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Analytical Notes

The effects of the Funding for Lending Programme on funding costs and mortgage rates.

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Reserve Bank of New Zealand ***Analytical Note - The effects of the Funding for Lending Programme on funding costs and mortgage rates***

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Key findings

- The Funding for Lending Programme lowered the weighted-average funding spread of commercial banks by about 15 basis points from the policy announcement date (12 August 2020) to the end of 2020.
- Pass-through from funding costs to mortgage rates is slow.
- As a result, the 6-month, 1-year, and 2-year mortgage rates would fall by about 10–20 basis points over a period of up to a year. These results may underestimate the full impact of the programme, as pass-through likely continues beyond the sample period of this study. Other estimation approaches may also yield higher estimated effects of FLP than those reported in this paper.

1. Introduction

As part of a package to deliver monetary stimulus to the economy during the pandemic, in 2020, the Reserve Bank deployed the Funding for Lending Programme (FLP) to offer low-cost, 3-year funding to banks (Kengmana 2021).[1] The purpose of the FLP is to lower the funding costs of banks and, consequently, encourage banks to pass on the lower cost to households and businesses and increase lending.[2] This paper evaluates this objective using a counterfactual analysis. Our key finding is that the FLP has lowered banks' funding costs, and the evidence suggests that banks have passed on these reduced costs to households.

In principle, the FLP lowers the funding costs of banks in two ways. First, it directly lowers the funding costs of banks that draw down FLP funding. Second, indirectly, it lowers funding costs by reducing the demand of banks for other funding sources. Within the second channel, it is also believed that the availability of FLP funding — rather than its drawdown— would ease banks' concern about potential deposit outflows, providing banks with confidence to lower deposit and wholesale rates. Our empirical model is designed to capture these conceptual channels of transmission.

Building on Cook and Steenkamp (2018), we break down the research question into two parts:

1. Did the FLP lower the weighted-average funding costs of banks from August to December 2020?

2. If so, what was the extent of pass-through to households, and over what horizon?

In attempting to answer the first question, we make use of the stable relationship between Australia and New Zealand funding costs to infer the counterfactual costs of funding New Zealand banks would have faced had FLP not been deployed. As the FLP was a domestic policy measure, we can attribute the effect to the difference between the actual and counterfactual funding costs. Measuring from the date when FLP was announced as a preferred tool for delivering additional stimulus (12 August 2020), we find that FLP lowered the weighted-average funding spread of banks by about 15 basis points (bps) through the end of 2020.

[1] The aggregate amount drawn from the Programme as of October 2022 was about $16.4 billion.
[2] See Table A4 for detailed terms of the FLP.

Next, we revise an existing RBNZ model and confirm that there is a stable relationship between funding spreads and mortgage rates. Applying the FLP effect on funding costs obtained from the previous step, we project that mortgage rates (6-month to 2-year) would fall by 10–20bps over a period of up to a year.

We also estimate the time it would take for the mortgage rates to reach the long-run levels. Bernhard et al. (2021) find that conventional monetary policy such as OCR cuts is effective in lowering mortgage rates offered by New Zealand commercial banks. Consistent with Cook and Steenkamp (2018), we find that pass-through is slow. Generally, it would take about 8–28 weeks to complete half of the convergence. These results may explain why mortgage rates had only fallen marginally during the sample period.

Our results are consistent with international experience of the use of funding for lending as an alternative monetary policy tool. Churm et al. (2021) find that the Funding for Lending Scheme implemented by the Bank of England boosted GDP in the UK by around 0.5–0.8% and inflation by about 0.6% at peak. Similarly, Kent (2021) notes that the Term Funding Facility implemented by the Reserve Bank of Australia has helped to reduce funding cost through lowering interest rates on fixed loans. Drawing from the experiences of Australia, Mexico, New Zealand, Saudi Arabia, Sweden, Switzerland, Taiwan, and the Euro Area, Casanova et al. (2021) find that policy measures that strengthen bank balance-sheet capacity are associated with subsequent loan growth.

