NORGES BANK PAPERS

Appendix to
Norges Bank Papers No. 4 | 2022: "A
framework for decisions on the
countercyclical capital buffer"

NORGES BANK

Indicators used in the decision basis for the countercyclical capital buffer (CCyB)

i.   Assessment of cyclical vulnerabilities

The assessment of cyclical vulnerabilities comprises three main elements: (a) household and corporate sector vulnerabilities, (b) real estate market vulnerabilities and (c) financial market vulnerabilities. To assess these three elements, Norges Bank uses various indicators, along with model-based and composite indicators. Indicators that will be used regularly are described below.

Household and corporate sector vulnerabilities. The ratio of total credit to GDP and its deviation from estimated trends are key indicators laid down in the international framework for the CCyB (Charts 1.1 and 1.2). It is important to look at the supply of credit broken down by borrower category, such as different groups of households and firms, and by source, such as banks and the bond market (Charts 1.4 and 1.5). Household saving and net lending can also shed light on the sustainability of credit developments (Chart 1.7).

The European Systemic Risk Board (ESRB) also recommends using indicators of external imbalances. Norway has a large current account surplus owing to oil and gas exports and the fiscal rule for petroleum revenue spending. Other measures of external imbalances may therefore be more useful, such as private sector net lending and banks' foreign funding (Chart 1.8).

Debt-servicing capacity can be assessed using both aggregated debt servicing costs (Charts 1.9 and 1.10) and measures of debt at risk based on studies of data for individual households and firms (see for example Solheim and Vatne (2013)). Studies at the household level will capture vulnerabilities related to skewed distribution of household debt-to-income ratios even if debt at the macro level does not appear to be particularly high. A number of studies show that debt servicing burdens have peaked just before crises, and the associated risks are reflected in financial Institutions' losses.[1]

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[1] See Drehmann, Juselius and Korinek (2017).

Chart 1.1 Credit as a share of GDP
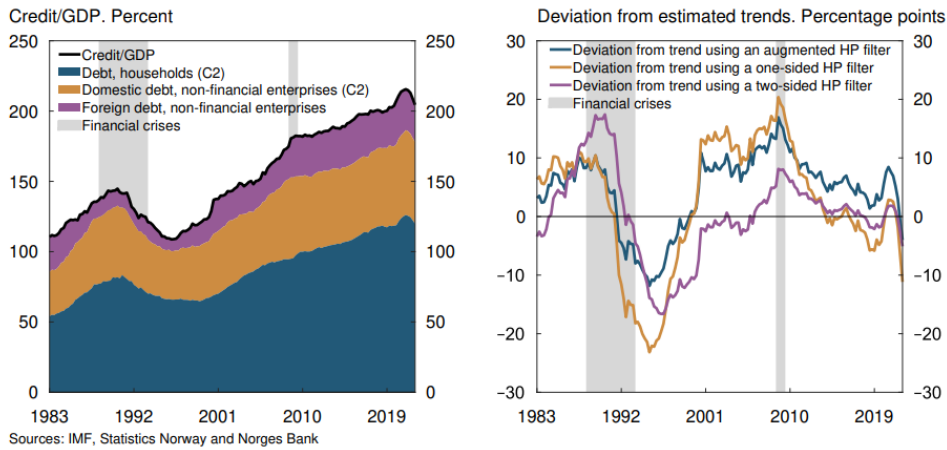
Mainland Norway. Percent. 1983 Q1 – 2022 Q1

Credit/GDP. Percent

Deviation from estimated trends. Percentage points

- Credit/GDP
- Debt, households (C2)
- Domestic debt, non-financial enterprises (C2)
- Foreign debt, non-financial enterprises
- Financial crises

- Deviation from trend using an augmented HP filter
- Deviation from trend using a one-sided HP filter
- Deviation from trend using a two-sided HP filter
- Financial crises

Sources: IMF, Statistics Norway and Norges Bank

Chart 1.2 Decomposed credit gap

Credit as a share of GDP. Mainland Norway. Gap measured as the deviation of the credit-to-GDP ratio from trend.[1] Percentage points. 1983 Q1 – 2022 Q1

- Domestic debt (C2), households
- Domestic debt (C2), non-financial enterprises
- Foreign debt, non-financial enterprises
- Total credit
- Financial crises

1) One-sided Hodrick-Prescott filter estimated on data augmented with a simple projection. Lambda = 400 000.
Sources: IMF, Statistics Norway and Norges Bank
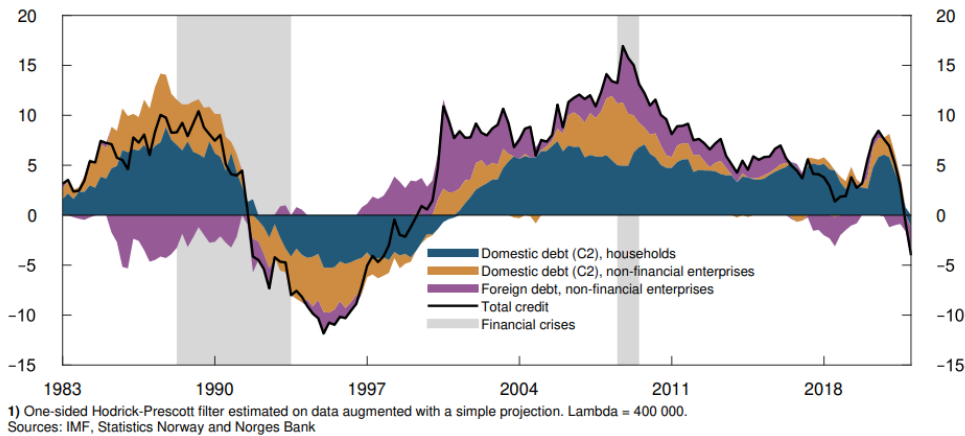
Chart 1.3 Household credit growth

Domestic credit (C2). Percentage change in transactions. January 2012 – April 2022

- Monthly change (seasonally adjusted and annualised)
- Twelve-month change
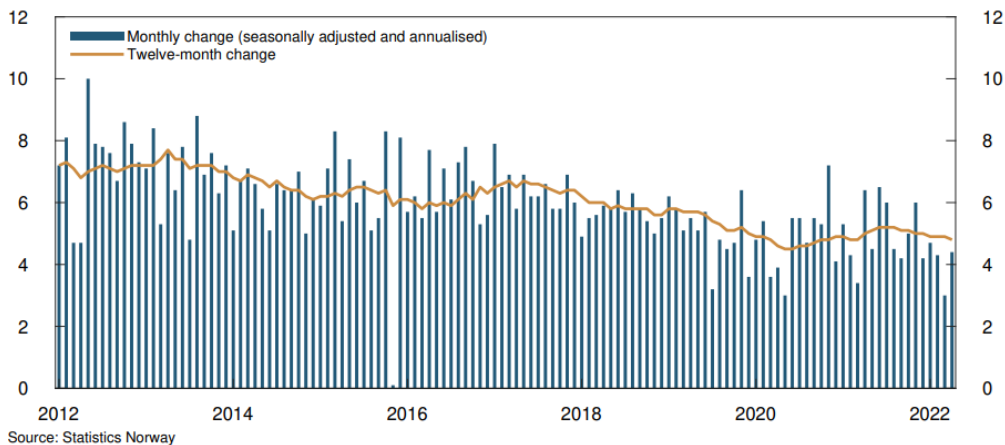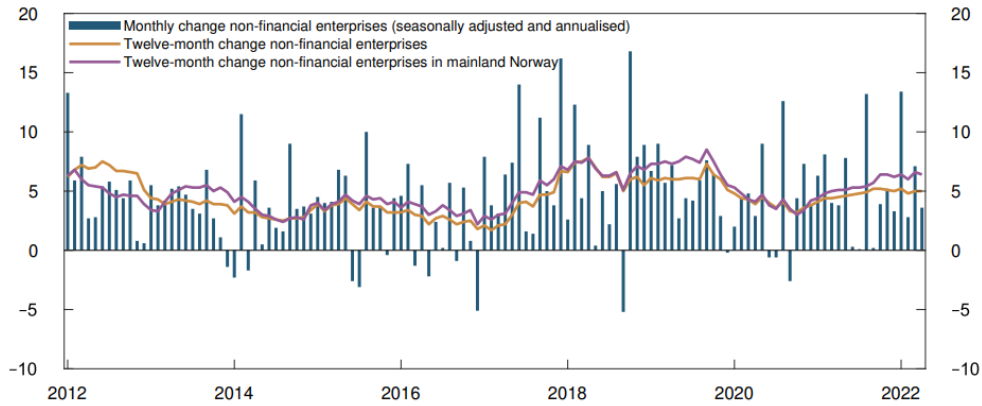
Source: Statistics Norway
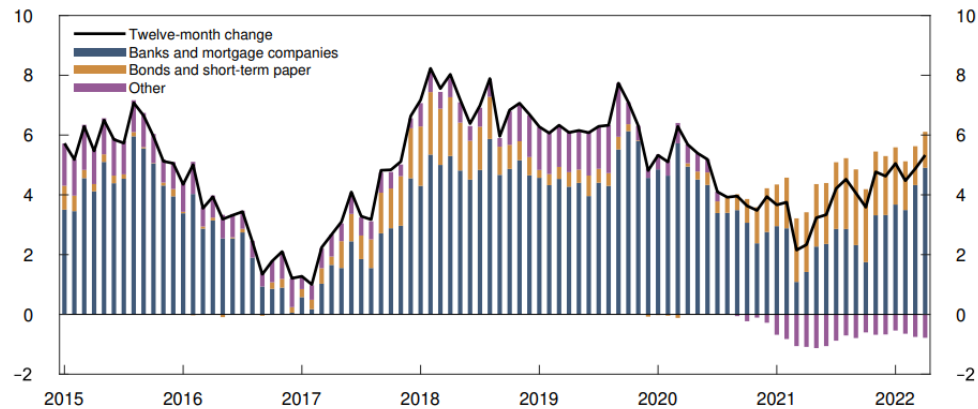
Chart 1.4 Corporate credit growth

