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Capital Review Paper 4: How much capital is enough?

December 2018

Submission contact details

The Reserve Bank invites submissions on this Consultation Paper by 5pm on 29 March 2019. Please note the disclosure on the publication of submissions below.

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Publication of submissions

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The Reserve Bank may also publish an anonymised summary of the responses received in respect of this Consultation Paper.

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How much capital is enough?

Non-technical Summary

Bank Capital: What is it?

Banks get their money from two places – their owners (often referred to as ‘shareholders’) and people they borrow from, including depositors (often referred to as ‘creditors’). The money that banks get from their owners is referred to as ‘capital’.

Banks in New Zealand, like banks around the world, are required to have minimum levels of capital. This means that a minimum percentage of all a bank’s money must come from its owners.

This minimum requirement exists to ensure that the owners of a bank have a meaningful stake in the business, because the more the owners have to lose, the more carefully they’ll manage the bank. Another reason banks are required to have minimum levels of capital is in case the bank loses money. When a bank loses money, it is the owner’s investment in the business (the bank’s capital) that is lost first, not the money the bank borrowed.¹

When the amount of a bank’s capital gets too low, and it can’t get any more capital, the bank is likely to fail. So the more capital a bank has, the more money it can stand to lose before going out of business. Higher levels of capital better protect depositors.

Capital requirements are the most important component of our overall regulatory arrangements. In the absence of stronger capital requirements, other rules and monitoring of bank’s activities would need to be much tougher.

The Capital Review

It is important that the Reserve Bank’s banking regulations are up to date. There is also increasing evidence that the costs of bank failures – both economic and social (well-being) costs – are higher than previously understood. This is why we’re reviewing the capital rules for banks.

The Reserve Bank has already consulted on how to measure the amount of a bank’s capital.

The question we are asking now is:

What minimum level (percent) of a bank’s money should come from its owners?

Our Proposals

Banks currently get the vast majority of their money by borrowing it (usually over 90 percent), with the rest coming from owners (usually less than 10 percent). The Reserve Bank is proposing to change this balance by requiring banks to use more of their own money. This proposal is consistent with steps taken by other banking regulators after the Global Financial Crisis.

¹ The Reserve Bank’s ‘Bank Financial Strength Dashboard’ also provides some useful background information and relevant data on bank capital:
<https://bankdashboard.rbnz.govt.nz/summary>

The Reserve Bank is proposing this change to reduce the chances of banks failing in New Zealand. If banks in New Zealand fail, some of us might lose money and some of us might lose jobs. However, there would also be indirect costs on all of society that may be harder to see that would negatively impact the well-being of all New Zealanders. In the end, we would all bear the cost of bank failures, in one way or another.

This is why we want to make the chances of this happening very small – so small that a banking crisis in New Zealand shouldn't happen more than once every two hundred years. We are also making other proposals that would help ensure banks calculate how much capital they have more accurately.

Extent of changes

The proposal would see banks' capital levels increase materially. We are proposing to almost double the required amount of high quality capital that banks will have to hold.

In practice, actual changes to the amount that they hold will be less than double and will vary. The increase will depend on their current levels of capital, how much extra they choose to hold above the required minimum, and whether they are a large or small bank.

Generally, it will be an increase of between 20 and 60 percent. This represents about 70 percent of the banking sector's expected profits over the five-year transition period. We expect only a minor impact on borrowing rates for customers.

Possible Impacts

If banks increase their capital, they will be more resilient to economic shocks and downturns, which will strengthen New Zealand's banking system and economy.

What's the downside?

Because the level of a bank's capital can have an impact on the interest rate it charges on its loans, it is possible that higher capital requirements could make it more expensive for New Zealanders to borrow money from a bank. While we certainly take this into account, we think this impact should be minimal.

Another potential impact is that bank owners would earn less from their investment in the bank. While we agree that this is likely to be the case, we believe this cost would be more than offset by the benefits of a safer banking system for all.

What do you think?

Whether you agree or disagree with our proposals, or would like to contribute to the discussion, we'd like to hear from you.

A glossary of acronyms and terms used in this paper is available in Appendix 2.

Please send us your thoughts by 29 March 2019 to CapitalReview@rbnz.govt.nz

Executive Summary²

The purpose of this paper is to seek public views on a proposal to increase the minimum level of regulatory capital in the banking system.

The setting of capital requirements for the banking system is a fundamentally important policy decision, as it is one of the key prudential tools to support financial stability.

Societal harm caused by banking crises is complex and multifaceted. Some commentators and researchers focus on the impact of the crisis in terms of the contraction in lending and flow-on effects to output. However the impact of a banking crisis is much wider than output effects.

Unsurprisingly, when presented with widespread unemployment, downward pressure on wages, collapsing house prices and the other manifestations of a banking crisis, people develop a sense of vulnerability - they lose confidence, become anxious, become unable or unwilling to plan or commit to the future. Recent studies from the World Bank (amongst others) suggest a broader view of the cost of crisis and societies risk appetite may be warranted. This literature suggests it is these shock-induced effects – the loss of confidence and a growing sense of insecurity – rather than simply output effects that lead to an increase in societal ills such as poor mental and physical health and societal disconnection.

To reach the proposed calibration in this Consultation Paper, we have taken a multifaceted approach, in that we have looked at both theory and evidence ranging from historical loss data, empirical findings, stress testing, and other modelling tools. We have brought this information together into a risk appetite model. As with any model, judgements need to be made about design and calibration. One key area of judgement is around the society's risk appetite for a financial crisis and its effects on the real economy.

The expected effect on banks' capital is an increase of between 20 and 60 percent. This represents about 70 percent of the banking sector's expected profits over the five-year transition period. We expect only a minor impact on borrowing rates for customers.

In this paper we outline the risk appetite framework that we used to arrive at our proposed capital requirements. This framework incorporates a specific, two-part, policy goal which is:

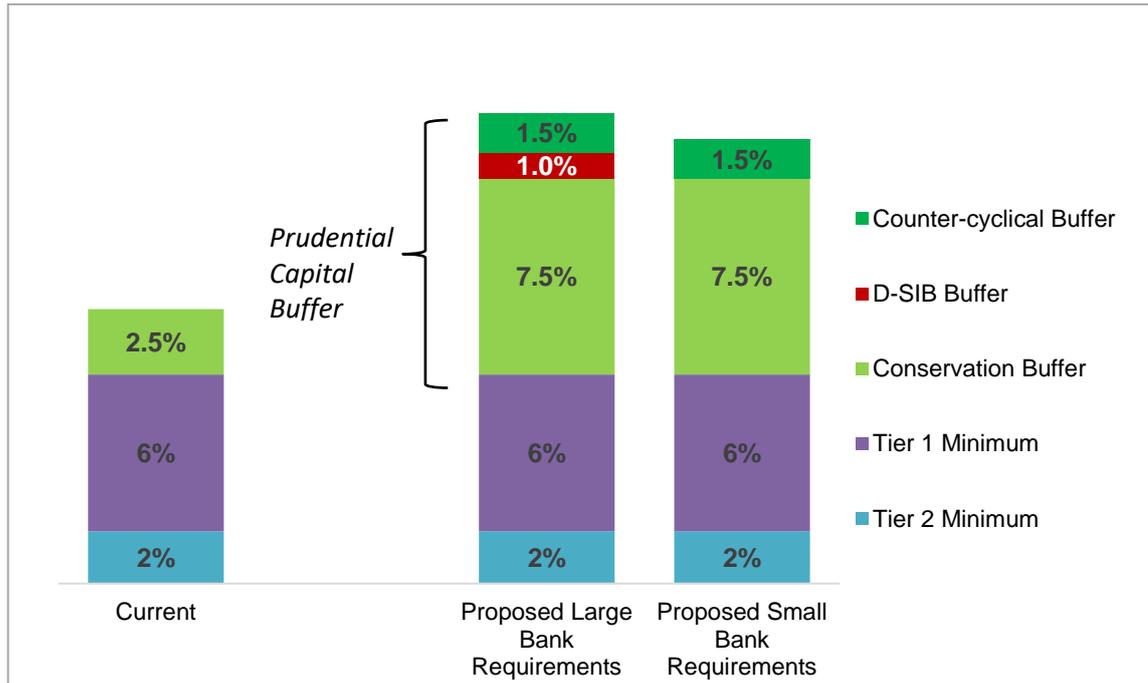
- Ensuring that the banking system has the confidence of depositors and other creditors even when subject to extreme shocks (delivering 'soundness'); and
- Having identified the level of capital needed to achieve soundness, increase soundness further if doing so can be achieved without any adverse impact on expected output (delivering 'efficiency').

In summary, we propose to:

² Appendix 2 provides a glossary of the key terms used in this paper.

- Limit the extent to which capital requirements differ between the Internal Ratings-Based approach (IRB) and the Standardised approach, by re-calibrating the IRB approach and applying a floor linked to the Standardised outcomes. This reflects one of the principles of the Capital Review: where there are multiple methods for determining capital requirements, outcomes should not vary unduly between methods. In essence, there should be as level a playing field as possible, both between IRB banks and between IRB and Standardised banks;
- These proposals are expected to raise risk-weighted assets (RWA) for the four IRB-accredited banks to approximately 90 percent of what would be calculated under the Standardised approach;
- Set a Tier 1 capital requirement (consisting of a minimum requirement of 6 percent and prudential capital buffer of 9-10 percent) equal to 16 percent of RWA for banks deemed systemically important, and 15 percent for all other banks;
- Assign 1.5 percentage points of the proposed prudential capital buffer requirements to a countercyclical component, which could be temporarily reduced to 0 percent during periods of exceptional stress;
- Assign 1 percentage point of the proposed prudential capital buffer requirement to D-SIB buffer, to be applied to banks deemed to be systemically important;
- Retain the current Tier 2 capital requirement of 2 percent of RWA, but raise the question of whether Tier 2 should remain in the capital framework; and
- Staged transition of the different components of the revised framework over the coming years.

Figure 1: Proposed capital ratio requirements (as percent of risk-weighted assets)



We welcome feedback on our proposals. The deadline for feedback is 29 March 2019.

Introduction

1. Banks' capital is a critical safeguard for the financial system. Capital is the form of banks' funding that stands first in line to absorb losses that they may incur, protecting depositors and other creditors. Having sufficient capital in the banking system promotes financial stability by reducing the likelihood of bank distress in the face of adverse conditions. A well-capitalised banking system will support the provision of credit to the real economy through all conditions.
2. Banking crises can have large and long-lasting impacts on an economy, beyond the initial economic downturn that may have precipitated them. In addition to the cost of lost economic output, broader societal costs of crisis events include impacts on health, mental wellbeing and social cohesion. When setting regulatory capital requirements, the Reserve Bank is effectively setting a risk appetite for both the frequency and severity of banking system stress events in New Zealand. This task involves balancing the benefits of higher capital levels, in terms of improved financial system stability, against potential costs, such as economic output that may be foregone from imposing excessively high requirements. This Consultation Paper discusses the Reserve Bank's proposed minimum capital requirements for banks locally incorporated in New Zealand and outlines the risk appetite approach the Reserve Bank has used.
3. The focus of this paper is on Tier 1 (going-concern) capital, both because of our focus on the highest quality of capital, but also because we are not proposing to change the regulatory requirements for Tier 2 capital at this time, although we are open to discussing whether Tier 2 should continue to play a role in the capital framework.
4. We are also proposing to have a significantly enhanced role for capital buffers in the capital framework, both in terms of the size of the total buffer, the composition of the buffer, and the operation of the buffer, including the supervisory response as banks enter into the buffer.

The Capital Review

5. In March 2017 the Reserve Bank launched a fundamental review of the regulatory capital requirements applying to locally incorporated banks (the 'Capital Review').
6. The current capital adequacy framework was adopted in 2013 and closely follows the international standards announced by the Basel Committee of Banking Supervision ('BCBS') in 2011. Our experience of the current framework, developments in other jurisdictions, and the BCBS's finalisation of aspects of the global standards prompted us to embark on the Capital Review.
7. The Capital Review is guided by six high-level principles:
 - Capital must readily absorb losses before losses are imposed on creditors and depositors;
 - Capital requirements should be set in relation to the risk of bank exposures;
 - Where there are multiple methods for determining capital requirements, outcomes should not vary unduly between methods;
 - Capital requirements of New Zealand banks should be conservative relative to those of international peers, reflecting the risks inherent in the New Zealand financial system and the Reserve Bank's regulatory approach;
 - The capital framework should be practical to administer, minimise unnecessary complexity and compliance costs, and take into consideration relationships with foreign-owned banks' home country regulators; and
 - The capital framework should be transparent to enable effective market discipline.
8. So far in the Capital Review we have considered what qualifies as capital and how banks measure risk. The in-principle decisions that have been made thus far in the Capital Review are summarised in Appendix 1.³
9. The in-principle decision to remove contingent convertible debt means that some banks will, in time, have to find new Tier 1 capital to replace that which has ceased to be eligible. Currently 16 percent of Tier 1 capital in the banking system is comprised of contingent convertible debt.
10. The in-principle decision to impose an output floor on IRB banks impacts on the base used to calculate the amount of capital required of IRB banks. In this paper we propose combining an output floor of 85 percent with a change to a calibration

³ Please refer to <https://www.rbnz.govt.nz/regulation-and-supervision/banks/consultations-and-policy-initiatives/active-policy-development/review-of-the-capital-adequacy-framework-registered-banks>.

parameter in the IRB framework (the 'IRB scalar') to 1.2. This is expected to increase the total RWA value of the four IRB banks from \$251bn to \$290bn, as at March 2018.

11. This paper also considers whether there should be non-risk based leverage requirements in the capital framework.
12. Although the decision was made to adopt Basel III's Standardised operational risk framework, and dual reporting, this paper does not discuss the implementation of these policies. These will be discussed in later consultations, as detailed in the proposed timeline presented in Appendix 4.

