

NORGES BANK PAPERS

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countercyclical capital buffer

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A FRAMEWORK FOR
DECISIONS ON THE
COUNTERCYCLICAL
CAPITAL BUFFER

A framework for decisions on the countercyclical capital buffer

A. Introduction

The countercyclical capital buffer (CCyB) is a part of banks' total capital requirements and one of the macroprudential instruments used in Norway. The objective of the CCyB is to strengthen banks' solvency and mitigate the risk that banks' lending standards amplify an economic downturn. The CCyB was introduced following the financial crisis as a part of a set of new international recommendations for bank capital and liquidity regulation (Basel III)¹. The recommendations have been implemented in EU/EEA law (CRD IV and CRR) and in Norwegian law (Financial Institutions Act with regulations). In Norway, the CCyB was activated in 2013.

Norges Bank sets the CCyB rate each quarter², after preparing a decision basis and exchanging information and assessments with Finanstilsynet (Financial Supervisory Authority of Norway).³ The decision basis is based on a broad set of indicators, models and market information and is in line with international recommendations.

This paper describes the framework for Norges Bank's decisions on the CCyB⁴ and is organised as follows: Section B explains what the CCyB is and how it relates to other capital requirements. Section C describes the principles followed by Norges Bank when it makes its decisions on the CCyB rate. Section D provides a description of the information basis for Norges Bank's decision on the CCyB rate. A detailed description of indicators is provided in the Appendix.

B. CCyB – a part of banks' total capital requirement

Experience shows that the financial system can trigger and amplify economic downturns. Financial system vulnerabilities can amplify shocks, leading to more serious consequences for the economy. The risk that the financial system cannot perform its functions and hence

¹ See Basel Committee on Banking Supervision (2010a and 2010b).

² Norges Bank was given decision-making authority to set the CCyB rate and did so for the first time in September 2021. Prior to this, Norges Bank advised the Ministry of Finance on CCyB rates.

³ See Regulation No 2657 of 3 September 2021 on Decisions on the Countercyclical Capital Buffer and Advice on the Systemic Risk Buffer.

⁴ This paper is an updated version of Norges Bank's framework for advice on the countercyclical capital buffer (see Norges Bank (2019)).

contribute to a severe downturn in the real economy is called systemic risk.

Capital requirements for banks increase financial system resilience. The requirements comprise minimum requirements and a number of buffer requirements (Chart 1) and follow from the EU/EEA capital framework.⁵ Banks in breach of the combined buffer requirements are to submit a plan for strengthening their capital ratios and may also be subject to restrictions on dividend and bonus payouts.

The capital buffers differ in their purpose. The CCyB is intended to strengthen banks' solvency and mitigate the risk that banks' lending standards amplify an economic downturn. Experience shows that economic downturns are typically amplified following a period of high credit growth and sharply rising asset prices, which are typical measures of system-wide cyclical vulnerabilities. The CCyB is intended to ensure that banks hold a capital buffer that corresponds to the level of cyclical vulnerabilities in the financial system.

The systemic risk buffer (SyRB) is also intended to strengthen banks' solvency during a downturn, but the level of this buffer is to be set based on more long-term, structural vulnerabilities, such as high debt levels or a closely interconnected banking system.⁶

In addition, banks designated as systemically important are to maintain larger buffers. The reason is that a problem in a systemically important bank can in itself have severe negative consequences for the economy. The capital conservation buffer is a fixed buffer intended to prevent banks' capital ratios from falling below the minimum requirement when large credit losses are incurred.

