

# Bulletin

## **2022 Bank Solvency Stress Test: Assessing the resilience of banks to a stagflation scenario.**

Thomas West, Ken Nicholls, Tyler Smith

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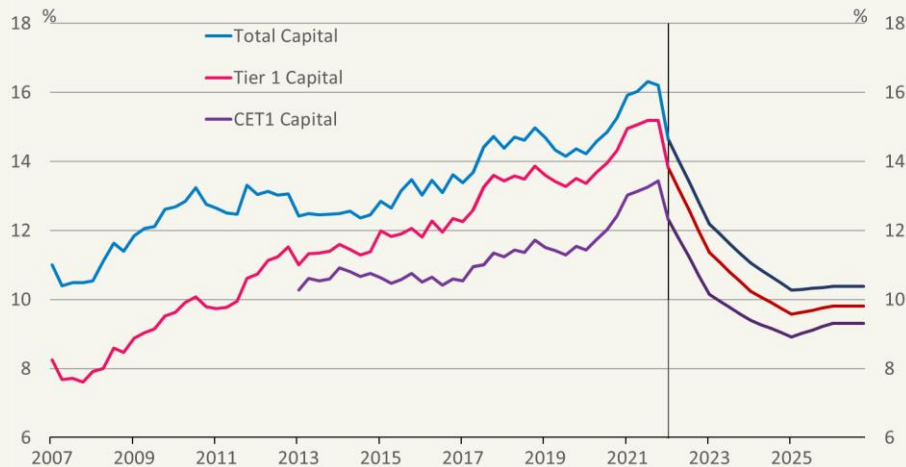
Reserve Bank of New Zealand  
PO Box 2498  
Wellington  
NEW ZEALAND

[www.rbnz.govt.nz](http://www.rbnz.govt.nz)

## Executive Summary

- Banking stress tests assess how banks can cope with severe but plausible scenarios. The scenarios modelled are not the most likely outcomes. We use the tests to look at banks' resilience, making sure they have enough capital to withstand severe shocks while being able to continue supporting the economy. This stress test focussed on bank capital and did not attempt to cover a liquidity stress such as a severe outflow of bank deposits.
- The 2022 Bank Solvency Stress Test consisted of a stagflation scenario that shares elements of the current economic environment. It featured a global slowdown in economic activity as central banks raise interest rates in the face of high inflation and the lingering impacts from the pandemic. The results of the stress test showed that the New Zealand banking sector is well placed to withstand a stagflation scenario of high inflation and low or negative economic growth. This resilience has been partly due to the build-up of capital since the Global Financial Crisis.
- The aggregate Common Equity Tier 1 ratio in the stress test fell 3.3 percentage points to a minimum of 8.9 percent before mitigants, as shown in Figure 1, well above the 4.5 percent regulatory minimum. The results before mitigating actions leave sufficient capital for banks to continue lending while maintaining capital ratios above the regulatory minima. That said, this would be a challenging macroeconomic environment for households and businesses with a large number of bank customers unable to repay their loans and experiencing large declines in wealth.

**Figure 1: Aggregate capital ratios**



Source: Banks' General Disclosure Statements, RBNZ Capital satellite survey, bank solvency stress submissions.

Note: System level aggregate until Mar-22, stress test submitting bank aggregate thereafter.

- In the scenario, which begins on 1 April 2022, the New Zealand economy experiences:
  - Falling house prices of 42 percent (47 percent from the peak in November 2021);
  - Equity prices falling 38 percent (42 percent since December 2021);
  - The unemployment rate rising to 9.3 percent;
  - Gross Domestic Product contracting by 5 percent;
  - The OCR peaking at 5.5 percent and the 2 year mortgage rate at 8.4 percent; and
  - In addition to the economic scenario, banks are impacted by and required to model a 1-in-25 year cyber risk event.
- The scenario causes aggregate impairment expenses of \$20.8 billion over four years, compared to the \$1.7b<sup>1</sup> real impairment cost of the COVID-19 pandemic over the past four years. Bank profits are negative in year 2 of the stress test. The combination of negative economic growth, rising interest rates and increasing unemployment lead to high levels of defaults whilst falling

asset prices reduce the collateral banks hold to minimise losses in the event of a default. The cyber event leads to aggregate costs of \$1.3 billion.

- The stress test results and sensitivity analysis we requested banks to carry out suggests unemployment was the main factor driving higher residential mortgage customer defaults. However, mortgage rates became an important driver of defaults as they increased above 6 to 7 percent, consistent with test rates that large banks have used since 2019 for their affordability assessments of mortgage applications.
- It is our first stress test since 2014 involving high interest rates. Banks noted the difficulty in modelling the impact of higher interest rates, given the lack of historical data. This highlighted some limitations for the stress test modelling of new economic risk factors. A number of banks indicated they are investing in their modelling capability and that this stress test proved a useful exercise.
- This was the first stress test conducted under the new capital framework that requires banks to hold more capital in the future. The combination of this stress event and rising capital requirements could make it difficult for banks to meet the new capital requirements when they are fully implemented in 2028. Our annual stress test will continue to be used to monitor this transition risk.
- The stress test results feed into our supervisory process for monitoring, managing and assessing risks of regulated banks. We would like to thank all participants for their open engagement in the 2022 solvency stress test.

## Background

The Reserve Bank - Te Pūtea Matua annual bank stress test programme enables us to investigate and understand the implications of current and emerging risks to financial stability; assess the resilience of participating banks to severe but plausible stress scenarios; and supports improvements in the use of stress tests by banks to identify and manage the risks facing their business. This year's programme consists of our annual solvency stress test, reported in this bulletin article, a liquidity stress test, and a residential mortgage portfolio sensitivity to flooding risk. The high-level results for the latter two stress tests will be reported on in the November 2022 *Financial Stability Report*.