There are multiple reasons why the estimated effects of FLP may be understated in this paper. First, pass-through beyond the sample period of this study cannot be captured in this paper. Second, quantitative and qualitative information provided by banks suggest larger effects than those reported in this paper. A more holistic review of the FLP programme is contained in the Review and Assessment of Monetary Policy over 2017-22.

The next section describes the empirical framework. Section 3 presents the results. Section 4 discusses the limitations of this study. Section 5 concludes.

2. Empirical framework

Our empirical strategy consists of two parts. First, we assess the effects of the Funding for Lending Programme (FLP) developed by the Reserve Bank. Next, we project the estimated effect of FLP on funding costs in an error correction framework to measure the impact of FLP on mortgage rates in New Zealand.

Effects of FLP on funding costs

To construct the counterfactual funding costs of New Zealand banks in the absence of FLP, we take the following steps:

- We take observations that pertain to the funding conditions of Australian banks. These include deposit rates $('d')$, deposit spreads $('ds')$, credit default swap $('cds')$ spreads, corporate bond spreads $('cs')$, and a term premium $('tp')$ from Australia. There are reasons to believe that bank funding costs in Australia and New Zealand are comparable. Firstly, the

Big Four banks are owned by the same corporate entities. Secondly, capital structures are similar between Australia and New Zealand banks.[3]

- Calculate the principal component of the rates and spreads using data from January 2002 to March 2021.
- Regress the New Zealand funding spread on the principal components over the sample period - January 2012 to August 2020:

$$fs_t = \beta_0 + \beta_1 PC_t^d + \beta_2 PC_t^{ds} + \beta_3 PC_t^{cds} + \beta_4 PC_t^{cs} + \beta_5 PC_t^{tp} + \epsilon_t, \quad (1)$$

where fs refers to the 3-month weighted-average funding spread of banks and $PC^{()}$ refers to the principal component of the respective interest rates or spreads described above, and superscripted accordingly. ϵ is a white noise error term that is normally distributed.

- Produce an out-of-sample counterfactual of the New Zealand funding spread, based on Australian funding conditions, from August to December 2020.

This last step produces a counterfactual of what the New Zealand funding spread would have been without the FLP. The reason is that the FLP stimulus had an influence on funding costs in New Zealand, but not on Australian banks, while the relationship between Australian and New Zealand funding costs was historically stable. Given this observation, we can extract the FLP effect as the difference between the actual and the counterfactual funding spreads.

Table 1 presents the timeline of events that led to the implementation of the FLP. In the benchmark model, we opt to measure the effect of FLP on 12 August 2020, when it was first announced as a preferred tool for delivering additional stimulus. As more details on the implementation of the FLP and drawdown emerged on a later date, it seems reasonable that the impact of the FLP on funding costs was not limited to the immediate aftermath of 12 August. For this reason, we measure the dynamic effect from the date of announcement through 31 December.

Table 1: FLP announcement dates

Date	Event
12 August 2020	FLP mentioned in conjunction with a negative OCR as a possible/preferred tool for delivering additional stimulus (noting OCR was to be held at 0.25 percent until March 2021 as per forward guidance).
23 September 2020	Bank staff instructed to look at deploying FLP on a standalone basis before the end of the year.
11 November 2020	FLP formally announced, including key parameters.

[3] See Appendix Fig. A1 and Fig. A2.

1 December 2020	Domestic Markets Announcement – Reserve Bank Outlines Details of FLP.
7 December 2020	FLP becomes operational.

The difference between the counterfactual funding spread and the actual funding spread is a reasonable estimate of FLP impacts, as they represent the change in funding spread that is unexplained by factors driving Australian funding costs. Given the identification challenges, we believe this is a reasonable starting point. Details of the data are included in Tables A2 and A3 of the Appendix.