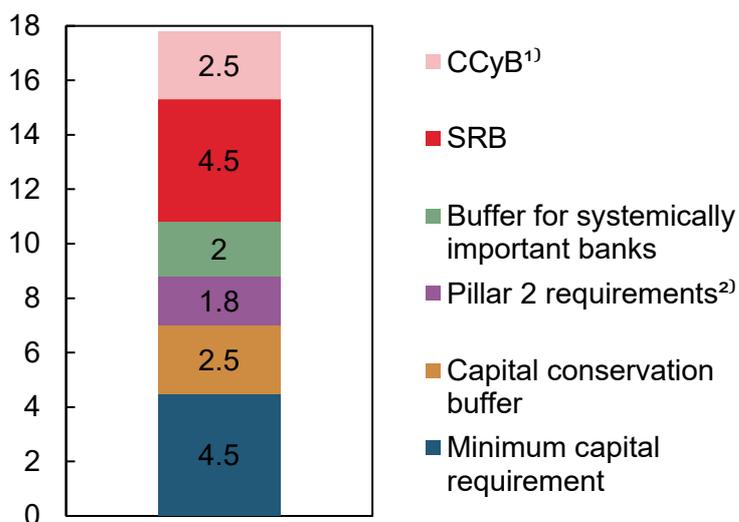
It is natural to view the capital requirements, especially the CCyB and SyRB, in relation to each other. It is difficult to make a clear distinction between cyclical and structural financial system vulnerabilities, and different vulnerabilities can amplify one another.

The benefit of higher capital requirements is a lower risk that the financial system will contribute to an economic downturn. Capital requirements can also entail costs. If higher capital requirements increase banks' funding costs, the knock-on effect can be higher lending rates and lower economic growth. In assessing capital requirements, the costs should be weighed against the benefits of the requirements as a whole.

⁵ The buffer rates are applied to each bank's total risk-weighted assets. Banks must also satisfy a leverage ratio requirement as a backstop to avoid risk-based capital requirements that are too low because risk weights determined by banks using the internal ratings-based approach are too low.

⁶ For a detailed description of the systemic risk buffer, see "A framework for advice on the systemic risk buffer", Norges Bank (2022).

Chart 1. Capital requirements for Norwegian banks. Percent



1) A CCyB of 2.0 percent applies from 31 December 2022 and of 2.5 percent from 31 March 2023.

2) Pillar 2 requirements are a weighted average for the seven largest Norwegian banks (DNB, Sparebank 1SMN, Sparebank 1 SR-Bank, Sparebank 1 Nord-Norge, Sparebank 1 Østlandet, Sparebanken Vest and Sparebanken Sør).

Sources: Finanstilsynet, Ministry of Finance and Norges Bank.

Under the EU capital framework, the CCyB can be reduced during a downturn in order to counteract credit supply tightening. A decision to reduce the CCyB can have immediate effect. In its decision basis, Norges Bank must provide an indication of when the CCyB will be increased again.⁷ When a decision is made to increase the CCyB, banks must normally be given 12 months to adjust before the new rate comes into effect. In special cases, this period may be shortened.⁸

The CCyB rate should normally be set between 0 percent and 2.5 percent, calibrated in steps of 0.25 percentage point or multiples of 0.25 percentage point. In exceptional circumstances, the rate can be set higher than 2.5 percent.⁹ Under the EU capital framework, a CCyB rate set at over 2.5 percent must be based on the same assessments as a rate between 0 percent and 2.5 percent.

A CCyB rate up to 2.5 percent is the only buffer rate that automatically also applies to foreign banks' operations in Norway. This is called automatic reciprocity and follows from the Basel Committee's

⁷ See last paragraph of Section 2 of [Regulation No 2657 of 3 September 2021 on Decisions on the Countercyclical Capital Buffer and Advice on the Systemic Risk Buffer](#). An indication of when the CCyB will be raised again also follows from the EU capital framework (see CRD IV, Article 136) and the recommendations from the Basel Committee (see BCBS (2010b)). However, CRD IV states that such an indication shall not be binding and the Committee recommends that the indication should be assessed and updated.

⁸ See Section 34 of Regulation No 2111 of 19 December 2019 on capital regulation and national implementation of CRR/CRD IV. According to the EU capital framework, an increase in the CCyB rate must be applied no later than 12 months after the decision was made, while a justification must be provided if this period is to be shorter than 12 months (see Article 136 of CRD IV).

⁹ Section 14-3, fourth paragraph, of the Financial Institutions Act.

recommendations and the EU capital framework. Similarly, Norwegian banks with lending activities in other EEA countries

must comply with host countries' CCyB rates.¹⁰ Under reciprocity, the same rate applies to all bank loans in a given country, ensuring a level playing field. The European Systemic Risk Board (ESRB) also recommends reciprocity for rates above 2.5 percent.¹¹

C. Principles for Norges Bank's decisions on the CCyB

Norges Bank's decisions on the CCyB rate are based on the following principles:

The CCyB rate should reflect the Bank's assessment of cyclical vulnerabilities in the financial system. Experience shows that economic downturns are typically amplified following a period of high credit growth and sharply rising asset prices. The Bank's assessment of cyclical vulnerabilities is based on a broad set of indicators, empirical models and analyses.