The risk appetite framework

13. The Reserve Bank is required, under the Reserve Bank of New Zealand Act, to promote the maintenance of a sound and efficient financial system, and to avoid the significant damage to the financial system that could result from the failure of a bank. "Soundness" and "efficiency" have a reasonably clear meaning in everyday language but we have to apply a specific meaning when it comes to setting capital policy. Ultimately, we need to translate the expectation articulated in the legislation into the calibration of our regulatory capital requirements. Here, the Reserve Bank is acting as the agent of society, and has to take into account the concerns and views of all stakeholders in a reasonable way.
14. The interpretation also needs to be sufficiently measurable to serve as a benchmark against which we can be held to account for our capital policy decisions. In this section we outline the "soundness and efficiency" interpretation we have applied when arriving at our proposed capital requirements.
15. A capital framework is made up of building blocks, be they definitions of qualifying capital instruments or specified methodologies that dictate how risk is calculated and aggregated. As well, banks typically operate with more capital than regulatory minima.⁴ In part, this is because banks prefer to maintain an operating buffer above regulatory minima to deal with year-to-year fluctuations in capital levels, but it may also reflect banks' own risk appetite, and the expectations of ratings agencies and funding markets.
16. In our view, only in exceptional circumstances would a prudential regulator be comfortable with regulated entities operating at the absolute minimum regulatory capital requirement most of the time. We recognise that in setting regulatory capital requirements banks can be expected to take a view on the appropriate voluntary buffer they wish to hold.

⁴ For example, combining the minimum requirement for Tier 1 capital and the conservation buffer delivers a regulatory Tier 1 capital target of 8.5 percent of RWA. As at the end of March 2018 the aggregate Tier 1 capital ratio across all locally incorporated banks was 13.4 percent.

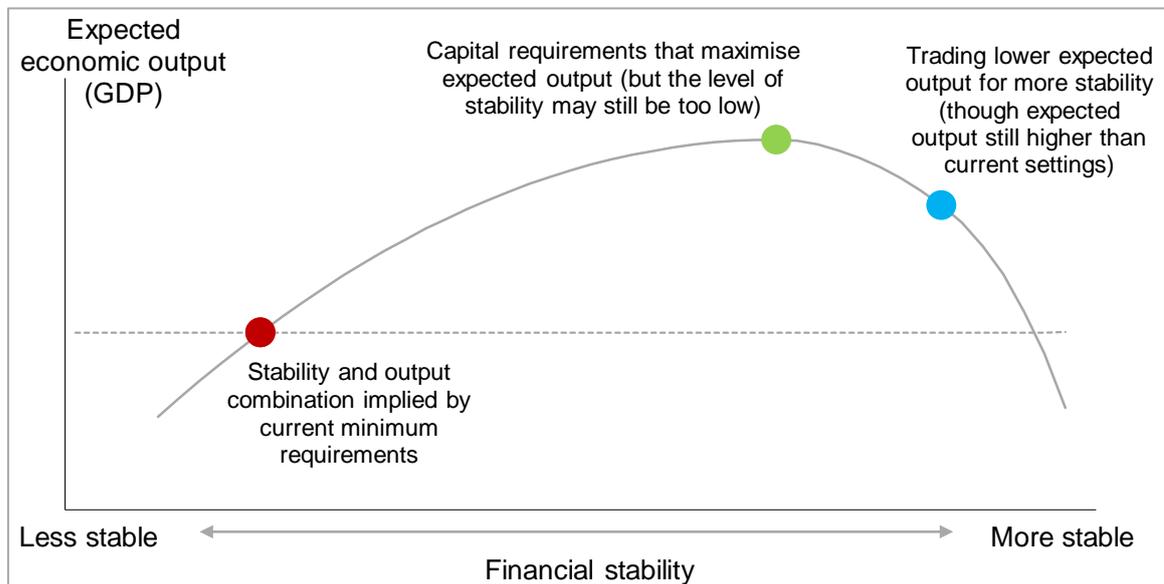
17. It is our view that the level of capital required of the banking sector should be sufficient to ensure banks can retain creditor confidence when subject to an extreme shock. Generally speaking this means banks can pay their debts – remain solvent in other words – when faced with large unexpected losses.
18. We can express our goal in risk appetite terms, focusing on the expected frequency and impact of financial crises. We specify that we want enough capital in the system as a whole to cover losses that are so large they might only occur very infrequently (for example once every 200 years). We believe this objective is reasonable and consistent with our legislated responsibility to maintain financial system “soundness”.⁵
19. Setting a goal to deliver ‘efficiency’ is not quite so straightforward. This is because, according to academics, regulators and banks themselves, the relationship between capital and economic activity is complex.
20. To summarise the common view about the relationship between capital and economic output very briefly, it is assumed that capital impacts on output in two competing directions. On the one hand, an increase in capital reduces the probability of a banking crisis and mitigates the extent of output losses that would occur in the event of a crisis. This is the output ‘benefit’ of capital. On the other hand, an increase in capital may prompt an increase in lending rates that reduces output by way of an impact on the volume of lending (this is the output cost of capital).
21. The literature suggests that up to relatively high levels of capital the benefits of increasing capital are expected to outweigh the costs. In this case, it makes sense to target higher capital, because doing so increases the stability and expected output (as the likelihood of banking crises fall).⁶ For very high levels of capital the benefits of increasing capital by a marginal amount may be quite small and outweighed by the costs. In this case, provided there is sufficient capital to deliver on the soundness objective, it makes little sense to increase capital further.
22. This complex relationship between output and stability informs how we think about efficiency in our legislation. There are combinations of capital which are ‘inefficient’ in that, if we fail to increase capital further, we are foregoing an opportunity to have a higher expected output. We believe a reasonable interpretation of ‘efficiency’ in the context of bank capital is therefore a regulatory setting – on the assumption the soundness objective is met – that realises available opportunities to increase stability (reduce risk) where doing so involves no loss of expected output.
23. Our risk appetite framework can be summarised as follows:

⁵ There are precedents for a 0.5 percent risk tolerance. A 0.5 percent risk of insolvency is embedded in insurance solvency standards across Europe, for example. The IRB capital equation for credit risk uses a 0.1 percent risk tolerance, although in practice the level of solvency delivered by the equation is somewhat less due to modelling uncertainties.

⁶ ‘Expected’ output is a weighted average level of output where the weights are the probability of a crisis (or no crisis) and the output levels are output in a crisis (or in the absence of a crisis).

- Ensure the banking system can retain the confidence of creditors when subject to an extreme shock, which means being solvent in a regulatory sense (delivering 'soundness'); and
 - Having set bank capital to at least achieve the soundness objective, take advantage of opportunities to generate more stability if doing so is unlikely to impose any material loss of expected output (delivering 'efficiency').
24. Our two-part policy goal lends itself to a two-step decision-making process:
- Step 1: Determine the level of capital that achieves the soundness objective. This is the provisional capital target.
 - Step 2: If it seems likely that increasing capital beyond what is required to achieve soundness will entail no loss of expected output, set the capital target above the provisional target.
25. We consider our policy goal and decision-making process a 'risk appetite framework' for capital policy. This is because our tolerance for risk – which we aim to be a fair reflection of society's risk appetite – plays a central role in both the policy goal and our decision-making process.⁷
26. The risk appetite framework we are applying when setting bank capital requirements is illustrated in Figure 3.

Figure 3: Stylised risk appetite framework



27. In Figure 3, "financial stability" refers to the probability that in any given year the banking sector will be solvent and enjoying the confidence of depositors and creditors. "Output" refers to expected output, taking into account all of the ways in which capital can impact on output (including the low output state caused by a financial crisis). Each

⁷ Note, we are not proposing this risk appetite framework be used other than for setting bank capital requirements.

point on the graph corresponds to a unique level of capital. As one moves along the graph to the right, the capital ratio, and the likelihood of financial stability, is increasing.

28. It is important to be clear on how we think about the meaning of 'efficiency' in the context of bank capital policy. Some may argue that higher capital increases banks' funding costs and makes them 'less efficient' at credit intermediation, for example. However, we think about it in terms of the impact of capital on output in all respects (not just the impact on banks' funding costs but also the consequences of a financial crisis) that lies at the heart of 'efficiency' in the context of bank capital policy setting.

Our analysis

29. Our analysis has a number of dimensions, ranging from looking at both theory and empirical evidence on historical loss data, stress testing, and other modelling tools. All of this analysis has informed, to varying degrees, our risk appetite model. As with any model, judgements need to be made about design and calibration. One key area of judgement is around the society's risk appetite for a financial crisis and its effects on the real economy.
30. We have considered what overseas regulators and other researchers have found to be the relationship between the level of capital and the probability of a banking crisis. Their estimates are sometimes based on regression analysis, sometimes other estimation methods. This option is attractive because it enables us to reflect a wide range of experiences in our policy setting, drawing on a variety of countries and types of crisis. However the downside of this approach is that the New Zealand-specific context cannot be captured in the estimates of the capital needed to ensure a sound banking system.
31. It is also important to acknowledge that the way risk weighted assets (RWA) is calculated varies from country to country (and bank to bank), and has changed over time with different versions of the Basel accords. This means aggregate RWA values can vary from country to country for what might be similar risks. This is important because RWA is the base to which regulatory capital ratios are applied.
32. Comparing RWA methodologies across countries with any precision is extremely challenging when the risks in countries can vary considerably, a problem compounded when banks are permitted to use their own modelled estimates when determining their RWA. Hence, when reviewing international findings that about the risk-weighted capital ratio required to avert crises it is important to realise that the findings would likely vary if a different country's RWA methodology was used.
33. On the crudest of measures – the ratio of aggregate RWA to aggregate unweighted assets in the banking system – it appears New Zealand is towards the higher end,

towards the US for example and some distance from the UK.⁸ On these grounds one could argue that results that reflect the US, rather than the UK, for example, might be more relevant.

34. A second, complementary, option is to use risk modelling tools to explore the possible scale and frequency of large losses in New Zealand. This requires us to consider the types of loans that are made by New Zealand banks, the historical record of bank losses in New Zealand, the drivers of banks' loan losses to be correlated, and the operational and/or trading-related risks to which New Zealand banks are exposed.
35. This second option has the benefit of enabling us to focus solely on the New Zealand banking system, with a key benefit being able to test the importance of key assumptions in a disciplined, coordinated way. Whilst all risk modelling tools are known to have weaknesses, they provide a useful tool for thinking about how much capital might be needed to avert a crisis. It is commonplace to use risk models when setting capital requirements for banks and insurance firms, for example, and risk models are a tool trustees use to set risk limits on managed funds.
36. A third option is to assess banks' resilience to hypothetical stress scenarios. Modelling the impact of scenarios on banks' balance sheets allows us to come to a view about the scale of potentially large, albeit infrequent, losses in New Zealand. Stress testing is regularly undertaken as part of the Reserve Bank's prudential supervision. Stress tests help to strengthen banks' preparedness for shocks and contribute to the Reserve Bank's understanding of financial system risks, but they have not yet been used to set capital requirements because of their limitations.
37. All three complementary approaches were used to inform our review of bank capital requirements.

International findings

Basel Committee on Banking Supervision (2010)

38. In 2010 the Basel Committee on Banking Supervision ('BCBS') published a report that summarised what was known at the time about the relationship between tangible common equity and the probability of a banking crisis.^{9 10} Their review included the findings from regression analysis as well as research based on portfolio risk modelling.

⁸ Firestone et al. (2017) have used an assumed ratio of RWA to assets of 0.66 for US banks, whereas Brooke et al. (2015) used 0.37 for UK banks. After applying the changes to the calibration of the IRB framework proposed in this paper, a similar calculation for New Zealand banks in aggregate results in 0.6 to 0.7.

⁹ BCBS (2010) "An assessment of the long-term economic impact of stronger capital and liquidity requirements." August 2010.

¹⁰ 'Tangible common equity' corresponds approximately to what is now considered to be common equity capital under the Basel III standards. It consists of shareholder funds less intangible assets and other deductions.

39. The BCBS reported that the probability of a crisis was 4.6 percent if common equity was 7 percent of risk weighted assets, which is the current minimum requirement for common equity under the Basel III standards (and in New Zealand).¹¹
40. In a 2015 report discussed later in the paper, Brooke et al. (2015) recalculated the BCBS's findings, converting tangible common equity into Tier 1 capital. They reported that the BCBS's study showed a 16 percent Tier 1 ratio (relative to RWA) was associated with a probability of crisis of 0.8 percent.

Table 1: Relationship between banking crises and capital (Basel Committee, 2010)

Tangible common equity ratio (as % of RWA)	Probability of a systemic banking crisis	Implied frequency of a banking crisis (crisis per X years)
6%	7.2%	14
7%	4.6%	22
8%	3.0%	33
9%	1.9%	53
10%	1.4%	71
11%	1.0%	100
12%	0.7%	143
13%	0.5%	200
14%	0.4%	250
15%	0.3%	333

Source: Basel Committee Long-term Economic Impact study (2010)

Bank of England (Brooke et al., 2015)

41. In 2015 researchers at the Bank of England (BoE) conducted a top-down and bottom-up analysis of the relationship between bank capital and the probability of a crisis. Assuming no impact from policies aimed to aid resolution, the estimated outcome of an 8 percent Tier 1 ratio was a probability of crisis of 1.2 percent during normal risk periods, rising to 5.5 percent in peak risk periods. The probability of a crisis was reduced to 0.5 percent to 3.1 percent (in moderate risk and high risk periods respectively) when Tier 1 capital was 14 percent of RWA. Even when Tier 1 capital was 16 percent the risk of a crisis during peak risk periods was 2.4 percent.

¹¹ At the time a new liquidity standard and the net stable funding ratio were being proposed. The BCBS also reported the relationship between tangible common equity and crisis probability assuming these new policies were implemented. The results were as reported above for capital above 12 percent of RWA, and the probabilities were lower for capital below that. If capital was 7 percent of RWA, assuming the new policies were adopted and effective, the probability of a crisis fell to 3.3 percent. It should be noted that New Zealand has not adopted the BCBS's liquidity standard, however our current liquidity framework bears conceptual similarities to the Basel standards.

42. The authors assumed that adopting polices to aid resolution would significantly reduce the probability of a crisis for a given level of Tier 1 capital. However even with this assumption, the probability of a crisis ranged from 0.3 percent to 1.7 percent when the Tier 1 ratio was 16 percent.