Our 2022 Bank Solvency Stress Test assesses the banking system resilience to a severe but plausible scenario featuring low or negative economic growth, high inflation and rising interest rates - conditions experienced by some economies during the 1970s and 1980s referred to as stagflation. The economic downturn in this scenario is much more severe than current forecasts or actual economic performance, even in light of the current high inflation and rising interest rates. As such, we consider the scenario a low probability event.

As in previous years, the stress test covered the five largest banks registered in New Zealand. However, this year we included four smaller locally incorporated banks<sup>2</sup> to test their resilience and raise the stress test capability across the industry.

The stress scenario covers four years commencing 1 April 2022. Data is collected annually.

The modelling was conducted in two phases. In phase 1, banks used their own modelling to determine the impact on their balance sheet, profit and capital from the scenario and detailed economic assumptions provided. Much of this modelling is performed on a loan level basis. In phase 2, we require banks to make adjustments if we assess the results underestimate the impact of the

<sup>1</sup> Banking system Impaired asset expenses, RBNZ income statement survey

<sup>2</sup> Heartland, TSB, ICBC and Bank of China. Their total assets are 3% the size of the large five banks.

scenario or banks have not followed our detailed instructions. This provides greater consistency of the final results reported in this bulletin on an aggregated basis.

Banks provided estimates before and after mitigating actions. Mitigating actions are taken in response to the economic shock which may not be certain in a stress environment, for example raising capital. These actions allowed firms to identify, test and model potential responses to the stress scenario.

Banks submitted a base case using their latest business-as-usual plan. This provided another point of comparison to the stress test results.

This year, large banks were also asked to run a mortgage sensitivity against their stress test results to varying mortgage rate paths. This was to better understand the relationship between economic conditions and bank loan losses.

## 2022 Stress test scenario

High inflation and lower or negative economic growth, referred to as stagflation, was a feature of a number of economies including New Zealand in the late 1970's and early 1980's. Central banks, such as the United States Federal Reserve, tightened monetary policy by increasing interest rates sharply to dampen rising prices. Although the structure of the financial system has changed since then, some of the conditions of the stagflation period appear similar today.

The scenario assumed that inflation expectations become unanchored in major advanced economies after inflation rates repeatedly surprise on the upside. This was partly due to energy prices remaining elevated, owing to a combination of subdued investment over the prior decade, and geopolitical instability in the producer and transit countries adding significantly to inflation.

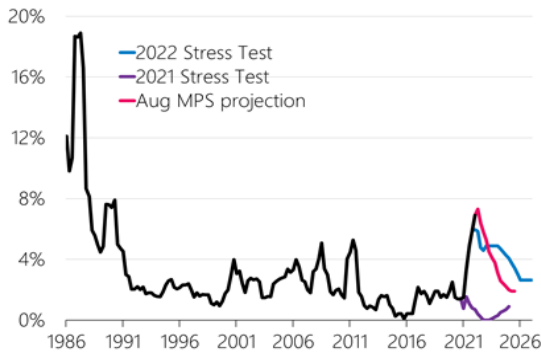
Bond markets react with sharply higher yields, and central banks raise policy rates to try to get inflation expectations under control. Rising borrowing costs causes a repeat of the European sovereign debt crisis as public debt to GDP increases. Corporate bankruptcies rise and international property prices decline, dampening economic growth. Spillovers through trade and financial channels worsen the global recession and depreciate the New Zealand dollar as commodity demand is choked off. Dairy producers face weak global demand conditions, with the Fonterra pay-out declining to \$6.50 by year 2 and then staying at that level in years 3 and 4. The negative economic outlook, downgrade of sovereign debt and increase in defaults lead rating agencies to downgrade New Zealand banks' long-term debt by two notches and short-term debt by one notch at the end of year 1.

The New Zealand economy enters the stress test with a CPI inflation rate of 6 percent, the highest rate in 30 years at the point of scenario design. Higher consumer price inflation becomes embedded in domestic expectations. The OCR is increased to 5.5 percent in the first quarter of year 3 and held there until inflation falls back to 3 percent toward the end of year 4. There are significant falls in asset prices; 42 percent for residential property (47 percent from the peak in November 2021); 45 percent for commercial property; and 38 percent for equities (42 percent from December 2021). The scenario also includes a 1-in-25 year cyber risk event which affects the banking sector, recognising the increasing risk from cyber evident through the pandemic.

Figures 2 to 5 show some of the main indicators banks are provided to model the effect of the scenario on their capital. The main difference in this year's scenario, compared to 2021, is the high inflation and interest rates. The house price shock is slightly more severe, but there is a lower peak unemployment rate (albeit the increase in the unemployment is similar). The projections from our

August Monetary Policy Statement, released after the scenario was developed, showed inflation peaks higher, but unemployment is much lower than the stress scenario.

**Figure 2: CPI Inflation (annual % change)**



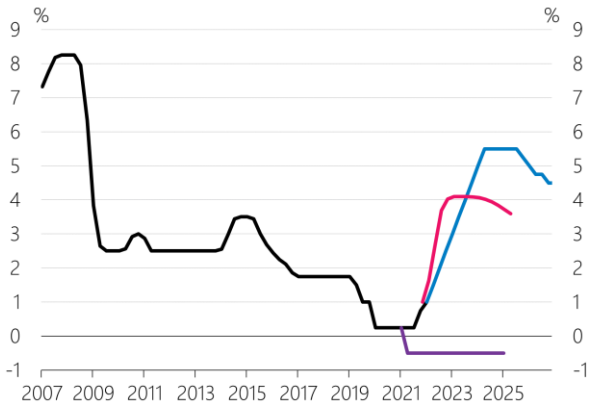
Source: Stats NZ.