Banks should as a main rule hold a CCyB. The buffer will strengthen banks' solvency and mitigate the risk that banks' lending standards amplify an economic downturn. The CCyB is not an instrument for managing credit growth or asset prices. According to the capital framework, the CCyB should, in principle, be set between 0 percent and 2.5 percent. The buffer rate should normally be in the upper part of this range. This is supported by analyses of the need for time-varying capital buffers, such as stress tests. The CCyB rate should not be reduced automatically even if there are signs that cyclical vulnerabilities are receding. If cyclical vulnerabilities recede substantially over time and the outlook for financial stability is good, the CCyB rate can be reduced. If cyclical vulnerabilities reach a particularly high level, the CCyB rate can be set above 2.5 percent.

If a downturn will or could cause a marked reduction in credit supply, the CCyB rate should be lowered. A reduction in the CCyB mitigates the risk of tighter lending standards that could amplify the downturn. For the sake of predictability for banks, when the CCyB is reduced, the Bank will indicate the earliest date on which the CCyB rate is expected to be raised again.

¹⁰ For exposures in non-EEA countries that have set their own capital buffers, the CCyB rate set by the authority of the jurisdiction in question should, in principle, be recognised. For non-EEA countries that do not have a system for setting a CCyB, the Norwegian rate should in general be applied. Norges Bank can set a different rate for these exposures.

¹¹ See ESRB (2014a).

D. Information basis for the decision on the CCyB

Decisions on the level of the CCyB are based on four assessments (Chart 2) and build on the principles for the CCyB described in Section C. The four assessments are:

- i. *Cyclical vulnerabilities in the financial system.* Assess cyclical features that could trigger or amplify a pronounced downturn.
- ii. *Access to credit.* Assess whether there is or could be a need to reduce the CCyB rate because creditworthy firms and households cannot obtain credit.
- iii. *Banks' capacity to absorb losses.* Assess whether banks hold sufficient buffers to weather a downturn, given the assessment of cyclical vulnerabilities.
- iv. *Effects of a change in the CCyB rate on banks and the economy.* Assess the impact of a change in the CCyB rate on banks and the economy before a decision to change the rate is made.

The four assessments are based on a broad set of indicators, models and market information. The set of indicators applied by Norges Bank is described in the Appendix and complies with the ESRB's recommendations.¹² Norges Bank will analyse developments in the indicators and compare the current situation with historical trends and averages.

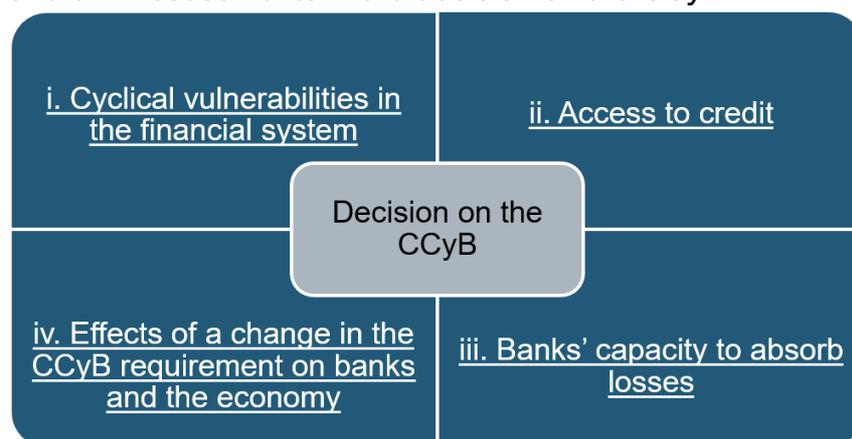
There will not be a mechanistic relationship between the CCyB and developments in different indicators and quantitative analysis. Decisions on the level of the CCyB are also based on judgement. The set of indicators will be updated as the body of data is expanded and new methods and indicators are developed.