Domestic credit (C2). Percentage change in transactions. January 2012 – April 2022

Source: Statistics Norway
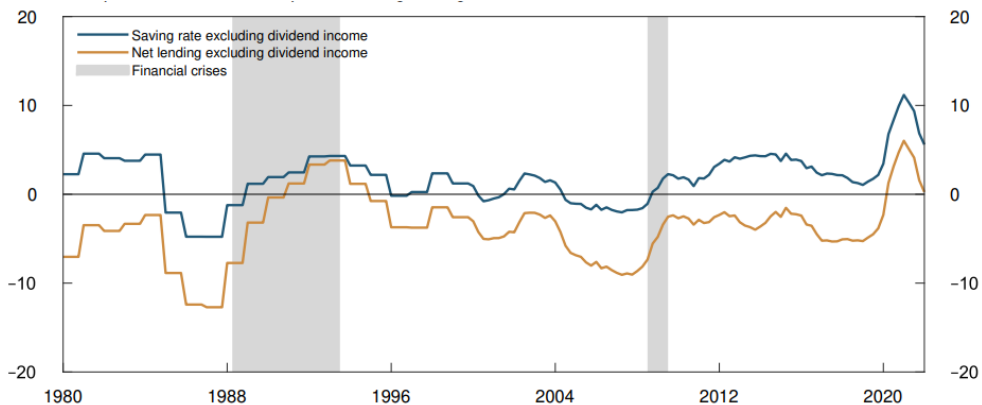
Chart 1.5 Corporate credit growth by source

Domestic credit (C2). Twelve-month change in credit holdings. Decomposed by credit source. Percent. January 2015 – April 2022

Sources: Statistics Norway and Norges Bank

Chart 1.6 Household saving and net lending[1]

As a share of disposable income. Percent. Four-quarter moving average. 1980 Q1 – 2022 Q1[2]

1) Saving and net lending of households and non-profit institutions serving households. Saving and net lending is adjusted by excluding dividend income received. Disposable income is adjusted by excluding dividend income received and adding savings in pension funds.
2) Annual data before 2002.
Sources: Statistics Norway and Norges Bank

Chart 1.7 Private sector net lending[1] and banks' net foreign funding
As a share of GDP. Four-quarter moving average. Percent. 1980 Q1 – 2022 Q1[2]
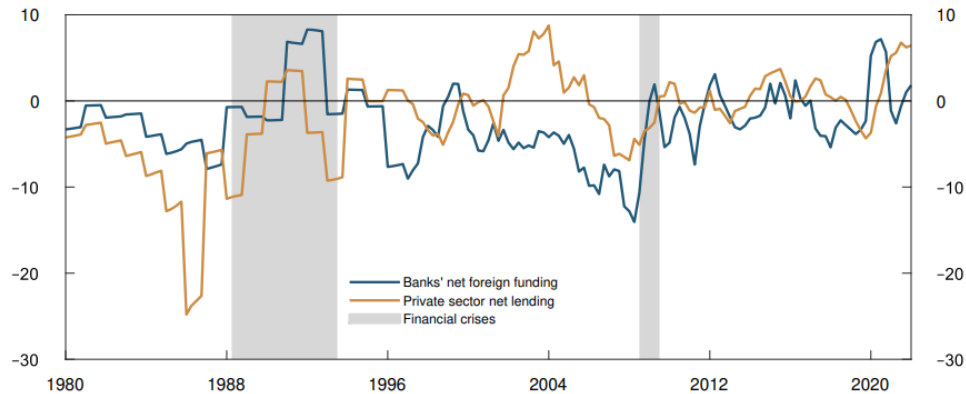
1) Total net lending less net public sector lending.
2) Annual data before 2002.
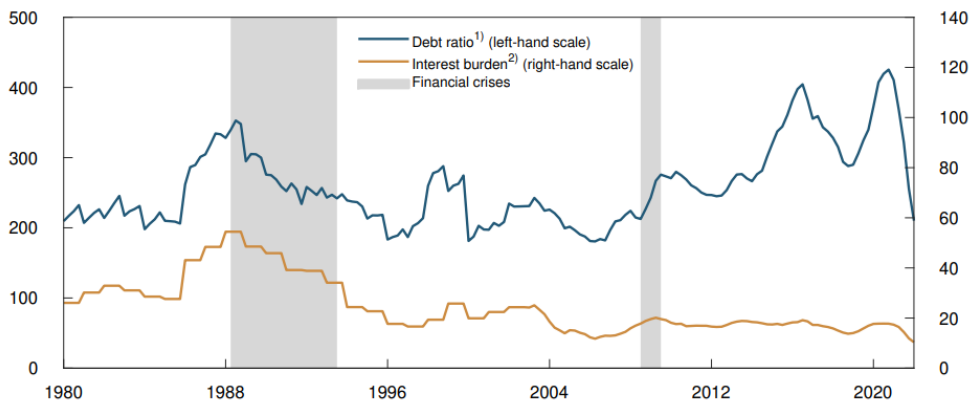Sources: Statistics Norway and Norges Bank

Chart 1.8 Household debt service ratio and interest burden
Percent. 1980 Q1 – 2022 Q1
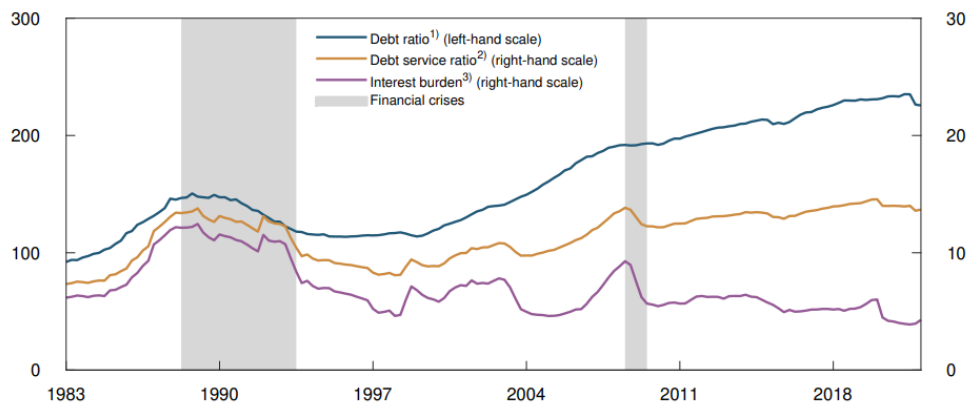
1) Loan debt as a percentage of disposable income.
2) Interest expenses and estimated principal payments as a percentage of disposable income and interest expenses.
3) Interest expenses as a percentage of disposable income and interest expenses.
Sources: Statistics Norway and Norges Bank

Chart 1.9 Non-financial corporations' debt-to-income ratio and interest burden
Percent 1980 Q1 – 2022 Q1

1) Loan debt as a percentage of disposable income, dividends paid and interest expenses.
2) Interest expenses as a percentage of disposable income, dividends paid and interest expenses.
Sources: Statistics Norway and Norges Bank

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Real estate market vulnerabilities. Residential and commercial property prices have risen substantially ahead of periods of financial instability in Norway (Charts 1.10 and 1.17). Other indicators can also be used for assessing cyclical vulnerabilities in the real estate market. Data for housing starts and completions and population growth (Chart 1.16) and housing market activity (Charts 1.13 and 1.14) are useful in order to understand house price developments and can provide information on house price developments ahead. Similarly, rents and yields (Charts 1.18 and 1.19) and transaction volumes in the commercial real estate market (Chart 1.20) can be used to assess market vulnerabilities.

Chart 1.10 Ratio of house prices to disposable income
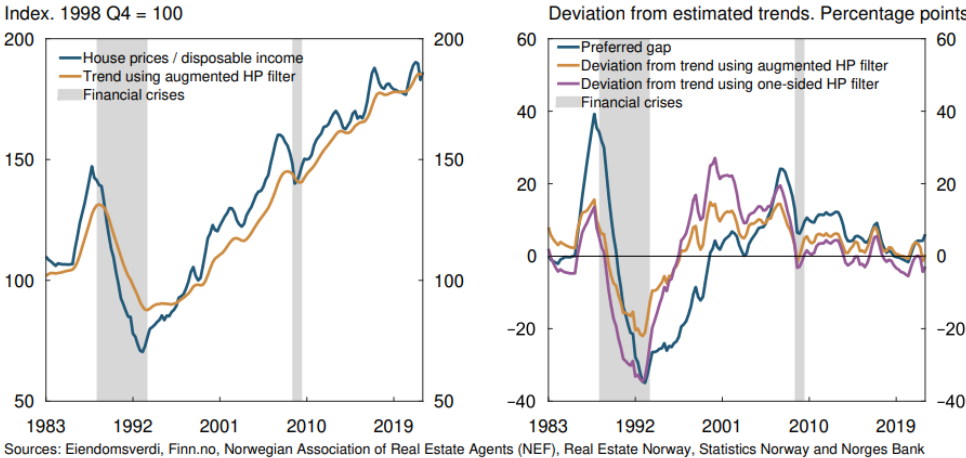Percent. 1983 Q1 – 2022 Q1

Sources: Eiendomsverdi, Finn.no, Norwegian Association of Real Estate Agents (NEF), Real Estate Norway, Statistics Norway and Norges Bank

