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Personal home loans: Price responsiveness as one dimension of assessing competition

A report for BNZ
1 December 2023

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Glossary

Acronym	Full name
ANZ	ANZ Bank New Zealand Limited
ASB	ASB Bank Limited
BNZ	Bank of New Zealand
bps	Basis points
Commission	Commerce Commission
Co-op	Cooperative Bank
D-SIB	Domestic Systemically Important Banks (as defined by the RBNZ)
ICBC	Industrial and Commercial Bank of China (New Zealand)
Kiwibank	Kiwi Bank Limited
LINZ	Land Information New Zealand
LVR	Loan-to-value
OCR	Official Cash Rate
PIP	Preliminary Issues Paper
SBS	Southland Building Society
SVAR	Structural Vector Autoregressive Regression
TSB	Taranaki Savings Bank
VAR	Vector Autoregressive Regression
Westpac	Westpac New Zealand

Scope and introduction

Purpose

1. Deloitte Access Economics (**we** or **our**) has been engaged by the Bank of New Zealand (**BNZ**) to review Link Economics' report into the nature of competition for personal banking services. Link Economics' report was attached to the Kiwi Bank Limited (**Kiwibank**) cross submission to the Commerce Commission's (**the Commission**) Preliminary Issues Paper (**PIP**) on the market study into personal banking services (**the market study**), released on 10 August 2023.

Structure and scope of this report

2. This report provides a review of Link Economics' report and an independent assessment of the constraint of Kiwibank's and other registered banks' personal home loan rates on ANZ Bank New Zealand Limited (**ANZ**), Westpac New Zealand (**Westpac**), ASB Bank Limited (**ASB**) and BNZ.

3. Deloitte Access Economics requested weekly data from interest.co.nz, a database that is shared with the Reserve Bank, on advertised home loan rates. The data captures advertised home loan rates across floating to 5-year fixed rates from 4 January 2002 to 3 November 2023. This data formed the basis for the independent assessment.

4. This report also puts Link Economics' findings in context. Firstly, Link Economics only assesses prices, which is one dimension of competition. In addition, its analysis of consumer switching supports a view of an increasing impact from Kiwibank on personal home loan products.

5. The remainder of this report is structured as per Table 1 below:

Table 1: Report structure and contents

Section	Content
Personal home loans: Competition is multifaceted	• The assessment of pricing responsiveness can provide a view on the nature of existing competition. However, it only sheds light on one dimension of competition. • Several other factors, such as the *ability* to switch and conditions of entry, exit and expansion, are also important considerations.
Link Economics' findings	• Overview of the analysis undertaken by Link Economics. • Caution is required in drawing wide conclusions from Kiwibank's June 2020 reduction in its variable rate. • We believe Link Economics' analysis indicates Kiwibank is getting a proportionally larger share of new and refinance mortgages.
Verification of price responsiveness	• We undertook our own analysis of the responsiveness of banks' advertised rates to each other to test Link Economics' conclusion that Kiwibank provides 'little to no constraint'. • Our empirical analysis indicates Kiwibank and other banks play a role in explaining the advertised rates of ANZ, ASB, Westpac and BNZ. • Further to this, our results indicate a degree of dynamism in how results vary across products.

Key points

- To verify Link Economics' findings, Deloitte Access Economics undertook econometric analysis of how firms respond to personal home loan rates of competitors over the period 4 January 2002 to 3 November 2023. By constructing a model using a wholesale cost benchmark and the lagged weekly values of the rates advertised by all registered banks, we tested for a causal relationship between Kiwibank and each of ANZ, ASB, Westpac and BNZ. **The results indicate:**

    o **Kiwibank <u>does</u> play a role in impacting the rates set by ANZ, ASB, BNZ and Westpac**.
    o **Wholesale rates are statistically significant in impacting the rates of almost every product for almost every bank**. This contrasts with the Link Economics results and indicates capital markets play a role in determining advertised personal home loan rates.
    o **Beyond Kiwibank, other registered banks also impact the rates set by ANZ, ASB, Westpac, BNZ and Kiwibank.**
    o **A degree of dynamism**. For example, Kiwibank's rates have a statistically significantly impact on ASB's 1-year rates, which in turn impacts BNZ's rates, which in turn impacts the rates of all other market participants analysed by Deloitte Access Economics.

