NORGES BANK MEMO

A framework for decisions on the countercyclical capital buffer

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A. Introduction

The countercyclical capital buffer (CCyB) is a part of the overall capital requirement for banks and one of the macroprudential instruments in Norway. The objective of the CCyB is to strengthen banks' solvency and mitigate the risk that banks' lending standards amplifies 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 quarter[2], in connection with which a decision basis is prepared and information and assessments are exchanged 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 *Norges Bank Paper* describes the framework for Norges Bank's decisions on the CCyB and is organised as follows:[4] Section B explains what the CCyB is and how it relates to other capital requirements. Section C describes the principles that Norges Bank follows when it makes decisions on the CCyB rate. Section D provides a description of the information basis for Norges Bank's assessment of the CCyB rate. A more detailed review 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 lead to shocks having 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 and set the CCyB rate 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 total buffer requirement are to submit a plan for strengthening 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 amplifies an economic downturn. Experience shows that economic downturns are typically amplified following a period of sharp rises in credit and asset prices, which are typical measures of cyclical vulnerabilities in the financial system. The CCyB is intended to ensure that banks hold a capital buffer that corresponds to their cyclical vulnerabilities.

The systemic risk buffer (SRB) is also intended to bolster bank solvency in the event 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]

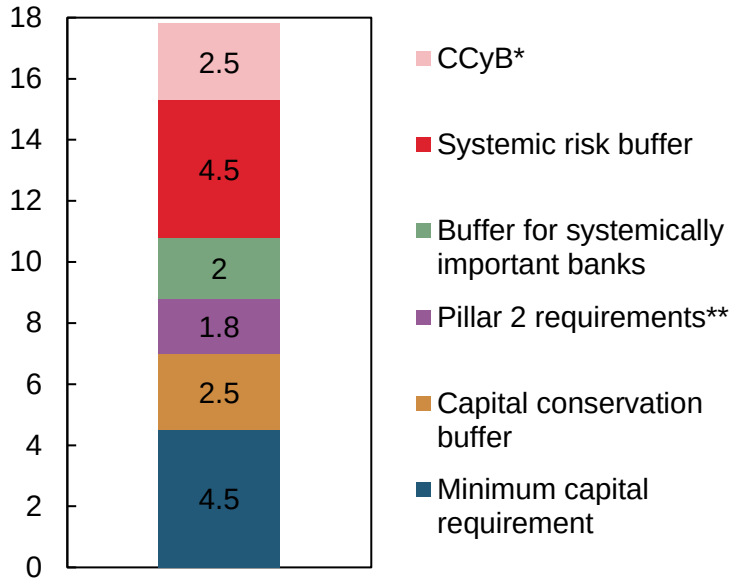
In addition, banks designated as systemically important are to maintain larger buffers. The reason is that a problem in systemically important banks can in itself have severe negative consequences for the economy. The capital conservation buffer is a fixed buffer intended to prevent capital ratios from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

It makes sense to see the capital requirements, especially the CCyB and SRB, as a whole. It is difficult to distinguish clearly cyclical and structural financial system vulnerabilities, and different vulnerabilities can reinforce one another.

The benefits of higher capital requirements are a lower risk that the financial system will contribute to an economic downturn. Capital requirements may also entail costs. If higher capital requirements increase banks' funding costs, the knock-on effect may be higher lending rates and lower economic growth. In the assessment of capital requirements, the costs should be weighed against the benefits. In this assessment, the overall capital requirement is of importance.

[5] The buffer requirement is applied on risk-weighted assets in each bank. Banks must also satisfy a leverage requirement to ensure that capital requirements are not too low as a result of lower risk weights in banks that calculate risk weights using internal ratings-based models.
[6] For a detailed description of the systemic risk buffer, see "A framework for advice on the systemic risk buffer" (in Norwegian only, forthcoming in English), 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 1 SMN, 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 rules, the CCyB can be reduced during a downturn in order to counteract credit tightening. A decision to reduce the CCyB can have immediate effect. In its decision basis, Norges Bank is to provide an estimate of when the CCyB will be increased again.[7] When a decision is made to increase the CCyB, banks shall normally be given 12 months to adjust before the new rate's effective date. In special cases, an earlier effective date can be decided.[8]

The CCyB rate shall normally range between 0 and 2.5 percent and is set in 0.25 percentage point increments or multiples thereof. In exceptional circumstances, the rate can be set higher than 2.5 percent.[9] Under the EU capital framework, the same assessments shall apply to a CCyB rate over 2.5 percent as to a rate between 0 and 2.5 percent.