Chart 1.11 House price inflation
Percent. January 2010 – May 2022

Sources: Eiendomsverdi, Finn.no and Real Estate Norway
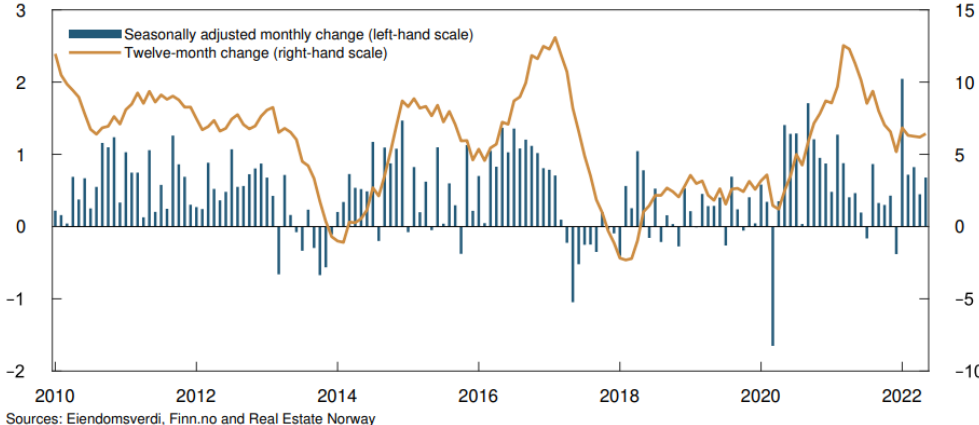
Chart 1.12 House price inflation in Norwegian cities
Twelve-month change. Percent. January 2010 – May 2022
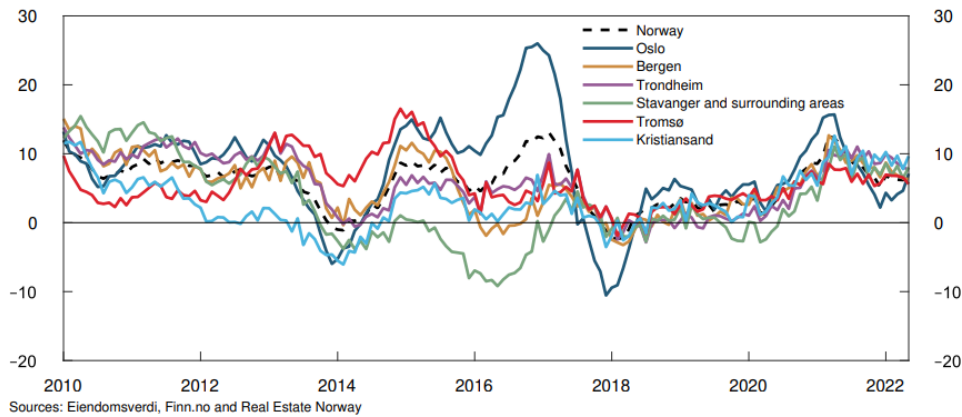

Sources: Eiendomsverdi, Finn.no and Real Estate Norway

Chart 1.13 Activity in the housing market for existing homes
In thousands of existing homes. January 2010 – April 2022

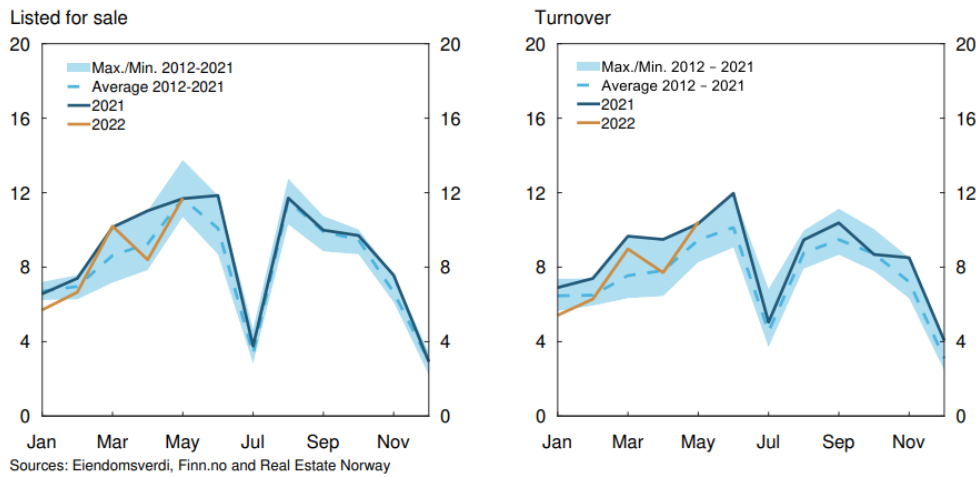Sources: Eiendomsverdi, Finn.no and Real Estate Norway

Chart 1.14 Activity in the housing market for existing homes
In thousands of existing homes. Time on the market in number of days.
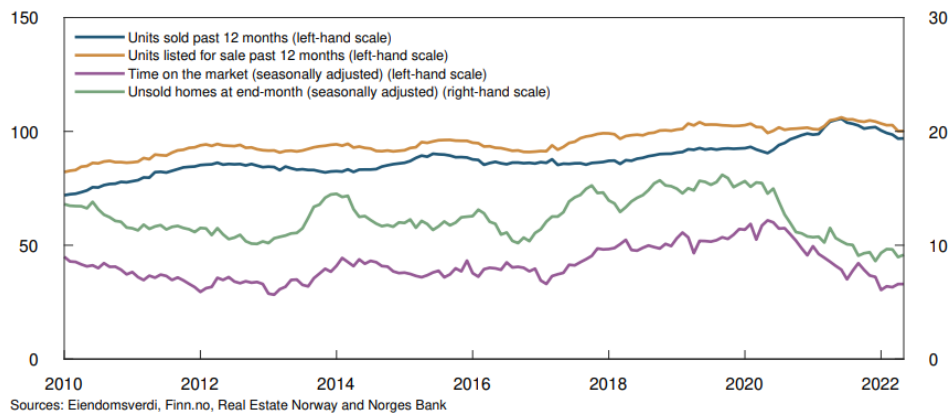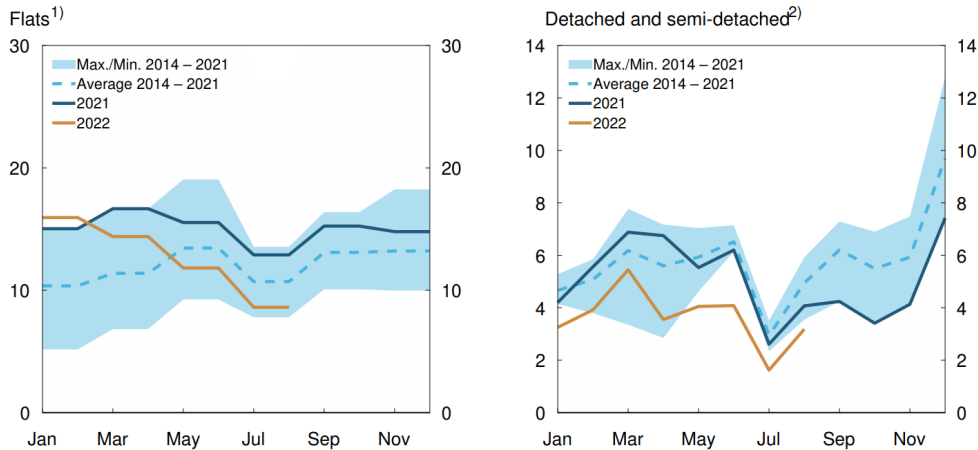January 2010 – May 2022

Sources: Eiendomsverdi, Finn.no, Real Estate Norway and Norges Bank

Chart 1.15 Activity in the housing market for new homes
Sales. In hundreds of new homes. January 2014 – August 2022

Flats[1]

Detached and semi-detached[2]

Legend:
- Max./Min. 2014 – 2021
- Average 2014 – 2021
- 2021
- 2022

1) Flats data are from Economics Norway's "ECON Nye Boliger" database and only include projects of more than 15 units. Data to end-April 2022. The data have been converted from bi-monthy to monthly frequencies with the same distribution.
2) Detached and semi-detached house data are from the Norwegian Homebuilders' Association.
Sources: Norwegian Homebuilders' Association, Economics Norway's ECON Nye Boliger and Norges Bank
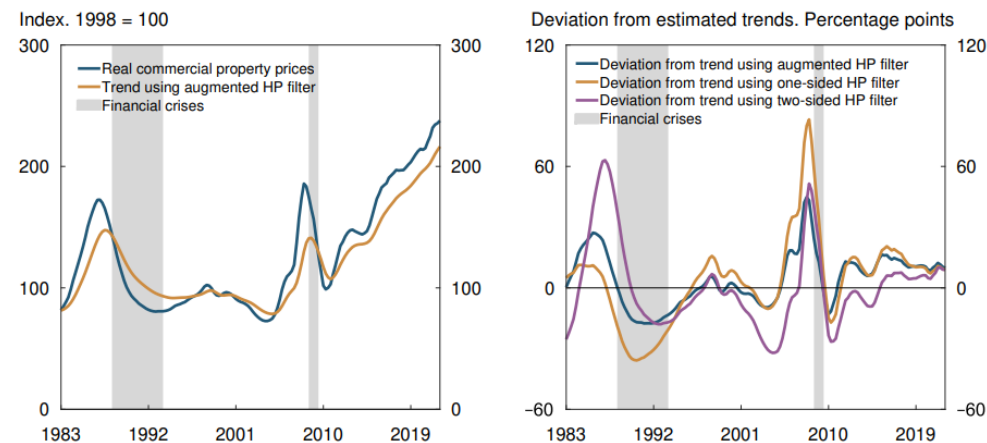
Chart 1.16 Construction and household growth
Housing starts, completions and annual change in number of households in thousands. 1993 – 2021[1]

Housing starts, completions and annual change in number of households. 1993 – 2021[1]