Transmission of lowered funding costs to mortgage rates

Following Cook and Steenkamp (2018), we decompose changes in mortgage rates into the effects of two different channels — one due to the change in the policy rate and another due to changes in funding costs.

This decomposition uses an error-correction model (ECM) in the spirit of Engle and Granger (1987). When there is a cointegrating relationship between the dependent and independent variables, such an approach has the benefit of including information about long-run adjustments in the model. In this instance, the benefit of applying an error-correction approach to assessing policy pass-through is that it will identify the long-run relationship between the policy rate, funding costs, and mortgage rates.

To utilise an ECM, we first assess whether a cointegrating relationship exists. Table A1 shows that all variables from Table 2 (mortgage rates, funding spreads and policy rates) are non-stationary over all samples (6-month, 1-year and 2-year). Since the residual of the long-run relationship is confirmed to be stationary, this indicates that there is a co-integrating relationship between the policy rate, funding spread, and the relevant mortgage rate in each case.

As in Cook and Steenkamp (2018), we use the approach of Darracq Paries et al. (2014),

$$\Delta r_t = \sum_{k=0}^{K} \delta_k \Delta pr_{t-k} + \sum_{j=1}^{L} \lambda_k \Delta r_{t-j} + \sum_{j=1}^{M} \gamma_k \Delta fs_{t-j} + \alpha(r_{t-1} - \beta_1 pr_{t-1} - \beta_2 fs_{t-1} - c) + e_t \quad (2)$$

where r_t is the mortgage rate, pr_t is the OCR, fs_t is the 3-month weighted-average funding spread and c is a constant term. The above equation is estimated for mortgage rates fixed for three different durations: 6-month, 1-year, and 2-year. The lag-lengths K, L and M are set at 1, as suggested by the Akaike information criterion.

The first three terms in this regression represent the short-run dynamics of the mortgage rate. α represents the speed of adjustment towards the long-run equilibrium, and the term in round brackets represents the long-run cointegration relationship between the variables. The coefficients β_1 and β_2 represent the long-run pass-through to the mortgage rate from the policy rate and funding spread respectively.

The model is estimated using weekly data from 2 January 2009 to 12 August 2020 to capture the pre-FLP effect. The post-FLP time period (between August 2020 and late 2021) is not long enough to perform an ECM analysis on. Therefore, we quantify the FLP effect in an alternative way. We combine the estimated effect of FLP on funding spreads with the ECM parameters to infer the pass-through effect of mortgage rates from FLP through the funding spread.[4]