Table 2: Relationship between banking crises and capital

Tier 1 capital ratio (as % of RWA)	Tier 1 leverage ratio (as % of gross exposures)	Probability of a systemic banking crisis	Implied frequency of a banking crisis
8%	3%	1.2%	83
11%	4%	0.7%	143
14%	5%	0.5%	200
16%	6%	0.3%	333

Source: Brooke et al. (2015)

Table 3: Re-estimation of Basel Committee LEI study

Tier 1 capital ratio (as % of RWA)	Tier 1 leverage ratio (as % of gross exposures)	Probability of a systemic banking crisis	Implied frequency of a banking crisis
8%	3%	6.3%	16
11%	4%	2.9%	34
14%	5%	1.3%	77
16%	6%	0.8%	125

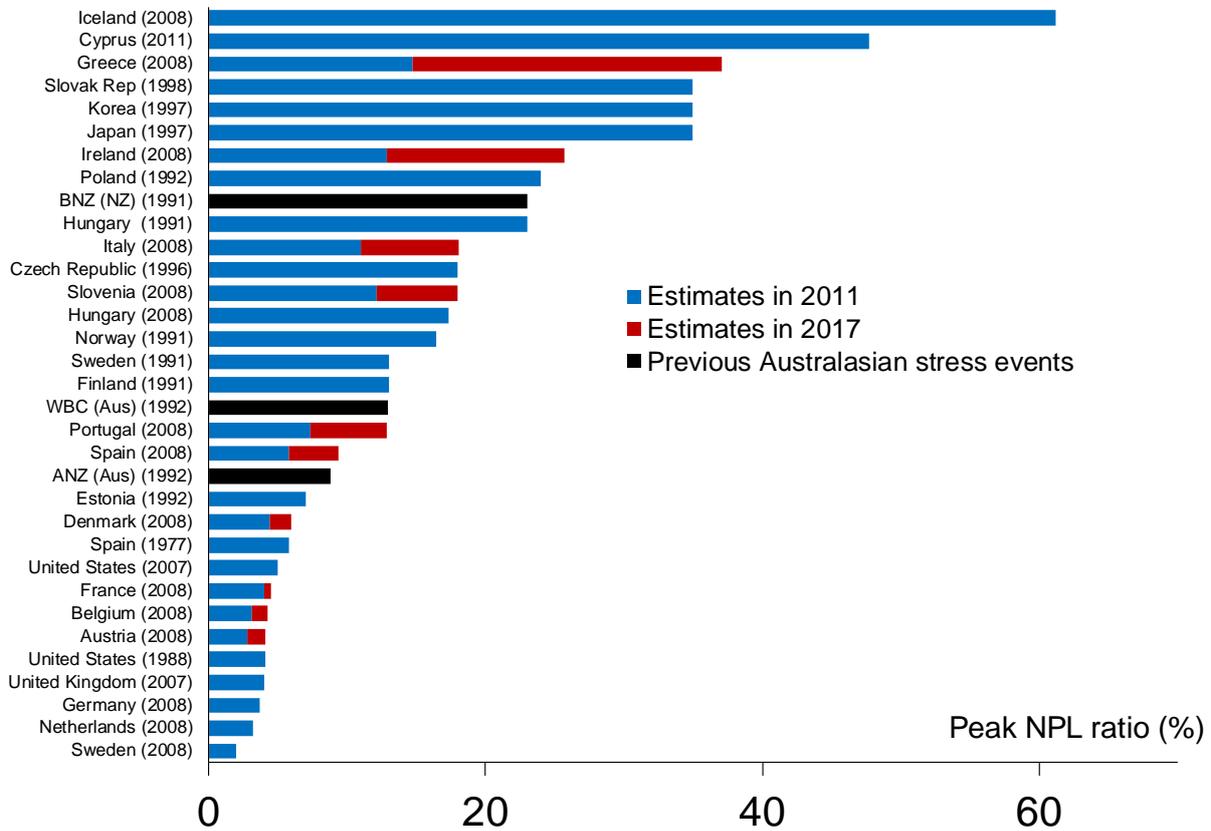
Source: Brooke et al. (2015)

IMF (Dagher et al., 2016)

43. In 2016 the International Monetary Fund (IMF) published staff estimates of the amount of equity capital that would have been sufficient to absorb the credit-related losses that occurred during crises experienced in a wide range of countries between 1970 and 2011. The analysis was based on peak non-performing loan ratios reported no later than 2011. The researchers made assumptions about the proportion of loan values that would be lost once the loan became non-performing (the loss given default or LGD), and banks' provisioning. They assumed, for example, an LGD of 50 percent to 75 percent (basing this on long-run US experience) and provisioning of 1.5 percent of loan assets. The authors concluded that common equity in the range of 15 percent to 23 percent of RWA would have been sufficient to absorb losses in 85 percent of cases.
44. Losses generated in the Global Financial Crisis (GFC) continued to emerge after 2011. Hence the peak non-performing loans (NPLs) ratios that were used in the IMF study were underestimates in some cases. In Figure 4 below we show the peak NPL ratios relied on in the 2016 study, for middle-high income countries, and more recent

estimates of peak NPL ratios. Given the scale of revisions in Ireland and Portugal, for example, it would seem the estimated levels for sufficient capital in the IMF study could reasonably be adjusted upwards.

Figure 4: Peak non-performing loan ratios (percent) for banking crises in 1970-2017



Source: Laeven and Valencia (2012, 2018), annual reports of BNZ, WBC, ANZ.

45. In Figure 4 we have included the peak NPL ratio reached by BNZ in 1991, and Australian banks Westpac and ANZ (1992). While neither New Zealand nor Australia have had banking crisis during this period (as that term is meant in the IMF study) these three banks experienced non-performing loans on the same scale, in the 1990s, as emerged in other countries during the GFC.

Federal Reserve Board (Firestone et al., 2017)

46. In 2017 economists at the Federal Reserve Board in the US published the findings from a 'bottom up approach'. The researchers simulated the net income of US banks and estimated the aggregate capital shortfall that would be large enough to constitute a 'financial crisis'. They used bank-level data covering the period 1988 to 2014. The authors concluded that when Tier 1 capital was 8 percent of RWA the probability of a financial crisis was 3.8 percent (the current Basel III minimum requirement (including buffer) is 8.5 percent and this is used in New Zealand currently). The authors estimated that, in order to reduce the probability of a crisis to 1 percent or less, Tier 1 capital would need to be 17 percent of RWA or more.

47. The analysts also explored what might be required assuming a positive contribution from the new liquidity regulations and an improved resolution regime.¹² The results still showed a probability of crisis of 2.6 percent when Tier 1 capital is 8 percent of RWA, and more than 0.5 percent when the Tier 1 ratio is 17 percent.

Table 4: Estimated probability of a financial crisis (percent) using a 'Bottom-up approach'

Tier 1 Capital Ratio (for RWA)	No adjustments for liquidity regulations or increased resolvability	Adjustments for liquidity regulations, but not increased resolvability	Adjustments for liquidity regulations, and 30% reduction for increased resolvability
8%	3.8	3.2	2.6
11%	1.9	1.8	1.3
14%	1.4	1.4	1.0
17%	1.0	1.0	0.7
21%	0.8	0.7	0.5
25%	0.7	0.7	0.5

Source: Firestone et al., 2017

48. The economists at the Federal Reserve also did a 'top down' approach, using regression analysis to predict the probability of a financial crisis given the system's capital and liquidity levels, and controlling for factors other than capital that might make the banking system vulnerable. This approach suggested Tier 1 capital of 8 percent of RWA generates a probability of crisis in excess of 4 percent. The top down approach found a Tier 1 ratio of 17 percent associated with a probability of crisis ranging from 0.5 percent to 3.5 percent.

¹² In the case of improved resolvability the authors adopted an assumption used by Brooke et al. – the capital required could fall by 30 percent – to provide comparability.

Table 5: Estimated probability of a financial crisis (percent) using a 'Top-down approach'

Tier 1 Capital Ratio (for RWA)	No adjustments for liquidity regulations or increased resolvability		Adjustments for liquidity regulations, but not increased resolvability	
	Specification (1)	Specification (2)	Specification (1)	Specification (2)
8%	6.3	6.8	4.4	4.7
11%	5.2	3.3	3.6	2.3
14%	4.3	1.5	3.0	1.1
17%	3.5	0.7	2.5	0.5
21%	2.7	0.2	1.9	0.2
25%	2.0	0.1	1.4	0.1

Source: Firestone, et al. (2017)

49. The findings from the research described above are summarised in the table below. The table illustrates the relatively consistent finding that a Tier 1/ RWA ratio in the vicinity of 16 percent is likely to deliver a sound banking system.

Table 6: Summary of research findings on capital needed to limit the probability of a crisis to 0.5 percent

Study	Capital needed to cap the probability of a crisis at 0.5%	
	Ratio measurement	Required amount
BCBS (2010)	CET1 (Equity) / RWA ¹³	10% to 13% (Bank of England restated as 16%+ Tier 1 Ratio)
Brooke et al. (2015)	Tier 1 Capital / RWA	14% to 16%
Firestone et al. (2017)	Tier 1 Capital / RWA	17%+
Dagher et al. (2016)	Equity / RWA	15% to 23% required to avoid 85% of the banking crises during the GFC

¹³ This is based on a pre-Basel III definition of CET1.

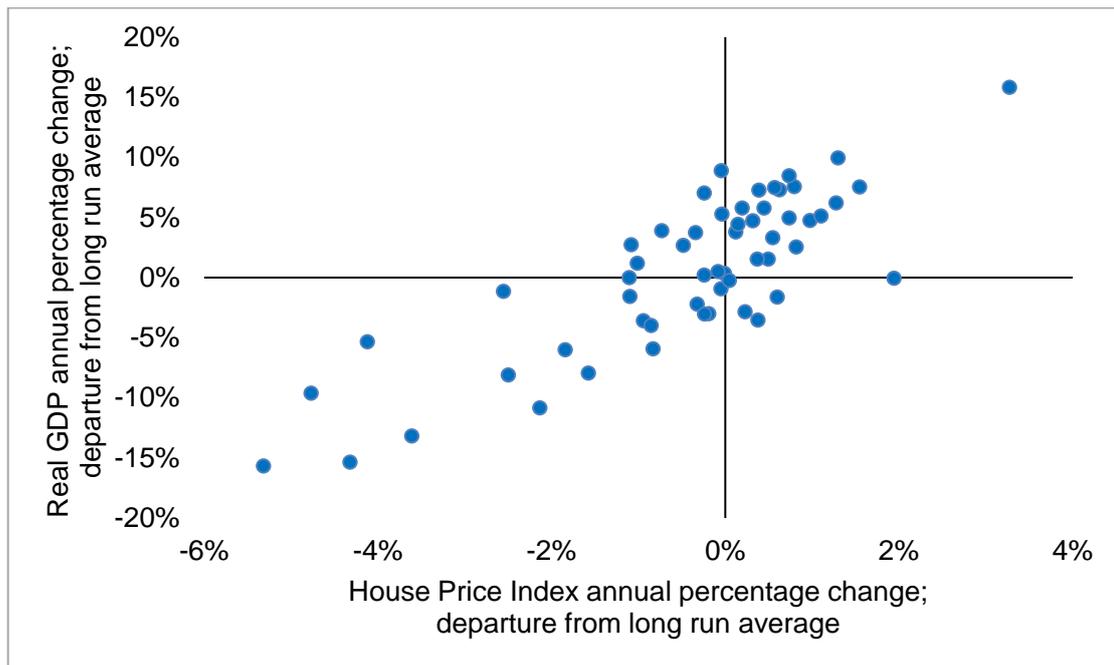
Modelling risk in the New Zealand context

50. There is a consistency in the findings from overseas studies reviewed above – these suggest that Tier 1 capital equal to or exceeding 16 percent of RWA is needed to limit the probability of a crisis to 1 in 200 years or thereabouts. However we believe it is important to also consider the New Zealand-specific context.
51. The small size and concentrated nature of the New Zealand banking sector, and the absence of any banking crisis here in the post-war era, poses some pragmatic constraints on the range of analytical tools that are available to us. In particular, in our view, the value of regression-based analysis applied to historical and cross-sectional loss data, along the lines of the top-down approaches discussed above, is likely to be limited in the New Zealand context.
52. Portfolio risk modelling, however, is an approach that is used in finance for setting strategy in the face of uncertainty. Portfolio risk models can be used to explore the scale of unexpected losses that might arise from a portfolio of assets with some probability, for example. This issue is similar to the challenge facing regulators tasked with setting capital requirements for banks when future bank losses are unknowable. Portfolio risk models are based on a set of simplifying assumptions and allow users to conduct sensitivity analysis. This helps inform judgement-based decisions.
53. A portfolio risk model underpins the capital calculation that IRB banks use to determine their RWA for credit risk.
54. In order to incorporate the New Zealand context in our analysis, and as a complement to our review of overseas findings, we used a portfolio risk model. We used the model to explore what level of Tier 1 capital might be sufficient to ensure the sector retained the confidence of the market after a large shock.
55. We used the risk tool to explore the range of *credit-related* losses that could potentially emerge from the aggregate portfolio of loans outstanding in the New Zealand banking system. In order to calculate the capital requirements needed to ensure solvency of the banking system in all but the rarest occasions (assumed to be 1 in 200 year events) we assumed the capital currently held to address operational and market risk would continue to be held (this is approximately one percentage point of additional capital).
56. Like the model underpinning the Basel III capital equation, our portfolio risk tool was a value-at-risk model ('VaR' model). In our case, we used the tool to consider the potential losses arising from aggregate lending. VaR models applied to portfolios of loans require users to provide assumptions about the average annual probability of default of the portfolio (PD) and the loss given default (LGD). These parameters feed into an estimated loss distribution, which is key to the analysis as it allows users to infer the probability that a given loss or something larger will eventuate, which is the key issue of interest.

57. To apply the model to aggregate lending, then, we needed to form assumptions about the long run annual average probability of default (PD), the loss given default (LGD) and correlation R. We explored a range of values for these variables, basing our assumptions on a variety of data.
58. In the case of long run average annual PD, for example, we considered New Zealand banks' impaired asset ratios, calculated over a long period. The average over all banks, from 1988 to 2017, was 3.2 percent on an unweighted basis, and 1.4 percent on a system-weighted basis (i.e. weighting banks' individual impairment ratios according to share of total assets). This is the longest data period available to us. The impaired asset ratio is an imperfect proxy for the annual PD because an asset may be classified as impaired more than a year after it first became classified as such (hence the impairment ratio in any given year will include more than one year's worth of impaired assets). Moreover, historical impairment ratios may understate impairments on all credit risk exposures (as not all assets bear credit risk), and will reflect changes in the definition of impaired assets over time.¹⁴ We accommodated these limitations by adopting a modelling range of 1.5 percent to 3 percent for the PD input.
59. We adopted a range of 35 percent to 50 percent for the LGD input. This partly reflected the LGD values currently prescribed in the IRB capital framework (for example, a minimum prescribed LGD value of 42.5 percent applies to high LVR farm loans). Our LGD range also reflects the results of stress tests, held with the big four banks, in 2014 and 2017. Based on the aggregate loan exposure of the four large banks, the 2017 stress test indicated a weighted average LGD rate of 31 percent. The estimated LGD rate from 2014 was slightly higher, at 37 percent.
60. Input values used for correlation R reflect our views about the relationship between the probability of default and GDP, seen through the lens of house prices and, to a lesser degree, rural land values (security value is a relevant factor for whether a borrower might default). Our input values were also informed by correlation values used in the current capital rules. We adopted a range of 0.16 to 0.4 for correlation R input. The close relationship between house values and real GDP can be seen from Figure 5, which plots the deviation from the long run average for annual growth in house prices and real GDP.