Legend:
- Number of housing starts
- Number of completions
- Change in number of households
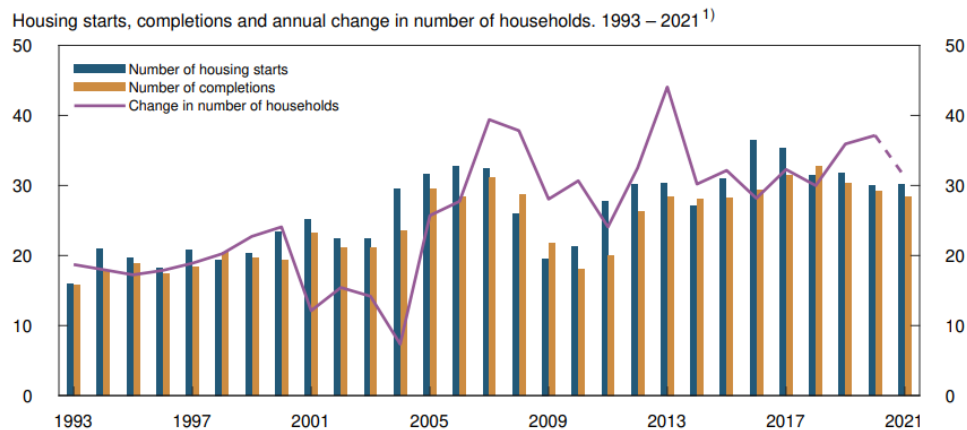
1) Household estimates for 2021 adjusted for actual population in 2021 and excluding refugees from Ukraine. Household growth estimates are based on Statistics Norway's population projections and the change in the number of persons per household over the past five years.

Sources: Statistics Norway and Norges Bank

Chart 1.17 Real commercial property prices
1983 Q1 – 2022 Q1

Index. 1998 = 100

Legend:
- Real commercial property prices
- Trend using augmented HP filter
- Financial crises

Deviation from estimated trends. Percentage points

Legend:
- Deviation from trend using augmented HP filter
- Deviation from trend using one-sided HP filter
- Deviation from trend using two-sided HP filter
- Financial crises

Sources: Dagens Næringsliv, JLL, OPAK, Statistics Norway and Norges Bank

Chart 1.18 Rental prices and yields
Prime real estate. 2007 Q1 – 2022 Q1[1]

Rents.[2] NOK per square metre

Yields. Percent
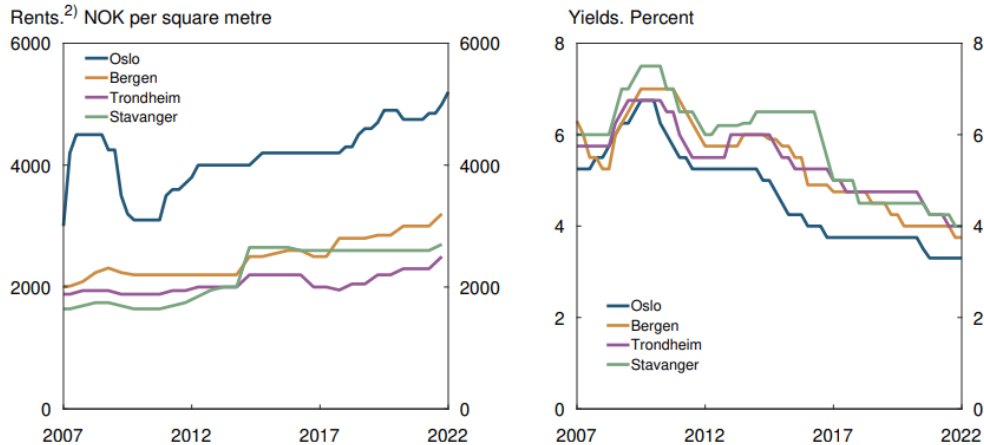
1) Rental prices for 2022 Q1 are for Oslo only.
2) Quarterly data for Bergen, Trondheim and Stavanger are estimated using linear interpolation of semi-annual observations.
Source: JLL

Chart 1.19 Estimated CRE risk premium
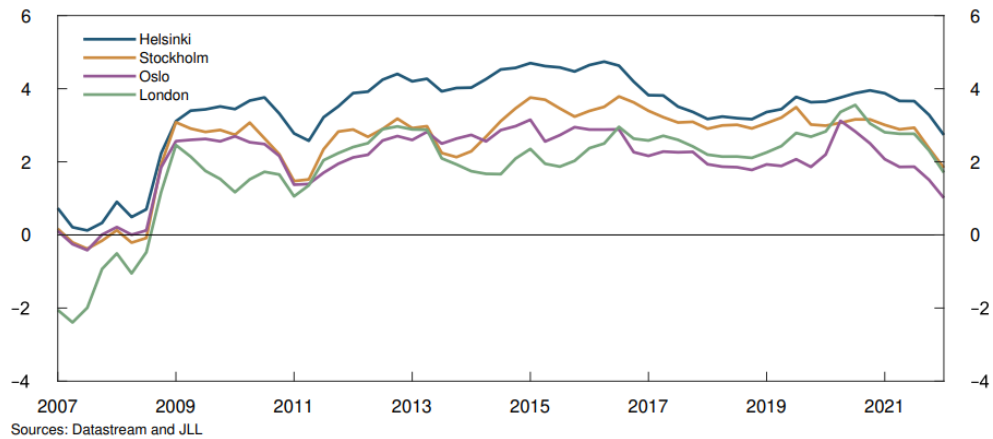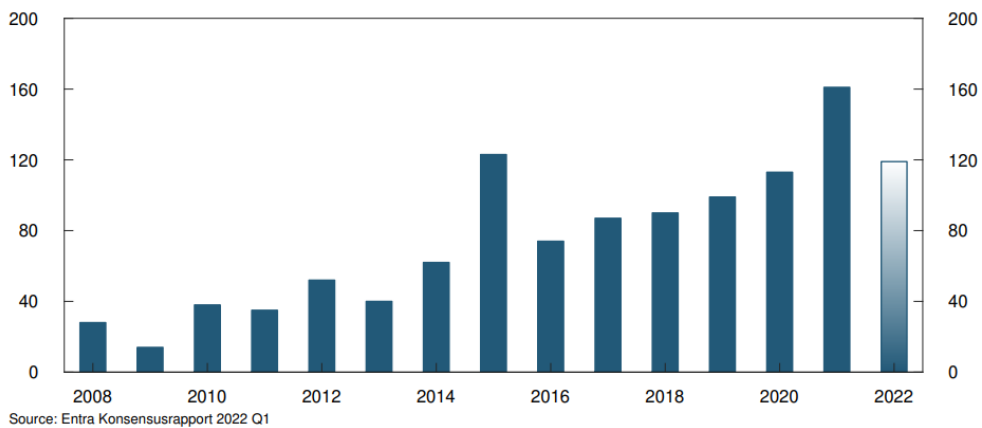Yield less the five-year swap rate. Prime real estate. Percentage points. 2007 Q1 – 2022 Q1

Sources: Datastream and JLL

Chart 1.20 CRE transaction volume
In billions of NOK. 2008 – 2022. Projections for 2022

Source: Entra Konsensusrapport 2022 Q1

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Financial market vulnerabilities. Persistently low interest rates can induce market participants to assume greater risk and lead to a sharp rise in equity prices (Chart 1.21 and 1.22). High equity valuations, relative to book values and earnings, and persistently low bond market risk premiums can also indicate a high level of risk appetite in financial markets (Charts 1.23 to 1.26).

Chart 1.21 Long government bond yields
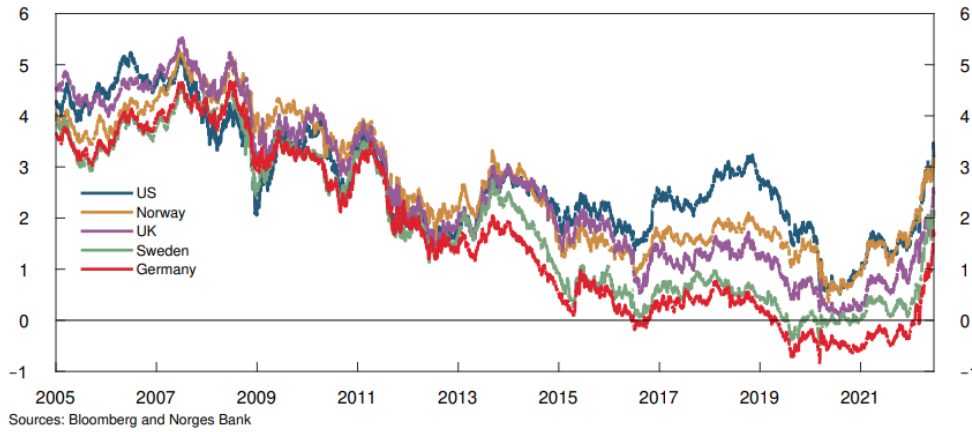Ten-year government bonds. Percent. 1 January 2005 – 17 June 2022