3. Results

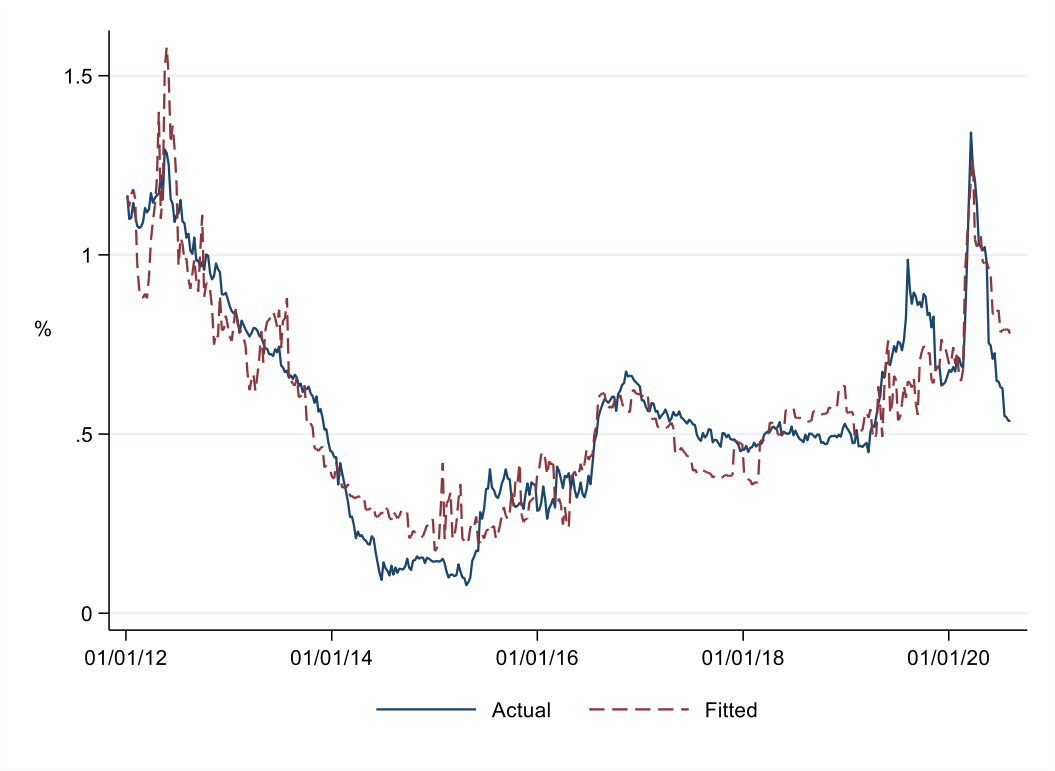
The results of the counterfactual analysis based on Equation (1) are shown in Figure 1. The upper panel shows that New Zealand bank funding costs were largely driven by the same shocks driving Australian funding costs during this period. The overall fit of the model is high, with Australian factors explaining up to 85% (Adjusted $\boldsymbol{R^2}$) of the variation of New Zealand funding costs.

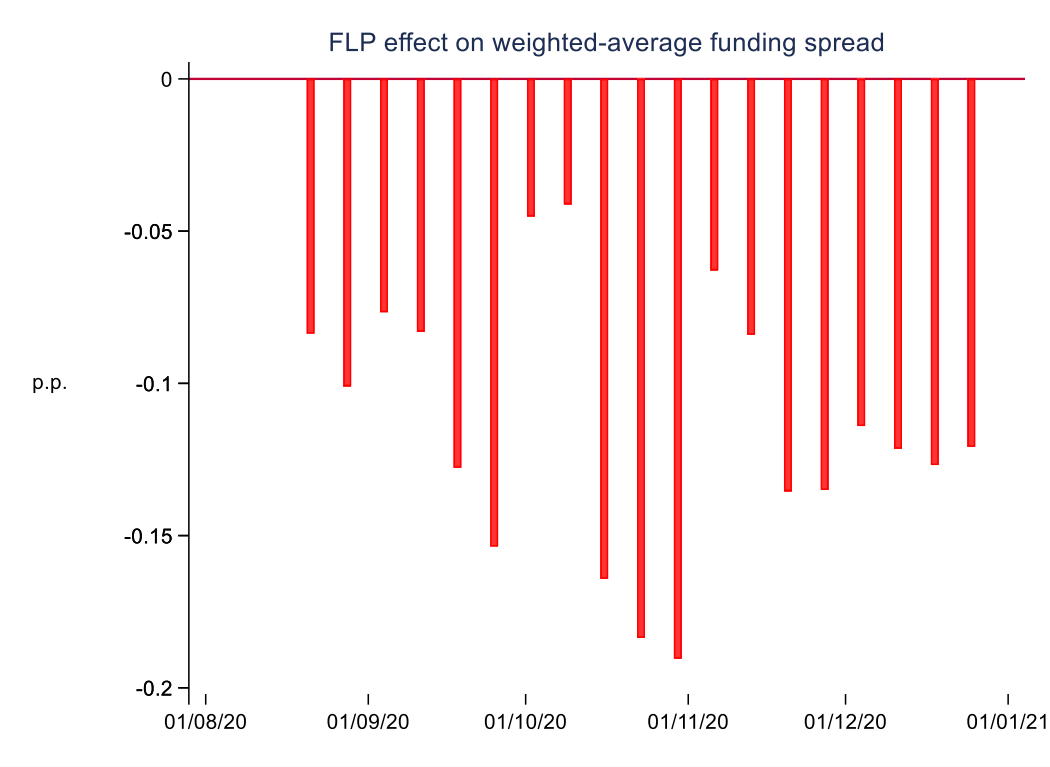
The Reserve Bank of Australia announced the Term Funding Facility — the Australian equivalent of the FLP — in March 2020. That may partially explain why the fitted line (estimated from Equation (1)) in the upper panel of Figure 1, which is driven by Australian funding costs, also falls around that period. Following the introduction of FLP, a wedge opened up, gradually resulting in the realised funding spread being about 15 basis points below what the fitted value from Equation (1) suggests by mid-October 2020 (two months after FLP announcement in August).[5] These results are presented in the lower panel of Figure 1 and are robust to different estimation periods.