**Figure 3: Unemployment rate**



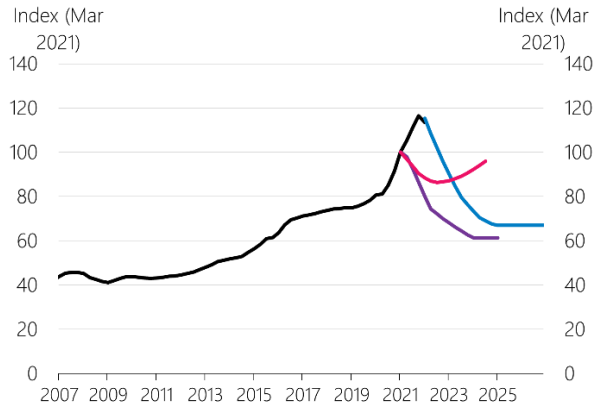
Source: Stats NZ.

**Figure 4: OCR path**



Source: RBNZ.

**Figure 5: House price index**



Source: REINZ.

The scenario has been benchmarked against our previous stress tests, stagflation experience from the 1970s and 1980s, and high interest rate scenarios used by the Bank of England in 2018 and a joint RBNZ/APRA stress test in 2014 shown in the table below. This is our first high interest rate scenario since 2014.

**Table 1: Key macroeconomic variables in recent stress tests and historical episodes**

	Bank rate	Inflation	Unemployment		Real GDP	Residential property price	Commercial property price	
	Peak level (%)	Peak level (%)	Peak level (%)	Increase (ppt.)	Peak-to-trough decline (%)	Peak-to-trough decline (%)		
Stress test	RBNZ (2022)	5.5	6.0	9.3	6.1	5.2	42	45
	RBNZ (2021)	-0.5	1.4	11.8	6.3	12.6	39	45
	BoE (2018)	4.0	4.9	9.5	5.8	4.0	30	40
	RBNZ (2014)	6.5	5.7	11.8	6.3	3.8	32	30
	RBNZ PBS (2020)	0.25	1.2	13.4	9.3	12.2	37	37
	RBNZ VSS (2020)	0.25	0.8	17.7	13.6	17.7	50	50
Historical stress	NZ '07-'11	N/R	N/R	6.7	3.4	2.6	10	28
	Ireland '07-'12	N/R	N/R	14.7	10.0	8.4	55	70
	US '80-'82	N/R	N/R	10.7	4.4	2.2	N/A	N/A

Sources: RBNZ; Bank of England, RBNZ; Bank of England; US Federal Open Market Committee (FOMC); International Monetary Fund, Woods and O'Connell (2012), 'Ireland's financial crisis: a comparative context', Quarterly Bulletin, Central Bank of Ireland.

Note: N/R – not relevant as these are low interest rate periods. 2020 and 2021 stress tests did not stress interest rates.

## Assessing capital resilience

Stress tests assess how bank loan impairments, net interest income, other income, operating expenses and risk-weighted assets (RWA)<sup>3</sup> are likely to change during periods of stress, and how these changes could impact capital outcomes under stressed scenarios. Bank resilience in stress tests is measured by their capital ratios which is the amount of capital as a percentage of RWA. There are three capital ratios to assess: Common Equity Tier 1 (CET1), Tier 1 Capital, and Total Capital. The stressed capital ratios are assessed against regulatory capital requirements.

This stress test is the first to be conducted under the new capital adequacy framework where minimum and Prudential Capital Buffer (PCB) requirements are rising until 2028.<sup>4</sup>

Banks are required to maintain their capital ratios above the minimum regulatory requirement at all times. At the beginning of the stress test on 1 April 2022, i.e. year 0, the minimum ratio was 4.5 percent for CET1, 6.0 percent for Tier 1 and 8.0 percent for Total Capital. In year 3 of the stress test, the minimum Tier 1 ratio increases to 7.0 percent and Total Capital 9.0 percent consistent with the phasing of the capital framework.

Banks are also required to maintain an amount of capital above these minima, referred to as the Prudential Capital Buffer (PCB), in 'good times' which can be drawn on in times of stress enabling banks to support customers and the economy in such circumstances. If capital ratios do fall into the PCB, there are automatic restrictions on the amount of dividends entities can pay. The size of the buffer is higher for the Domestic Systemically Important Banks (D-SIBs)<sup>5</sup>. At the beginning of the stress test the PCB was 2.5 percent for all banks. This increases to 5.5 percent for D-SIBs and 3.5 percent for other banks by year 4.

We tend to assess individual banks' pre-mitigant capital results against the regulatory minima and post-mitigant capital results against the PCB. However, while banks' capital outcomes are assessed against these regulatory benchmarks, we do not use our stress test as a pass/fail exercise.

<sup>3</sup> A bank's RWAs are calculated by applying a risk-weight, based on the riskiness of the asset to the size of the assets (exposures).

<sup>4</sup> <https://www.rbnz.govt.nz/regulation-and-supervision/banks/prudential-requirements/information-relating-to-the-capital-adequacy-framework-in-new-zealand>

<sup>5</sup> D-SIB banks include ANZ, ASB, BNZ and Westpac. Kiwibank is the other large; bank referred to in the bulletin.