Sources: Bloomberg and Norges Bank

Chart 1.22 Equity markets
Selected equity markets. Index. 3 January 2005 = 100. 1 January 2005 – 17 June 2022
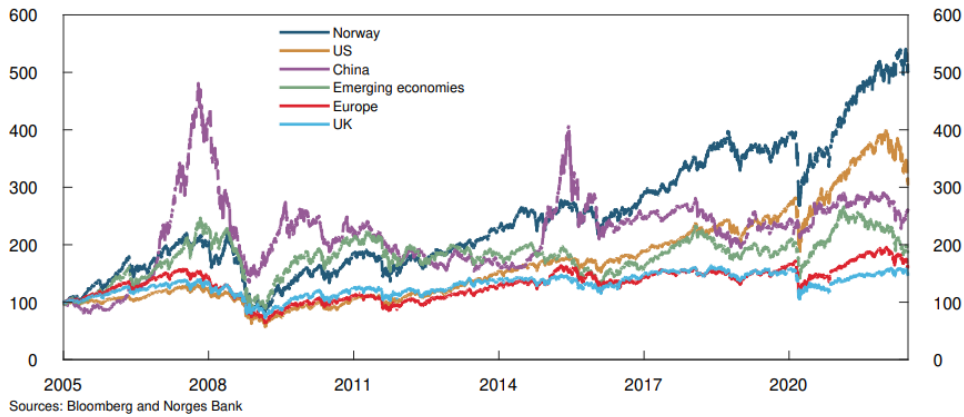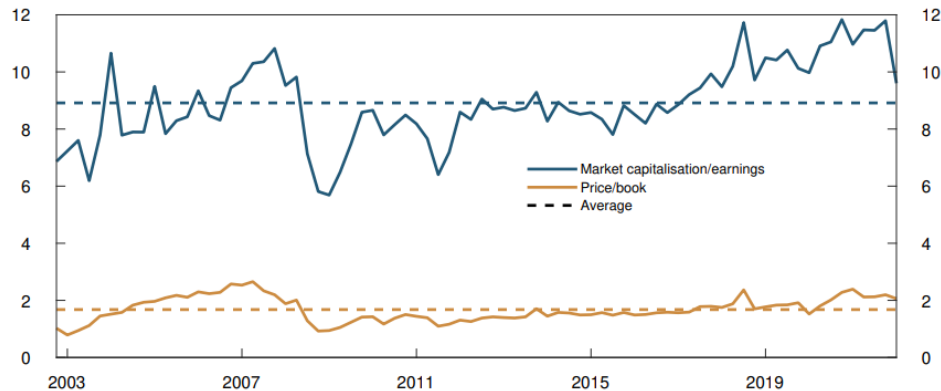

Sources: Bloomberg and Norges Bank

Chart 1.23 Market capitalisation relative to earnings and book value
Sample of listed Norwegian companies.[1] 2002 Q4 – 2022 Q1

1) Market capitalisation is the value of a company's equity and interest-bearing debt less cash. Earnings are a four-quarter moving average of operating earnings before depreciation, amortisation and impairment. Price/book is the ratio of the market value of the company's equity to its book value excluding intangible assets. The sample is Norwegian listed companies excluding financial institutions, companies engaged in oil production etc, companies registered abroad, companies without interest bearing debt and companies presenting incomplete financial reports.
Sources: Bloomberg and Norges Bank

Chart 1.24 Market capitalisation above expected earnings[1]
Oslo Børs. Earnings next four quarters. 2005 Q2 – 2022 Q1
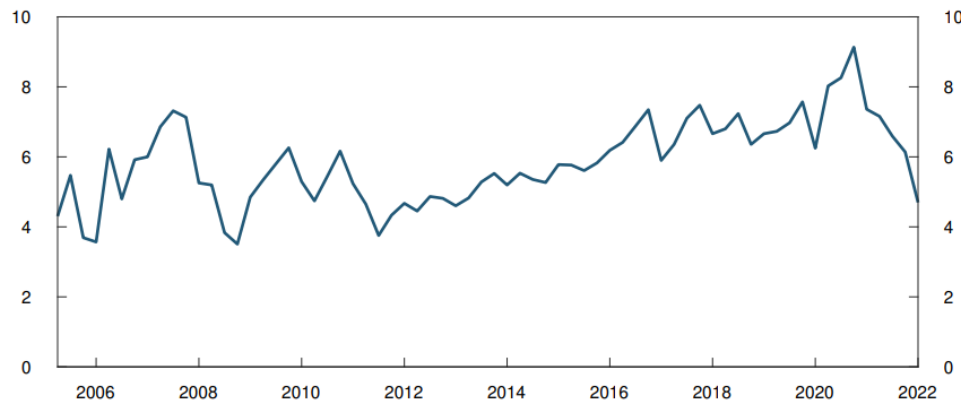
1) Earnings are operating profit before depreciation, impairment, interest income and interest expenses.
Source: Bloomberg

Chart 1.25 Bond market risk premiums[1]
High credit rating. Five-year bonds. Basis points above three-month Nibor.
Week 1 2002 – week 24 2022[2]
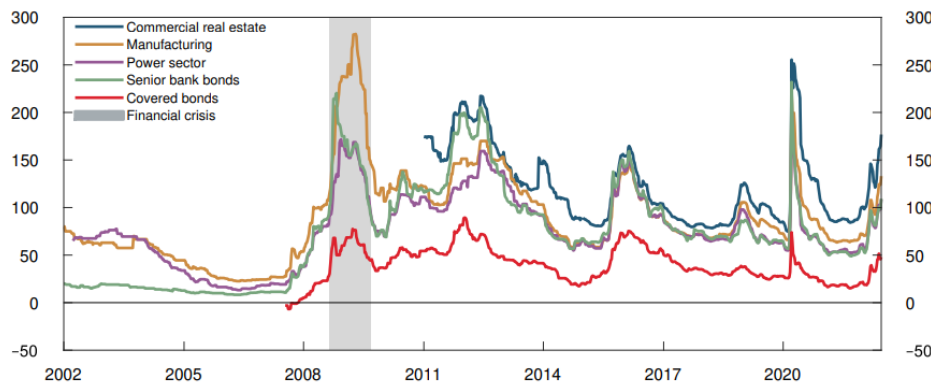
1) Indicative risk premium on five-year senior bonds issued by banks and companies with a high credit rating (BBB- or better).
2) There is a break in the series owing to a change in the data source from DNB Markets to Nordic Bond Pricing in August 2015. Covered bonds data from week 27 2007
Sources: DNB Markets and Nordic Bond Pricing

Chart 1.26 Bond market risk premiums
Low credit rating. Five-year bonds. Basis points above three-month Nibor.
Week 32 2015 – week 24 2022

Source: Nordic Bond Pricing
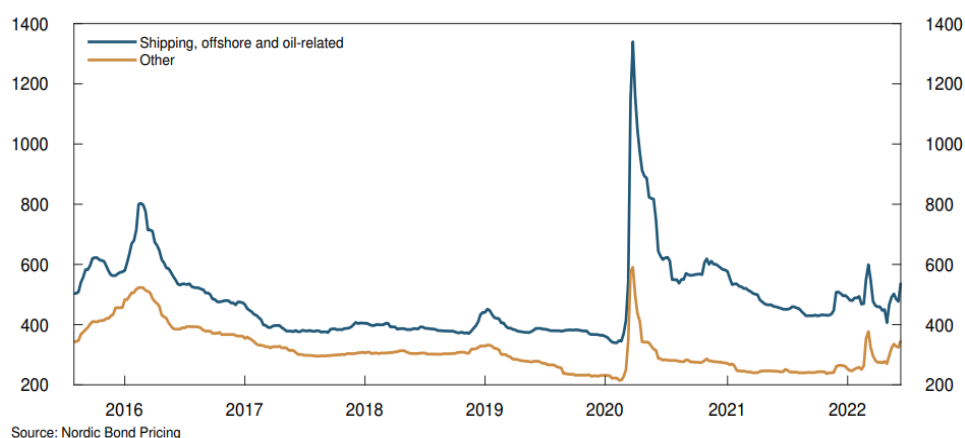
Composite indicators. Model estimates and composite indicators can contribute to the assessment of the overall level of cyclical vulnerability. Norges Bank uses quantile regressions to link the risk of a substantial fall in GDP to a measure of cyclical vulnerability (Chart 1.27) (see box 1 in *Norges Bank Papers* 4/22).[2] The analysis includes a broad set of cyclical vulnerability indicators. The greater the number of indicators towards the right in the chart, the higher the level of cyclical vulnerability indicated.

The heatmap for composite indicators (Chart 1.29)[3] tracks developments in a broad range of indicators in three main areas: risk appetite and asset valuations, non-financial private sector vulnerabilities (household and corporate) and financial sector vulnerabilities. Developments in each individual indicator are colour-coded, with green (red) indicating low (high) levels of vulnerability. The heatmap thus provides a visual summary of vulnerabilities in the Norwegian financial system today compared with historical episodes.

Norges Bank has also developed an early warning model for financial crises based on a large number of combinations of explanatory variables and trend estimation models (Chart 1.28).[4]

Calculations of reference rates for the CCyB are based on the credit gaps in Chart 1.1 and follow international recommendations (Chart 1.30).

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[2] See also Arbatli-Saxegaard, Gerdrup and Johansen (2020).
[3] See Arbatli and Johansen (2017).
[4] See Norges Bank (2014) and Anundsen et al (2016).

