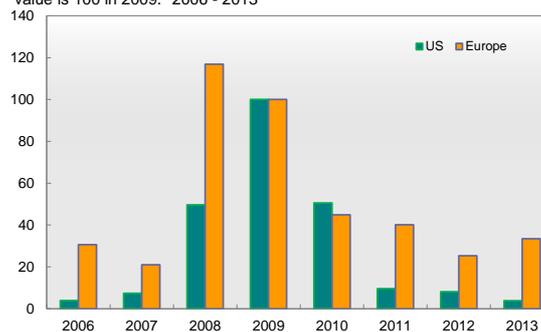
1) Offered and completed public equity issues. The numbers include ordinary equity. Private placements and hybrid capital are not included. The sample consists of banks covered by SNL Financial.
Source: SNL Financial

Banks' issuances of new equity are influenced by increased regulatory requirements and the need to "pass" authorities' stress tests. US stress tests in 2009 showed that 10 out of 19 bank holding companies needed to increase their equity. The EU conducted stress tests in 2009/2010, 2011 and 2014.

Issuing new equity leads to an immediate strengthening of the capital ratios and is therefore well-suited to quickly responding to authorities' or the market's requirements for higher capital. It takes longer to increase capital through retained earnings. Retaining earnings has, however, been more important for building capital than issuing equity. DNB improved its CET1 ratio by 5.5 percentage points between 2007 and 2013. The equity issue contributed only 1.2 percentage points, while retained earnings contributed 4.9 percentage points.

There are several reasons why issuing new equity is not banks' preferred alternative for increasing equity. Issuance may be expensive in terms of direct costs. Banks may also fear that the stock market will take the issue as a negative signal about the quality of the bank's assets and future earnings potential. Bank balances are opaque and stock markets have less information about a bank than its management and large shareholders. This may particularly be true in times of stress. If authorities require that most banks strengthen their capital over a short period of time, as in the US in 2009, banks may be more willing to issue equity.

Another argument often used to explain why banks are unwilling to raise new equity in times of stress is the presence of a "debt overhang". The core of this argument is that the new equity will not be fully reflected in higher market value of the equity. Debt providers will also benefit in terms of increased market value of debt, reducing the incentive for current shareholders to approve equity issuance. Appendix 2 explains the argument in more detail.

4. Liquid assets currently held by Norwegian banks

High-quality liquid assets (HQLA) are grouped into different asset categories, or "levels". These are Level 1, Level 2A and Level 2B. According to the EU definition, they approximately consist of:

Table 3. HQLA according to the European Commission's regulation[15] for the LCR

Level	Liquid asset	Specifications	LCR haircut
Level 1	Banknotes, coins and central bank deposits		0%
	Government securities		0%
	International organisations/PSEs/Local authorities	Assigned a risk weight of 0% under the CRR	0%
	Covered bonds	Issue size of min. EUR 500m. Subject to asset coverage and rating requirements	7%
Level 2A	PSEs/Local authorities	Assigned a risk weight of 20% under the CRR	15%
	Covered bonds	Issue size of min. EUR 250m. Subject to asset coverage and rating requirements	15%
	Corporate debt securities	Issue size of at least EUR 250m. Subject to rating requirement	15%
Level 2B	Asset-backed securities (ABS)	Underlying assets: mortgages, auto loans, SME loans, consumer loans. Tranches of min. EUR 250m	25–35%
	Corporate debt securities	Issue size of min. EUR 250m. Subject to rating requirement	50%
	Equities		50%
	Covered bonds	Issue size of min. EUR 250m. Subject to asset coverage requirement	30%
	Restricted-use committed liquidity facilities (RCLF)	Backed by assets specified by the central bank	

The Norwegian banking sector is characterised by the presence of one leading banking group, DNB Bank Group (DNB). At the end of 2014 Q2, DNB held the majority of total HQLA reported by all Norwegian banks[16]. The Norwegian subsidiary of Nordea AB, Nordea Bank Norge Group, also held a substantial share of HQLA.[17]

Level 1 HQLA held by Norwegian banks vary considerably over time (see Chart 19).[18] DNB's assets strongly influence developments in aggregated HQLA over time. DNB's adjustment to the LCR is very different from the rest of the Norwegian banking sector, due to its access to deposit facilities with the US Federal Reserve (Fed) and the ECB and its ability to obtain funding on favourable terms in the US money market. Large shares of this funding are deposited with the Fed with a positive, though small, interest margin. The reason for this activity may be twofold: to take advantage of arbitrage opportunities and to improve the LCR. Arbitrage is possible in part because of regulatory advantages for branches of foreign banks in the US and in part because Norwegian and Swedish banks have access to funding at favourable

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[15] See European Commission Delegated Regulation of 10 October 2014 to supplement Regulation (EU) 575/2013 with regard to liquidity coverage requirement for Credit Institutions.
[16] Excluding Norwegian branches of foreign banks.
[17] Other large banks in Norway are Sparebanken Vest, SpareBank 1 SR-Bank, SpareBank 1 SMN, Santander Consumer Bank, Sparebanken Sør and SpareBank 1 Nord-Norge. The remaining 116 Norwegian banks are small.
[18] Our dataset for LCR and its components cover the period from Q4 2011 to Q2 2014, in which all Norwegian banks reported LCR to Finanstilsynet based on the Basel 2010 definition. We have calibrated the data to the Basel 2013 definition, assuming the Basel 2013 revision only impacts the calculation of Norwegian banks' net outflows, not their HQLA. Consequently our dataset is not calibrated to the EU-definition.

prices compared with many other foreign banks. To some extent, DNB funds these deposits in central banks by issuing debt (commercial paper (CP) and certificates of deposit (CD)) with maturities over 30 days, increasing its LCR.