- Link Economics found Kiwibank provides 'little to no constraint' in personal home loan products. For example, it found none of ANZ, ASB, Westpac or BNZ responded to Kiwibank's 100 basis points reduction in its variable rate in June 2020. **On the whole, Deloitte Access Economics notes:**

    o **Caution against drawing wider inferences from a case study of the variable market,** given the relatively low demand in New Zealand for variable products and the possibility that other competitors may focus more on fixed-rate products or through other competitive responses, with the value share of floating accounting for only 14.7% of total personal home loans as at June 2020.
    o The rate differential between Kiwibank and the rates for ANZ, Westpac, ASB and BNZ for 1-year fixed and 2-year fixed rates during the same time as the variable rate reduction was lower, with an average differential of 6 basis points for 1-year products and 3 basis points for 2-year products.

- Link Economics undertook regression analysis to consider whether being a 'larger bank' increases the ability of a firm to win new customers. It concluded that simply being a larger bank leads to a firm winning twice as many new home loans and 20% more refinanced home loans (holding price constant). **Deloitte Access Economics notes:**

    o **These results actually highlight the competitive pressure imposed by Kiwibank**, as it is more useful to consider these results relative to market shares than in terms of an absolute number of customers.
    o Analysis of value shares of personal home loans over the period considered in the Link Economics report indicates **Kiwibank is outperforming all market participants**. Kiwibank has proportionally grown its residential mortgage book the most, growing its value share by 31%, relative to its share in 2018.

- While assessing the responsiveness of banks' pricing is a means of assessing the current level of competition for personal home lending in New Zealand, **it is unlikely to provide a complete picture of the competitive dynamics in the market. Pricing is only one dimension of competition. Competition includes other factors, for example:**

    o Non-price factors are an important element in driving customer satisfaction
    o Switching behaviour, which includes multihoming, is an important measure of level of competition and a focus should remain on the consumers' ability to switch
    o Conditions of entry, exit and expansion.

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Personal home loans: Competition is multifaceted

6.   The Commission's market study provides an opportunity to study in-depth whether competition in personal banking, of which home loans or home lending is an in-scope product, is promoting outcomes that benefit New Zealand consumers over the longer term.[1]

7.   While the assessment of pricing responsiveness of banks to other banks' pricing changes provides a view on the nature of existing competition for personal home lending, we consider the market study should continue to focus on the *ability* of consumers to switch and the conditions of entry, exit and expansion.

8.   In a workably competitive market, the *ability* of consumers to switch or multihome between firms heightens the extent of competition in a market. An engaged consumer base adds to competitive tension, adding to the incentive to, amongst other outcomes, offer competitive rates, innovate, and increase product and service quality.

9.   Further, the threat of entry and expansion heightens the extent of competition in a market, and increases the incentive to price competitively, innovate and increase product quality and service. We would note that the ability to switch also supports entry and expansion for new and existing firms. An engaged consumer base will also be aware of new entrants and the products or services they offer, ensuring new entry and expansion is not deterred.

10.   Factors that unnecessarily impede the *ability* to switch and / or impede entry and expansion are likely to impact the level of competition for personal banking services in New Zealand. Therefore, while assessing the responsiveness of banks' pricing is a means of assessing the level of competition for personal home lending in New Zealand, it is unlikely to provide a complete picture of the competitive dynamics in personal home loans services.

11.   In this context, advertised home loan interest rates offered for floating and fixed-term mortgages is <u>one</u> dimension of competition between banks. The interest rates advertised are the prices banks advertise to attract and retain consumers. However, it should be noted:

11.1.   Banks may also respond to a change in a competitor's advertised rates through "below-the-line" discounting.

11.2.   A competitive response may also encompass a range of other actions, depending on its competitive strategy at the time, focus areas and cost base. For example, a bank may choose to respond to offer additional financial benefits to existing and new consumers while keeping advertised interest rates the same, or engage in advertising to emphasise non-price factors of its home lending offering.

11.3.   The responsiveness of banks' pricing may also reflect the importance consumers place on attributes of home loans. As we have previously noted[2], non-price factors are an important element in driving customer satisfaction in New Zealand. Banks may respond along non-price dimensions of their service offerings in response to a change in a competitor's advertised rates.

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[1] Commerce Commission "Market study into personal banking services – Preliminary Issues paper" (10 August 2023) at [2].