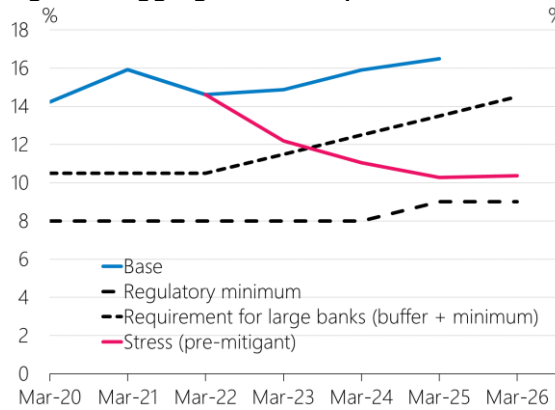
## Stress test results before mitigating actions

### Aggregate capital results show resilience to a severe shock

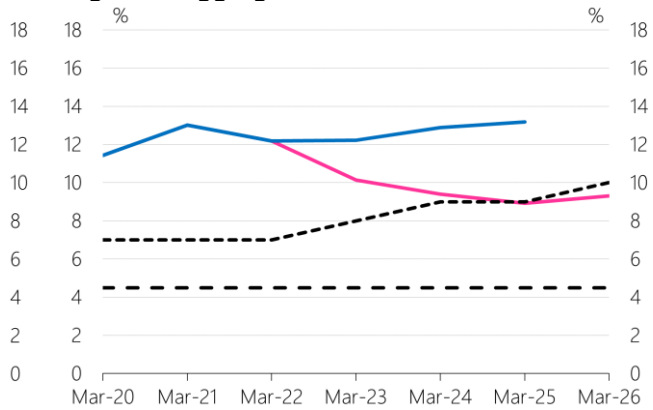
The 2022 stress test shows that banks are resilient to a severe economic downturn scenario with rising inflation and high interest rates. Banks remain well positioned to support the economy by meeting any demand for lending during a period of stress due to the large capital buffers that have been built up since the global financial crisis.

The aggregate CET1 ratio in the stress test fell 3.3 percentage points to a minimum of 8.9 percent before mitigants shown in Figure 7. This remains well above the regulatory minimum. The aggregate total capital ratio fell by 4.3 percentage points to a trough of 10.3 percent and comes closer to the regulatory minimum ratio in year 3 as the minimum requirement is lifted, Figure 6.<sup>6</sup> At the end of the stress scenario in 2026, banks have proved their resilience to the shock, but will be challenged to meet the higher capital requirements when fully implemented in 2028. By contrast, the aggregate base case capital ratios are well above the capital requirements.

**Figure 6: Aggregate total capital ratios**



**Figure 7: Aggregate CET1 ratios**



Source: RBNZ *Capital satellite survey*, bank solvency stress submissions, RBNZ calculations.

Note: Base case projection to year 3 only from bank projection data.

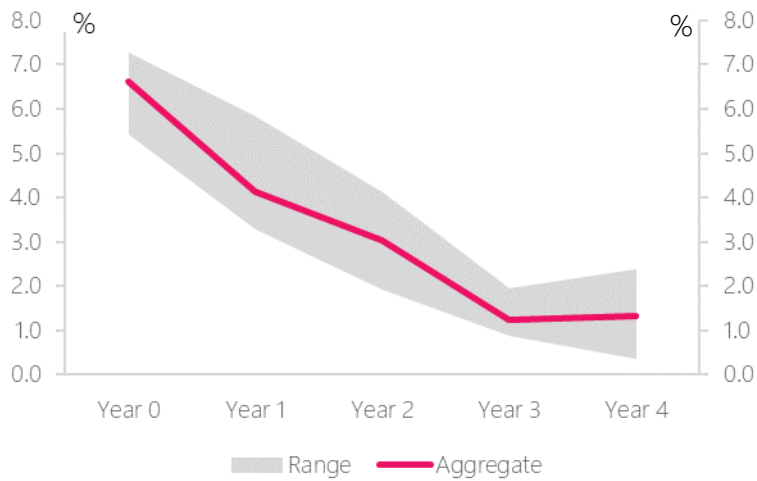
### Range of bank capital results

The range of the individual bank results varies due to differences in starting capital position, underlying profitability, and mix of businesses in their loan portfolios which create different loss rates.

Figure 8 shows how far the stress capital ratios exceed the regulatory minimum for all 3 capital ratio for the large banks. Values below zero indicate a bank's capital ratio has fallen below the minimum. All the large banks are able to maintain capital above the regulatory minimum for all three capital ratios in all years. The smaller banks are able to maintain their CET1 and Tier 1 capital above the minimum regulatory ratio before mitigating actions<sup>7</sup>.

<sup>6</sup> The value of some existing Tier 2 capital is 'non-conforming' which means less of the instruments can be counted towards tier 2 capital over time. This is the main driver of the larger fall in Tier 2 capital ratio. Banks were permitted to raise new Tier 2 capital as a mitigant if they assessed it was appropriate.

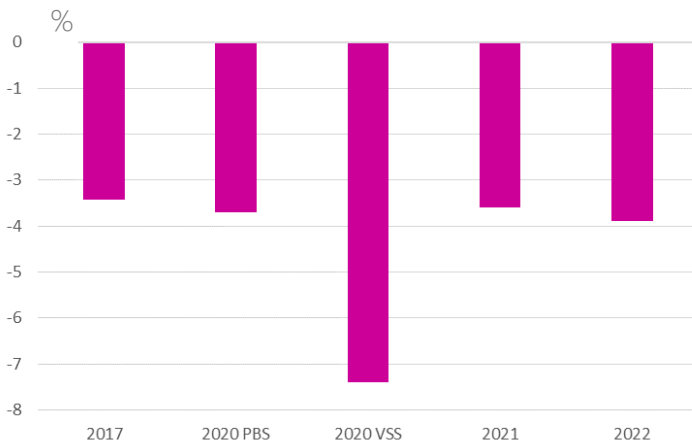
<sup>7</sup> One of the smaller banks' capital ratio falls below the minimums and only for the total capital ratio. After mitigants its capital ratio is restored above the regulatory minimum.