¹⁴ For example, Basel II requires exposures that are 90 days past due to be classified as in default.

Figure 5: NZ House Price Index and Real GDP, 1990-2018



Source: Stats NZ and RBNZ.

61. Based on our range of input values for PD, LGD and correlation R, our conclusion from our risk analysis is that Tier 1 capital equal to 16 percent of RWA is sufficient to cover credit-related losses (after taking account of provisions) and operational and market trading-related risk. In other words, a Tier 1 capital ratio of 16 percent of RWA is needed to ensure our banking sector retains creditor confidence after enduring an extreme shock.

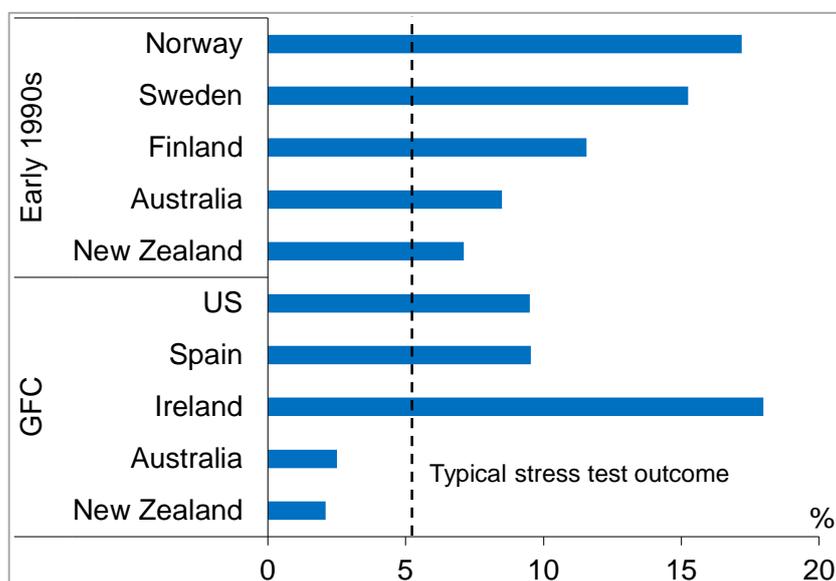
Stress tests

62. By assessing the impact of a hypothetical stress event on balance sheets and profitability, stress tests generate an estimate of the ability of banks to remain solvent during a severe crisis. Stress tests are a useful part of the supervision framework, and the Reserve Bank's view is that undertaking stress tests strengthens banks' understanding of risk and improves their internal risk management processes. Stress tests also improve our understanding of current and emerging risks to financial stability.
63. While stress tests are one useful lens on the calibration of capital requirements, there are several reasons why there is no automatic link between the two. First, a given stress scenario will not capture all possible risks facing the banking system. Second, it is difficult to capture the real-world complexities of a financial crisis. For example, stress tests assume banks know how the scenario will play out in advance, and do not explicitly take into account the second-round impacts of tightening lending standards and loan re-pricing on borrowers. Similarly, stress testing does not capture the complex interplay amongst various stakeholders, as banks assess the impact of a macroeconomic shock on their balance sheet alone. Finally, there is limited internal

evidence to inform the calibration of banks' models, partly because there has been no large loan loss events in New Zealand in recent decades.

64. Recent stress tests have found that the banking system can maintain significant capital buffers above current minimum requirements during a severe downturn. During the 2017 stress test, the capital ratios of major banks fell to around 125 basis points above minimum requirements, while earlier tests had a trough buffer ratio of around 200 basis points. However, stress test results are sensitive to assumptions on the scale and timing of credit losses, and on the ability of banks to generate underlying profit under stress.¹⁵
65. Credit losses assumed in the stress tests are below the rate observed in some severe historical crises (Figure 6). Factors supporting this conclusion could include greater macroeconomic flexibility (such as having a floating exchange rate and independent monetary policy) and tighter lending standards in recent years. However, stress test outcomes would be significantly more severe if credit losses increased by two percentage points, which is well within the range of uncertainty around the modelled loss rates. The timing of losses can also significantly amplify the impact on banks. For example, if losses are recognised in a short period, underlying profit will not be able to offset losses to the same extent assumed in stress tests.

Figure 6: Cumulative bad debt charge during historical crises (percent of initial assets)



Source: Dunstan (2018), RBNZ

¹⁵ See Dunstan, A. (2018) and Lilly, C (2018).

Assessing the impact of capital on output

66. Having settled on 16 percent Tier 1 capital ratio in our analysis, as being sufficient to meet our soundness objective, our risk appetite framework then requires us to consider whether there may be remaining opportunities, at this level of capital, to increase stability further with no material impact on expected output.
67. In order to make this assessment we have drawn on the 'optimal capital' literature. In this context 'optimal capital' means capital levels that lead to the highest possible level of expected output. As discussed earlier, on the one hand, higher capital levels lower the probability and impact of bank failure, providing a benefit in terms of a reduction in the likelihood of facing the output losses associated with financial crises. On the other hand, higher capital levels may increase banks' average funding costs, lowering the quantity of credit available to the economy at a given price. Reduced credit availability may lower the economy's potential output over time. Balancing these two competing effects, this analytical framework can estimate a capital ratio that maximises the expected value of output over time.
68. The optimal capital approach does not specify a risk tolerance. Whatever level of capital emerges from the analysis as maximising output is the optimal level, even though the probability of crisis associated with that level of capital might be high. In contrast, we are not indifferent to risk and have set our capital target specifically with a risk appetite in mind. However, the optimal capital literature is of assistance to us because it explores in great depth the complex two-way relationship between capital and output.
69. In order to assess whether there were any win-win opportunities remaining from a Tier 1 capital ratio of 16 percent, we need to form some view about the output cost of crises, on the one hand, and the impact of capital on lending rates and output, on the other. Our efficiency assessment involved adopting the methods used in this literature for our own analysis, using New Zealand-specific inputs where that was reasonable, and assumptions from overseas studies otherwise.
70. The range of empirical estimates of the output impact of financial crises is wide. One key judgement is in determining the extent to which the output losses that are observed alongside a financial crisis are attributed to the financial crisis itself, or to the underlying real shock to the economy that might have precipitated the crisis. A second judgement relates to the permanence of the impact of financial crises. Economic output can take a long time to recover to its pre-crisis trend, and in many cases may never do so. The counterfactual path of output chosen to measure the cumulative loss of output arising from a financial crisis therefore depends on assumptions about whether that pre-crisis trend was sustainable or not.
71. Table 7 summarises recent estimates of the cost of a financial crisis under different modelling assumptions. The estimated cost is measured as the net present value of output that is foregone which can be attributed to the financial crisis.

Table 7: The estimated output cost of financial crises

Study	Estimated cost of a financial crisis Source: Firestone et al. (2017)		
	Duration of impact on economy	Discount rate used	Net present value (NPV) as a percentage of GDP
Firestone et al. (2017)		2.7%	41% to 99%
BCBS LEI (2010)	No permanent effect	5%	19%
BCBS LEI (2010)	Moderate permanent effect	5%	63%
BCBS LEI (2010)	Large permanent effect	5%	158%
Brooke et al. (2015)	Permanent effect	3.5%	43%

72. The impact of higher capital requirements on banks' average cost of funding, and therefore the lending rates it charges borrowers, will depend on how the banks' investors respond. Investors in a bank's capital, such as its shareholders, typically require a higher return on their investment than debt investors, such as depositors. This is because investors in a bank's capital bear more of a bank's risk. More capital may imply that a bank's funding costs should increase to reflect a greater reliance on this costlier funding source. On the other hand, under certain conditions, economic theory would suggest that increases in a bank's capital ratios should result in no change in their weighted average funding cost. This would reflect the fact that the bank becomes a less risky investment for both its capital and debt investors, meaning both parties' required return on investment should fall.¹⁶
73. As this theoretical result is not likely to fully hold in practice, the extent to which changes in a bank's capital requirements affect its average cost of funding is ultimately an empirical question. We surveyed a range of recent studies that estimate the degree of 'Modigliani-Miller offset'.¹⁷ On average, we found that around half of the increase in a bank's average funding costs that would be implied by a change to a higher share of capital funding would be offset by a lower required return on a bank's capital and non-capital funding.
74. Estimating the impact on output of a move to a higher capital share in banks' funding structure requires both assessing the impact of a higher share of capital funding on the cost of bank credit, and then the impact of more costly bank credit on the steady-state level of output. From the range of studies we have surveyed, we consider a

¹⁶ See Modigliani, F., Miller, M. (1958).

¹⁷ That is, the proportion of an increase in banks' weighted-average cost of funding from a higher share of costlier capital funding that does not occur because of the decline in the required return on its capital and debt funding. An offset of 0 percent implies that changes in the share of funding from capital result in no change to the required return on capital and debt funding respectively, while an offset of 100 percent implies changes in the share of capital funding result in no change in the weighted-average cost of funding.

reasonable point estimate is that a one percentage point increase in a banking system's Tier 1 capital ratio from current levels may lead to a 6 basis point increase in the price of bank credit once Modigliani-Miller effects are taken into account.

75. By lowering credit availability at a given price, from the studies we have surveyed we consider a one percentage point increase in the Tier 1 capital ratio could lead to a 3 basis point decline in the steady-state level of GDP. This represents the ongoing 'cost' of higher capital requirements that should be balanced against the previously discussed benefits (avoidance of costly financial crises).
76. Depending on the authors' view of the inputs discussed above, and other assumptions in their analytical frameworks, studies that estimate an optimal capital ratio can arrive at a wide range of results. These results will also be sensitive to the jurisdiction being assessed, in terms of the calibration of the model to local financial system conditions (such as the initial cost of equity and debt and the banks' asset allocation), and definitions used such as the type of capital ratio being measured. Table 8 summarises the main conclusions from the range of optimal capital studies we have surveyed.

Table 8: Studies estimating an optimal capital ratio

Study	Optimal capital ratio (CET1 unless otherwise noted)	
	Range	Notes
BCBS (2010)	10% (crises have no permanent effect) 13% (crises have moderate permanent effects on GDP)	Uses tangible common equity as proxy for CET1
Schanz et al. (2011)	10% to 15%	Uses pre-Basel III definition of capital
Miles et al. (2012)	18% to 20% (crises have some permanent effects on GDP growth) 16% to 18% (crises have no permanent effects on GDP growth)	
Yan et al. (2012)	10%	
Junge & Kugler (2012)	Up to twice the Basel III minima	
Mendecino et al. (2015)	12% to 16% (Total capital ratio)	
Brooke et al. (2015)	10% to 14% (baseline result) 7% to 11% (costs of crises are temporary) 15% to 19% (improved resolution arrangements and other UK prudential reforms are ineffective) 7% to 11% (transition to higher capital is moderately costly)	
Cline (2016)	7% to 8% (leverage ratio) 12% to 14% (Tier 1 ratio)	
Firestone et al. (2017)	13% to 26% (Tier 1 ratio)	

77. To complement these international studies we have also undertaken our own modelling exercise using a similar analytical approach. This included an assessment of New Zealand-specific issues, such as the tax revenue impacts of different capital settings given the high proportion of the banking system that is foreign-owned, and the tools we have in place to resolve banks. Our modelling work showed a similarly wide range of plausible optimal capital ratios as the international literature discussed above, depending on the different assumptions and model inputs. Because of this uncertainty, we have not used this modelling to specifically calculate an optimal capital ratio for New Zealand.
78. With that said, the results of our modelling work, and our read of the international literature, suggest that the Tier 1 capital ratio of 16 percent that we think will meet our desired soundness objective is within the bounds of an optimal capital ratio, taking into account New Zealand conditions. In our view, at a Tier 1 capital ratio of 16 percent there would be little room to increase stability further without some impact on expected output. It is important to note here that, had our analysis indicated that we needed more Tier 1 capital than 16% to meet our soundness objective, that objective implies we would, within reason, propose the higher level regardless of the level of expected output associated with it

The going-concern capital proposal

79. As explained above, we are proposing to adopt a Tier 1 capital target of 16 percent of RWA. RWA in this ratio factors in changes to the IRB framework arising from the proposed recalibration of the IRB framework and imposition of an output floor, which we explain in more detail below.

Minimum requirements

80. It is important to note that we are proposing a much larger role for prudential capital buffer in this Consultation Paper, compared to the current capital framework. The current framework includes a capital conservation buffer, set to 2.5 percent, and countercyclical capital buffer, currently set to 0 percent. We are now proposing a prudential capital buffer of 10 percentage points.
81. The important change in what we are proposing is in how we allocate the Tier 1 requirement between a regulatory minimum – which if breached means a bank is in breach of its Conditions of Registration – and prudential capital buffer. The consequences of entering into the prudential capital buffer vary in significance because, as will be explained below, we propose escalating supervisory responses and dividend restrictions when banks breach the buffer. Entering into the prudential capital buffer would not be a breach of a condition of registration in and of itself.
82. We are proposing a Tier 1 ratio of 6 percent of RWA as a regulatory minimum, which is unchanged from the current capital adequacy framework. Of this, no more than 1.5

percent of RWA can be contributed by AT1 capital or non-redeemable preference shares.¹⁸ We propose that the balance of 10 percent consists of prudential buffers.

83. Unlike the Tier 1 minimum requirement, which must be met with common equity and AT1 instruments, we propose that the prudential buffers be met solely with CET1 capital, as is currently the case. Our proposed prudential buffers are outlined in more detail later in the paper.
84. The current capital framework includes a minimum gone-concern (Tier 2) capital ratio of 2 percent of RWA. The section on 'Tier 2 capital' invites submitters' views on the role for Tier 2 capital, given the proposed emphasis on going-concern (Tier 1) capital.