CCyB rates up to and including 2.5 percent are the only CCyB rates that automatically also apply to foreign banks' operations in Norway. This is called automatic reciprocity and is based on the Basel Committee's recommendations and the EU capital framework. Similarly, Norwegian banks with lending activities in other EEA countries must

[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. A time estimate for raising the CCyB again is also based on EU regulation (see Article 136 of CRD IV) and the recommendations from the Basel Committee (see BCBS (2010b)). In CRD IV, however, it is pointed out that such an indication shall not be binding, and the Committee points out that the estimate shall 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 EU regulation, the implementation of an increase in the CCyB rate shall take place at the latest 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.

comply with host countries' CCyB rates.[10] Under reciprocity, the same rate applies to all bank loans in a given country, levelling the 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 shall reflect an assessment of cyclical vulnerabilities in the financial system. Experience shows that economic downturns are typically amplified following a period of sharp rises in credit and asset prices. The assessment of cyclical vulnerabilities is based on a broad set of indicators, empirical models and analyses.

Bank should normally hold a CCyB. Such buffers strengthen banks' solvency and mitigate the risk that banks' lending standards amplifies an economic downturn. The CCyB is not an instrument for managing credit growth or asset prices. Under the rules, the CCyB should, in principle, range between 0% and 2.5%. The buffer rate should normally be in the higher 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 significantly over time and the outlook for financial stability is good, the CCyB rate may be reduced. In the event of particularly high cyclical vulnerabilities, the CCyB rate may be set above 2.5 percent.

In the event of a downturn that causes or potentially causes markedly reduced access to credit, the CCyB rate should be lowered. A reduction in the CCyB mitigates the risk of tighter lending standards, which can amplify a downturn. For the sake of predictability for banks, when the CCyB is reduced, an estimate will be provided of the earliest expected date for when the CCyB rate will 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 applies in principle. 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 different assessments (Chart 2), and are based on the principles for the CCyB described in Section C. The four assessments are:

i. *Cyclical vulnerabilities in the financial system.* Assess cyclical aspects that may 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 access credit.
iii. *Banks' capacity to absorb losses.* Assess whether banks' buffers are sufficient in a downturn, given the assessment of cyclical vulnerabilities.
iv. *Effects of a change in the CCyB requirement on banks and the economy.* Assess the importance of a change in the CCyB rate before a decision is made to change the CCyB rate.

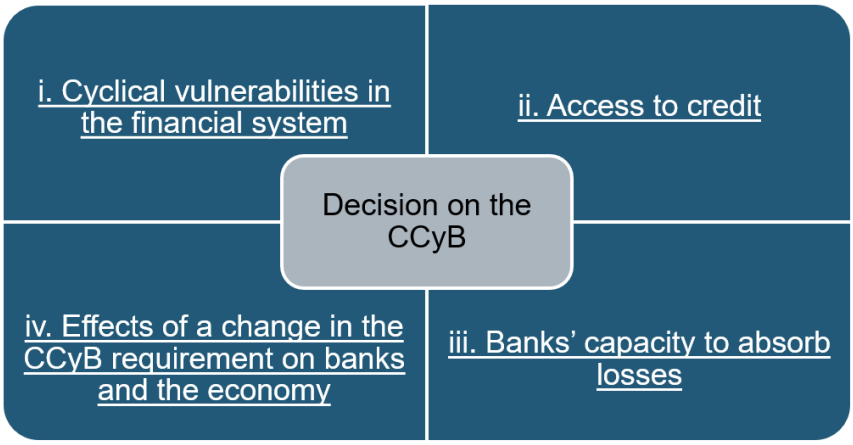
Assessments of the four areas in Chart 2 are based on a broad range of indicators, models and market information. The set of indicators that Norges Bank applies are described further in the Appendix. The set of indicators satisfy the ESRB's recommendations.[12] Norges Bank will analyse developments in 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 based on judgement. The set of indicators will be updated as access to data is expanded and new methods and indicators are developed.