**Figure 8: Large banks' capital ratio in excess of regulatory minima pre-mitigant**

Source: Bank solvency stress submissions, RBNZ calculations.

### Comparison to previous stress tests

The headline fall in CET1 ratio of 3.3pp (percentage points) is similar to that recorded in 2021. However, to compare previous stress tests we need to adjust for changes in the way RWA have been calculated as part of the new capital framework. In particular the requirement for D-SIBs to have a floor on the size of the risk weighted assets, affecting the opening RWAs, and the higher risk weights in future years.<sup>8</sup> After allowing for these two factors, the fall in CET1 of 3.9 is slightly higher than recent stress test except for the COVID very severe scenario (VSS) in 2020 shown in Figure 9.

**Figure 9: CET1 capital ratio maximum fall**

Source: Bank solvency stress submissions, RBNZ calculations.

Note: Excludes conversions of Tier 1 or Tier 2 capital to CET1; 2022 on a comparable basis to other stress tests

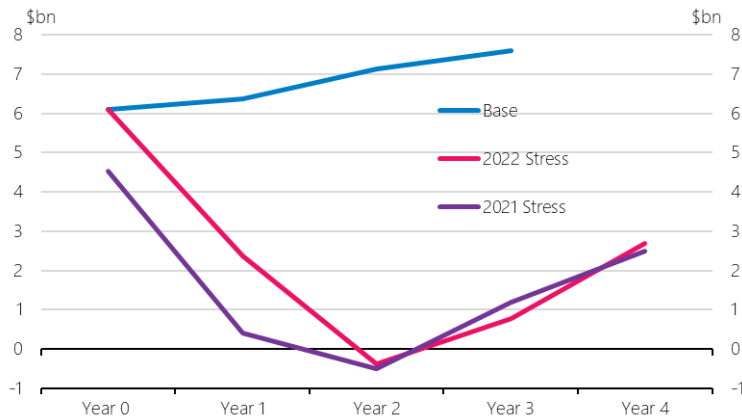
### Aggregate Bank Profitability

Bank aggregate profit after tax fell from \$6.1 billion in the year prior to the stress test (year 0) to \$2.3 billion in year 1, and a loss of \$400 million in year 2. Aggregate profits then rise in year 3 and 4 but are still far below pre-stress levels (Figure 10).

<sup>8</sup> The new capital standards require D-SIBs to increase the risk weights of some assets (i.e through a 'scalar' factor). This occurs in the first year of the stress test.



**Figure 10: Profit after tax**



Source: Bank solvency stress submissions, RBNZ calculations.

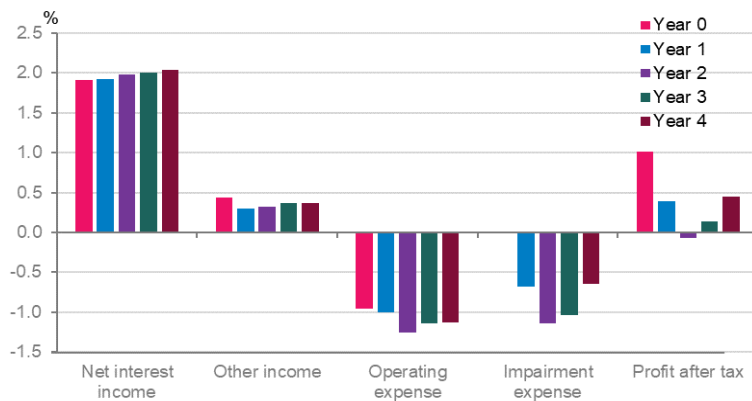
The main drag on profit is the increase in impairment expense. In year 0 impairment expense was close to zero, as shown in Figure 11. Aggregate impairment expenses of \$21 billion (this includes \$0.6 billion from smaller banks) over four years is the equivalent to a loss of approximately 3.5 percent of banking assets. The impairment expense in this year’s stress test was over 30 percent higher than in 2021 reflecting the additional effect of high interest rates on defaulting customers.

Net interest income provides a strong buffer for New Zealand banks in times of stress.<sup>9</sup> This year banks modelled much higher net interest income than last year’s stress test as it was assumed higher funding costs in a rising rate environment could be passed on to customers in the form of higher interest rates. In comparison, the 2021 scenario had negative interest rates that led to a large decline in modelled net interest income with a floor on the reduction in deposit rates and a squeeze in asset margins. (We provide a sensitivity on lower NIM later in the bulletin).

Other income fell in year 1 due to lower fee income and loss of trading income from market risk.

Operating expenses increased due to rising wage costs offsetting reductions that automatically flow from lower activity. Expenses increased by a further \$1.3billion in year 2, equivalent to 0.21 percent of average assets, due to the additional costs from the cyber risk event.

**Figure 11: Decomposition of banks’ profitability, pre-mitigant (% of assets)**



Source: Bank solvency stress submissions, RBNZ calculations.

<sup>9</sup> Internal sensitivity analysis shows that if income fell, similar to the 2021 stress test, the minimum CET1 ratio would fall to 8.0 percent and the aggregate capital ratio would come close to the minimum in year 4. This would add pressure on banks and additional importance to their mitigating actions

### **Cyber operational risk event**

This year's Solvency Stress Test also asked banks to consider how a cyber-attack would impact their business. Banks were required to base this off a 1-in-25 year cyber risk event/s which affects the general banking system.