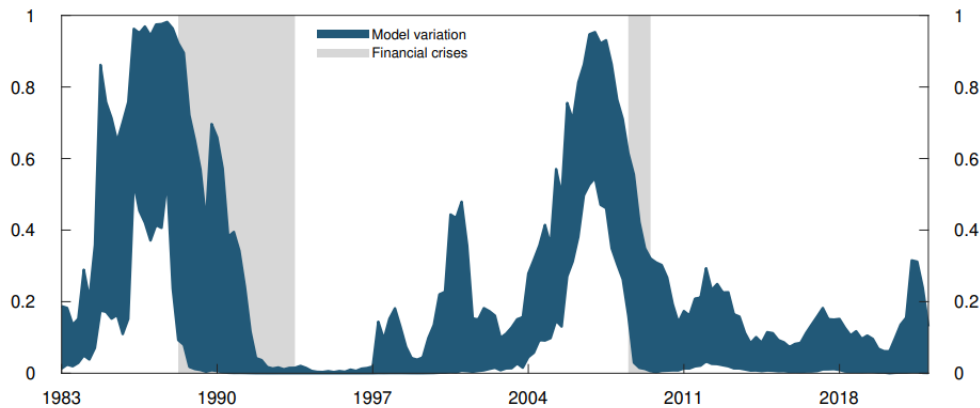**Chart 1.27 Cyclical vulnerabilities and GDP growth**
Cyclical vulnerability indicators (normalised) on the horizontal scale and
5th percentile projections for GDP growth on the vertical scale. 1985 Q1 –
2022 Q1. Projections as from 2022 Q2
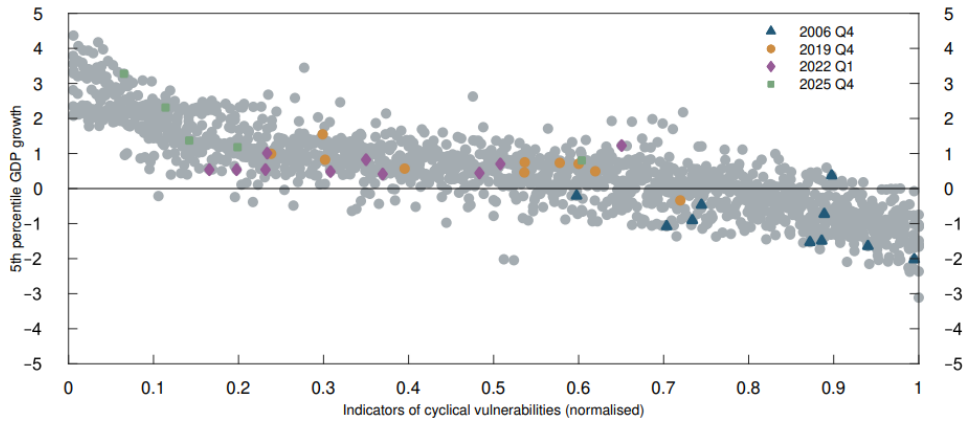
Source: Norges Bank

Chart 1.28 Estimated crisis probabilities from model specifications[1]
1983 Q1 – 2022 Q1

1) Norges Bank has developed early warning models for financial crises based on credit and property price developments. The models are described in Monetary Policy Report 3/14 (page 40) and in Anundsen, A. K., K. Gerdrup, F. Hansen and K. Kragh-Sørensen (2016) "Bubbles and crises: The role of house prices and credit", Journal of Applied Econometrics, 31 (7), November/December, 1291-1311. Estimated crises probabilities are based on a large number of combinations of explanatory variables and trend estimation models.
Source: Norges Bank

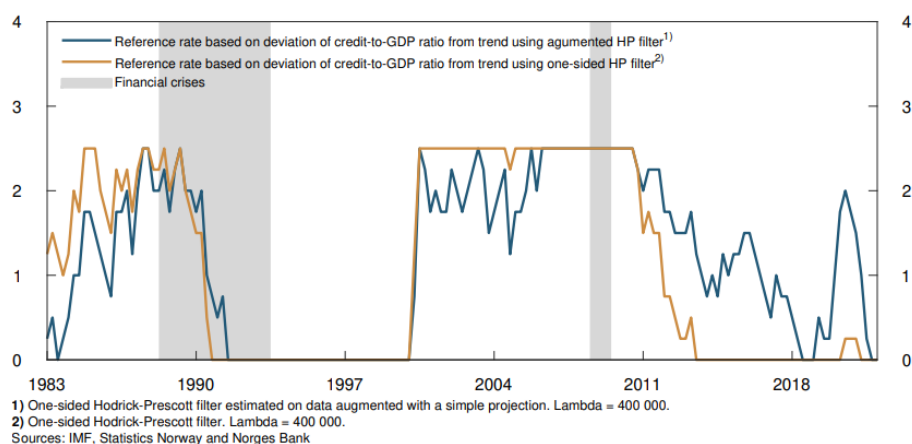**Chart 1.29 Composite indicators in the heatmap[1]**
1980 Q1 – 2022 Q1
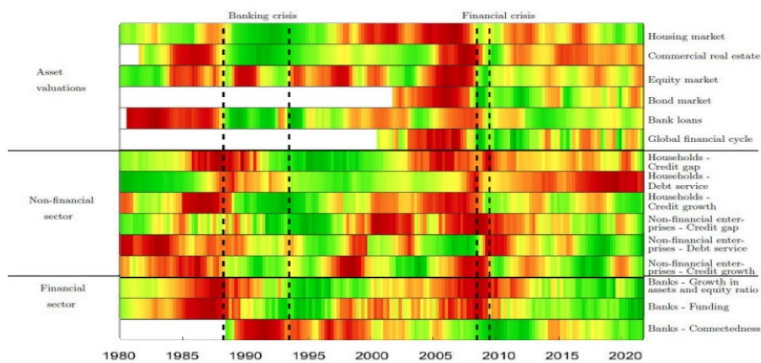
1) The heatmap tracks developments in a broad range of indicators. Developments in each indicator are colour-coded, with green (red) indicating low (high) levels of vulnerability. Composite indicators are constructed by averaging individual indicators. For a detailed description of the heatmap and the individual indicators, see Arbatli, E.C. and R.M. Johansen (2017) "A Heatmap for Monitoring Systemic Risk in Norway". Staff Memo 10/2017. Norges Bank.
Sources: BIS, Bloomberg, Dagens Næringsliv, DNB Markets, Eiendomsverdi, Finn.no, Norwegian Association of Real Estate Agents (NEF), OECD, OPAK, Real Estate Norway, Statistics Norway, Thomson Reuters and Norges Bank

Chart 1.30 Reference rates for the CCyB using different trend estimates
1983 Q1 – 2022 Q1

1) One-sided Hodrick-Prescott filter estimated on data augmented with a simple projection. Lambda = 400 000.
2) One-sided Hodrick-Prescott filter. Lambda = 400 000.
Sources: IMF, Statistics Norway and Norges Bank

ii.   Access to credit

In its assessment of access to credit, Norges Bank uses information about two main areas: (a) financial market stress and (b) bank credit standards.

Financial market stress. Indicators of financial market stress are associated with tightening financial conditions. Developments in fixed income and equity markets can be useful indicators here (Charts 1.21 and 1.22). The Composite Indicator of Systemic Stress (CISS) can capture vulnerabilities related to correlations and close linkages between markets (Chart 1.31).[5]

Banking sector stress can be measured using different indicators, for example money market premiums (Chart 1.32), risk premiums on bonds issued by Norwegian and Nordic banks, equity price developments for the banking sector and banks' CDS prices (Chart 1.33). Since banks from other Nordic countries have substantial market shares in Norway, these banks must also be included in the assessment.

Stress in the corporate bond market can be measured by bond issuance (Chart 1.34) and risk premiums for companies with high and low credit ratings (Charts 1.25 and 1.26).

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[5] See Hagen and Pettersen (2019).

**Chart 1.31 CISS indicator for Norway[1]**
Week 38 2003 – week 23 2022
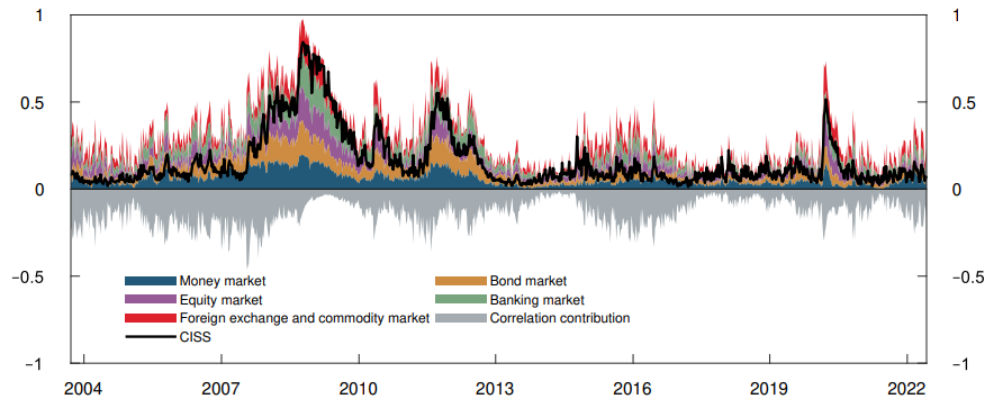
1) The CISS, shown by the black line, is higher the more stress there is in the different market segments (the coloured areas above zero increase) and the more correlation there is between market segments (the grey area below zero decreases). The CISS is described in Monetary Policy Report 1/19 and Hagen, M. and P.M. Pettersen (2019) "An improved composite indicator of systemic stress (CISS) for Norway". Staff Memo 3/19. Norges Bank.
Sources: Bloomberg, DNB Markets, Refinitiv Datastream and Norges Bank