The set of indicators largely comprises indicators that are suitable for assessing an increase the CCyB. Indicators that can be used in a decision to reduce the CCyB rate in a downturn have not been identified and analysed in the economics literature to any appreciable extent. International rules and recommendations, and other countries' CCyB frameworks, currently contain limited information on the assessments on which a reduction in the CCyB rate should be based. A decision to reduce the CCyB, such as the reduction from 2.5 percent to 1 percent in March 2020, must therefore rely more on professional judgement. This is also in line with ESRB recommendations.¹³

¹² See ESRB (2014a).

¹³ See ESRB (2014a), where designated authorities are recommended to monitor indicators of stress in financial markets, but to exercise greater judgement when deciding when to reduce the buffer. The ESRB (2018) recommends that market-based stress indicators should be supplemented by measures of credit growth and credit conditions to assess access to credit.

Chart 2: Assessments in the decision on the CCyB



i. Cyclical vulnerabilities

Cyclical vulnerabilities in the financial system can trigger or amplify a sharp downturn. An assessment of cyclical vulnerabilities comprises three main elements: (a) household and corporate sector vulnerabilities, (b) real estate market vulnerabilities and (c) financial market vulnerabilities. See the Appendix for an overview of the indicators on which Norges Bank will base its assessments of cyclical vulnerabilities.¹⁴

Household and corporate vulnerabilities are primarily related to debt accumulation. Higher debt increases borrowers' vulnerability to negative income shocks and higher interest rates. For example, borrowers' debt-servicing capacity can be assessed by examining the share of their income that is spent on interest and principal payments. Weaker debt-servicing capacity increases the risk of credit losses for banks. Risk-taking by both banks and borrowers is often high in periods of strong credit growth. Experience shows that strong credit growth has led to deeper crises.¹⁵ The ratio of credit to GDP, measured as the deviation from trend (the credit gap), has historically risen ahead of crises in both Norway¹⁶ and other countries¹⁷ and is recommended as a key indicator by the Basel Committee and the ESRB.¹⁸ The usefulness of the credit gap as an indicator for the CCyB will vary across countries and over time. After a period of high credit growth, the credit gap may narrow even if credit growth remains high because trend growth is high. In such a scenario, cyclical vulnerabilities may persist even though the credit gap is narrowing.

¹⁴ The ESRB recommends that designated authorities monitor a set of variables that cover measures of property prices, credit developments, external imbalances, the strength of bank balance sheets, private sector debt burdens and potential mispricing of risk (ESRB 2014a). The ESRB also recommends that authorities monitor indicators derived from models combining a selection of these indicators. See ESRB (2014b) for a detailed analysis of indicators used in setting the CCyB rate.

¹⁵ See Schularick and Taylor (2012) and Jorda, Schularick and Taylor (2011 and 2013).

¹⁶ See eg Gerdrup (2003), Riiser (2005), Vo (2011) and Gerdrup, Kvinlog and Schaanning (2013).

¹⁷ See eg Borio and Drehmann (2009), Borio and Lowe (2002), Drehmann et al (2011) and Reinhart and Rogoff (2009).

¹⁸ See BCBS (2010b), ESRB (2014a) and Schularick and Taylor (2012).

Aggregated measures of credit can conceal increased vulnerabilities in segments of the credit market. It is therefore important to examine the supply of credit broken down by source and borrower category. Information on household and corporate saving can also be used to shed light on the sustainability of credit developments.¹⁹

Developments in residential and commercial property prices are important indicators for the assessment of cyclical vulnerabilities. Both indicators have risen substantially ahead of periods of financial instability in Norway. Real estate is both an asset and collateral and influences economic agents' desire to borrow and their access to credit. Interactions between credit and asset prices can lead to a build-up of vulnerabilities and amplify an economic downturn.²⁰ Most household debt in Norway is in the form of residential mortgages. Commercial real estate (CRE) is the sector with the largest share of bank debt and is among the sectors in Norway that have historically exposed banks to the largest credit losses.²¹

Financial market developments can influence the assessment of cyclical vulnerabilities. Periods of persistently low risk pricing can indicate that financial market participants are underestimating risk in the financial system. This can result in higher debt ratios and asset valuations, leading to higher credit and market risk in the economy. Studies find that risk pricing indicators can signal an increase in non-financial sector vulnerabilities.²² Examples of risk pricing measures include bond market risk premiums and indicators of equity market overvaluations.