[2] Deloitte Access Economics "Personal bank services: Consumer switching, conditions of entry and expansion, profitability and innovation – A report for BNZ" (7 September 2023) at [24] – [25], available at https://comcom.govt.nz/__data/assets/pdf_file/0020/329033/BNZ-Submission-on-Market-study-into-personal-banking-services-Preliminary-Issues-paper-7-September-2023-Attachment-A.pdf

Link Economics' findings

12. Link Economics undertook empirical analysis to assess:

    12.1. The response of ANZ, Westpac, ASB and BNZ to a reduction by Kiwibank of its advertised variable mortgage interest rate by 100 basis points (**bps**) from 4.4% to 3.4% in mid-June 2020.[3]

    12.2. The impact of the advertised interest rates on mortgages set by Kiwibank on the advertised interest rates set by ANZ, Westpac, ASB and BNZ, by fitting linear regressions and studying the statistical significance and coefficients of different variables.[4]

    12.3. The ability of smaller market participants to win customers through switching. Link Economics uses Land Information New Zealand (**LINZ**) data on mortgage registrations, using scatter plot and panel regression analysis, overlaid with advertised interest rate data on mortgages.[5]

13. The price responsiveness analysis was based on month-end advertised personal home loan rates from June 2018 to June 2023.

14. As discussed in the previous section, competition for personal home lending is likely to be multifaceted. Other banks' responses to changes in Kiwibank's interest rates may not necessarily be reflected in changes to their own advertised rates. The exact response may range from changes in the effective rate charged by banks to changes in non-price dimensions or advertising strategy.

15. We consider it is important the Commission views Link Economics' findings in this context. That is, Link Economics' analysis is confined to examining some, but not all, dimensions of competition for personal home lending.

Kiwibank's 100 basis point reduction in the variable rate

16. In June 2020, Link Economics notes that Kiwibank dropped its variable interest rate 100 bps from 4.4% to 3.4%. According to mortgage rate data presented by Link Economics from interest.co.nz, none of ANZ, Westpac, ASB or BNZ responded to this interest rate reduction from Kiwibank, with a 100 bps gap between Kiwibank and ANZ, ASB, Westpac and BNZ persisting for more than a year.[6]

17. Deloitte Access Economics notes the volume share of variable mortgage products is relatively small compared to 1-year and 2-year mortgage products over Link Economics' assessment period. The 1-year and 2-year fixed term mortgages have accounted for the majority of mortgages, by value, since January 2019.

18. Figure 1 shows that variable rate mortgage products make up a relatively small proportion of mortgages in New Zealand by value overall, accounting for about 14.7% as at Kiwibank's 100 bps variable rate drop (June 2020).

[3] Link Economics "The nature of competition for personal banking services" (2023) at [3a].
[4] Link Economics "The nature of competition for personal banking services" (2023) at [3b].
[5] Link Economics "The nature of competition for personal banking services" (2023) at [9] – [10].
[6] Link Economics "The nature of competition for personal banking services" (2023), at [22] and Figure 1.

19.   The proportion of mortgages with a variable rate dropped to 12.5% by June 2021. This relatively low proportion of variable rate mortgages contrasts with overseas markets, where nearly 70% of Australians, for example, are on variable rate mortgage products.[7]

Figure 1: Value of mortgages by time until next repricing
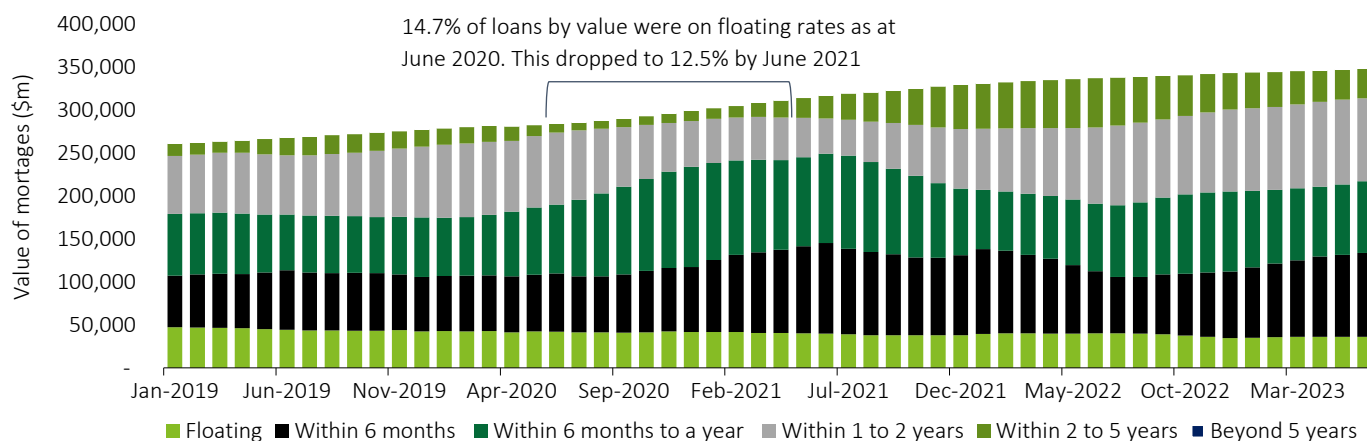
Source: Deloitte Access Economics analysis of RBNZ data. This data is confined to mortgages held by registered banks.