Chart 1.32 Premium in the Norwegian three-month money market rate[1]
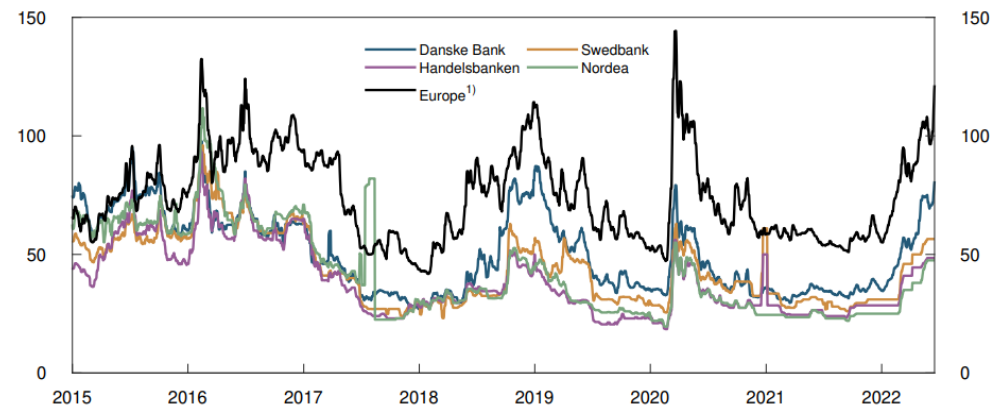Five-day moving average. Percentage points. 1 January 2007 – 18 March 2022
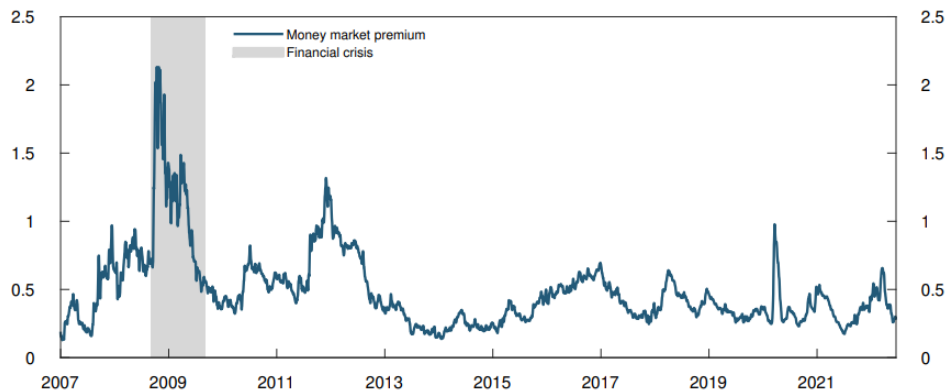
1) Norges Bank's forecast of the difference between three-month money market rate and expected policy rate.
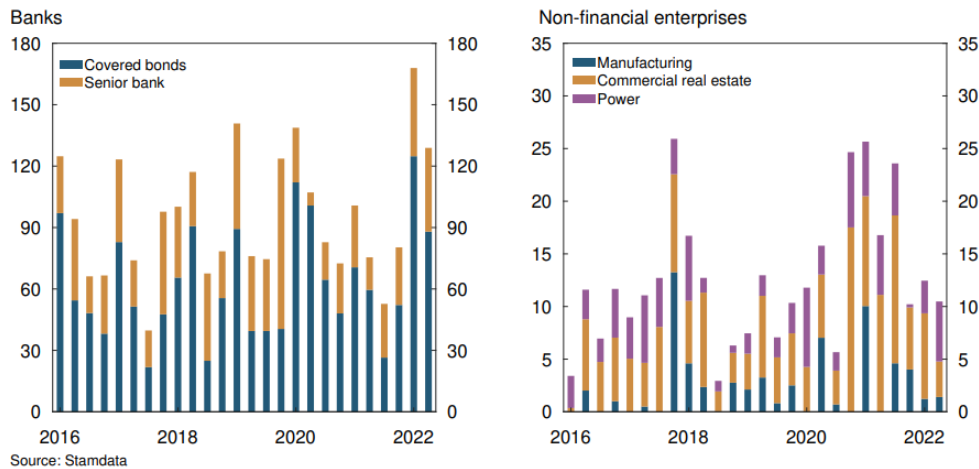Sources: Refinitiv Datastream and Norges Bank

Chart 1.33 CDS prices for Nordic banks
Five-year senior bonds. Five-day moving average. Basis points. 1 January 2015 – 17 June 2022

1) The Markit iTraxx Europe Senior Financial index.
Source: Bloomberg

Chart 1.34 Activity in the bond market
In billions of NOK. Norwegian issuers

Source: Stamdata

Banks' credit standards. Increased lending margins can be an indicator of a tighter credit supply (Chart 1.35). Developments in credit (to different sectors and from different sources) can, in combination with measures of banks' credit standards, such as from Norges Bank's Survey of Bank Lending (Chart 1.36), provide information on the financing conditions faced by households and firms. Other indicators of credit conditions, such as debt-to-income (DTI) and loan-to-value (LTV) ratios for new loans, eg from Finanstilsynet's (Financial Supervisory Authority of Norway) residential mortgage lending survey, will also be used.

Chart 1.35 Interest margin on credit from banks and mortgage companies
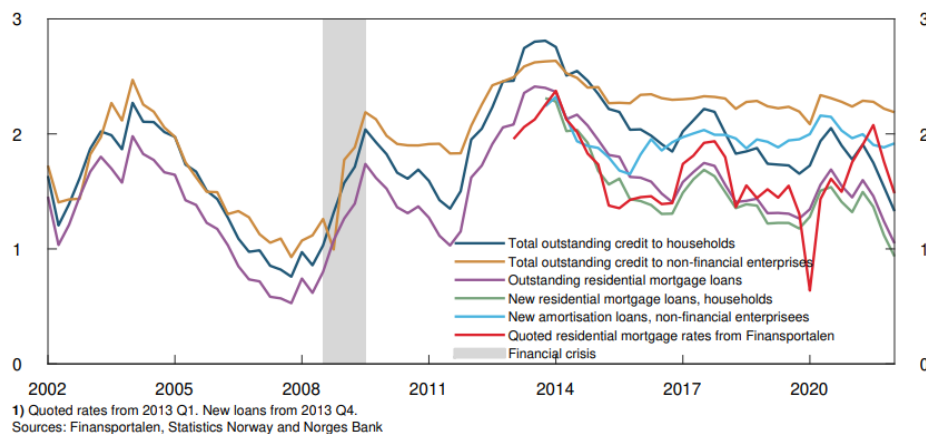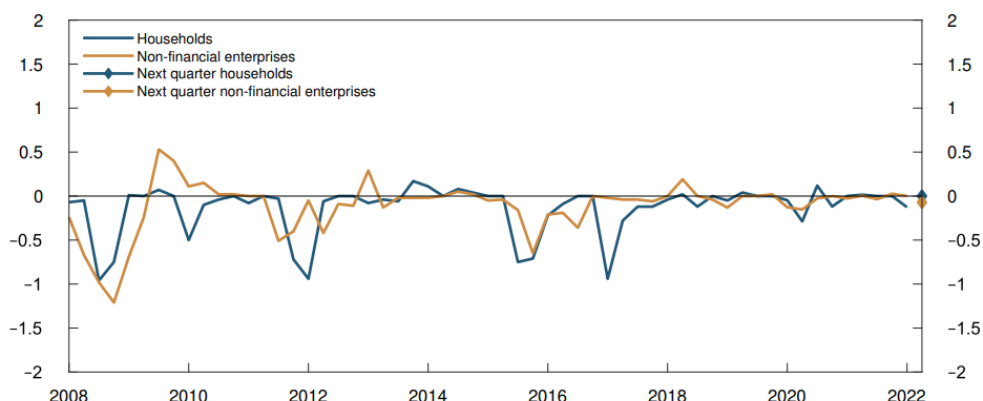Percentage points over three-month Nibor. 2002 Q1 – 2022 Q1 [1]

1) Quoted rates from 2013 Q1. New loans from 2013 Q4.
Sources: Finansportalen, Statistics Norway and Norges Bank

Chart 1.36 Banks' credit standards for households[1] and enterprises[2]. Change from the previous quarter. Norges Bank's Lending Survey. 2008 Q1 – 2022 Q2


1) Residential mortgages.
2) Total credit to non-financial enterprises.
3) Scale: 2/1 = Much/somewhat easier to obtain credit, 0 = Approx. unchanged, -1/-2 = Somewhat/much tighter credit standards.
Source: Norges Bank

iii.   Banks' capacity to absorb losses

An assessment of banks' capacity to absorb losses will be based on banks' profitability, capital ratios and losses. Banks' return on equity (Charts 1.37 and 1.38), capital ratios (Chart 1.42), credit loss ratio (Chart 1.39) and credit impairment (Chart 1.40) can be used as indicators. In addition, stress tests that take cyclical vulnerabilities into account are important in determining whether banks hold sufficient capital to weather a downturn with large losses without amplifying the downturn by tightening credit conditions (Chart 1.41).

Chart 1.37 Large Norwegian banks' return on equity
Percent. 2008 Q1 – 2022 Q1
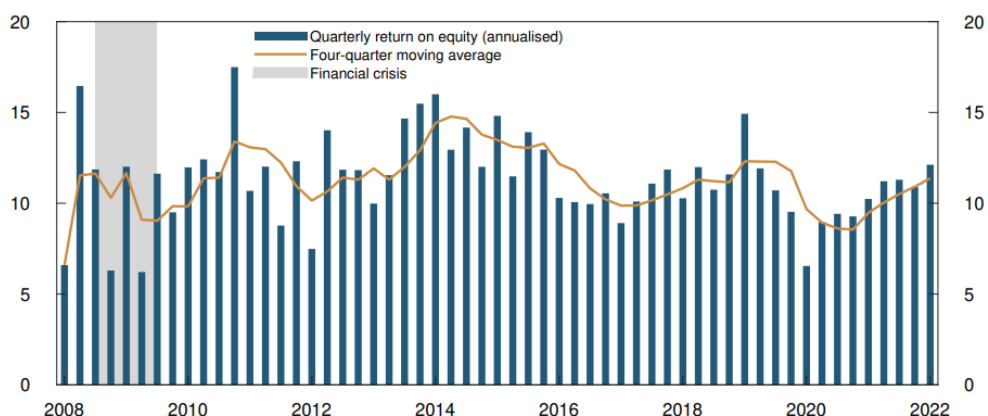
Sources: S&P Capital IQ and Norges Bank