Norges Bank also uses model-based and composite indicators to assess cyclical vulnerabilities (see Appendix).²³ These include empirical analyses of the relationship between indicators of cyclical vulnerabilities and the depth of potential downturns (see Box I for an explanation of the method). Developments in cyclical indicators provide a solid basis for assessing the level of cyclical vulnerabilities and crisis depth in cyclical stress tests. Indicator estimates can contribute to the assessment of how cyclical vulnerabilities will develop ahead.

¹⁹ Banks' wholesale funding share is another indicator that can shed light on the sustainability of credit growth (see for example Riiser (2008) and Dahl et al (2011)). Interpretations and possible measurement problems related to this indicator are discussed in Alstadheim (2020).

²⁰ See eg Claessens, Kose and Terrones (2011), Drehmann, Borio and Thatsaronis (2012) and Anundsen et al (2016).

²¹ See Kragh-Sørensen and Solheim (2014).

²² See eg Aikman et al (2017), Arbatli and Johansen (2017) and Danielsson, Valenzuela and Zer (2018).

²³ Research indicates that composite indicators combining information from a number of different indicators are better predictors of financial crises than single indicators (ESRB (2014b), Lang et al (2019)).

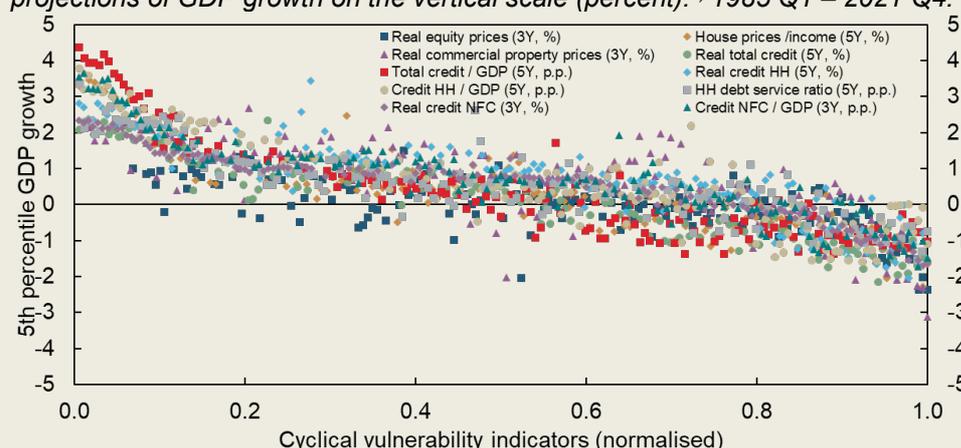
Box I: Relationship between indicators of cyclical vulnerabilities and depth of downturns

Empirical analyses show that financial crises hit harder when the pre-crisis level of cyclical vulnerabilities is high. Using quantile regressions, we have linked the risk of sharp falls in GDP to measures of cyclical vulnerabilities.¹

The analysis provides measures of cyclical vulnerabilities and appurtenant estimates of how far GDP can fall in the event of a sharp downturn. We use a broad set of cyclical vulnerability indicators, including five-year changes in credit, house prices and the household debt service ratio and three-year changes in commercial property and equity prices. Each indicator is normalised based on its historical distribution in the period, so that all the indicators are on a common scale. Historical observations indicate that the estimated risk of a fall in GDP (vertical scale) rises with the level of cyclical vulnerabilities (horizontal scale) (Chart 3).

Possible falls in GDP are measured at the 5th percentile, which means that five out of 100 cases of possible GDP growth are expected to be lower than this. The 5th percentile will be much lower than expected growth and provides a good starting point for quantifying the potential depth of a crisis in stress tests.

Chart 3: Linkages between cyclical vulnerabilities and GDP growth. Cyclical vulnerability indicators (normalised) on the horizontal scale and 5th percentile projections of GDP growth on the vertical scale (percent).¹ 1985 Q1 – 2021 Q4.