Output floor and calibration of the IRB approach

85. Changes to RWA arising from policy decisions made following the 'denominator' consultation affect the quantum of capital required under the proposed Tier 1 capital target, in particular, the setting of an 'output floor' on RWA calculated under the IRB approach to credit risk.¹⁹ The 'output floor' sets a lower bound on the RWA outcomes produced from the IRB approach, tying them to the outcomes to a percentage of the outcomes that would be calculated under the Standardised approach. As at March 2018, RWAs produced by the IRB approach were on average 76 percent of the RWA outcome that would be produced under the Standardised approach.²⁰
86. Consistent with the principles of the Capital Review, the Reserve Bank's objective is to reduce average differences in RWA outcomes between the IRB and Standardised approaches while preserving the risk differentiation benefits that the IRB approach can offer. As discussed in Appendix 3, the Reserve Bank's preferred approach to determining IRB banks' credit risk RWA is to:
 - i. Adjust a parameter in the existing IRB framework (the 'IRB scalar') to reduce the average difference in RWA outcomes between the IRB and Standardised approaches. An increase in the IRB scalar would result in a more conservative calibration of New Zealand's IRB framework while fully preserving its risk differentiation properties.
 - ii. Set an output floor linked to the Standardised approach at an aggregate portfolio level, at a calibration that is not usually expected to be binding. The output floor would act as a backstop, limiting the maximum amount of RWA reduction available from the use of the IRB approach.

¹⁸ In December 2017 the Reserve Bank made the in-principle decision to no longer recognise contingent convertible debt as Tier 1 capital. Only non-redeemable preference shares and common equity will be available under the revised standards.

¹⁹ The Reserve Bank has also revised its decision to standardise externally-rated large corporates. Please refer to Appendix 3 for more information.

²⁰ We expect supervisory adjustments to one bank's IRB models following the Reserve Bank's Benchmarking project are likely to increase this figure to 80 percent.

87. We propose that the credit risk RWA for IRB banks would be determined by the higher of i) credit risk RWA calculated under the IRB approach (incorporating the higher IRB scalar); and ii) credit risk RWA under the Standardised approach multiplied by the output floor.
88. We propose to increase the IRB scalar from its current calibration of 1.06 to 1.2. We also propose to set an output floor at 85 percent of the Standardised outcome, on an aggregate portfolio basis. We estimate that these two adjustments will increase IRB banks' aggregate RWA to 90 percent of the outcome that would result under the Standardised approach. This outcome would materially close the gap between IRB and Standardised banks, and is consistent with the third principle of our Capital Review (where there are multiple methods for determining capital requirements, outcomes should not vary unduly between methods).
89. The proposed output floor and scalar settings, along with the requirement to standardise the sovereign and bank portfolios, are expected to increase aggregate RWA across the four IRB banks by approximately 16 percent, or \$39bn, relative to March 2018 levels.

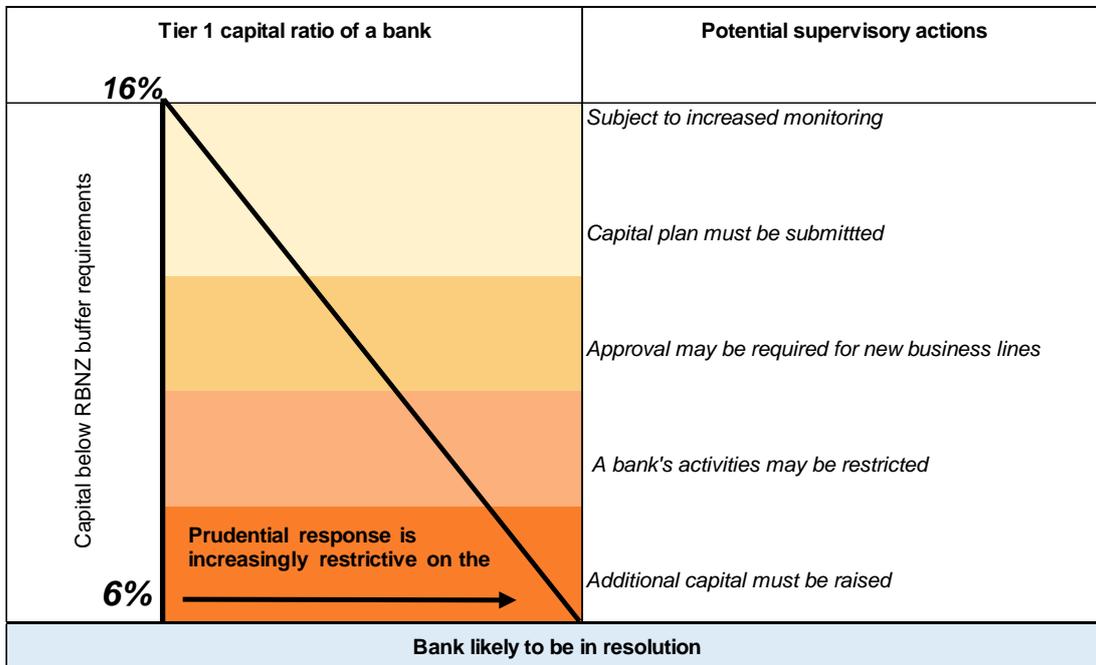
Operational aspects of prudential capital buffer

90. There are important differences between prudential capital buffer requirements and the regulatory minimum capital ratios. Take, for example, the minimum Tier 1 requirement of 6 percent. This is a minimum requirement in that a registered bank will be in breach of its Conditions of Registration if its Tier 1 capital ratio falls below 6 percent of RWA. In contrast, a buffer requirement means banks are expected to be above the buffer level of capital but would not be in breach of its conditions if it were to operate inside it (all else equal), for example following a large loss event.
91. The current capital framework requires banks to maintain a conservation buffer of 2.5 percent of RWAs in CET1 capital, beyond the CET1 needed to meet the minimum requirements. Banks can enter into this buffer without being in breach of their conditions of registration. However, once in the buffer they face limits on their ability to distribute their earnings, for example through dividends, and must provide a plan for the Reserve Bank's approval setting out how the bank will rebuild its buffer.
92. A bank will not be in breach of their Conditions of Registration if they enter into our proposed prudential capital buffer. However, we propose they will be subject to automatically triggered restrictions on discretionary payments and an increasingly intensive supervisory response (for example, preparation of a capital plan, as is the case with the current conservation buffer). These two policies are quite separate in that they may be triggered at different levels within the prudential buffer.
93. We are proposing that when Tier 1 capital is between 13.5 percent and 16 percent discretionary payments such as dividends to shareholders, or distributions on Tier 1-qualifying preference shares will be limited to 60 percent of net earnings. If Tier 1 capital is below 13.5 percent but above 11 percent, discretionary payments will be

limited to 30 percent. At Tier 1 levels below this, no discretionary payments will be permitted.

- 94. The escalating supervisory response (ESR) to a bank entering the prudential buffer will vary depending on the extent to which a bank has entered into the prudential buffer. We are not yet in a position to consult on a fully developed suite of supervisory responses, but we can illustrate the policy with indicative responses as outlined in Figure 7.²¹
- 95. An important aspect of the proposed buffer policy is that it complements and coexists with the 'business-as-usual' supervision of banks that is undertaken by the Reserve Bank. It is not a substitute for the monitoring and engagement with banks, supplemented by enforcement action where necessary that we are currently undertaking. However, together with the proposed output floor on IRB models, it should facilitate less detailed scrutiny over risk models, and to some extent may alleviate the need for the Reserve Bank to significantly intensify our supervision activity.
- 96. We are not, at this time, seeking feedback on the detailed supervisory responses we would take as banks enter into different tiers of the prudential capital buffer. However we do welcome feedback on the proposed size of the prudential capital buffer, bearing in mind the role we are proposing for buffers.

Figure 7: Stylised escalated supervisory response



- 97. The high level concept is that as banks go further into the prudential capital buffer, the nature and consequences of the supervisory response is increasing severity. In bad

²¹ We have populated our illustration of our proposed escalating supervisory response using measures employed in the US Prompt Correction Action framework.

times especially, capital is a lagging indicator and the escalating nature of the intervention is designed to stop and reverse deterioration to the extent possible.

98. The details of the nature of the supervisory response, the precise trigger points, the timeframes and obligations on banks to respond, and so on are important details, which warrant a standalone consultation with stakeholders. For the purposes of this Consultation Paper, we merely wish to introduce the concept of an Escalating Supervisory Response, and to illustrate the sorts of response we have in mind.
99. Currently the Reserve Bank has an array of possible supervisory responses, so in this regard we are not proposing new tools or powers. What we are proposing to do is to develop a framework of escalating supervisory responses based on objective triggers that can provide clarity and much more certainty about the circumstances and conditions under which we would expect to use our tools.
100. Examples of the current tools and powers available to the Reserve Bank under existing legislation are information gathering powers, such as section 94, 95, and 99 of the Reserve Bank of New Zealand Act, powers to issue directions (section 113), or the power for a bank to be placed into Statutory Management (section 117).
101. The intention, following a consultation process on the details of the escalating supervisory response is that the Reserve Bank would produce a set of guidelines, principles, and/or requirements to formalise and clarify when we expect existing powers to be used and under which circumstances (noting that the Reserve Bank will always need to reserve the right to exercise its financial stability powers as appropriate to emerging circumstances).
102. On the other side of the ledger, when banks are operating above the prudential capital buffer, and with the additional risk mitigants that are being proposed for internal model banks especially, in the form of floors and scalars for example, the Reserve Bank will look to continue to give banks the discretion they currently enjoy, imposing relatively less of a regulatory burden on banks.
103. For example, the four largest banks in New Zealand operate under the internal models capital framework. These banks develop their own capital models and seek Reserve Bank approval to use each and every model for their regulatory capital calculation. The process to do this is within four 'model change windows' each year. In practice, the Reserve Bank has found it difficult to review and approve model change requests in a timely manner, and in fact, have for a protracted period actually 'closed the window'. This means we have not been processing most model change requests from internal model banks.
104. This is an acknowledged bottleneck and source of frustration for the large 'internal model' banks. The combination of measures being proposed in the various components of this Capital Review, will for example facilitate a much more streamlined and efficient process for internal model approval. Other initiatives to improve the efficiency of supervision and smooth the ease of compliance, such as establishing

materiality thresholds for breaches of Conditions of Registration, and providing more guidance on when model change approval is required are either underway or will be consulted on next year. Indeed, whether model change approvals are required at all, or whether some form of notification and Pillar 2 response (capital overlay if there are concerns about a model) may be a better approach and all will be considered.

Countercyclical capital buffer (CCyB)

105. In the aftermath of a financial crisis, a case can be made for temporarily reducing the size of the regulatory buffer. The top segment of the buffer could be set to zero during these exceptional circumstances (but not otherwise), meaning all the banks to which it applied could have Tier 1 capital marginally lower for a period. In our view, it is likely that this step would slow the speed of transition back to the 'normal time' capital buffers.
106. The objective of providing increased flexibility to operate with lower capital ratios after a systemic crisis would be to reduce the likelihood of a severe credit crunch. The buffer of capital that can be used to support lending during a systemic crisis is known as the countercyclical capital buffer (CCyB), and is one of the macroprudential tools available to the Reserve Bank. Globally, the CCyB is a new, and untested, macroprudential tool, so evidence of its impact on bank lending is limited. However, there is international evidence that reductions in other forms of regulatory capital requirements can cause an increase banking system lending.²²
107. The CCyB we are proposing would have a positive value at all times, except following a financial crisis. The 'early set' component of the CCyB would be built up automatically once the banking system has returned to profitability and the economy is recovering from the effects of the financial crisis.²³ There is a high degree of certainty that the early set buffer will be built up prior to a systemic crisis. The CCyB could also be increased further during periods of elevated systemic risk.
108. We are consulting on a 1.5 percent 'early set' CCyB. This calibration aims to balance the macroprudential objective of supporting lending, against the risk that capital buffers will need to be drawn on to absorb subsequent further losses. We believe that a 1.5 percent CCyB could potentially support up to 10 percent of lending during a crisis. In our view, informed by international evidence and our own analysis, a higher calibration for the early CCyB would mean that banks could operate at capital ratios that do not meet our soundness objectives. Banks that fall within the adjusted regulatory buffer during a crisis would be subject to the escalating supervisory response discussed in the previous section.

²² For example, see Jiménez, G, Ongena, S, Peydro, J, Saurina, J (2013); and de Ramon, S, Francis, W, Harris, Q (2016).

²³ The Bank of England and Central Bank of Ireland both have an early set component of their CCyB. Many countries have also implemented a CCyB early in the financial cycle, before there has been a sustained period of rapid credit growth.

109. The Reserve Bank will publish its approach to setting the CCyB in more detail alongside its final policy position for the Capital Review. This will include proposals for how quickly the CCyB would be increased following a financial crisis, supervisory expectations that would be in place once the buffer is cut, and indicators to guide both the release of the buffer and increases beyond the early set CCyB.
110. Under Basel III, the CCyB concept includes a ‘reciprocity’ principle whereby banks are required to reciprocate CCyB rates applying in jurisdictions where they have risk exposures. For example, an overseas bank with 10 percent of its total private sector credit exposure (on a risk-adjusted basis) located in New Zealand would face an additional capital requirement equal to 10 percent of the applicable New Zealand CCyB rate. New Zealand is not a Basel Committee member, meaning that it is not guaranteed that overseas banks would be required by their home regulator to apply a New Zealand CCyB to their New Zealand exposures.
111. The Reserve Bank will engage with regulators, such as Australian Prudential Regulation Authority (APRA), as to whether the early set portion of the CCyB should (or will) be reciprocated. That is, this would mean that the additional capital would automatically increase group capital requirements for Australian banks. As we understand it, APRA’s position is that a New Zealand CCyB should be reciprocated for ADIs’ New Zealand exposures.²⁴ Any proposal to deem a portion of the prudential buffer a CCyB therefore has implications for foreign banks with exposures to New Zealand borrowers.
112. We are interested in hearing views as to what role this top segment of the capital buffer should play in the framework, and in particular:
- Should there be an option to set the top segment of the prudential buffers to zero in the exceptional circumstances following a crisis; and
 - Is 1.5 percent an appropriate calibration for the ‘early set’ component of the CCyB?