Furthermore, the FLP effect documented in Figure 1 is larger than what randomness in data is likely to generate, supporting the notion that FLP is economically and statistically impactful. The estimation result of Equation (1) reveals that randomness in the data can generate about a 12 basis point change in funding spread that is unexplainable by fundamental factors.[6] Our finding that the estimated FLP effect (actual less counterfactual funding spread after FLP announcement) exceeds 12 basis points from the sixth week onward and remains persistently so suggests that the fall in the spread is likely due to FLP rather than pure chance. The delayed pass-through is also consistent with the anecdotal evidence that suggests that back then, management of the commercial banks waited for the details of the FLP before responding.

[4] We multiply the difference between counterfactual and actual funding spreads by β_2 in Equation (2).
[5] Note that a gap has opened up between the actual and fitted funding costs even prior to the introduction of FLP in August. To err on the side of caution and *not* attribute these differences as the effect of FLP, we deduct the starting point difference from the FLP effect calculated in the lower panel of Figure 1.
[6] One standard deviation of the residuals is about 12 basis points.

Figure 1: The FLP effect on the New Zealand bank funding spread





The upper panel of Table 2 shows that both funding spreads and policy rates are significant drivers of mortgage rates. We find that a 1 percentage point increase in the funding spread is associated with a larger than 1 percentage point increase in the 1-year and 2-year mortgage rates.[7] Wald tests in the lower panel verify that these estimates are statistically significant.

Table 2: Change in pass-through estimates pre-FLP

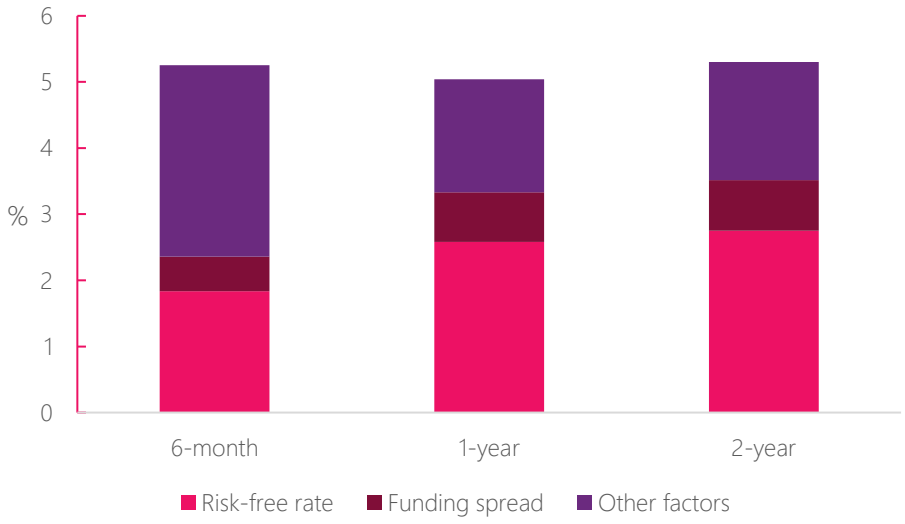
	6-month mortgage rate	1-year mortgage rate	2-year mortgage rate
Policy rate (β_1)	0.8***	1.086***	1.045***
	(0.011)	(0.009)	(0.008)
Funding spread (β_2)	0.767***	1.139***	1.198***
	(0.03)	(0.027)	(0.03)
ECM (α)	-0.025**	-0.049***	-0.083***
	(0.009)	(0.012)	(0.012)
ADF: for unit root	0.247***	0.205***	0.289***