1) HH stands for households and NFC stands for non-financial corporations. 3Y and 5Y stand for 3- and 5-year change, respectively.

Source: Norges Bank

¹ See Arbatli-Saxegaard, Gerdrup and Johansen (2020).

ii. Access to credit

In a downturn, Norges Bank must assess whether the downturn will or could result in a marked reduction in access to credit. This entails assessing whether banks' capital situation could entail substantial credit constraints on the real economy.

In this assessment, Norges Bank will use information on two main areas: (a) financial market stress and (b) banks' credit standards (see Appendix for an overview of the indicators).

Measures of financial market stress, such as risk premiums, can provide information on tightening financial conditions and banks' access to funding (see for example the description of a composite indicator for

systemic stress in the Appendix). More limited access to funding and higher market prices for funding can impair banks' ability to maintain credit supply and offer other financial products, while at the same time weakening non-financial enterprises' access to market financing. Historically, indicators of market stress have risen prior to crisis periods in Norway and other countries, but market signals can fluctuate considerably and must be interpreted with caution.

Households' and enterprises' access to credit is determined by banks' credit standards. Credit standards and lending conditions can, for example, be measured using Norges Bank's Survey of Bank Lending. Interest rate spreads on bank lending are useful indicators of financing conditions faced by households and enterprises.

It may take time before indicators signal substantial credit constraints on the real economy. Especially in abrupt downturns, information provided by indicators will often be limited. In such a situation, it will be particularly relevant to conduct an overall assessment of the risk of substantially tighter credit standards in the near future.

iii. Banks' capacity to absorb losses

Banks' capacity to absorb losses is analysed to assess whether banks have sufficient time-varying capital buffers in a downturn. This must be assessed in light of the level of cyclical vulnerabilities, which can trigger or amplify a downturn with large bank losses. A high level of vulnerabilities can exacerbate downturns. Banks should therefore hold larger capital buffers when vulnerabilities are increasing.

An assessment of banks' capacity to absorb losses will be based on banks' profitability, capital ratios and losses (see indicators in the Appendix). Banks' loss prospects in a downturn should also be taken into account, given an assessment of cyclical vulnerabilities. Stress tests contain such information and can shed light on whether banks hold sufficient capital to weather a downturn with large losses without amplifying the downturn by tightening credit conditions (see Box II).

Box II: Stress testing as a part of the decision basis for the CCyB

Stress testing is used by the authorities in many countries to analyse the consequences for banks of a pronounced, but conceivable downturn. Some stress tests focus on the resilience of individual banks in a given crisis scenario. Other stress tests also take into account how banks' behaviour affects developments in the real economy. The focus is then more on macroeconomic outcomes and not on the resilience of individual banks.

Norges Bank primarily uses macro stress tests, and this kind of stress testing framework is a natural starting point for assessing the effects of reducing the CCyB in a downturn. For Norges Bank, stress testing is a key tool for describing the benefit of banks holding buffer capital in reserve.

In a crisis, credit losses will typically substantially weaken banks' Common Equity Tier 1 (CET1) capital ratios. In addition, the risk weights used in calculating capital requirements will rise because credit risk is higher than in good times. Both can contribute to reducing CET1 capital ratios.

How banks choose to curb the fall in capital ratios will influence how the crisis will affect the economy in the stress test. In Norges Bank's stress tests¹, it is assumed that banks will limit the fall in capital ratios in a hypothetical crisis by tightening the supply of new credit in order to meet the capital requirements. We normally assume that banks will change their lending practices along two dimensions to comply with capital requirements. First, banks will increase lending margins, pushing up earnings and capital ratios. Second, banks will tighten credit standards by increasing collateral requirements. Together, these changes will restrain credit growth, investment and consumption. Banks' behaviour will thereby contribute to exacerbating the downturn in the real economy.

On the other hand, if the authorities have introduced buffer requirements prior to the crisis, capital requirements can be reduced at the same time as actual capital ratios fall. This could dampen the rise in lending margins and the tightening of credit standards, since banks will satisfy the new lower requirements even after credit losses. Norges Bank's stress tests assume that banks will allow capital ratios to fall in a crisis if capital requirements are reduced.