20.   Given the relatively low demand for variable rate mortgage products, it is possible that consumers and, therefore, competitors responses may be more focused on products that are demanded in higher proportion, such as 1-year fixed and 2-year fixed rates, which comprised of the majority of all mortgages by value as at Kiwibank's 100 bps variable rate drop (June 2020).[8] Potentially, reflective of this:

20.1.   The rate differential between Kiwibank and the rates for ANZ, Westpac, ASB and BNZ for 1-year fixed and 2-year fixed rates during the same time as Kiwibank's variable rate reduction was lower, averaging 6 bps for 1-year products and 3 bps for 2-year products.[9]

20.2.   We observed the following rate movements, by product (from weekly mortgage rate data from interest.co.nz) between June 2018 and November 2023:

20.2.1. **1-year rates**: ANZ, ASB, Westpac, BNZ and Kiwibank each moved their 1-year rates 51, 44, 44, 42 and 37 times respectively

20.2.2. **2-year rates**: ANZ, ASB, Westpac, BNZ and Kiwibank each moved their 1-year rates 45, 38, 49, 41 and 46 times respectively.

20.2.3. **Floating rates:** ANZ, ASB, Westpac, BNZ and Kiwibank each moved their floating rates 14, 13, 14, 15 and 16 times respectively.

21.   The difference in frequency of changes to floating rates, relative to 1-year and 2-year, also raises the possibility that competitive responses may be more focused on 1-year and 2-year fixed rated personal home lending products.

22.   We would further note that variable rate mortgage products are not homogenous between banks. For instance, we understand that certain banks offer offset features within their variable rate mortgage products, which allows consumers to subtract transaction account savings

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[7] Reserve Bank of Australia "Statement on monetary policy – Box A: Mortgage interest payments in advanced economies – One channel of monetary policy" (February 2023) at graph A.1, available at https://www.rba.gov.au/publications/smp/2023/feb/pdf/box-a-mortgage-interest-payments-in-advanced-economies.pdf

[8] This assumes that loans secured by residential mortgage due to be repriced within 6 months to 2 years were on 1-year fixed or 2-year fixed rates and is based on Figure 1 above.

[9] Calculated as the average from June 2018 to November 2023 of the average gap between the advertised rates of each of ANZ, ASB, Westpac and BNZ with Kiwibank from weekly interest.co.nz data for 1-year and 2-year products.

amount from the home loan balances when calculating interest payments.[10] Such differences in variable rate mortgage product characteristics may impact competitive responses to variable rate reductions.

23. Ultimately, this evidence suggests caution against drawing wide conclusions on the nature of competition from this period of variable rate reduction by Kiwibank. In addition, as discussed later in the report, empirical analysis conducted by Deloitte Access Economics indicates that Kiwibank plays a role in impacting ANZ, Westpac, ASB and BNZ and other banks' advertised rates, including for variable rate mortgage products.

Link Economics' analysis indicates Kiwibank is getting a proportionally larger share of new and refinance mortgages

24. Link Economics undertook empirical analysis to understand the ability of Kiwibank to win customers through switching. The analysis was based on LINZ data on mortgage registrations, using scatter plot and panel regression analysis, overlaid with mortgage rate data.

25. Link Economics found Kiwibank has struggled to increase their market share, but that they do have some success in winning customers that switch (i.e., consumers that refinance loans).[11]

26. **Scatterplot analysis** was used to compare the relationship between the number of new and refinanced home loans won by the five banks and their respective advertised mortgage rates. Deloitte Access Economics would caution against placing too much weight on the scatter plot analysis conducted by Link Economics and the resulting inferences made. From our understanding, this analysis was purely based on apparent visual trends. There is not enough data in the scatter plot analysis to draw meaningful conclusions and the use of different scales and trend lines may indicate alternative relationships.