[7] The null hypotheses of $\beta_2 = 1$ are rejected at the 0.05 and 0.01 significance levels, supporting that the estimated β_2 are larger than 1 for the 1-year and 2-year mortgage rates.

p-value	0.0001	0.0001	0.0001
Wald: $\beta_1 = 1$	630.35***	53.50***	1.51
Wald: $\beta_2 = 1$	106.59***	10.87**	12.85***
N (obs)	601	601	601

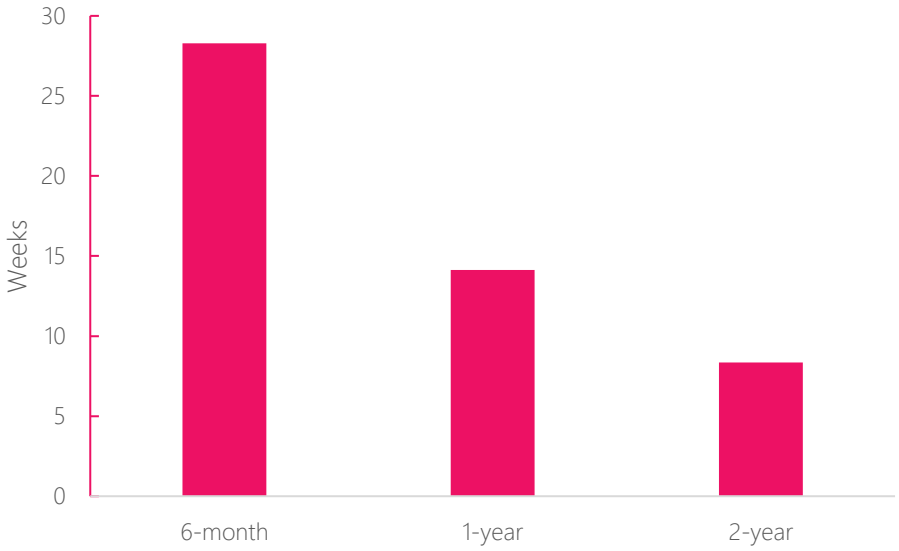
Figure 2 shows the long-run contributions to the level of mortgage rates estimated in Equation (2). These are calculated as the product of the long-run coefficients and the sample averages of the risk-free rate (policy rate) and funding spreads. It shows that while the risk-free rate is the major contributing factor of mortgage rates, the funding spread is also material, accounting for about 10–15 percent of the level of mortgage rates. Accordingly, if one takes 15 basis points as the estimated effect of FLP on the funding spread, the implied changes in mortgage rates range, respectively, from 10 to 20 basis points over a period of up to a year.

Figure 2: Long-run contributions to mortgage rates



However, the transition to the long-run value is slow. Consistent with Cook and Steenkamp (2018), we find that it takes about 8–28 weeks for half of the convergence to be completed (Figure 3). These results may help explaining the minimal fall in mortgage rates during the sample period.

Figure 3: Half-life estimates of convergence to long-run equilibrium



4. Limitations

The effects of the FLP may be inaccurately estimated in this study. Factors leading to overestimation include the delayed effects of other government policies that may affect domestic funding costs. These policies include the Large Scale Asset Purchase (LSAP) programme, the prospect of negative interest rates, Term Auction Facility in Australia, and wage subsidy. That may explain why the gap between the actual and counterfactual funding costs in Figure 1 opened up in early 2020, prior to the announcement of FLP. To mitigate that, we attribute only the *increase* in the gap following August 2020 as the FLP effect.