The set of indicators largely comprise indicators that are suitable for assessing whether to increase the CCyB. Indicators that can be used for reducing the CCyB rate in the event of an economic downturn have not been identified and analysed in the economics literature to any appreciable degree. 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. Assessments of whether 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 recommendations from the ESRB.[13]

[12] See ESRB (2014a).
[13] ESRB (2018) points out 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 may 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 use in 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 devoted to interest and principal payments. Weaker debt-servicing capacity increases the risk of bank credit losses. Both banks and borrowers often take on higher risk 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 (credit gap), has historically risen ahead of crises in both Norway[16] and other countries[17], 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 time. After a period of high credit growth, the credit gap may narrow even if credit growth is high because trend growth remains high. In such a

[14] The ESRB recommends that designated authorities monitor a set of variables that cover property prices, credit developments, external imbalances, 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) and ESRB (2014a), and Schularick and Taylor (2012).

scenario, cyclical vulnerabilities may persist even though the credit gap is shrinking.

Aggregate measures of credit can conceal increased vulnerabilities in segments of the credit market. It is therefore important to examine the breakdown of credit by source and borrower category. Information on household and corporate saving may also be used to shed light on whether credit developments are sustainable.[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 thus influences economic agents' desire to borrow and their access to credit. The interaction between credit and asset prices may lead to a build-up of vulnerabilities and may amplify an economic downturn.[20] Residential mortgages account for most household debt in Norway. Commercial real estate (CRE) is the sector with the largest bank debt and is among the sectors in Norway that have historically exposed banks to the largest credit losses.[21]

Financial market developments may also have an impact on cyclical vulnerabilities. A period of persistently low risk pricing may indicate that financial market participants are underestimating risk in the financial system, pushing up debt burdens and asset valuations and in turn credit and market risk. Studies find that risk pricing indicators may signal an increase in non-financial sector vulnerabilities.[22] Examples of risk pricing measures include bond market risk premiums and indicators of equity market overvaluation.

Norges Bank also uses model-based and composite indicators to assess cyclical vulnerabilities (see Appendix).[23] This includes empirical analyses of the relationship between indicators for cyclical vulnerabilities and the severity of the possible downturn (see Box I for an explanation of the method). Developments in the cyclical indicators provide a solid basis for assessing the level of cyclical vulnerabilities and crisis depth in cyclical stress tests. Estimates of the indicators can contribute to the assessment of how cyclical vulnerabilities develop ahead.

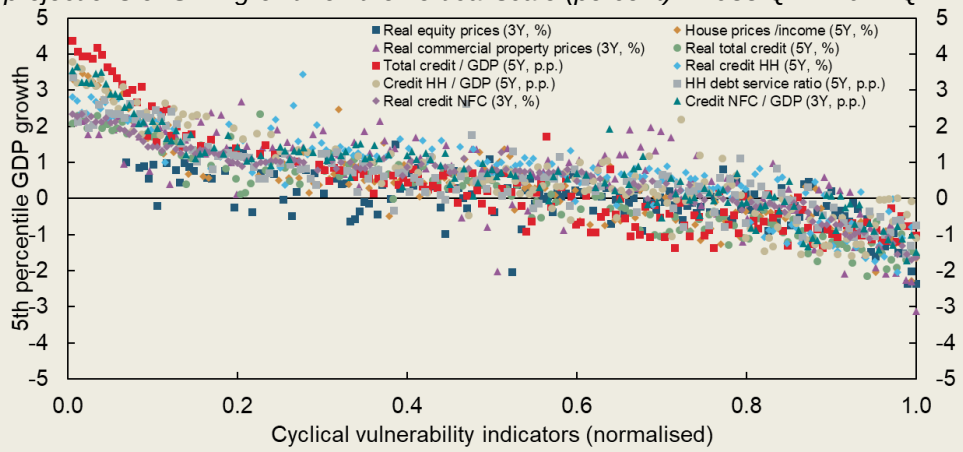
[19] Banks' wholesale funding share is another indicator that can shed light on whether credit growth is sustainable, see for example Riiser (2008) and Dahl et al (2011). Interpretations and possible measurement problems related to this indicator are discussed in Alstadheim (2020).
[20] See eg Claessens, 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 provide better signals of financial crises than individual indicators alone (ESRB (2014b), Lang et al (2019)).