27. Link Economics also fitted a **panel regression** to the LINZ and mortgage rate datasets to test the statistical significance of a "Big Bank" dummy variable. This was done on the basis that, if a bank is a "Big Bank" (defined by Link Economics as ANZ, ASB, Westpac and BNZ), and it was statistically significant in determining the percentage of the number of loans won, this indicated these banks are more successful at winning customers.

28. We note Link Economics' panel regression analysis does not take into account the impact of banks other than ANZ, ASB, Westpac, BNZ and Kiwibank. The exclusion of banks other than ANZ, Westpac, ASB, BNZ and Kiwibank changes the interpretation of the "Big Bank" variable. The "Big Bank" variable indicates the average percentage difference in the number of new and refinance loans a "Big Bank" would get compared to a Kiwibank, rather than all "small banks" holding all other factors constant.

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[10] See, for example, BNZ's TotalMoney product. Details of this product are available at https://www.bnz.co.nz/personal-banking/home-loans/home-loan-types/totalmoney#how-totalmoney-works
[11] Link Economics "The nature of competition for personal banking services" (2023) at [7].

Table 2: Link Economics' assessment of personal home loan switching

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Regression equation estimated

$$Log(Loans_{i,t}) = \alpha_0 + \alpha_1 One\ Year\ Fixed\ Rate_{i,t} + \alpha_2 Big\ Bank_{i,t} + \varepsilon_{i,t}$$

- Where "Big Bank" is a dummy variable taking the value of 1 for ANZ, ASB, BNZ or Westpac, and 0 for Kiwibank. The model was not fitted for any other institutions.

- A dummy for COVID-19 was also introduced for refinanced home loans. Link Economics did not provide commentary on what exactly this variable represented and why it was only included for refinanced home loans, but not new loans.

Source: Link Economics

29. Deloitte Access Economics is of the view Link Economics' results indicate that Kiwibank does act as a constraint on ANZ, Westpac, ASB and BNZ for both new and refinance personal home loans.

30. As noted above, the "Big Bank" variable indicates the average percentage difference in the number of new and refinance loans ANZ, Westpac, ASB and BNZ would get compared to Kiwibank, holding all other factors constant.

31. For **new home loans**, the average difference is estimated to be 104%, or roughly twice the amount as Kiwibank.

    31.1. If, for illustrative purposes, there were 10 new home loans present in the market, and all banks charged the same interest rate, the results indicate that ANZ, Westpac, ASB and BNZ would on average be expected to get roughly 2.3 new home loans each, compared to Kiwibank's 0.8 new home loans. Proportionally, this amounts to ~8% of new home loans being gained by Kiwibank and ~23% to ANZ, Westpac, ASB and BNZ each.[12]

    31.2. The implied ~8% of all new home loans being gained to Kiwibank is supportive of the fact that Kiwibank does act as a constraint on ANZ, Westpac, ASB and BNZ.

32. For **refinance mortgages**, and taking the same illustrative number of 10 additional refinance loans, the results indicate that ANZ, Westpac, ASB and BNZ would be expected to get on average ~2.1 refinance loans each and Kiwibank would get ~1.7 refinance loans. Proportionally, this amounts to ~17% of refinance loans being gained by Kiwibank and ~21% to ANZ, Westpac, ASB and BNZ each.[13] The competitive pressure of Kiwibank implied by Link Economics' panel regression analysis is therefore more significant for refinance mortgages.[14]

Analysis of the change in the value of mortgages over time

33. We believe that considering relative value share movements, as opposed to implied changes in absolute number of mortgages, is likely to yield stronger competition insights.

34. Access to the LINZ dataset used by Link Economics was not obtained in time for this report. However, using the value of mortgages carried by registered banks on their balance sheets,

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[12] Link Economics' results suggest the log of the number of new loans won by a 'big bank' if mortgage rates were, say, 5%, is given by 9.33 − 0.14(0.05) + 1.04 and for Kiwibank is given by 9.33 − 0.14(0.05). This implies that, with mortgage rates at 5%, the large banks would win 31,786 new loans each and Kiwibank 11,214. As shares, the big banks would win 23% of the new loans each and Kiwibank 8%. The share of new loans won does not change with the assumed mortgage rate.