Chart 1.38 Contributions to changes in banks' return on equity
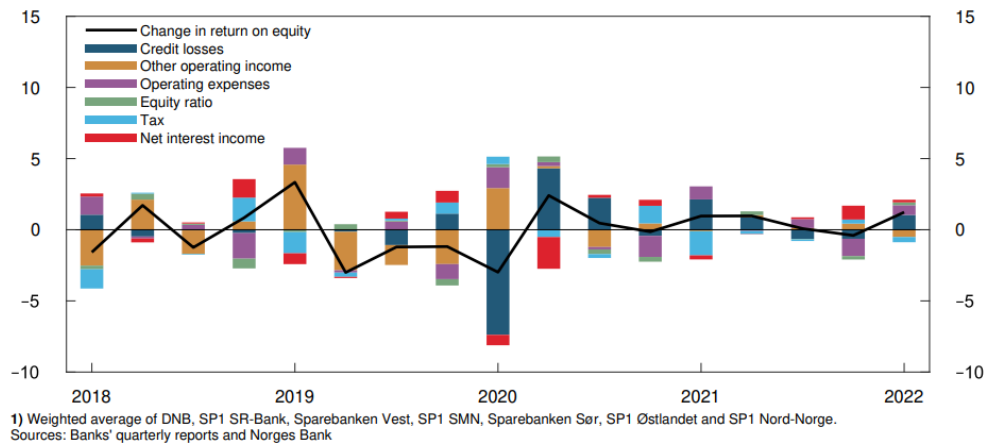Large Norwegian banks. Percent. 2018 Q1 – 2022 Q1

Chart 1.39 Credit losses as a share of gross lending
Annualised. All banks and mortgage companies in Norway. Percent.
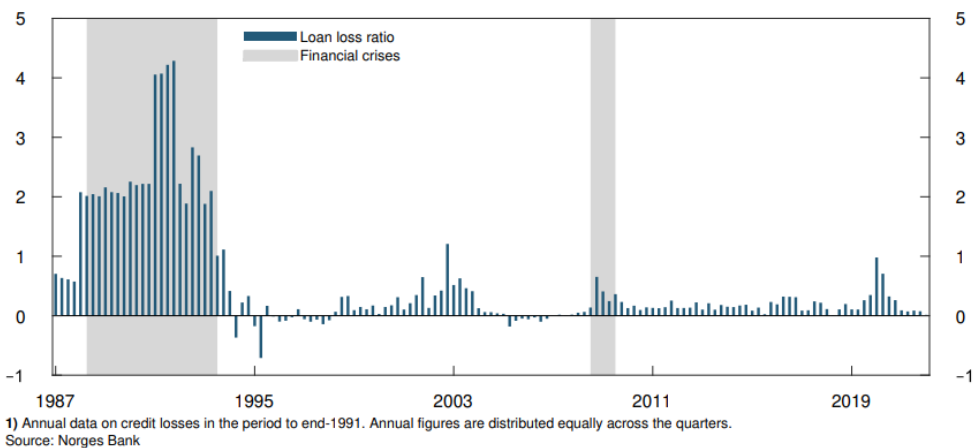1987 Q1 – 2022 Q1

Chart 1.40 Impairment of loans by stage under IFRS 9
Twenty-three largest Norwegian banks. Share of gross lending. Percent.
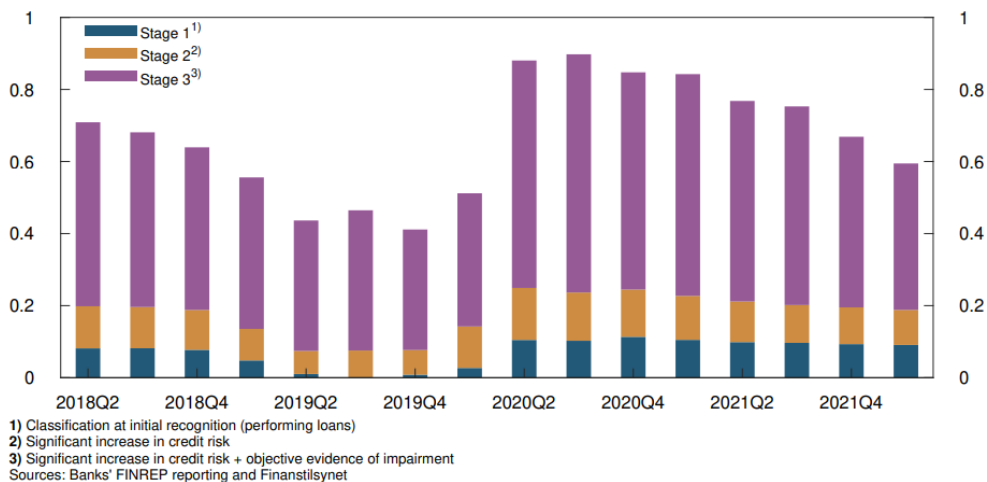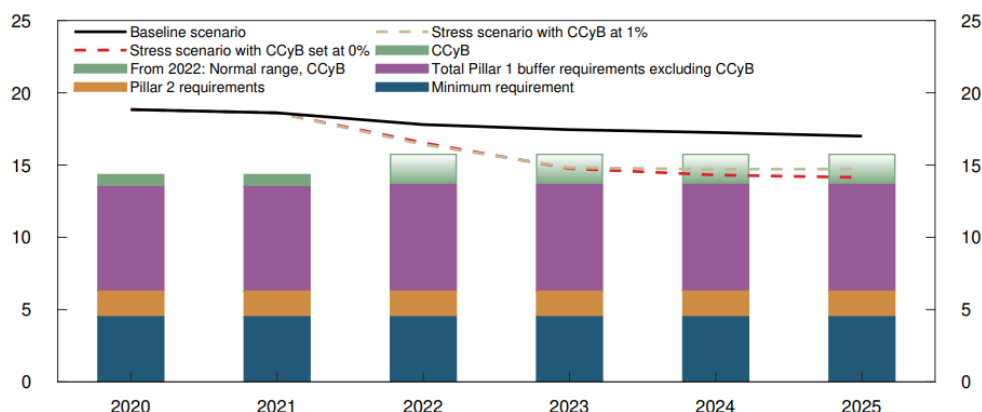2018 Q2 – 2022 Q1

Chart 1.41 The stress test in *Financial Stability Report* 2021
Macro bank's capital requirements, CET1 capital, baseline scenario and stress scenario. Percent

Sources: Banks' quarterly reports, Finanstilsynet (Financial Supervisory Authority of Norway), S&P Capital IQ and Norges Bank

iv. Effects of a change in the CCyB rate on banks and the economy

When an increase in the CCyB rate is being considered, an assessment is made of banks' need to raise capital, adjust their dividend policy or increase earnings by raising lending rates. This assessment can be based on banks' capital ratios compared with the capital requirements (Chart 1.42), banks' earnings, (Charts 1.37 and 1.38) and lending growth (Chart 1.5).

When a reduction in the CCyB rate is being considered, an assessment must be made of whether the reduction can be expected to have the intended effect and increase banks' willingness to lend to households and firms. Stress tests (Chart 1.41) can provide an indication of the extent to which a lower CCyB rate could affect bank lending. In its assessment, Norges Bank will also use information about banks' liquidity and capital situation and other relevant market information.

Chart 1.42 Capital ratios for large Norwegian banks
Capital ratios as at 2022 Q1. Percent
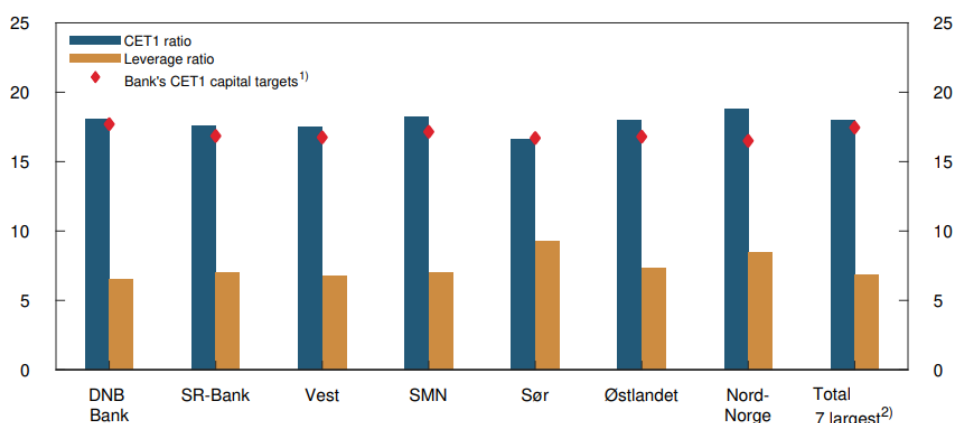
1) Banks' regulatory requirements as at 31 March 2023 with an added capital requirement margin.
2) Total 7 largest is a weighted average of the seven banks in the chart.
Sources: Banking groups' quarterly reports and Norges Bank

References

Anundsen, A. K., K. Gerdrup, F. Hansen and K. Kragh-Sørensen (2016): "Bubbles and Crises: The Role of House Prices and Credit", *Journal of Applied Econometrics*, 31:1291–1311, 2016.

Arbatli, E. C. and R. M. Johansen (2017): "A Heatmap for Monitoring Systemic Risk in Norway", *Staff Memo* 10/2017, Norges Bank.

Arbatli-Saxegaard, E. C., K. R. Gerdrup and R. M. Johansen (2020): "Financial imbalances and medium-term growth-at-risk in Norway", *Staff Memo* 5/2020, Norges Bank.

Drehmann, M., M. Juselius and A. Korinek (2017): "Accounting for debt service: the painful legacy of credit booms", BIS Working Paper No 645, June 2017.

Hagen, M. and P. M. Pettersen (2019): "An improved composite indicator of systemic stress (CISS) for Norway", *Staff Memo* 3/2019, Norges Bank.

Norges Bank (2014): *Monetary Policy Report with financial stability assessment* 3/2014.

Solheim, H. and B. H. Vatne (2013): "Measures of household credit risk", *Economic Commentaries* 8/2013, Norges Bank.