The ratio of liquid assets to total assets for all banks combined rose from 10 to 19 percent, and then fell to about 15 percent in 2014 Q2 (see Chart 20). When the two largest banks are excluded, developments in the remaining banks' holdings are stable over time.

Chart 19. Level 1 HQLA in Norwegian banks[1]. In billions of NOK. 2013 Q3 - 2014 Q2.
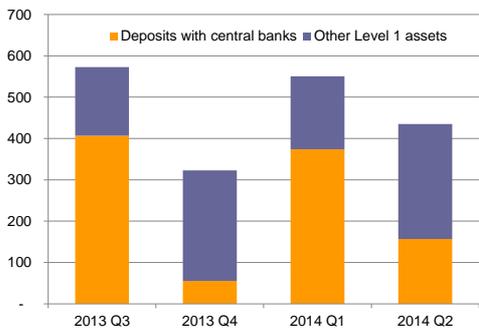
1) All currencies combined based on Basel III definition.
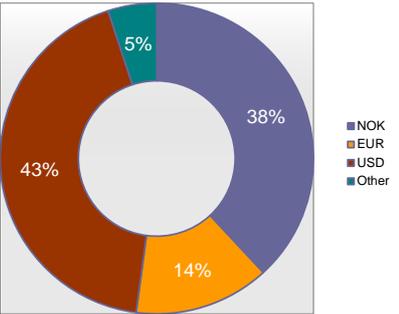Source: Finanstilsynet

Chart 20. HQLA in percent of total assets[1]. 2011 Q4 - 2014 Q2
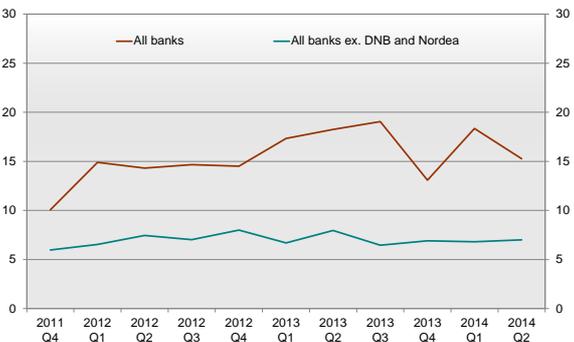
1) After haircut and Level 2 cap based on Basel III definition.
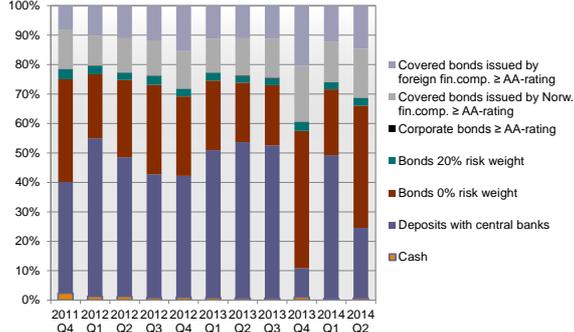Sources: Finanstilsynet and Norges Bank

According to the Basel III 2013 definition and the European Commission Delegated Regulation, the currency denomination of HQLA must be consistent with the distribution by currency of net outflows. A perfect currency match is not required, however.[19] As a large portion of Norwegian banks' activities are in NOK, they also have a high liquidity need in NOK compared to other currencies and require sufficient available liquid assets in the same currency. A small sovereign bond market is a constraint on the availability of HQLA in NOK. The situation may be similar for Swedish and Danish banks and their respective currencies. The supply of liquid assets in major currencies is far better. Therefore, HQLA in NOK for Norwegian banks accounted for only 38 percent of the total at the end of 2014 Q2 (see Chart 21). USD is dominant, with 43 percent of the total.

Chart 21. HQLA by currency in percent of total HQLA excluding haircuts.[1] All Norwegian banks. 2014 Q2.

1) Basel III definition.
Source: Finanstilsynet

Chart 22. HQLA decomposed for all Norwegian banks[1]. Percent. 2011Q4 - 2014 Q2

1) Excluding haircuts and Level 2 cap. Basel III definition.
Sources: Finanstilsynet and Norges Bank

A substantial part of HQLA for Norwegian banks constitutes deposits with central banks (see Chart 22). Covered bonds make up a larger portion of high-quality liquid assets for other banks than for DNB. These assets are subject to haircuts and cap. Consequently, Norwegian banks cannot make use of all these bonds

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[19] Under European Commission Delegated Regulation, national authorities may require institutions to restrict currency mismatch by setting limits on the proportion of net liquidity outflows in a currency that can be met during a stress period by holding liquid assets not denominated in that currency.

as HQLA when reporting their LCR. The composition of HQLA therefore looks somewhat different, especially for the smaller banks, after applying haircuts and the Level 2 cap.

Norwegian banks' bond (and bill) portfolios qualifying as high-quality liquid assets have increased over the past two-and-a-half years (see Chart 23). Covered bonds in particular, by both Norwegian and foreign issuers, have increased in volume.