[13] This assumes the 10 refinance loans occur in a period without COVID-19.

[14] Link Economics' results suggest the log of the number of refinance loans won by a 'big bank' if mortgage rates were, say, 5%, is given by 8.70 − 0.09(0.05) + 0.20 and for Kiwibank is given by 8.70 − 0.09(0.05) (assuming the COVID dummy is set to 0). This implies that, with mortgage rates at 5%, the large banks would win 7,306 refinance loans each and Kiwibank 5,992. As shares, the big banks would win 20.7% of refinance loans each and Kiwibank 17%. The share of refinance loans won does not change with the assumed mortgage rate.

Deloitte Access Economics considered whether this type of value share analysis would yield further insights.

35.   Figure 2 and Figure 3 analyse the change in the proportion of mortgages, by value, between June 2018 and June 2023 (the same period considered by Link Economics' report). Figure 2 demonstrates that of the three registered banks shown who successfully increased their value share, only one was a Domestic Systemically Important Bank (**D-SIB**) (ANZ). Westpac, ASB and BNZ all saw a reduction in their relative value share during the period, as did TSB.

Figure 2: Proportional change in value share (percentage change, June 2018 to June 2023)
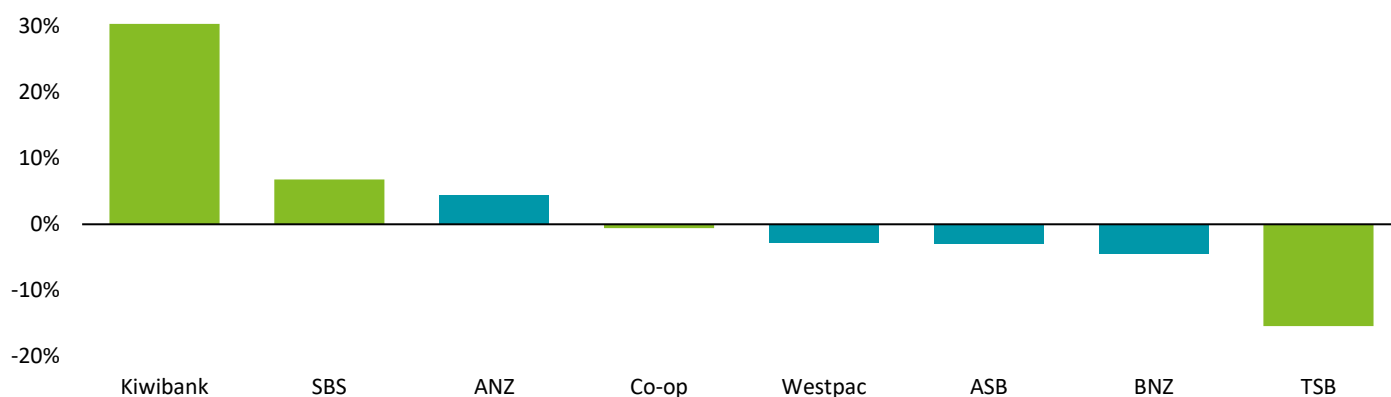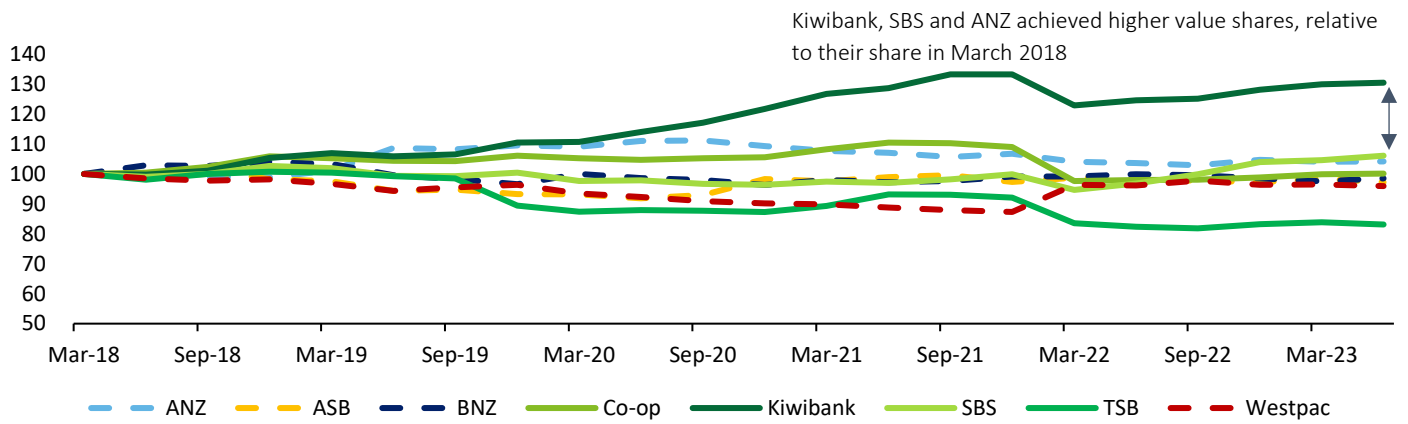