Domestic systemically important bank buffer (D-SIB)

113. New Zealand’s banking system is highly concentrated with the four Australian-owned banks accounting for 88 percent of system assets. These four banks are clearly ‘systemic’. Our proposed Tier 1 capital ratio requirement has been set to reflect our assessment of the capital levels needed to ensure that the system *as a whole* is likely to maintain market confidence, which includes the system remaining solvent in the face of very large unexpected losses. Our capital policy and risk appetite reflects the systemic effects we envisage would follow should a major bank fail.
114. Although the failure of a smaller institution is not likely to result in financial instability, the failure of any registered bank has the potential to undermine public and market confidence in the soundness of other institutions. Moreover, a case can be made that inherent risks are higher in smaller institutions. For example, there may be less

²⁴ Refer to Part A of APRA’s Prudential Practice Guide APG110 – Capital Buffers, August 2016.

diversification in the composition of loan portfolios, or relatively lower underlying profitability compared to larger peers due to a lower ability to realise economies of scale. On this basis a case could be made for banks with less systemic importance to have similar levels of capital as 'systemically important' banks.

115. On the other hand, there will also be practical differences in the ability and responsiveness of small and large banks to our proposed capital requirements. One can look at the time it would take banks to achieve 16 percent Tier 1 capital, assuming all banks grow at a similar rate (here we assume all banks' credit exposures grow at 6 percent, a similar rate to the growth in credit across the system in recent years). We estimate that the large four banks would be able to achieve the 16 percent target over a period of approximately 5 years through retained earnings alone, taking into account proposed changes to the IRB framework that affect their RWA calculation. In contrast, we estimate that the smaller banks, as a group, would take longer, something in excess of 7 or 8 years.
116. On balance, however, we think it is useful to view the difference between larger and smaller banks through the risk appetite lens. The risk appetite calibration is at a system level, and while the Reserve Bank is obviously concerned that there is an adequately robust fence at the top of the cliff for both large and small banks, the systemic impact of a small bank failure is likely to be much less than that of a large bank. Another way to articulate this, is that you may have a higher risk appetite for balancing the regulatory impost of higher capital against the likelihood of failure.
117. While the four biggest banks in the system, at 88 percent of system assets, currently meet any reasonable definition of 'systemic', that may not always be the case. There are various thresholds within the current prudential requirements that could be used, often, but not always based on size. Therefore, we will need to undertake further policy work to set up a D-SIB framework and to confirm which banks should be classified as D-SIBs. We intend to publish an approach to setting up a D-SIB framework in more detail alongside the final policy position for the Capital Review.

Table 9: Proposed capital impacts on Standardised banks and IRB banks

Capital impacts with proposed Tier 1 target	Standardised banks	IRB banks
Current RWA \$bn	38.4	251.1
New RWA (post floor and scalar) \$bn	38.4	290
Current Tier 1 \$bn	5.2	33.6
Current Tier 1 as percent of current RWA	13.60%	13.40%
Proposed Tier 1 using 16% of RWA, \$bn	6.2	46.4
Increase required in Tier 1 \$bn	0.9	12.8
Non-compliant AT1 to be replaced \$bn	0.1	6.2
Net earnings, average past five years \$bn	0.3	4.4
Estimated number of years required to meet new requirements through retention of earnings²⁵	7+ years	5 years

Tier 2 capital requirements

118. New Zealand's current capital framework requires a bank to have Tier 2 capital of 2 percent of RWA, taking the minimum capital requirement to 8 percent of RWA (or 18 percent and 17 percent for systemic and non-systemic banks respectively if you add in the buffer).
119. As discussed in Box 1, Tier 2 capital serves a different purpose from Tier 1 capital. Unlike Tier 1 capital, Tier 2 capital is considered to only have "gone-concern" loss absorbency. This is because Tier 2 capital only absorb losses when the bank is being wound up or liquidated. This means Tier 2 capital can support resolution actions, but not the on-going operation of the bank.
120. Our focus in the Capital Review has been on ensuring that the financial system remains sound by reducing the chances of banks failing. This has been the focus because of the potentially large, widespread costs across the real economy that could result from tightening of credit conditions, bank failures and any associated financial system crisis. This focus has led to the proposed Tier 1 capital ratio of 16 percent of

²⁵ This analysis assumes 6 percent annual credit growth and a stable return on interest-earning assets.

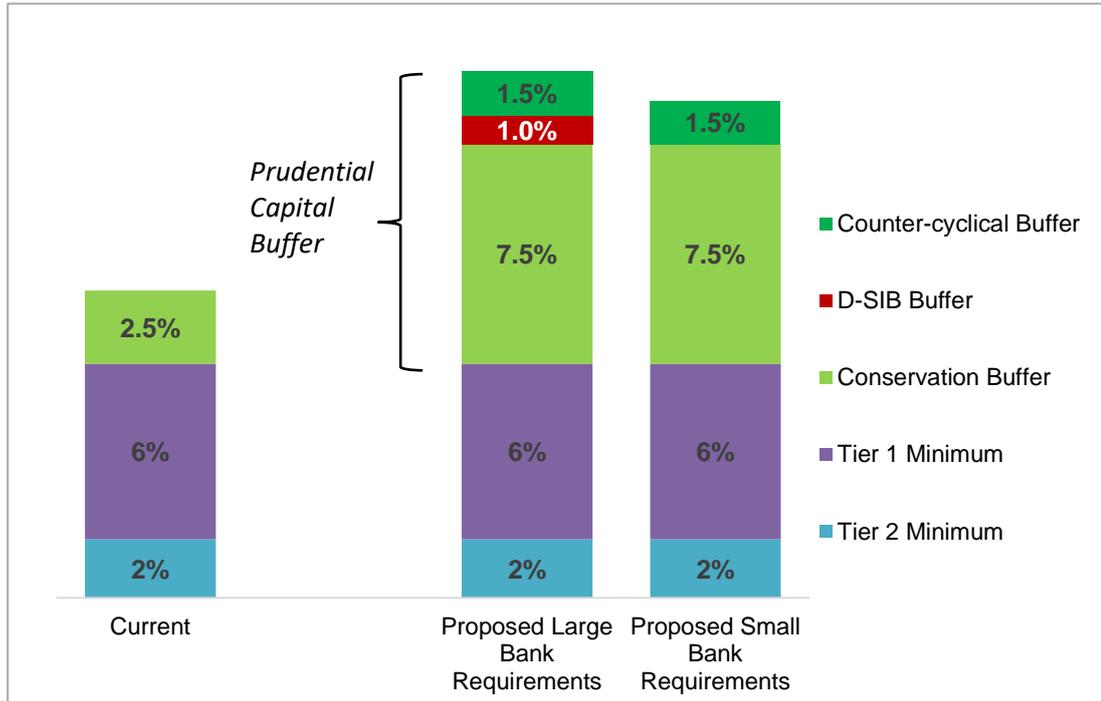
RWA for systemically important banks and 15 percent of RWA for non-systemically important banks.

121. The Reserve Bank considers that setting the Tier 1 capital ratio at 15 or 16 percent of RWA makes the chances of bank failure substantially smaller than they are under current requirements. Having more Tier 1 capital increases the likelihood that a bank would remain viable by absorbing any losses through Tier 1 capital without having to be put into resolution. This is the point at which Tier 2 would start absorbing losses. In this environment there may be less justification for setting regulations for the required level of Tier 2 capital.
122. We are currently still intending to require banks to have 2 percent of RWA as Tier 2 capital. However, we recognise that a higher requirement for Tier 1 capital raises a number of questions around the future role of Tier 2 capital.
123. As part of this consultation we are interested in hearing views about the role of Tier 2 capital. In particular we are interested in perspectives on the following questions:
 - What are the advantages and disadvantages of having Tier 2 capital requirements?
 - Is there continuing value in setting a specific requirement for Tier 2 capital, if the Tier 1 capital requirement is set to 15 or 16 percent?

Summary of capital ratio proposals

124. Figure 8 illustrates the composition of the capital ratio requirements. We are consulting on:
 - A Tier 1 capital ratio requirement of 16 percent for systemically important banks, which includes a conservation buffer of 7.5 percent, countercyclical capital buffer of 1.5 percent, and a D-SIB buffer of 1 percent;
 - A Tier 1 capital ratio requirement of 15 percent for non-systemically important banks, which includes a conservation buffer of 7.5 percent and countercyclical capital buffer of 1.5 percent; and
 - A question on whether Tier 2 capital requirements should be retained.

Figure 8: Proposed Capital Requirements



Leverage ratio

125. Unlike other jurisdictions, the current capital framework in New Zealand does not include a leverage ratio requirement. This Consultation Paper does not propose detailed leverage ratio requirements at this stage, but rather seeks views on the general question of whether leverage ratio requirements should be included in the New Zealand framework.
126. A high-level description of the exposure measure (to calculate the leverage ratio) is described below to allow submitters to understand the proposed leverage ratio requirements. The proposals focus on both minimum and disclosure leverage ratio requirements. A leverage ratio can be derived as:

$$\text{Leverage Ratio} = \frac{\text{Tier 1 Capital}}{\text{Exposure Measure}}$$

127. An excessive build-up of leverage in a system can lead to heightened risks for banks, and lead to a destabilising process of deleveraging during a crisis. Additionally, banks may underestimate risks or be exposed to risks that are inadequately captured by the current risk-based framework. A leverage ratio can address these issues by setting a minimum non-risk based capital requirement.
128. Including leverage ratio requirements in the capital adequacy framework would also align the New Zealand framework more with the international Basel standards, as well

as the proposed APRA standards. There are potential advantages of harmonising New Zealand's capital framework with Basel or APRA standards in the case of the leverage ratio, as detailed in our previous summary of submissions.²⁶ The key advantage for a leverage ratio is the potential for greater understanding of the New Zealand framework and banks.

129. On the other hand, the mitigants to the risks of maintaining IRB modelling put forward as part of the Capital Review, and the proposed minimum capital ratio, will address some of the risks that a leverage ratio aims to capture.²⁷ The leverage ratio is also not expected to be binding on New Zealand banks during normal times with the proposed capital ratio and we do not believe it would impact a bank's long-term portfolio allocation.
130. The options we are consulting on are:
- 1) No leverage ratio requirements (*status quo*)
 - 2) A requirement to disclose a leverage ratio but not set a minimum requirement
 - 3) Disclosure and minimum leverage ratio requirements
131. Given the potential advantages in harmonising New Zealand's capital framework with respect to the leverage ratio, the Reserve Bank's preferred option is the third (disclosure and minimum leverage ratio requirements).
132. The calculation of the leverage ratio is intended to be similar to APRA's methodology in that there would be a simplified methodology for Standardised banks.²⁸
133. The minimum leverage ratio requirements are currently proposed to be set at 3 percent for Standardised banks and 4 percent for IRB banks. This would be a minimum ratio requirement, and treated like the 6 percent minimum Tier 1 capital ratio. The leverage ratio for a bank would be disclosed alongside their capital ratio in disclosure statements.
134. Further consultation will follow on leverage ratio requirements if it is decided that they will be included in the New Zealand framework.

²⁶ Please refer to: <https://www.rbnz.govt.nz/regulation-and-supervision/banks/consultations-and-policy-initiatives/active-policy-development/review-of-the-capital-adequacy-framework-registered-banks>.

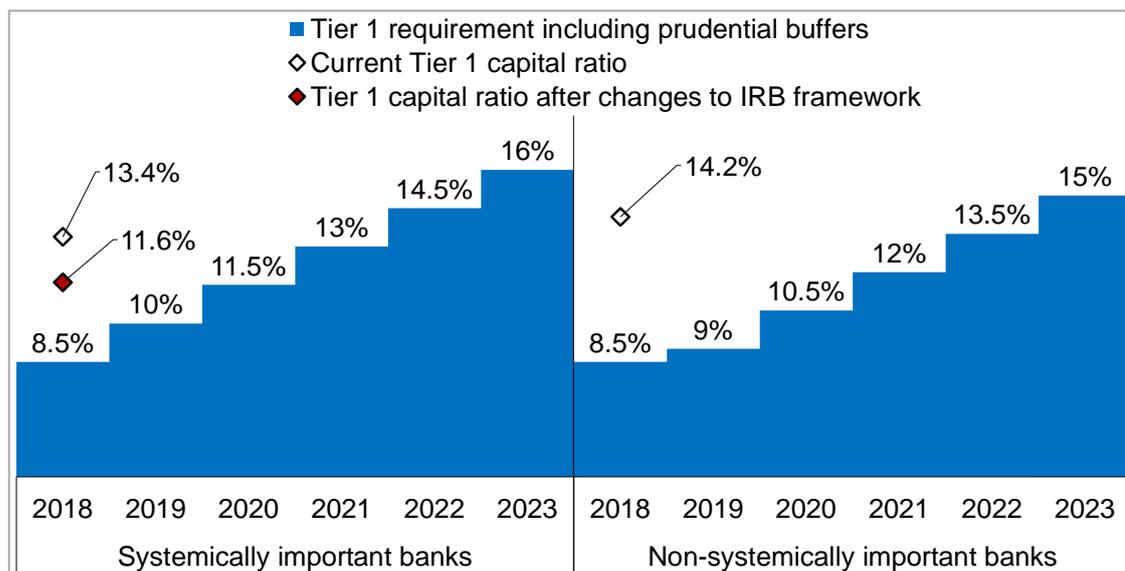
²⁷ In this context, 'the 'mitigants' are mainly the changes to the IRB framework, such as a floor against the Standardised framework, dual reporting, and reducing the scope of models.

²⁸ For banks using the Standardised approach, the exposure measure would be calculated by combining the total assets of a bank's balance sheet with off-balance sheet exposures (calculated using Standardised credit conversion factors), and less any items deducted from Tier 1 Capital. For IRB banks, derivative and Security Financing Transaction (SFT) exposures would be calculated separately to other on-balance sheet exposures. Derivative exposures would be calculated as per BS2B (paragraph 4.74), but be scaled by 1.4. SFTs would be calculated at a gross level, and would not allow for netting for cash receivables and cash payables with the same counterparty (in line with APRA methodology). Remaining on and off-balance sheet exposures would be calculated using the same approach as for Standardised banks (using Standardised credit conversion factors).

Transitional arrangements

135. There are obviously a number of changes to the Reserve Bank's capital framework for banks, both within this Consultation Paper, and in previous consultation papers. Following this consultation, which closes on 29 March 2019, and consideration of stakeholders' submissions, the Reserve Bank expects to make final decisions by June 2019.
136. It is likely that any decisions to change the capital framework will take time for banks to implement, both to meet the higher capital requirements, and to address IT (and other) system build requirements.
137. The decisions will impact on different banks in different ways, and while there are more proposed changes for the IRB banks, we note that the Standardised banks will likely find it harder to meet proposed capital requirements solely via retained earnings within the proposed five-year transitional period (see Table 9). However, banks have the option of raising more capital via new issuance, and pending a policy decision on Tier 1 instrument for mutual banks could improve the ability of mutual banks to raise capital.