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

Empirical analyses show that financial crises hit harder when cyclical vulnerabilities prior to a crisis are high. With the aid of 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. They include 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 indicators are scaled the same way. 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 possible crisis depth in stress tests.

Chart 3: Linkages between cyclical vulnerabilities and GDP growth. Cyclical vulnerabilities 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 the event of a downturn, Norges Bank must assess whether the downturn will result in or potentially result in a marked reduction in access to credit. This entails assessing whether, owing to banks' capital situation, banks' credit provision could be a significant barrier to developments in 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, may 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 a higher price for funding may impair banks' ability to maintain credit supply and offer other financial products. At the same time, this may weaken 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 sharply and must be interpreted with caution.

Banks' credit standards are crucial for households' and enterprises' access to credit. Credit standards and lending conditions can, for example, be measured with the aid of Norges Bank's Survey of Bank Lending. Interest spreads on bank lending are useful indicators of financing conditions faced by households and enterprises.

It may take time before indicators provide signals that credit supply has become a significant barrier to developments in the real economy. Especially in the event of abrupt downturns, indicators will often not be very informative. 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. That, in turn, must be assessed in light of the level of cyclical vulnerabilities, which can trigger or amplify a downturn and lead to substantial bank losses. Elevated vulnerabilities may 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 adequacy 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 meet 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 policymakers 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' adjustment affect developments in the real economy. In these cases, the focus is more on macroeconomic outcomes and not on 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 how useful it is for banks to hold a buffer capital reserve prior to a crisis.

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

How banks choose to cushion a fall in capital adequacy will be significant for the economic impact of the crisis in the stress test. In Norges Bank's stress tests[1], it is assumed that banks will limit the decline in capital adequacy in a hypothetical crisis by tightening the supply of new credit in order to meet the capital requirements. It is assumed that banks will change their lending practices along two dimensions to comply with capital requirements. First, banks increase lending margins, increasing earnings and capital adequacy. Second, banks tighten credit standards by increasing collateral requirements. Overall, these changes pull down credit growth, investment and consumption. In this way, banks' behaviour will contribute to worsening the downturn in the real economy.

On the other hand, if policymakers have introduced capital buffer requirements prior to the crisis, capital requirements can be reduced at the same time as actual capital adequacy falls. This may dampen the rise in lending margins and the tightening of credit standards, since even after credit losses, banks satisfy the new lower requirements. Norges Bank's stress tests assume that banks 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 may elucidate the level of the CCyB desirable if a crisis should occur. As a small open economy, Norway is exposed to external shocks. Vulnerabilities in the Norwegian financial system may 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 especially deep and losses substantial, a greater reduction in capital requirements than otherwise may be necessary to cushion banks' tightening of credit.

Stress testing alone cannot provide answers to the question of what is the correct level of the CCyB. The results of stress tests are shrouded in considerable uncertainty since they assess developments in a situation that rarely arises. Stress test results will vary from year to year, owing to both new assessments of the magnitude of cyclical vulnerability and new assessments of economic relationships. Macroprudential stress testing also focuses on the usefulness of being able to reduce capital requirements in a crisis and provides little information about the trade-offs between the benefits of contingency arrangements 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 assesses a change in the CCyB rate, it must also assess banks' options for adjusting to such changes and the effects of changes in the CCyB rate on the economy.

When the CCyB rate is being increased, banks' needs for raising capital, adjusting their dividend policy or increasing earnings by raising the pricing of loans are assessed. This assessment may be based on banks' capital adequacy compared with their capital requirements, earnings and credit growth (see indicators in the Appendix). An increase in the pricing of loans may curb credit growth and property price inflation, which will be a positive side effect if credit growth is high. There is some empirical evidence regarding the effect on the economy of these adjustments under different conditions (see Box III). It has been documented that banks' adjustments may also have undesirable outcomes. Banks may opt to raise their capital ratios by increasing the share of exposures with low risk weights in the capital adequacy framework, for example residential mortgage loans. This may impair firms' access to financing if they lack alternative credit sources. Norges Bank therefore monitors the composition of banks' credit growth and assesses potential side effects of changes in the CCyB rate.