Chart 23. Bond holdings qualifying as HQLA.[1] In billions of NOK. All banks. 2011 Q4 - 2014 Q2

Bonds 0% risk weight
Bonds 20% risk weight
Corporate bonds ≥ AA-rating
Covered Bonds Norwegian ≥ AA-rating
Covered Bonds foreign ≥ AA-rating
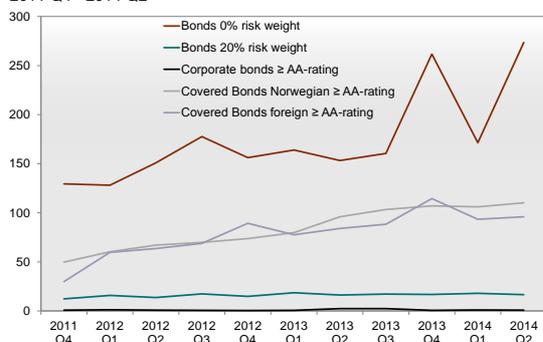
1) Basel III definition.
Source: Finanstilsynet

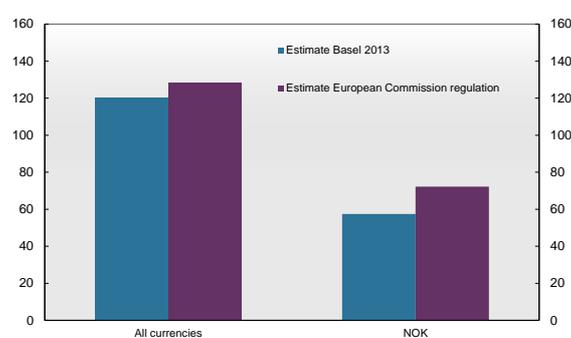Chart 24. LCR.[1] Norwegian banks. Percent. As at 30 June 2014

Estimate Basel 2013
Estimate European Commission regulation

1) Liquidity Coverage Ratio. Simplified estimates.
Sources: Finanstilsynet and Norges Bank

Norwegian banks have been reporting their LCR to Finanstilsynet based on the guidelines given by the Basel Committee. These guidelines differ from the EU definition finalised in October 2014 mainly in terms of how covered bonds are included. The European Commission Delegated Regulation allows banks to hold a much higher percentage of covered bonds in their liquidity buffers and with smaller haircuts than recommended by the Basel Committee. Covered bonds of a lower standard (e.g. small issue size) will not be eligible as HQLA.

In Chart 24, we estimate the impact of the EU definition for Norwegian banks' LCR compared to the Basel Committee's definition. The only deviation from the Basel definition is assumed to be covered bonds and the related haircut and cap. We assume half of banks' covered bonds reported as HQLA to Finanstilsynet will be Level 1 according to the EU definition. The remaining part is assumed to be Level 2 (i.e. Level 2A). When this approximation is performed, the LCR improves for all currencies combined and for NOK separately. The effect is greater for the LCR in NOK, implying greater improvements in smaller banks' LCR.

Norges Bank has recommended[20] that banks should, as a starting point, hold liquid assets in currencies in which they have liquidity needs. Norges Bank considers that there are at present insufficient available high-quality liquid NOK assets for banks to be able to meet a 100 percent LCR for NOK in practice without a negative impact on bond markets and reduced money market liquidity. For currencies with insufficient availability of liquid asset, the EU rules provide for three alternative mechanisms for LCR compliance: a central bank credit facility that can count towards the LCR; permitting banks to hold larger amounts of Level 2A assets subject to the imposition of larger haircuts; and the use of high-quality liquid assets in another currency.

The purpose of the new liquidity requirement is to improve banks' resilience to turbulence in funding markets. Norges Bank is of the opinion that it would not be appropriate to set up a new central bank facility, including the RCLF in Table 3, with the sole purpose of enabling banks to meet the LCR requirement. An appropriate LCR ratio for NOK would be on the order of 60 percent, which is at the same level as the recommendation set out by Sveriges Riksbank for Swedish banks in SEK. Norwegian banks can reach their total LCR requirement by having a lower LCR in NOK, but a higher LCR in USD

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[20] See *Financial Stability Report* 2014, Norges Bank.

or EUR. A higher minimum LCR for NOK than 60 percent could result in higher concentration of other banks' covered bonds in banks' liquidity buffers. This could increase systemic risk.

In addition to the requirement to meet LCR for all currencies combined, Norges Bank has recommended that the LCR requirement should be fully met in other significant currencies. Banks with significant liquidity risk in foreign currencies should therefore comply fully with the LCR for each currency.

# 5. Banks' adjustment to the LCR

Current LCR levels

The LCR for most Norwegian banks at 2014 Q2 is above the requirement of 100 percent (see Chart 25). Out of 124 banks, 82 banks are above 100 percent, while 42 are below.

Chart 25. LCR for all Norwegian banks as of 2014 Q2. Basel 2013 definitions. Random order. Percent
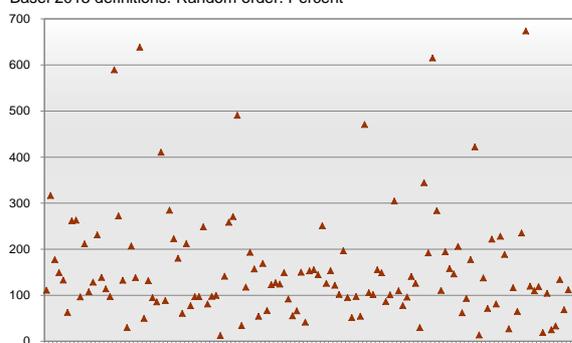
Source: Finanstilsynet and Norges Bank