On the other hand, by examining only the period from August to December, we may have underestimated the impact of the FLP. Note that extending our analysis over a longer time-frame would make it even harder to disentangle the effects, with a range of factors potentially clouding the results. However, this shortened sample is also a key limitation.

The funding plans of banks are slow-moving, and the FLP may have taken time to be reflected in funding costs beyond the point at which it became operationalised. Banks may have held off incorporating the FLP into their funding plans until the details of the programme were known in late 2020. Just as funding plans can be slow-moving, retail interest rate pricing can also be sticky depending on a range of factors. Indeed, drawdowns occurred only gradually and we did see some downward pressure on mortgage rates in the first half of 2021, even as expectations of increases in the OCR were on the rise.

5. Conclusion

This paper evaluates the effectiveness of the FLP by estimating its effect on funding spread of New Zealand banks and mortgage rates. Our results suggest that following the introduction of the FLP, the funding spread fell 15 basis points lower than what would be expected based on the historic relationship between the spread and measures of Australian funding costs. In turn, the historically stable relationship between the funding spread and mortgage rates implies that mortgage rates have also fallen because of the FLP.

Appendix

For the ECM analysis, we run the Engle and Granger (1987) two-step procedure for cointegration analysis. As a first step we estimate the long-run (equilibrium) equation:

$$y_t = \delta_0 + \delta_1 x_t + u_t \qquad (A1)$$

This equation gives a measure of disequilibrium obtained from the OLS residuals.

As a second step, we estimate the error correction model.

$$\Delta y_t = \phi_0 + \sum_{j=1} \phi_0 \Delta y_{t-j} + \sum_{h=0} \theta_h \Delta x_{t-h} + \alpha \tilde{u}_{t-1} + \varepsilon_t \qquad (A2)$$

This estimation describes how y and x behave in the short run consistent with a long-run cointegrating relationship.

Table A1 shows that all variables from Table 2 (mortgage rates, funding spreads and policy rates) are non-stationary over all samples (6-month, 1-year and 2-year). Insignificant p-values indicate rejection of the null hypothesis that the variable has a unit root.

Table A1: Unit root tests (levels)

	6-month	1 year	2 year
Mortgage rate- Z(t)	-0.988	-0.69	-0.692
p-value	0.758	0.849	0.849
Policy rate- Z(t)	-0.937	-0.982	-1.135
p-value	0.776	0.760	0.701
Funding spread- Z(t)	-1.521	-1.352	-1.528
p-value	0.523	0.605	0.520

MacKinnon(1996) p-values

Table A2: New Zealand funding cost components

Components	Sub-components
Domestic long-term wholesale	Medium-term domestic wholesale

Components	Sub-components
	Long-term domestic wholesale
Foreign short-term wholesale	
Foreign long-term wholesale	Medium-term foreign wholesale
	Long-term foreign wholesale
Retail and corporate deposits	Domestic retail and corporate term deposits
	Retail and corporate overnight deposits
Note: these components are combined into a weighted-average funding cost by Bank staff and converted back to a 3-month horizon.	
Source: interest.co.nz, Bloomberg, Bank calculation	

Table A3: Australia bank funding cost components

Components	Sub-components
Bank funding costs	Cash Market: Interbank Overnight (%)
	Banks' Term Deposits [$10000]: Average - All Terms (% pa)
	Banks' Term Deposits [$10000]: Average Special Rate - All Terms(% pa)
	Building Societies/Credit Unions & Mutual Banks: Trans Accts [$5000](%pa)
	Banks' Bonus Savings Accounts: Savings Accounts [$10000] (% pa)
	Online Savings Accounts: Savings Accounts [$10000] (% pa)