Banks approached this challenge in a number of different ways and modelled the impacts of scenarios including various distributed denial of service attacks, attacks locking banks out of critical infrastructure, kill chain malware and ransomware events with all attacks modelled to extend over a significant period of around one to two months.

Estimated losses from the respective events varied in line with the benchmark and bank operational risk as expected. Losses related to a variety of factors such as reimbursements to customers, consultancy and legal fees, loss of business, technology upgrades and communication and media costs.

Whilst the aggregate cost from the cyber risk event in this stress test was small in comparison to impairment expenses, it highlights to banks our view that multiple risks can crystallise and need to be managed during an economic downturn. The exercise furthered our understanding of banks' process management in handling and quantifying a cyber-risk stress event.

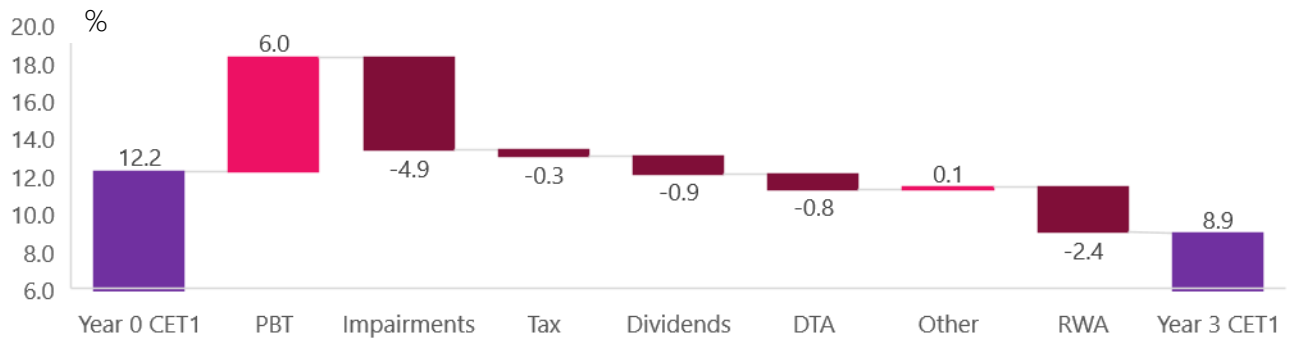
### **Impairment expense and higher RWAs drive the fall in capital ratios**

Impairment expenses, which are the main focus of these stress tests, reduce aggregate CET1 capital by 4.9pp as shown in Figure 12. Further details of impairments expense are provided in the next section.

RWAs increased by over 30 percent, further reducing aggregate CET1 capital by 2.4pp by year 3. Weaker economic conditions leads to a deterioration in credit quality across retail and non-retail portfolios requiring banks to apply higher risk weights to these loans. This effect was compounded by the higher risk weights introduced in year 1. The scenario assumption of a 2-notch ratings downgrade for bank and sovereign debt increases risk weights on these exposures for all banks. The higher RWAs reduces the capital ratio. However, if conditions were to improve after the scenario period, these assets could return to the lower risk weights, improving the capital ratio.

Distributions, which are mainly dividends paid out by banks in year 1 from pre-stress profits, reduce capital by a further 0.9 pp. The increase in deferred tax assets (DTA), generated by higher defaulted loans remaining on bank balance sheets and yet to be written-off, are required to be deducted from capital equivalent to 0.8 pp.

Profit before tax and impairment expense (PBT), i.e. income less expenses before impairment expenses and tax, provides a significant buffer against the fall in capital.

**Figure 12: Decomposition of changes in Aggregate CET1 ratio by year 3**

Source: Bank solvency stress submissions, RBNZ calculations.

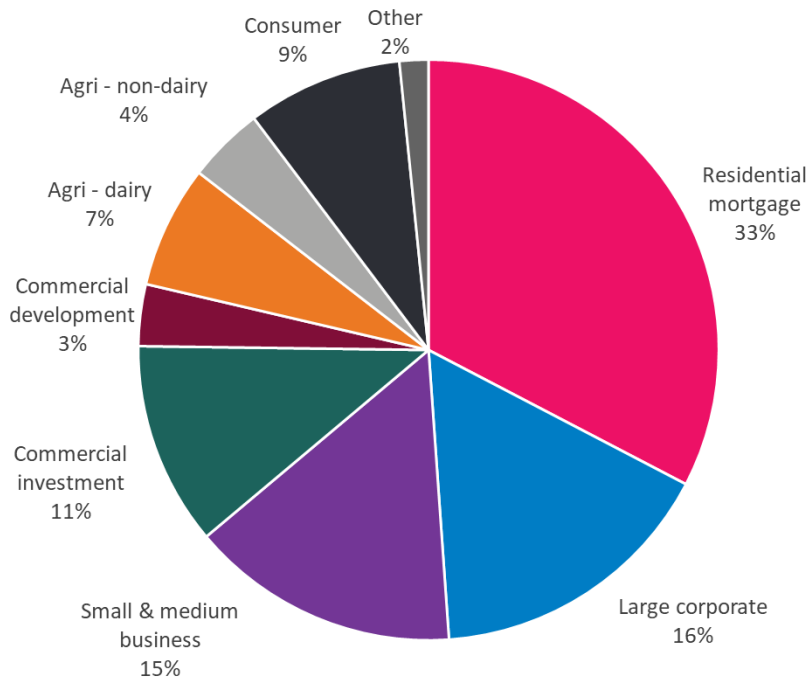
### Impairment expenses

The aggregate loss rate was 3.7 percent for the four years of the stress test (Table 2).<sup>10</sup> This was higher than the 2021 loss rate of 3.2 percent, due to higher loss rates on residential mortgage and corporate business portfolios. The higher loss rate was due to the higher rate of defaults on mortgages and large corporate loans, which may be due to the higher interest rates than in 2021 scenario.