Chart 26. Overview of adjustment options – LCR
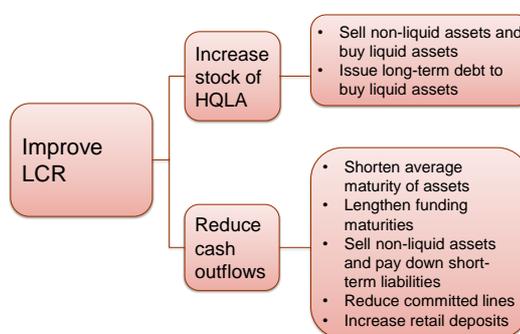
Source: Norges Bank

On average, Norwegian banks meet the LCR requirement of 100 percent for all currencies combined. Still, banks below the requirement of 100 percent have on aggregate a shortfall of liquid assets of approximately NOK 16 billion as at 2014 Q2, estimated on the basis of the EU definition of the LCR, using the same assumptions as for the estimates in Chart 24.

Strategies to improve the LCR

To improve the LCR, banks have several options (see Chart 26). EBA (2013) evaluates several combinations of strategies available for banks. The expected opportunity costs associated with each of the seven adjustment strategies are estimated based on historical volatility adjusted yield differentials (asset side) and historical funding costs differentials (liability side). EBA's extensive empirical analysis suggests that expected opportunity costs based on combinations of the potential adjustment strategies are on the order of 2.4 percent per year per unit of LCR improvement; i.e. it costs the European banking sector about EUR 2.4 billion to reduce the liquidity gap by EUR 100 billion. Two alternative combinations of adjustment strategies are also tested to assess the sensitivity of the results with respect to banks' behavioural adjustments and the ensuing expected opportunity costs. The total opportunity cost per country shows quite a large variation. Estimated costs for Norway are in the region of 2 to 3 percent. Estimated costs for other European countries are in the range of 2 to 5 percent.

EBA has also looked at the impact of adjustment costs on lending margins. It depends on the pass-through of these costs to bank customers and on the repricing capacity of banks. EBA allocates the incremental costs to a subset of bank products only, namely, those that are capital- and liquidity-intensive.

This substantially increases the impact of the LCR, but it is in line with the literature, banks' practice in product pricing and qualitative liquidity regulation. The analysis combines various data sources and empirical studies to derive an estimate of the repriceable base during the transition period. The incremental costs of the LCR are allocated to the volume of repriceable loans to determine the impact on lending margins. The impact on lending margins differs widely across countries. The differences are driven by the variations in liquidity shortfalls across countries.

Over the long run, banks will be able to distribute the adjustment cost over the entire lending portfolio. For all countries together it is estimated that 31 percent of total assets can be repriced over the long run (the same figure is used for Norway). This will vary between countries due to differences in fixed-rate versus floating-rate on lending. Over the four years of the LCR transition period it is assumed for all countries that only 65 percent of the lending portfolio will be repriced, i.e. only 20 percent of total assets will be repriced in the transition period (the same figure is used for Norway). EBA notes that some countries (including Norway) feature substantial percentages of loans that can be repriced before maturity. The data thus underestimate the repriceable base for Norway during the transition period.

Overall, the impact on lending margins is low. For the EU the impact is 7 basis points in the long term, and 3.6 basis points in the short term. For Norway the impact is negligible (0.5 basis point). The effect of the lower LCR requirement during the phase-in period (low increase in lending margins) outweighs the effect of the lower repriceable base. The effects on GDP of the increase in lending margins are limited as a result of the low impact on these spreads. Across the EU the long-term impact on GDP is approximately 3 basis points. This is mainly due to the fact that EU banks already have an average LCR of 115 percent.

The EBA impact study presents the methodology, literature reviews of individual strategies and underlying data sources. We discuss briefly the different adjustment strategies with reference to Norwegian banks.

Replacing assets that do not qualify as HQLA with assets that do qualify

By increasing HQLA, the numerator of the LCR will increase, thus improving the LCR. Norwegian banks and covered bond mortgage companies held at the end of 2014 Q2 approximately NOK 100 billion of securities that are not HQLA-compliant. DNB has stated in public reports that its policy is to reinvest the non-qualifying part of its liquidity portfolio as it matures in HQLA-compliant assets. Banks are not expected to dispose of non-qualifying bonds and bills completely. Covered bonds issued by a subsidiary do not count as HQLA for the parent bank, but may still be held as eligible collateral for borrowing at Norges Bank or for supporting the market liquidity of the bonds. Also, some asset holdings do not count as HQLA as they are used as collateral for settlement exposures (encumbered assets).

Increasing the stock of assets with low haircuts at the expense of assets with higher haircuts

To improve their LCR, Norwegian banking groups could also adjust their HQLA by replacing e.g. Norwegian covered bonds qualifying as Level 2 (15 % haircut), with Norwegian government bonds qualifying as Level 1 (0 % haircut), assuming there is a sufficient supply. Norwegian government bonds normally have a lower yield than covered bonds (see example in Chart 27). Banks' interest income will be reduced if government bonds replace covered bonds. This will be partly offset by reduced haircut, better utilisation of the covered bond cap and lower capital risk weights.
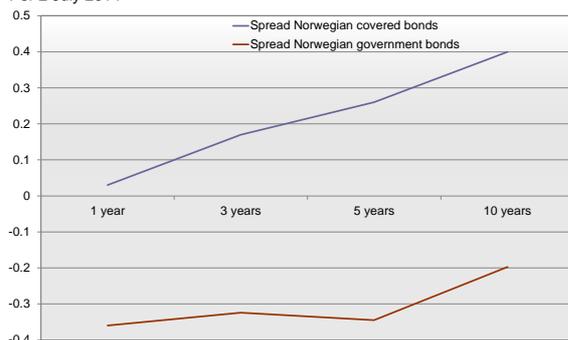
Table 4. Estimated cost if a bank replaces a stock of 10 billion covered bonds with government bonds. In millions of NOK.