Components	Sub-components
	Cash Management Accounts At Banks: Savings Accounts [$10000] (% pa)
	Cash Management Accounts At Banks: Savings Accounts [$50000] (% pa)
Corporate funding costs[8]	Non-Fin Corp A-Rated Bonds: Spread to AGS: 3 Year Target Tenor(Units)
	Non-Fin Corp A-Rated Bonds: Spread to AGS: 5 Year Target Tenor(Units)
	Non-Fin Corp A-Rated Bonds: Spread to AGS: 7 Yr Target Tenor (Units)
	Non-Fin Corp A-Rated Bonds: Spread to AGS: 10 Yr Target Tenor (Units)
	Retail and corporate overnight deposits
Term premium	Principal component of term premiums from 1-year to 10-year horizon
Source: Reserve Bank of Australia, Haver	

Table A4: Terms of FLP

Terms	Details
First announcement date	12 August 2020
Formal announcement date	11 November 2020
Transaction period	7 December 2020 – 6 June 2022 for initial allocations, and until 6 December 2022 for additional allocations.
Duration of loan	3 years
Price	OCR
Allocations	Initial allocation of 4 percent of a bank's eligible loans, and an additional allocation of 50 cents for every dollar of net growth in eligible loans

[8] Although these rates come from non-financial companies, they may reflect funding costs of banks that are not captured by other variables.

Terms	Details
	commencing 1 November 2020, up to a maximum of 2 percent.
Aggregate outstanding	$1.04 billion (as of Dec 2020), $6.73 billion (as of Dec 2021).

Figure A1: Average capital structure of Australian banks, 2016-2021. Source: RBNZ.

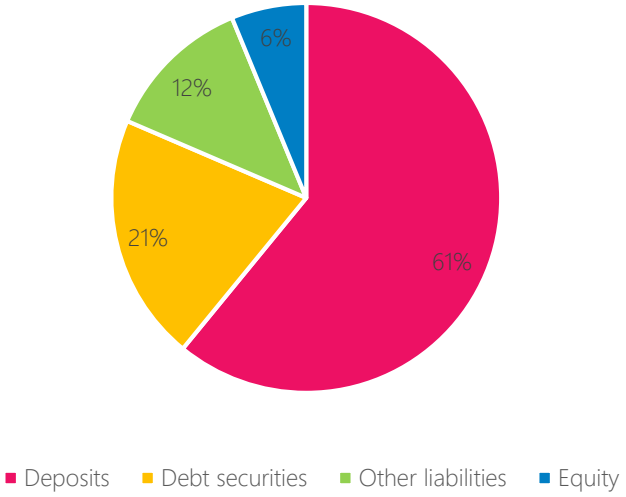
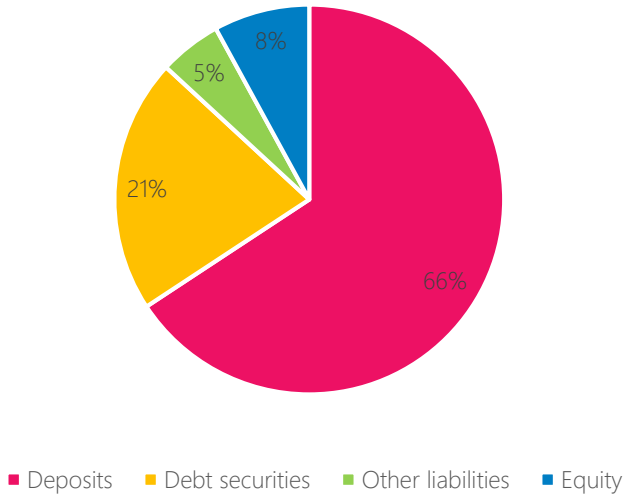


Figure A2: Average capital structure of New Zealand banks, 2016-2021. Source: APRA.



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