Figure 9: Proposed transitional arrangements to meet higher capital ratio requirements



138. Appendix 4 lays out the initial proposal on transitional arrangements, and we would like to seek submitters' views on whether the proposed timeframes are reasonable.
139. Full implementation of dual reporting, the output floor, and higher IRB scalar are proposed to be in place by June 2020, for example. Given the scale of the proposed change, the transitional arrangements for the prudential capital buffer requirements are naturally longer, with a five-year set of transitional arrangements being proposed.

We seek your views

We welcome feedback on our proposed calibration of the capital framework and any related issues raised in this paper.

We welcome feedback on the risk appetite framework outlined in the consultation paper.

We seek specific feedback on the proposed Tier 1 capital requirement of 15 to 16% (which includes the proposed prudential capital buffer of 9 to 10%):

- What would be the impact of this increase in capital requirements on borrowing costs?
- What are the likely benefits and costs of higher capital requirements for New Zealand's economy?

We seek your views on the proposed additional capital requirement for banks that may be deemed 'systemically important' in New Zealand (D-SIBs):

- Should banks identified as D-SIBs be subject to higher capital requirements than other banks?
- If so, what factors should a framework consider in identifying such banks, and what would be the appropriate size of any additional capital requirement?

We seek your view on the proposed Countercyclical Capital Buffer (CCyB) and in particular:

- Should there be an option to set the CCyB to zero in the exceptional circumstances following a crisis?
- Is 1.5 percent an appropriate calibration for the 'early set' component of the CCyB?

We seek specific feedback on the role of Tier 2 capital:

- **What are the advantages and disadvantages of having Tier 2 capital requirements?**
- **Is there continuing value in setting a specific requirement for Tier 2 capital, if the Tier 1 capital requirement is set to 15 or 16 percent?**

We seek specific feedback on the proposed consequences for banks (e.g. dividend restrictions) that breach the prudential capital buffer and the concept of an 'Escalating Supervisory Response'.

We seek specific feedback on the leverage ratio:

- **Do you agree that minimum leverage ratio requirements should be part of the capital framework?**
- **Do you agree that leverage ratio disclosure requirements should be part of the capital framework?**
- **Do you agree with the proposed minimum leverage ratio calibration for Standardised and IRB banks?**

We seek your feedback on the proposed transition period provided to banks to meet the proposed capital requirements and the benefits and costs associated with a shorter or longer transition period.

We also seek your feedback on whether any banks not identified as 'systemically important' should be provided with a longer transition period to meet the new capital requirements.

We seek specific feedback on the output floor and recalibration of the IRB approach:

- **Do you agree with the Reserve Bank's assessment of the relative merits of each approach to setting an output floor on the IRB approach?**
- **Do you agree with the Reserve Bank's proposed method of narrowing the difference in capital outcomes between the IRB and Standardised approaches to credit risk?**
- **Do you agree with the Reserve Bank's proposed calibration of the output floor and IRB scalar?**
- **What systems or other implementation issues may arise with the Reserve Bank's proposed method of narrowing the difference in capital outcomes between the IRB and Standardised approaches to credit risk?**

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Appendix 1 – In-principle decisions taken in the Capital Review

Decisions in 'The definition of capital' consultation (19 Dec 2017):

- Tier 1 capital will consist of common equity and perpetual non-redeemable preference shares (not contingent convertible debt).
- Tier 2 capital will consist of long term subordinated debt and can include long term redeemable preference shares (not contingent convertible debt).
- The possibility of including a Tier 1 instrument able to be issued by mutual society banks will be explored.

Decisions in 'The calculation of risk weighted assets ('RWA') used to calculate the capital ratio' (6 July 2018)

- Internal Ratings Based ('IRB') models will remain part of the framework for qualifying banks.
- IRB banks will be required to calculate their capital ratios using both the Standardised approach and the IRB approach ('dual reporting').
- The Basel Committee's newly published Standardised approach for operational risk will be adopted for all banks in due course.
- There will be no change to the way market risk calculated by IRB or Standardised banks for the time being.

The following decisions were made in 'The calculation of risk weighted assets ('RWA') used to calculate the capital ratio', but are now clarified since our response to submission in July 2018. (Detail on these can be found in Appendix 3):

- IRB banks will be required to use the Standardised approach methodology for credit exposures that have an external rating (for example, banks, sovereigns and large corporates).
- The outputs from the IRB models will be constrained by an 'output floor'.

Appendix 2 – Glossary

AT1 capital	Additional Tier 1 capital. AT1 capital, which includes perpetual preference shares, is the second highest quality of capital behind CET1.
Capital	Part of a bank's funding that allows it to absorb financial losses while remaining solvent. Includes the investment of the bank's shareholders (e.g. ordinary shares and retained earnings).
Capital ratio	A bank's capital divided by its RWA. A capital ratio is a key indicator of the financial strength of a bank, measuring the losses it can withstand relative to the risk of its business.
CET1 capital	Common Equity Tier 1 capital. CET1 is the highest quality of capital as it is permanently available to absorb a bank's financial losses. CET1 includes shareholders' investment (ordinary shares) and the bank's retained earnings.
Conservation buffer	A type of prudential capital buffer that applies to all banks. The conservation buffer promotes capital resilience by requiring banks to maintain capital levels above the minimum requirement.
Countercyclical capital buffer	A type of prudential capital buffer that the Reserve Bank may increase or decrease over the financial cycle. Increasing the countercyclical capital buffer aims to build banks' capital resilience and guard against financial stability risks. Lowering the countercyclical capital buffer enables banks to operate at lower capital levels during periods of financial system stress, to promote their ability to continue lending to support the economy.
D-SIB buffer	Domestic-Systemically Important Bank capital buffer. A type of prudential capital buffer that applies to banks that are deemed systemically important and whose failure would have a significant impact on the economy and the rest of the financial system. A D-SIB buffer promotes higher capital strength at banks and lowers their probability of failure.
IRB approach	Internal Ratings Based approach to credit risk. One of the two methodologies available to calculate RWA for banks' credit risks, IRB involves the use of inputs from credit models developed internally by the bank to a formula specified by the Reserve Bank. The Reserve Bank must accredit a bank to use the IRB approach, and approve the models it uses in its RWA calculation.
IRB scalar	A parameter in the IRB approach to credit risk set by the Reserve Bank. The IRB scalar adjusts the level of conservatism in the IRB approach's calibration.
Leverage ratio	A measure of a bank's financial strength that does not attempt to adjust for risk. A leverage ratio measures a bank's capital levels relative to a non-risk based measure of its financial position, such as the accounting value of its assets. While both a leverage ratio and the risk-based capital ratio use the same definition of capital, they contrast in what they measure this capital against (e.g. assets (accounting definition) versus RWA respectively).
Minimum capital requirements	A minimum capital ratio requirement. If a bank has a capital ratio below the minimum requirement, it is likely to be in financial distress from a prudential perspective, and the Reserve Bank would likely seek to place it in a resolution.
Non-performing loans	Generally speaking, non-performing loans are loans that are at risk of not being fully repaid, or where interest on the loan may not be fully paid by the borrower.
Output floor	A limit on the IRB approach. An output floor means that, when determining its capital ratio, the RWA a bank calculates using the IRB approach cannot

	go below a certain proportion of the RWA that it would calculated under the Standardised approach.
Prudential capital buffer	An amount of capital above the minimum capital requirement. A bank that operates with a capital ratio within the prudential capital buffer applying to it would not be in breach of its Conditions of Registration, but it may have restrictions placed on it and be required to rebuild its capital levels over time.
Risk appetite framework	A risk appetite framework enables decisions about the right balance of risk and return. In the context of this Consultation Paper, the Reserve Bank has developed a risk appetite framework to determine settings for its capital framework that strike a balance in its outcomes on financial stability, economic activity and societal welfare.
Risk-weighted assets (RWA)	Risk-weighted assets (RWA) is an adjusted picture of a bank's financial position (e.g. its loan portfolios and other investments, and its operational and market trading activities) that takes into account the risk profile of that financial position.
Standardised approach	Standardised approach to credit risk. One of the two methodologies available to calculate RWA for banks' credit risks, the Standardised approach requires banks to use Reserve Bank-specified tables to determine the risk weights to apply to different types of loans and other assets.
Tier 1 capital	Tier 1 capital consists of CET1 capital and Additional Tier 1 (AT1) capital.
Tier 2 capital	Tier 2 capital, which includes some subordinated debt, is capital that can generally only absorb losses once a bank has already entered into financial difficulty. It is therefore considered of lower quality than Tier 1.

Appendix 3 – Output floor and changes to the IRB approach

1. In its July 2018 response to submissions on proposals to change the way banks calculate their 'risk-weighted assets' (RWA) the Reserve Bank announced two in-principle decisions to change the calculation framework for banks that use the internal-ratings based (IRB) approach for credit risk:²⁹
 - i. The revised framework will include a floor on RWA produced using the IRB approach, tied to the RWA outcomes that would be calculated using the Standardised approach ('output floor'); and
 - ii. The revised framework will no longer allow the IRB approach to be used to determine RWA for the Sovereign and Bank IRB exposure categories, and for exposures to externally-rated Corporates. Instead, IRB banks would use the Standardised approach to determine RWA for these categories.

2. Consistent with the Reserve Bank's principles for the Capital Review, the motivation for these in-principle decisions is to:
 - i. Reduce undue differences in the overall capital requirement outcomes produced by the IRB and Standardised approaches; and
 - ii. Promote simplicity in the framework by removing the IRB approach in areas where the Reserve Bank considers that the benefits of potentially improved risk sensitivity under IRB do not outweigh the additional complexity, compliance costs and scope for undue variation in RWA outcomes across banks.

3. In September 2018 the Reserve Bank conducted a Quantitative Impact Study (QIS) of the four IRB banks. The QIS required the IRB banks to provide information on their current application of the IRB approach, and estimates of the RWA outcomes they would report if they were to use only the Standardised approach for credit risk. The purpose of the QIS was to collect information to assess the impact and inform the final design of the earlier in-principle decisions, as well as inform potential future modifications to the IRB approach (e.g. adoption of proposals APRA has made for some IRB exposure categories).

4. Having collected the necessary information in the QIS, the Reserve Bank now proposes to finalise the details of the earlier in-principle decisions on changes to the IRB approach.

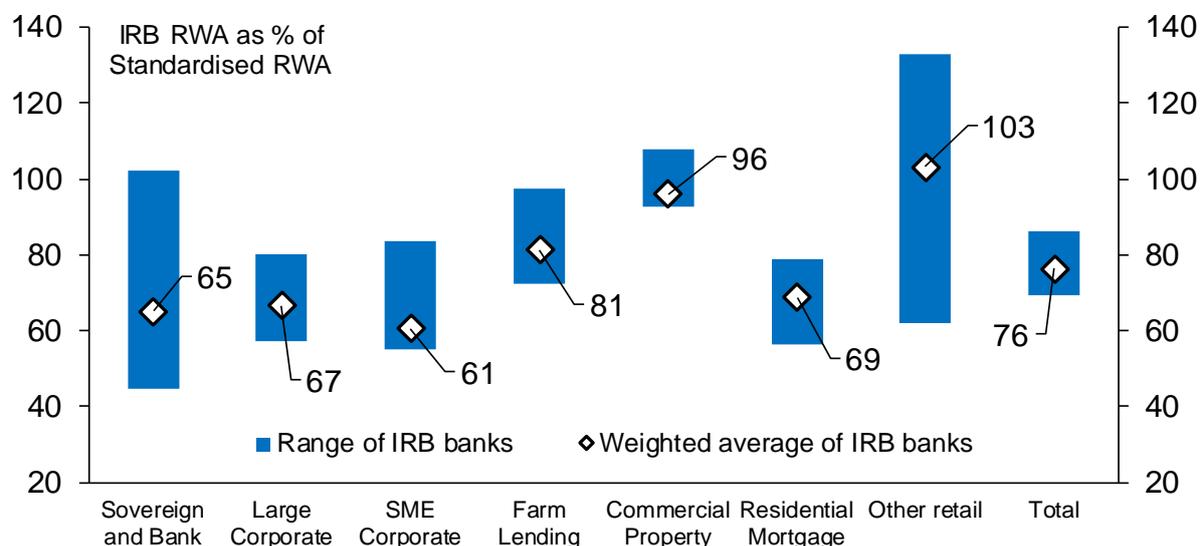
Setting an output floor on the IRB approach to credit risk

5. Figure A1 plots the relative RWA outcomes of the current IRB approach and the Standardised approach, by IRB exposure category, based on information collected in the QIS. The data show that on average the current IRB approach results in RWA

²⁹ See "The calculation of risk-weighted assets: Response to submissions", 6 July 2018, <https://www.rbnz.govt.nz/regulation-and-supervision/banks/consultations-and-policy-initiatives/active-policy-development/review-of-the-capital-adequacy-framework-registered-banks>.

outcomes of 76 percent of the Standardised approach, though there is considerable variation both across exposure categories, and across IRB banks.³⁰

Figure A1: RWA under the IRB approach as a percentage of RWA under the Standardised approach, by IRB exposure category



Source: RBNZ Quantitative Impact Study (2018). Data as at March 2018.

- The Reserve Bank has considered three broad approaches to setting an output floor on the capital outcomes produced by IRB approach tied to outcomes under the Standardised approach, summarised in Table A1.

Table A1: Options for setting an output floor on the IRB approach relative to the Standardised approach for credit risk

Type of IRB output floor	How IRB banks would implement this output floor
Exposure-by-exposure	IRB banks would calculate an IRB and Standardised capital requirement for each individual credit exposure. IRB Banks use the maximum of the IRB outcome and X percent of the Standardised outcome, and aggregate across all individual exposures to determine the total credit risk RWA used in the capital ratio calculations.
Exposure category (asset class)	Policy work would be undertaken to align the definitions of the exposure categories in the IRB and Standardised approaches. For each exposure category (e.g. retail SME lending), IRB Banks would calculate RWA as the maximum of the IRB outcome and X percent of the Standardised outcome. The resulting RWA for each exposure category is aggregated to a total credit risk RWA used in the capital ratio calculation.
Total exposure	IRB Banks would perform two standalone calculations across the aggregate of their credit risk exposures: RWA using IRB as at present, and RWA as if they were only

³⁰ Following the conclusion of its project to benchmark the IRB banks' models for mortgage and farm lending exposures, the Reserve Bank expects that supervisory adjustments to one bank's IRB models are likely to increase this to 80 percent of the Standardised outcome. The intention is that these adjustments will 'reset' the relative conservatism between IRB banks to a more neutral setting.