A stress test that reflects the assessment of cyclical vulnerabilities in the financial system can provide an indication of the appropriate level of the CCyB in the event of a crisis. As a small open economy, Norway is exposed to external shocks. Vulnerabilities in the Norwegian financial system can make the Norwegian economy more vulnerable in the event of adverse external shocks and amplify a downturn. This suggests that the depth of the downturn in the stress scenario varies with measures of cyclical vulnerabilities. If the downturn is deep and losses substantial, a larger reduction in capital requirements than otherwise can be necessary to prevent banks from severely tightening credit.

Stress testing alone cannot answer the question of the correct level of the CCyB. The results of stress tests are shrouded in considerable uncertainty since we assess developments in a situation that rarely arises. Stress test results will vary from year to year, owing to both new assessments of the level of cyclical vulnerability and new assessments of economic relationships. Macroprudential stress testing also focuses on the advantage of being able to reduce capital requirements in a crisis and offers little information about the trade-offs between the benefits of preparedness and the costs associated with capital requirements.²

¹ See Andersen et al (2019) for a detailed description of Norges Bank's model framework for macroprudential stress testing.

² Projections for economically optimal capital levels may contribute to making such trade-offs. A stylised approach to optimal variable capital levels is discussed in Alstadheim (2021). For an updated analysis of optimal capital levels in Norway, see Andersen and Juelsrud (2022, forthcoming).

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

When Norges Bank is considering a change in the CCyB rate, banks' options for adjusting to the change and the effects of the change on the economy must also be assessed.

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 capital requirements, banks' earnings and lending growth (see indicators in the Appendix). An increase in lending rates can have a dampening impact on credit growth and property price inflation, which will be a favourable outcome if credit growth is high. There is a range of empirical evidence regarding the effect on the economy of these adjustments under different conditions (see Box III). It has been documented that banks' adjustments can also have undesirable outcomes. Banks can opt to raise their capital ratios by increasing the share of exposures assigned low risk weights in the capital adequacy framework, such as residential mortgage loans. This can impair firms' access to financing if alternative credit sources are not available. Norges Bank therefore monitors the composition of banks' loan portfolios and assesses the potential side effects of changes in the CCyB rate.

If 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. Empirical knowledge regarding the effect of lowering capital requirements on lending growth is currently limited (see Box III). Stress tests can provide an indication of the extent to which a lower CCyB rate could affect bank lending (see Box II), as can simple calculations based on how much bank capital is freed up if the CCyB is reduced.

There are a number of conditions that will influence an assessment of the effect of a reduced CCyB rate. For example, the effect of reducing the CCyB rate can depend on whether banks will maintain their access to wholesale funding if they reduce their capital ratios. Norges Bank's assessment of banks' liquidity situation and other market information will be relevant. Furthermore, banks' capital ratios compared with their capital requirements and capital targets, and viewed in the context of prospects for future losses, can provide information on potential adjustments. If other requirements applying to banks are or could be binding, this may limit the effect of a lower CCyB rate. If the CCyB rate is reduced, it may also be relevant to assess whether it is appropriate for banks to withhold dividend payouts in order to strengthen their solvency and lending capacity. Such an assessment should include whether the Norwegian capital market could be negatively affected by dividend restrictions. A reduction in the CCyB rate can also be influenced by the specified date when Norges Bank expects, at the earliest, to raise the CCyB rate again.

Box III: Economic effects of a change in the CCyB rate

When a capital requirement is increased, banks can increase their capital ratios in several ways. They can, for example, raise more capital by increasing earnings or they can reduce the risk-weighted assets used to calculate these capital ratios. Banks' adjustments can have consequences for the real economy. If banks raise lending rates to increase earnings, access to credit will become more costly. If banks tighten credit standards to reduce risk-weighted assets, access to credit will be reduced. On the other hand, there will be little or no effect on lending rates or credit standards if banks raise more capital by withholding dividend payouts or raising new equity from investors. If banks already have sufficient capital, they will not need to increase it, and higher capital requirements will not have direct effects on the economy. Experience from Norway indicates that the largest banks let their capital ratios remain close to the total requirements, implying that banks often have to make adjustments when capital requirements are increased.