The main contributions to the impairment expenses came from:

- Residential mortgages made up 33 percent of total impairments (Figure 13), despite comprising 57 percent of credit exposures. The residential mortgage loss rate of 1.9 percent was lower than most other portfolios (Table 2) as consumers continued making mortgage payments for as long as possible during stress periods, even when they were unable to service other loans. The loan-to-value ratio restrictions, and an increase in the equity of home-owning households from house price growth in recent years, contributed to reduced losses for banks on defaulted loans.
- Large corporates and small & medium-sized businesses contributed 31 percent of total impairments. Loans to smaller businesses suffered higher default rates than larger businesses, as smaller businesses generally have less cash reserves than larger banks to draw from in stress events. This year's stress test required banks to default one of their five largest corporate exposures.
- Commercial property contributed 14 percent of total impairments. These were the sectors most impacted in this stress test with the highest portfolio loss rates. This reflects the steep fall in property prices in the scenario.
- Agricultural lending contributed 11 percent of total impairments, with elevated defaults caused by the interaction of cost inflation, interest expenses, and reduced commodity prices. Assumed falls in rural land prices further contributed to credit losses.

<sup>10</sup> Loss rate calculated as impairment expense as a proportion of lending.

**Figure 13: Share of impairment expense over four years**

Source: Bank solvency stress submissions, RBNZ calculations.

**Table 2: Stress test four-year loan default and loss rates by lending type**

Portfolio	Exposure	Cumulative Default Rate <sup>1</sup>		Cumulative Loss rate <sup>2</sup>	
	(\$B)	2021	2022	2021	2022
Residential mortgages	351.3	9.1%	11.2%	1.5%	1.9%
Large Corporate	48.5	10.0%	11.8%	4.6%	7.0%
SME Corporate	46.7	19.4%	18.1%	5.4%	6.7%
Commercial property - investment	34.0	27.4%	26.7%	5.8%	7.0%
Commercial property - dev & other	7.7	42.0%	25.1%	13.5%	9.3%
Agri lending - Dairy	29.7	23.7%	20.8%	5.1%	4.8%
Agri lending - non-Dairy	21.0	24.9%	19.0%	4.0%	4.2%
Consumer	18.5	11.4%	13.0%	11.8%	9.8%
Other	5.2	n/a	12.3%	n/a	6.5%
Total	562.5	13.1%	13.8%	3.2%	3.7%

Portfolio	Exposure	Cumulative Default Rate <sup>1</sup>		Cumulative Loss rate <sup>2</sup>	
	(\$B)	2021	2022	2021	2022

[1] The default rate equals the cumulative defaulted exposures over four years as a proportion of the opening exposures.

[2] The loss rate equals the cumulative impairment expense over four years as a proportion of the opening exposure.

Source: Bank solvency stress submissions, RBNZ calculations.

## Adjustments to bank submissions in phase 2

In phase 2 we requested adjustments to net interest income and impairment expenses for residential mortgages and agriculture exposures of some banks to improve the consistency of results.<sup>11</sup>

We then asked banks to re-run the impact of this on the capital ratios for phase 2 results. The size of adjustment differed across banks with an aggregate impact on the minimum CET1 of only 12 basis points (bps).

## Mitigating actions

In response to the impact of the scenario, banks can consider additional management actions, referred to as mitigants. These differ across banks in size and timing and are less certain in a stress environment. The table below shows the main mitigants taken by banks to increase capital ratios compared to what was included and prescribed in the pre-mitigating results.

Table 3: Mitigating actions taken by banks

	Pre-mitigating submissions	Mitigating Action
Capital raisings	No equity injections or issuance of capital instruments	Equity injections and issuance of Tier 1 and Tier 2 capital
Dividends	Dividends fall in proportion to profits subject, to regulatory restriction.	Further reduction or cancellation of dividends.
Revenue	Banks adhere to prescribed guidance on retail deposit and mortgage rates.	Some repricing of retail customers deposits to improve profits.
Expenses	Expenses similar to the base case, adjusted for any automatic reductions such as profit related bonuses.	Further cuts in discretionary spending and reduction in headcount.
Impairments	It is assumed defaulting customers are not returned to non-defaulting state.	Providing assistance to customers to reduce the amount of defaults and/or improve the return they received from defaulted customers.
RWAs	Required to maintain market share growth in line with the prescribed lending growth rates of the scenario.	Not replacing maturing business and having higher loan to valuation ratio for new mortgage lending to reduce risk weighted assets.

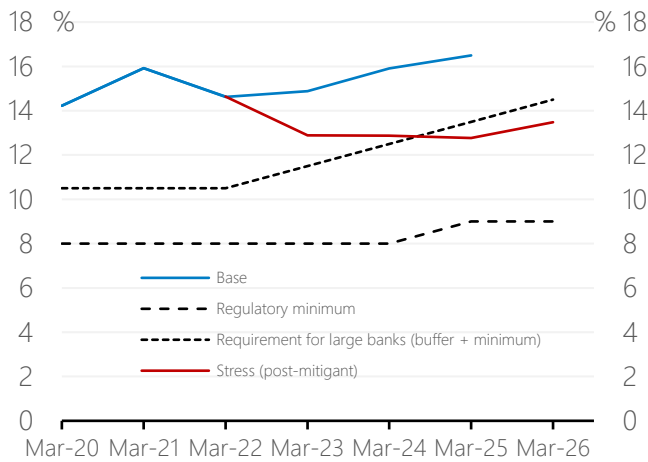
<sup>11</sup> All results in this bulletin reflect RBNZ adjustments.