Item	Amount
Yield difference	-52
Haircuts: Effect on net interest income due to lower stock necessary	11
Saving of increased CET1 capital due to 0 versus 10 percent risk weights	10
Total effect	-31

The stock of covered bonds reported as HQLA by the Norwegian banking groups is approximately NOK 200 billion at the end of 2014 Q2. For illustration purposes, we have estimated the cost to replace NOK 10 billion of these covered bonds with Norwegian government bonds (see Table 4).

The difference in non-risk adjusted yields between Norwegian government bonds and covered bonds is about 52 basis points on average over the yield curve, assuming the average spread on maturities of one, three, five and ten years. This corresponds to a yearly cost of about NOK 52 million. These costs are offset by the difference in haircuts. Covered bonds (at Level 2) are subject to a 15 percent haircut, while government bonds have no haircut. If we assume the funding costs related to these bonds are equivalent to the cost of a three-year senior bank bond , the bank will gain NOK 11 million on a lower stock of bonds necessary due to lower haircuts. Also, there is a 0 percent (regulatory capital) risk weight on Norwegian government bonds, but a 10 percent risk weights on qualifying covered bonds. Less CET1 capital required results in approximately NOK 10 million in lower funding costs assuming a 12 percent return on equity. All of this totals about NOK 30 million in increased costs for the bank, disregarding adjustment for risk.

According to the EU regulation, covered bonds can make up 70 percent of total HQLA. The estimate above does not take into consideration that holding more government bonds will make the covered bond cap less of a constraint for many banks. Optimising the stock of HQLA to ensure that more covered bonds could be included will be beneficial especially for smaller banks, which have binding constraints. Smaller banks also have the lowest levels of LCR and need strategies to improve their ratio. Therefore, this strategy could be relevant – though less relevant after the European Commission decided to allow covered bonds in Level 1 with a haircut of 7 percent.

**Shortening maturities of assets**

When net outflows are reduced, the LCR would increase. A possible way to reduce net outflows is to increase inflows within 30 days. Because the inflow rate is 100 percent on loans to financials, banks would prefer such loans with maturities within 30 days. In the Norwegian interbank market most loans already mature within 30 days. Loans to financials with longer maturities than 30 days may be made within a banking group. Internal loans will, independent of maturity, be netted in a consolidated LCR. Most loans to customers normally have maturities substantially longer than 30 days, and are partly assumed to be rolled over at maturity. This means that there are probably limited opportunities for Norwegian banks to increase cash inflows in the LCR.

Reducing credit or liquidity lines

Commitments are a large outflow component in the LCR for Norwegian banks, and account for about 10 percent of total outflows. These are lines of credit to both enterprises and households. Recent

developments show that interest rates on lines of credit secured on dwellings have increased compared to interest rates on instalment loans (see Chart 28). Repricing of credit lines can be a strategy for decreasing outflows by lowering the demand for such products or to raise income to cover for the cost of holding sufficient HQLA. A focus on enhancing the LCR may have led banks to increase the price of these credit lines. It is also likely that this development is caused by more attention to and awareness of capital requirements for the unused credit lines, as banks are required to gradually increase their capital base.

Chart 28. Interest rates on loans to households from Norwegian banks and mortgage companies. Percentage points. 2010 Q1- 2014 Q2
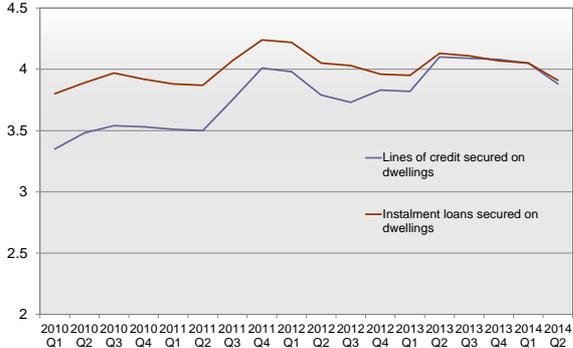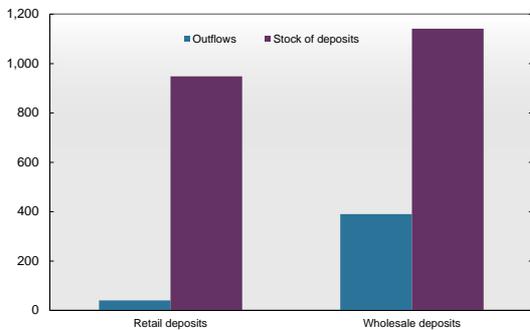

Source: Statistics Norway

Lengthening funding maturities

By reducing the share of funding falling due within 30 days, banks would reduce net outflows. Most Norwegian banks do not rely heavily on funding with short maturities. When DNB is excluded, outflows related to payments on bonds and certificates (both interest and principal payments) represent only 2 percent of total 30-day outflows for all banks. The potential is therefore small for these banks to improve their LCR by increasing maturities. DNB, on the other hand, relies more on short-term funding. A substantial part of this funding is in foreign currency and deposited with foreign central banks. DNB could benefit from increasing the length of its short-term funding to improve its LCR ratio. Such a strategy would not benefit the LCR in NOK.