The introduction of, and subsequent increases in, the CCyB rate in Norway coincided with increases in other capital requirements, making it difficult to isolate the effect of the CCyB on banks' capital accumulation.

A study of banks' adjustment to increased capital requirements up to 2014 suggests that capital was largely built up by retaining profits and not paying out dividends to shareholders (see Aronsen et al (2014)). An empirical study of Norwegian banks' adjustment to new capital requirements introduced in 2013 argues that banks adjust their capital ratios in response to new capital requirements (see Wold and Juelsrud (2018)). Moreover, Wold and Juelsrud document the effects on the real economy of increased capital requirements: banks reduced their risk-weighted assets and increased lending rates, and corporate lending fell relative to household lending when the capital requirements were increased. Corporate loans are riskier and are therefore assigned higher risk weights than household loans. Galaasen and Solheim (2018) describe a possible shift away from corporate lending as a result of an increase in the CCyB rate. Using data for European banks, Gropp et al (2018) also finds that banks that participated in the stress test conducted by the European Banking Authority (EBA) in 2011 adjusted to higher capital requirements by reducing risk-weighted assets, not by increasing equity capital. Higher capital requirements then have a tightening effect on the economy.

Capital requirements and their macroeconomic effects have been the subject of many studies. Basel Committee (2010c) summarises empirical analyses of the impact of higher capital requirements on GDP, credit growth and lending margins.¹ The studies highlight the macroeconomic costs of higher capital requirements as they entail higher total financing costs for banks and thereby higher lending margins. This contributes, in turn, to reduced credit provision and lower total output in the short term than would otherwise be the case. Basel Committee (2021) shows results based on macroeconomic models of the effects of the transition from Basel II to Basel III, using data from the euro area, the US and Norway. The study finds positive effects on GDP when both the advantages and the disadvantages of the changes are taken into account.

The results of the Norwegian and international studies on increased capital requirements are uncertain and vary with the choice of methodology and analysis period. In most of the studies, the negative long-term impact is small. Many of the studies find that the shorter-term impact of increased capital requirements depends on how the quantification of the central bank's response pattern. Lower GDP growth and inflation as a result of higher capital requirements could be counteracted by lower policy rates. Moreover, the results depend on how fast the requirement is expected to be complied with. Longer implementation times reduce costs.

We can likely expect the opposite effect on the real economy if capital requirements are reduced. With lower buffer requirements, banks can allow themselves to increase risk-weighted assets by increasing lending or shifting lending to assets with higher risk weights. This will affect the economy in that it will be easier and perhaps

less expensive to borrow. Banks can, however, also choose not to change lending rates or credit standards and keep their capital ratios unchanged even capital requirements are reduced. They may do this for example because they expect to have to pay more for debt financing if they reduce their capital ratios because of higher risk. Another possible reason is that banks find it costly to adjust capital ratios up again later if capital requirements should increase again. A Danish study (see Imbierowicz, Kragh and Rangvid (2018)) indicates that banks tend not to reduce their capital ratios when capital requirements are reduced.

Empirical knowledge about the effect of reducing capital buffers is limited. Jiménez et al (2017) uses experience of dynamic loss provisioning in Spain to shed light on the potential effects of time-varying capital buffers. They find that banks that had built up capital in good times, and could therefore draw down these buffers in periods of weak profitability, were better able to maintain credit supply during the financial crisis. This eased credit conditions for enterprises in a period of tighter access to financing. Imbierowicz, Kragh and Rangvid (2018) studies the effects of both higher and lower capital requirements and finds that reduced capital requirements lead to some increase in lending, and not only to higher "voluntary" buffers. Arbatli and Juelsrud (2020) studies the effects of lower capital requirements as a result of the phasing in of Basel II in Norway and find that banks with a larger reduction in capital requirements increased their lending more. Moreover, firms that borrowed from these banks increased their investments more. ECB (2021) studies the relationship between a reduction in capital requirements and European banks' credit provision during the Covid-19 pandemic and finds that banks with capital ratios close to the capital requirements reduced lending most, while a reduction in capital requirements that widened the gap between capital ratios and requirements increased banks' credit provision.

¹ See also Jacobsen et al (2011) and Vale (2011). See Basel Committee on Banking Supervision (2019a), which provides a shorter update of the 2010 study.

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