With a reduction in the CCyB rate, it is necessary to assess whether the reduction can be expected to have the intended effect and increase banks' willingness to lend to households and firms. There is currently limited empirical knowledge regarding the effect of lowering capital requirements on credit growth (see Box III). Stress tests can provide an indication of the magnitude of the potential effect of a lower CCyB rate on bank lending (see Box II), as can simple calculations based on how much capital is freed up from a lower CCyB.

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 requirement may 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, a comparison of banks' capital ratios with their capital requirements and capital targets may provide information on potential adjustments. This should be viewed in the context of prospects of future losses. If other requirements applying to banks are binding, or may become binding, this may limit the effect of a lower CCyB rate. In the event of a lower CCyB requirement, it may also be relevant to assess whether it is appropriate that banks withhold dividend payouts to strengthen their solvency and lending capacity. Such an assessment should consider whether the Norwegian capital market may be negatively affected by dividend restrictions. The effect of a reduced CCyB rate may also be influenced by the specified date for 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 may have consequences for the real economy. When banks raise lending rates to increase earnings, access to credit will become more costly. When banks tighten credit standards to reduce risk-weighted assets, access to credit is reduced. Effects on lending rates or credit standards will be minimal, if any, if banks raise more capital by deciding not to distribute dividends or by raising new equity. If they already have sufficient capital, they can leave their capital unchanged, in which case the increase in the capital requirement will not have direct effects on the economy. Experience from Norway shows that the largest banks let their capital ratios remain close to the total requirement, implying that banks often have to make adjustments to higher capital requirements.

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' adjustments to new capital requirements introduced in 2013 claims that banks adjusted 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 loans fell relative to household loans when the capital requirements were increased. Corporate loans are riskier and the risk weight is therefore higher than for household loans. Galaasen and Solheim (2018) describe a possible shift away from corporate lending as a result of an increased CCyB requirement. Using data for European banks, Gropp et al (2018) also find 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. The Basel Committee (2010c) summarises empirical analyses of the impact of stronger capital requirements on GDP, credit growth and lending margins.[1] The study points out the macroeconomic costs accruing from higher capital requirements, as they entail higher total financing costs for banks and hence 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. The 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 the advantages and disadvantages of the changes are taken into account.

The results of the Norwegian and international studies of increased capital requirements are uncertain and vary with the choice of methodology and analysis period. In most studies, the negative long-term impact is small. Common to many of the studies is that the shorter-term impact of increased capital requirements depends on how the central bank's response pattern is specified. Lower GDP growth and inflation owing to higher capital requirements may be counteracted by

lower policy rates. Moreover, the results depend on how fast the requirement is assumed to be phased in. Longer implementation times entail lower costs.

We can likely expect the opposite effect on the real economy if capital requirements are reduced. In the event of lower buffer requirements, banks can allow themselves to increase risk-weighted assets by increasing lending or increasing the share of loans with higher risk weights. This will affect the economy in that it becomes easier and perhaps less expensive to borrow. Banks may also choose not to change lending rates or credit standards, keeping the level of capital ratios unchanged even if the capital requirement is reduced. This may be because the bank expects that it will have to pay more for debt financing if it reduces its capital ratio as a result of an increase in risk. Another possible reason is that banks find it costly to adjust capital ratios upwards later if the capital requirement should increase again. A Danish study (see Imbierowicz, Kragh and Rangvid (2018)) suggests that banks tend not to reduce their capital ratios when the capital requirement is reduced.

There is limited empirical evidence about the effect of reducing capital buffers. Jiménez et al (2017) use experience from dynamic 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 poised to maintain credit supply during the financial crisis. This contributed to easing credit conditions for enterprises in a period with tighter access to financing. Imbierowicz, Kragh and Rangvid (2018), mentioned above, study the effects of both higher and lower capital requirements and finds that reduced capital requirements result in some increase in lending, and not only higher voluntary buffers. Arbatli and Juelsrud (2020) study the effects of lower capital requirements as a result of the phasing in of Basel II in Norway and finds that banks with a greater reduction in capital requirements increased their lending more. Thus, firms that borrowed from these banks increased investment more. ECB (2021) studies the relationship between a reduction in capital requirements and credit supply for European banks during the Covid-19 pandemic and finds that banks with capital ratios close to the capital requirements reduced lending the most, while a reduction in capital requirements that increased the gap between capital ratios and requirements increased banks' credit supply.

[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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