Increasing retail deposits

Replacing non-retail deposits or short-term funding with retail deposits is an efficient way to lower net outflows and increase the LCR (see Chart 29). It is therefore likely that Norwegian banks will try to increase their share of retail deposits at the expense of wholesale deposits. In this chart, deposits from households are classified as retail while all other deposits are classified as wholesale.

Chart 29. Retail and wholesale deposits with maturites of less than 30 days for all banks.[1] 2014 Q2. In billions of NOK

1) Basel III definition.
Sources: Finanstilsynet and Norges Bank

Chart 30. Deposit margins (3 month NIBOR – interest rate on deposits). Norwegian households. Percentage points. 2001 Q2 – 2014 Q2
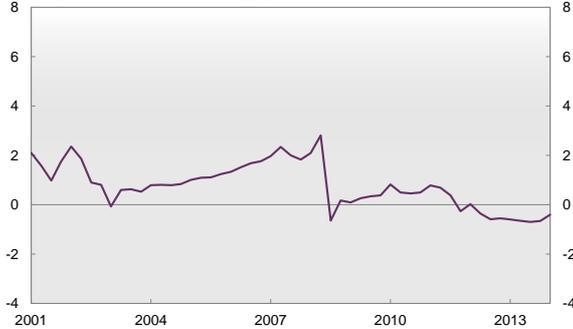
Source: Statistics Norway

There have been signs of intensified competition for retail deposits. Since deposit rates have increased over the past few years (see Chart 30), and deposit margins have been negative over the past two years, money market rates are lower than retail deposit rates. There are several possible explanations for this: high risk premiums on alternative bond funding, competition from foreign banks with higher funding costs and a low interest rate environment. But also the coming LCR requirements could be contributing to these developments as stable deposits generate only very low outflows. Such behaviour would be in contrast to EBA's assumption that the banking sector prefers the status quo on retail deposits to avoid inefficient competition.

Deleveraging

The LCR could also be improved by reducing assets that, due to their short-term funding, generate net outflows, but do not qualify as liquid assets. Norwegian banks hold about NOK 65 billion in non-eligible securities. The majority is "held to maturity" by DNB as a part of its liquidity portfolio. These are not expected to be sold at any time soon, but will mature gradually and be reinvested in HQLA-compliant assets. It is also likely that quite a large portion of other non-eligible securities held by Norwegian banks cannot be sold if they are covered bonds issued by the bank's own mortgage company and used for market support. Internal holdings do not count in the consolidated LCR.

To be able to benefit from the deleveraging strategy, non-eligible assets must have been funded by short-term liabilities. Assuming NOK 30 billion in non-eligible assets being sold or maturing and net outflows reduced correspondingly (items with a 100 percent run-off rate), the LCR for the banking sector as a whole would increase by about 10 percentage points, disregarding the inflow constraint. NOK 30 billion in reduced outflows would most likely lead to a more binding inflow constraint, and there may be less of an improvement in the LCR.

6. Summary

One of the responses to the financial crisis that started in 2007-2008 was to introduce wide-reaching regulatory reforms for financial institutions. Several studies show that tighter regulation may lead to marginally higher lending margins and marginally reduced GDP growth. The benefits of the reforms, however, are generally viewed as being much larger than the costs due to a reduction in the frequency of future crises.

So far Norwegian banks have strengthened their capital by retaining earnings. This is also the likely future adjustment choice, provided that the book return ROE continues to be at sufficiently high levels. The relationship between the level of bank capital and the cost of capital is central to banks' choice of strategies for strengthening their capital. It may be reasonable to expect that large Norwegian banks in a steady state have a cost of equity of about 10 percent and book return ROE of about 12 percent. Such levels are within the range found in other studies.

The coming LCR requirement creates a demand for high-quality liquid assets. It is likely that banks will first change the components that the LCR relies heavily on. Banks may be more inclined to perform changes that quickly and cheaply can be reversed in order to avoid limiting banks' future adjustment options. It is important whether the LCR must be met for all significant currencies or just on an aggregated basis. Norges Bank considers that there are not enough eligible assets in NOK, and has recommended that an appropriate LCR for NOK is in the order of 60 percent. Studies show that the impact on lending margins from complying with the LCR is low and negligible for Norway.

References

Admati, A.R, P. M. De Marzo, M. F. Hellwig and P. Pfleiderer, 2010, "Fallacies, Irrelevant Facts, and Myths in the Discussion of Capital Regulation: Why Bank Equity is Not Expensive", Stanford GSB Research Paper No. 2063

Basel Committee, 2010, "An assessment of the long-term economic impact of stronger capital and liquidity requirements", Basel Committee on Banking Supervision, Basel, Switzerland

Brealey, R.A., S. C. Myers and F. Allen, 2008, Principles of Corporate Finance, International Edition, McGraw-Hill, Singapore

Boyd, J. H., S. Kwak and B. Smith, 2005, "The real output losses associated with modern banking crises", Journal of Money, Credit and Banking, 37, pp. 977-999

Chechetti, S. G., M. Kohler and C. Upper, 2009, "Financial crisis and economic activity", Paper presented at Federal Reserve Bank of Kansas City's symposium at Jackson Hole, Wyoming. Paper can be downloaded from www.bis.org