Mitigating actions increased the aggregate CET1 ratio low point by 0.9 pp to 9.9 percent. The actions are ordered in terms of their impact on aggregate capital (capital actions having the most impact).

The issuance of Tier 1 and Tier 2 capital increased the total capital ratio by a further 1.6pp to a minimum of 12.8 percent. However, it was noted by other submitters that the ability and likely success of raising capital under such a scenario was unclear.

After applying mitigating actions the aggregate total capital ratio is well above the regulatory minimum as shown in Figure 14. However, four banks still remained within the PCB at the end of the stress test. It is likely to take a long period without dividends and/or capital raisings to meet the 2028 capital requirements.

**Figure 14: Aggregate total capital ratio after mitigating actions**



Source: RBNZ *Capital satellite survey*, bank solvency stress submissions, RBNZ calculations.

## Sensitivity analysis

We often want to assess the sensitivity of the results to changes in important variables. For this stress test, large banks were requested to provide sensitivities of their results to changes in interest rates. We also performed a top-down sensitivity using our desktop model to assess changes in the net interest margin.

### Changes in mortgage rates sensitivity

As part of the 2022 Solvency Stress Test the large banks were required to model two different mortgage rate paths to identify the impact on mortgage defaults:

- Sensitivity 1 – No rate change, mortgage rates held at the March 2022 level; and
- Sensitivity 2 - mortgage rates 100bps lower than the prescribed stress test rates (e.g. the peak 2 year fixed rate is 7.4 percent and the stress test is 8.4 percent).

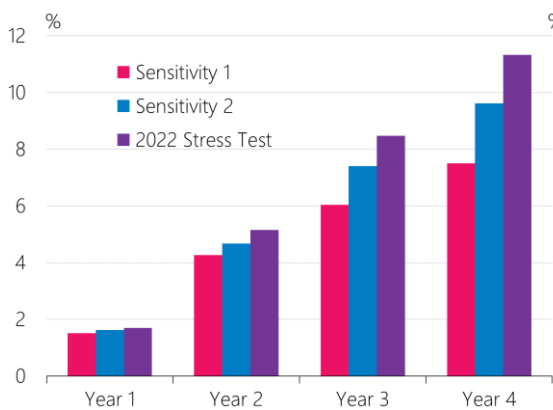
Figure 15 shows cumulative defaulting customers as a percentage of total customers for the two sensitivities compared to the stress test results. The difference between the heights of the bars represents the effect of the different mortgage rates on defaults - all other drivers for both sensitivities, such as the unemployment rate and house prices, were the same as the stress test.

Defaults in the stress test increase more rapidly than the no rate change sensitivity in years 3 and 4, as the 2 year stress mortgage rate rises above 7 percent (peaking at 8.4 percent). Defaults in

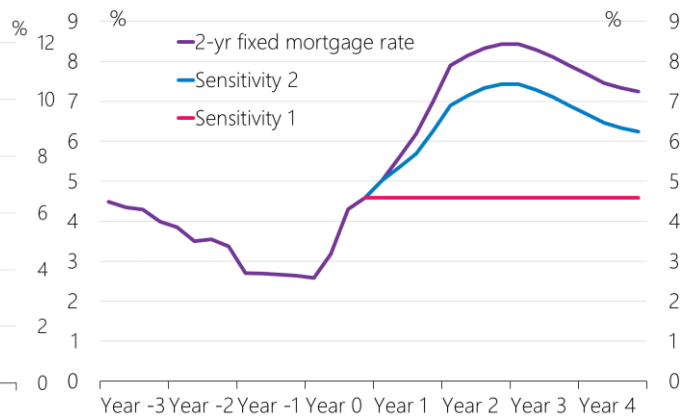
Sensitivity 2 compared to the no rate change sensitivity show a similar pattern but to a lesser extent with rates peaking at 7.4 percent. By the end of year 4, defaults in the stress test were 50 percent higher than in the no rate change sensitivity and 18 percent higher than sensitivity 2 with most of the differences occurring in years 3 and 4.

The results of the sensitivity suggest mortgage interest rates were an important driver of defaults once they exceeded 6 to 7 percent. This conclusion is consistent within the range of test rates large banks have used since 2019 for the affordability assessments of mortgage applications.<sup>12</sup>

**Figure 15: Cumulative mortgage default rates**



**Figure 16: Solvency stress paths for 2-year fixed mortgage rates**



Source: Bank solvency stress submissions, RBNZ calculations.

### Changes in NIM sensitivity

Aggregate NIM increased slightly in this stress test as most banks maintained the margin between their deposit and mortgage rates. This was quite different to recent stress tests which have featured a low OCR and a sharp contraction in NIM - the zero floor on deposit rates meant banks could not reduce deposit rates in line with reductions in mortgage rates.

In the 2021 stress test, aggregate NIM contracted by 30 bps causing a fall of annual net interest income of approximately 15 percent. We applied the lower 2021 stress test NIM assumptions to the 2022 stress test results. This leads to a fall in the aggregate capital ratio by a further 100 bps in year 4 to 9.3 percent, bringing it close to the regulatory minimum of 9 percent and some banks below the minimum. This would increase the importance of banks’ mitigating actions.

### Conclusion

The results of this stress test show that in a severe scenario with higher interest rates and a severe economic downturn, losses would reduce bank capital buffers. In the stress test the buffers were used as they were designed to be during a period of stress. In aggregate, banks would be able to continue to operate but some would face more stress than others. Most banks would need to initiate mitigating actions (such as capital issuance, distribution restriction and expense reductions) to replenish their capital buffers and to meet the rising capital requirements being implemented in accordance with the revised capital adequacy framework.

<sup>12</sup> For further discussion of test rates refer to November 2022 FSR