	<p>using the Standardised approach. IRB banks' capital ratios would be determined using the maximum of the IRB RWA and X percent of the Standardised RWA. The Basel Committee decided to follow this approach to setting the output floor in the revised Basel III framework, which APRA has announced it will adopt for Authorised Deposit-taking Institutions (ADIs) using the IRB approach in Australia.</p>
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7. The Reserve Bank does not favour setting an output floor on an exposure-by-exposure basis. This approach would potentially distort the risk differentiation of the IRB approach by raising capital requirements for the lowest risk exposures (as assessed by IRB models) but leaving higher risk exposures unaffected. This could have an uneven impact across IRB banks depending on how they have designed their models, and encourage the development of models with less risk differentiation to reduce the impact of the floor. Moreover, an exposure-by-exposure output floor would appear to be the most complex to implement in IRB banks' systems, and it would be difficult to enable effective disclosure of the operation of the floor to banks' stakeholders.
8. The Reserve Bank also does not favour setting an output floor at the exposure category (asset class) level. While an asset class-level floor would narrow the range of possible IRB capital outcomes within each exposure category, it would do so by potentially reducing the overall risk sensitivity of the IRB approach if there are genuine differences in the underlying risks of IRB banks' different credit portfolios.
9. The Reserve Bank considers a 'total exposure' basis for the output floor is preferable to an exposure category basis. While a 'total exposure' floor would still potentially reduce the overall risk sensitivity of the IRB approach, this would be to a lesser extent than setting a range of floors for each exposure category. A 'total exposure' approach would allow higher risk exposure categories, as assessed by banks' IRB models, to offset lower risk exposure categories, while still in aggregate limiting the extent to which the IRB approach can produce unduly lower total RWA outcomes than the Standardised approach.
10. Based on its own analysis, and feedback from submitters to the earlier consultation, the Reserve Bank considers a 'total exposure' approach would be the simplest of the three options to implement. The earlier in-principle decision that IRB banks will be required to calculate and disclose RWA outcomes as if they were only using the Standardised approach ('dual reporting') will mean that IRB banks will already produce the comparable total credit risk RWAs for the purpose of determining the quantum of the output floor, without requiring significant changes to their IRB calculation systems. The 'total exposure' approach also supports the consistency of New Zealand's IRB framework with the finalised Basel III framework, and APRA's intended implementation of an output floor.
11. Due to the offsetting effect noted above, it is likely that a 'total exposure' floor calibrated at the same level as the more granular options would be less binding on IRB banks. Remaining differences in total RWA outcomes between the IRB and Standardised calculations after imposing the output floor would likely be largest under this option. However, to the extent that this difference is material, the

calibration of a 'total exposure' output floor can be revised upwards to produce the same desired overall RWA outcome as under the more granular options.

Narrowing the difference in outcomes between the IRB and Standardised approaches

12. A key point raised through the consultation process was that, the more binding an output floor tied to the Standardised approach is, the less risk sensitive the IRB framework becomes. The Reserve Bank made an in-principle decision to retain the IRB approach in the capital framework primarily because of the risk differentiation benefits that IRB can offer, compared to the simpler but less fine-grained Standardised approach. A principle of the Capital Review is that capital requirements should be sensitive to the risks of banks' exposures.
13. Based on the QIS results, IRB banks' current implementation of the IRB approach delivers credit risk RWAs of between 67 and 86 percent of the comparable Standardised approach calculations, with an average of 76 percent (Figure A1 above). To achieve the Reserve Bank's objective of materially narrowing the relative RWA outcomes between the current IRB and Standardised approaches would require calibrating an output floor at a level that is likely to be a binding constraint on most or all IRB banks. However, doing so would significantly reduce the risk sensitivity of the capital requirements applying to a large share of the banking system's credit exposures, as IRB banks' RWA for credit risk would effectively be determined by the outcomes of the Standardised approach. This would negate the benefits of continuing to allow the IRB approach to be used, and undermine the achievement of the Reserve Bank's risk sensitivity objective.
14. To address this tension, the Reserve Bank proposes a two stage approach to reduce undue differences in the credit risk capital requirement outcomes produced by the IRB and Standardised approaches:
 - i. Firstly, the Reserve Bank proposes to increase the existing fixed multiplier ('IRB scalar') that already applies to all IRB banks' credit risk RWA, to increase the average RWA outcome of all IRB banks closer to what would be calculated were they only using the Standardised approach; and
 - ii. Secondly, apply an output floor tied to the Standardised outcome on a total exposure basis, as discussed above, as a backstop against any outlier IRB RWA outcomes that remain once a higher IRB scalar has been applied.
15. We propose that the credit risk RWA for IRB banks would be determined by the higher of i) credit risk RWA calculated under the IRB approach (incorporating the higher IRB scalar); and ii) credit risk RWA under the Standardised approach multiplied by the output floor.
16. The IRB scalar, currently set at 1.06, has been part of the Reserve Bank's capital framework since the adoption of the IRB approach with Basel II. The IRB scalar was set at its current level by the Basel Committee in 2006 as a way of ensuring that the then-new IRB approach delivered prudent capital outcomes relative to the earlier Basel I framework.

17. The Reserve Bank considers the main benefit of using the IRB scalar to narrow the differences in capital outcomes between the IRB and Standardised approaches is that adjustments to the scalar would fully preserve the risk differentiation of the IRB framework. The IRB scalar multiplies the capital requirement for all credit exposures by a fixed amount, meaning the level of the scalar has no impact on the relative capital allocated to each exposure.
18. In its approach to calibration, the Reserve Bank has sought to ensure that the joint calibration of the IRB scalar and output floor are aimed at having RWA from the IRB approach (with higher scalar) remaining as the binding constraint for most or all IRB banks, to achieve its risk sensitivity objective.
19. The Reserve Bank proposes to increase the IRB scalar from its current calibration of 1.06 to 1.2. It is also proposed that an output floor will be set at 85 percent of the Standardised outcome, on an aggregate portfolio basis. We estimate that these two adjustments (higher scalar and output floor) will increase IRB banks' aggregate RWAs to 90 percent of the outcome that would result under the Standardised approach.
20. The output floor and scalar settings we are proposing will increase aggregate RWA across the four large banks by approximately 16 percent, or \$36bn, relative to March 2018 levels.
21. At present, IRB banks are required to apply the IRB scalar to exposures that have their RWA determined under the Standardised approach. The Reserve Bank proposes to apply the higher IRB scalar only on exposures that have their RWA determined under the IRB approach or the supervisory slotting approach. Exposures that use the Standardised approach (e.g. equity, other assets and a small number of other credit portfolios) would no longer have the IRB scalar applied to them.
22. While increasing the IRB scalar from its current level would mean New Zealand's IRB framework would become more conservatively calibrated than that of other jurisdictions, this divergence would be transparent (for example, the level of the scalar is already reported in IRB banks' credit risk disclosures), and simple to unwind when making international comparisons of New Zealand IRB banks (it is a fixed number applied equally to all credit exposures). While the finalised Basel III framework sees the removal of the IRB scalar, APRA has announced that it is likely to retain the concept of a scalar in its Basel III implementation, albeit at a yet-to-be-determined level, meaning New Zealand would not be in a unique position. Taken together, the Reserve Bank does not consider that increasing the IRB scalar would materially undermine the ability of stakeholders to assess the capital position of New Zealand IRB banks.
23. As IRB banks already calculate their IRB RWA applying a scalar set at 1.06, the Reserve Bank does not expect any operational or systems difficulties would be encountered by a move to a higher calibration.

Scope of the IRB approach for Sovereign, Bank and externally-rated corporate exposures

24. In its July 2018 response to submissions the Reserve Bank announced the in-principle decision to remove the option of the IRB approach for determining capital requirements for exposures in the Sovereign and Bank (including Public Sector Entities) exposure categories, and for exposures where a counterparty has received a rating grade from a credit rating agency (for example, exposures to large corporates).
25. The Reserve Bank's view is that for these types of exposures the net benefits of the IRB approach, particularly improved risk sensitivity of capital requirements, are limited compared to the use of the Standardised approach. Sovereign and Bank (including Public Sector Entities) exposures are difficult to reliably model, given a small history of data to draw on. This can result in high variability in IRB banks' modelled capital outcomes despite relatively similar underlying risks. For externally-rated counterparties, there is a question of whether banks' internal models can provide any further information on that counterparty's risk than what is already captured in the external rating grade.
26. As part of the QIS the Reserve Bank collected information from IRB banks on the prevalence of external rating grades for the Sovereign, Bank and Large Corporate exposure categories to estimate the impact of the in-principle decision. While external ratings are available for between 70 to 90 percent of the IRB banks' Sovereign and Bank (including Public Sector Entities) exposures by value, only 11 percent of IRB banks' large corporate exposures had an external credit rating available (around \$6.4 billion in total exposure). This likely reflects the limited role of public debt markets in financing New Zealand's corporate sector compared to other countries.
27. Given this information, the Reserve Bank considers that the additional complexity that would need to be added to the IRB framework to implement a dual calculation approach for exposures to large corporates (switching between Standardised and IRB depending on whether a counterparty has a current external credit rating or not) is unlikely to outweigh any likely practical benefit. As such the Reserve Bank has decided to reverse its earlier in-principle decision and will continue to allow the use of the IRB approach for externally-rated corporate exposures.
28. Table A2 summarises the Reserve Bank's final decision on the scope of the use of the IRB approach for the Sovereign, Bank and Corporate exposure categories in the revised IRB framework.

Table A2 In-principle and final decisions on the scope of the IRB approach

BS2B Exposure Category	Current approach	In principle decision (July 2018)	Final decision
Sovereign	IRB	Standardised	Standardised
Bank (incl. Public Sector Entities)	IRB	Standardised	Standardised
Corporate	IRB	Standardised if externally rated, otherwise IRB	IRB

29. Table A3 summarises the current and proposed future scope of the IRB approach in New Zealand, and proposed application of the IRB scalar and output floor.

Table A3: Current and future capital framework for IRB-accredited banks

RWA methodology for IRB-accredited banks	IRB approach ('Basel equation')	Supervisory slotting approach	Standardised approach
Description	Banks use RBNZ-approved internal models	Banks combine internal models with RBNZ-prescribed risk weights	RBNZ-prescribed risk weights
Examples of exposures using this methodology (status quo)	Sovereign, bank, corporate and retail	Most specialised lending (e.g. commercial property)	Equity, other assets and a limited number of small credit portfolios
Examples of exposures using this methodology (proposed)	Corporate and retail	Most specialised lending (e.g. commercial property)	Sovereign, bank, equity, other assets and a limited number of small credit portfolios
IRB scalar (status quo)	1.06	1.06	1.06
IRB scalar (proposed)	1.2	1.2	1
In scope of output floor?	Yes	Yes	No

30. Table A4 provides an example of how an IRB bank would calculate their credit risk RWA under the revised framework. An example IRB bank exposures spread across the three methodologies – IRB, Supervisory slotting, and Standardised. At present, these portfolios have an RWA value of \$260. Applying the revised IRB scalar values in Table A3, this increases to \$292. If the bank were to only apply the Standardised approach, these exposures would have an RWA value of \$309. The IRB bank applies the output floor by calculating the maximum of RWA under the IRB and supervisory slotting approaches, and 85 percent of the RWA outcome under the Standardised approach for these portfolios. In this example, the output floor is not binding. The bank's total RWA for credit risk is \$292.

Table A4: Worked example of application of revised IRB scalar and output floor

Current approach to RWA for credit risk	Current RWA outcome	RWA outcome with revised IRB scalar	RWA outcome under full Standardised approach	RWA outcome after applying floor
IRB	200	226	250	=max(226+57, 0.85*(250+50))
Supervisory slotting	50	57	50	
Standardised	10	9	9	9
Total credit risk RWA	260	292	309	292

Appendix 4 – Proposed Transitional Arrangements for Capital Review decisions

Status	Capital Review	Q1 2019	Q2 2019	Q3 2019	Q4 2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020	2021	2022	2023
In-principle decision announced in Dec. 2017	Phase-out of non-compliant AT1 instruments		New capital instruments need to be compliant from Jun. 2019 onwards; 20% of non-compliant AT1 de-recognised each year after revised exposure draft is confirmed									
In-principle decision announced in Dec. 2017	Tier 1 instrument for mutual societies	Confirm decision in Jan 19										
In-principle decision announced in Jul. 2018	Dual reporting		12 month transition period for system build					Disclosure requirements in effect				
Consultation on design of floor vs scalar closes March 2019	Output floor			Consult on exposure draft in Q3 2019	Revised exposure draft published in Q4 2019			In effect Q2 2020				
Consultation on design of floor vs scalar closes March 2019	Scalar (for IRB banks)				In effect Q4 2019							
In-principle decision announced in Jul. 2018	Require standardised approach for Sovereign and Bank portfolios			Consult on exposure draft in Q3 2019	Revised exposure draft published in Q4 2019			In effect Q2 2020				
In-principle decision announced in Jul. 2018	Standardised Measurement Approach for Operational Risk Capital requirements					Consult on exposure draft for Op Risk (Q1 2020)	Publish revised exposure draft for Op Risk (Q3 2020)		In effect Q3 2020			
Consultation on calibration of capital requirements closes March 2019	Transition to higher ratio requirements > 5 year phase-in		Required Tier 1 ratio from Q2 2019 to Q1 2020:				Required Tier 1 ratio:			13.0% for D-SIBs	14.5% for D-SIBs	16.0% for D-SIBs
			<ul style="list-style-type: none"> 10% for Domestic Systemically Important Banks (D-SIBs) 9% for non-D-SIBs 				<ul style="list-style-type: none"> 11.5% for D-SIBs 10.5% for non-D-SIBs 			12.0% for non-D-SIBs	13.5% for non-D-SIBs	15.0% for non-D-SIBs
Consultation on whether to introduce leverage ratio and potential calibration, closes March 2019	Leverage Ratio				Consult on Leverage Ratio exposure draft (Q4 2019 – Q1 2020)		Publish revised draft for Leverage Ratio (Q2 2020)		Minimum Leverage ratio and disclosure requirements in effect			
Consult on revised disclosure requirements once various Capital Adequacy exposure drafts are revised	Disclosure requirements					Consult on changes to Order-in-Council (OIC)		Publish revised OIC; new disclosure requirements in effect				