Dimson, E. P., P. Marsh and M Staundton, 2006, "The worldwide equity premium: a smaller puzzle", London Business School, 7 April

EBA, 2013, "Report on impact assessment for liquidity measures under Article 509(1) of the CRR", European Banking Authority

ECB, 2011, "Common Equity Capital, Banks' Riskiness and Required Return on Equity", Special feature A in Financial Stability Review, December, European Central Bank

Elliot, D., S. Salloy and A. O. Santos, 2012, "Assessing the cost of financial regulation", IMF Working Paper, 12/233

European Commission, 2014, "Economic review of the financial regulation agenda: Frequently asked questions", MEMO/14/352, 15 May

Hoggarth, G., R. Reis and V. Saporta, 2002, "Costs of banking system instability: some empirical evidence", Journal of Banking and Finance, 26, pp. 825-855

IIF, 2010a, Interim report on the cumulative impact on the global economy of proposed changes in the banking regulatory framework", Institute of International Finance, June

IIF, 2010b, The net cumulative economic impact of banking sector regulation: some new perspectives, Institute of Financial Finance, October

IIF, 2011, The net cumulative economic impact on the global economy of changes in the financial regulatory framework, Institute of Financial Finance, September

Kashyap, A. K., J. C. Stein and S. Hanson, 2010, "An Analysis of the Impact of "Substantially Heightened" Capital Requirements on Large Financial Institutions", http://www.people.hbs.edu/shanson/Clearinghouse-paper-final_20100521.pdf

King, M. R., 2010, "Mapping capital and liquidity requirements to bank lending spreads", BIS Working Paper, 324

Laeven, L. and F. Valencia, 2008, "Systemic banking crises: a new database", IMF Working Paper, 224

Miles, D. K., G. Marcheggiano and J. Yang, 2011, "Optimal bank capital", *CEPR Discussion Papers* No. 8333

Modigliani, F. and M. Miller, 1958, "The cost of capital, corporation finance, and the theory of investments", American Economic Review, 48, pp. 261-275

Myers, S. C., 1984, "The capital structure puzzle", Journal of Finance, July, pp. 575.592

Reinhart, C. M. and K. Rogoff, 2008, "Banking crises: an equal opportunity menace", NBER Working Paper 14587

Slovik, P. and B. Cournede 2011, "Macroeconomic Impact of Basel III", OECD Economics Department Working Papers, 844

Winje, H. and L.-T. Turtveit, 2014, "Norske bankers tilpasning til økte kapitalkrav", Norges Bank Staff Memo, No. 14, (in Norwegian)

Appendix 1. Example: Cost of equity and ROE

This appendix provides numerical estimates of the steady-state cost of equity and ROE for large Norwegian banks. The purpose is to explore the effect of higher equity levels in banks. Table A presents four cases where the calibration of the examples is either chosen to provide high or low estimate of ROE. For the first two cases an estimate of the cost of equity is made first and then converted to the accompanying ROE by using a PB ratio of 1.2. In the two last cases an estimate of ROE is made first.

Case 1. The risk-free interest rate is 5 percent and the market premium of 5.7 percent is equal to the long-run average of the market premium on Oslo Børs (see Table 1 in Section 2). The equity premium for the stock is equal to the market premium, implying a beta equal to 1 within a CAPM framework.[21] These assumptions do not take into account any particular effects of higher equity levels.

Case 2. The risk-free rate is 1 percentage point lower than in Case 1. Due to higher levels of equity, banks' betas are reduced from 1 to 0.8. As an example, assume that the equity beta is equal to the asset beta divided by the equity ratio ($\beta_E = \beta_A/w$). If the equity ratio at the outset is 6 percent and the equity beta is 1, then the asset beta is 0.06. Increasing the equity ratio from 6 to 8 percent would then imply an equity beta of 0.75. An equity beta of 0.8 therefore means that the MM-effect is large, but lower than 100 percent.

Case 3. The ROE is set equal to the average ROE for Norwegian banks for the period 1993-2013 (see Table 1 in Section 2). Again, here it is not made explicit adjustments for higher equity levels.

Case 4. This case assumes that higher equity reduces ROE, but that this reduction is partly offset by measures taken by banks. The result is a reduction in ROE by about 1 percentage point.

Table A. Numerical estimates of the steady-state cost of equity and ROE

Approach	Case No.	Aim of cali-bration	Risk-free interest rate	Market premium	Beta	PB	Cost of equity	ROE	Implied PE
From cost of	1	High ROE	5.00	5.70	1.00	1.20	10.70	12.84	9.35
equity to ROE	2	Low ROE	4.00	5.70	0.80	1.20	8.56	10.27	11.68
From ROE to	3	High ROE				1.20	10.92	13.10	9.16
cost of equity	4	Low ROE				1.20	10.00	12.00	10.00
						Average	10.04	12.05	10.05
						Range	[8.6, 10.9]	[10.3, 13.1]	[9.2, 11.7]

Appendix 2. Debt overhang and the issuance of new equity

The problem that equity issuance will benefit bondholders and not only shareholders, is known as "the debt overhang problem". This appendix explains the factors causing this problem and how it influences the incentive to issue equity.

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[21] Estimates of beta for the large Nordic banks show betas below 1 before the crisis, betas higher than 1 during the crisis and about 1 for longer time periods.

A bank has debt with face value of 90 maturing in one year. The constant risk free interest rate is 3 percent. The volatility of the bank's assets is 0.1 (10 percent), which is very high. Chart 1 shows the estimated volatility for four large Nordic banks.[22] The high asset volatility is chosen to better illustrate how uncertainty about a bank's asset value is at the heart of the debt overhang problem.

Chart 1. Implied asset volatiy for large Nordic banks. Rate

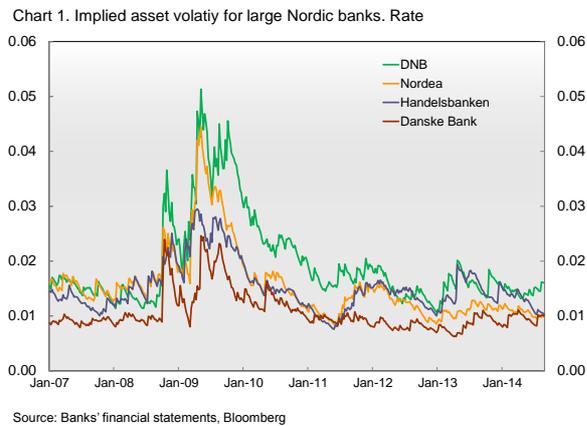Source: Banks' financial statements, Bloomberg

Chart 2 shows the market value of equity today (green line) as a function of the market value of assets today. The market value of equity is equal to the value of a call option on the bank's assets with a contract price equal to the face value of maturing debt. When the market value of assets is slightly above the face value of debt, or lower, a large part of the equity value is caused by the possibility of an increase in the future asset value (the difference between the green and the yellow line). The yellow line is the market value of debt if there is no uncertainty about future asset value.

The market value of unsecured debt and the corresponding yield on unsecured debt traded in the market depends on the value of the bank's assets today (see Chart 3). If the asset value is 80 the yield is approximately 12 percent. If the asset value is 110, the yield is close to the risk free interest rate of 3 percent.

Chart 2. Market value of equity and total assets

Chart 3. The value of and interest rate on secured and unsecured debt
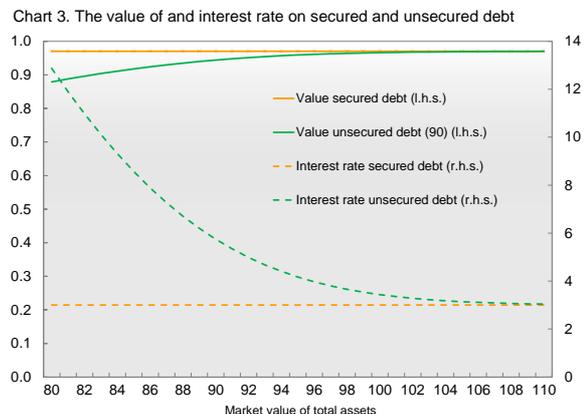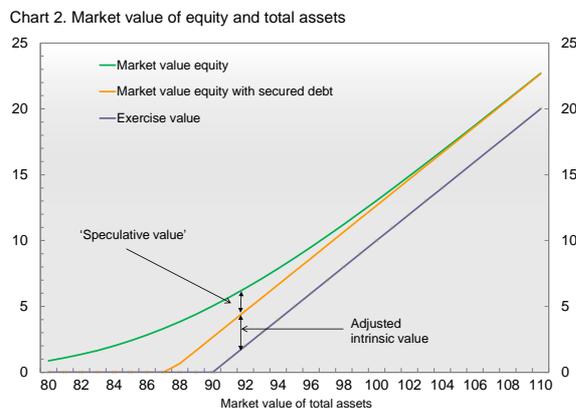
The bank wishes to issue 10 in new equity. This equity will be used to scale up the bank's current assets, thereby maintaining the asset volatility of 0.1. Chart 4 shows an example where equity is issued when the bank's asset value is 102 before the issuance. This causes the market value of the bank's assets to increase to 112. The new equity causes the market value of equity to increase by 8.5 (from 6.4 to 14.9).

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[22] By using observations of a bank's market value of equity, estimated stock volatility, nominal debt and risk-free interest rate the market value of a bank's total assets and asset volatility may be derived. It is assumed that the market value of equity may be valued as a call option on the bank's total assets. This procedure is common when, e.g. computing distance-to-default risk measures.

When 10 is paid in, the equity only increases by 8.5, meaning that the net present value (NPV) is -1.5. This negative NPV corresponds to the increase in market value of debt. Chart 3 shows that the yield on the debt after injection of new equity has fallen to a few basis points above the risk-free interest rate. In order for investors to be willing to pay in 10 in new capital, it is necessary that the old shareholders compensate the new investors to make their NPV zero. This is done by offering the new shareholders a larger proportion of stock than what would follow if the equity issuance did not influence the market value of debt. Chart 5 shows the necessary value and dilution necessary to attract new equity investors for different asset values today. Note that when the market value falls sufficiently low (below 87) it is not possible to attract new investors. This is because the market value of equity after new capital is injected will be below 10, meaning that even if the new shareholders get 100 percent of the shares, the NPV will still be negative.

The situation is different in the presence of an explicit or implicit guarantee of the bank's debt. In this case, the yield on debt equals the risk free interest rate. Issuing equity when there is a guarantee will not increase the value of bonds, but will instead reduce the market value of the guarantee.

Chart 4. The effect of issuing new equity on the market value of equity

Chart 5. Necessary dilution and value transfer from old investor to attract new investors with new equity of 10