Source: Deloitte Access Economics analysis of RBNZ data (blue indicates a D-SIB bank. Bank of Baroda, Heartland,[15] Rabobank, Bank of China, Bank of India, China Construction Bank and ICBC are not shown but were included in volume share calculations. Market share only includes registered banks.)

36.   Figure 3 shows the relative change in volume shares, by value, indexed to March 2018. The analysis in Figure 2 gives a sense of the change in volume shares of participants in personal home loans, as measured by the value of residential mortgages held, over time. Figure 2 demonstrates Kiwibank has proportionally grown its residential mortgage book the most, increasing by 31% since 2018.

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[15] Heartland is not shown because we understand them to have only substantively re-entered the provision of conventional home loans in 2020. They were included in calculations.

Figure 3: Relative change in value share, March 2018 to June 2023 (Index, 100 = % share by value as at March 2018, scale starts at 50)

Source: Deloitte Access Economics analysis of RBNZ data (Values shown are an index, with a base of 100 representing market share by value as at March 2018. Heartland,[16] Bank of Baroda, Rabobank, Bank of China, Bank of India, China Construction Bank and ICBC are not shown but were included in volume share calculations. Value share only includes registered banks.)

37.   Taken as a whole, the relative movements in volume shares since March 2018 indicate that Kiwibank has been successful in expanding its share, compared to other banks. We consider, based on this evidence alone, that Kiwibank can be seen as imposing a competitive constraint on ANZ, Westpac, ASB or BNZ, in contrast to the conclusion reached by Link Economics.

Link Economics indicate Kiwibank does not significantly impact rates of ANZ, ASB, Westpac and BNZ

38.   Link Economics undertook empirical analysis to study the impact of the mortgage rates set by Kiwibank, as well as the impact of the average of the rates set by ANZ, Westpac, ASB and BNZ. Link Economics does this by fitting the below linear regressions and studying the statistical significance and coefficients of different variables:[17]

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[16] Heartland is not shown because we understand them to have only substantively re-entered the provision of conventional home loans in 2020. They were included in calculations.
[17] Link Economics "The nature of competition for personal banking services" (2023) at [84].

Table 3: Link Economics' competitive constraint analysis of Kiwibank

Regression equation estimated

1
$$ANZ\ Rate_t = \alpha_0 + \alpha_1 \left(\frac{ASB\ Rate_t + BNZ\ Rate_t + Westpac\ Rate_t}{3} \right) + \alpha_2 Cash\ Rate_t + \alpha_3 Kiwibank\ Rate_t + \alpha_4 Kiwibank\ Up_t + \varepsilon_{ANZ,t}$$

2
$$Westpac\ Rate_t = \delta_0 + \delta_1 \left(\frac{ASB\ Rate_t + BNZ\ Rate_t + ANZ\ Rate_t}{3} \right) + \delta_2 Cash\ Rate_t + \delta_3 Kiwibank\ Rate_t + \beta_4 Kiwibank\ Up_t + \varepsilon_{Westpac,t}$$

3
$$ASB\ Rate_t = \tau_0 + \tau_1 \left(\frac{ANZ\ Rate_t + BNZ\ Rate_t + Westpac\ Rate_t}{3} \right) + \tau_2 Cash\ Rate_t + \tau_3 Kiwibank\ Rate_t + \tau_4 Kiwibank\ Up_t + \varepsilon_{ASB,t}$$

4
$$BNZ\ Rate_t = \beta_0 + \beta_1 \left(\frac{ASB\ Rate_t + ANZ\ Rate_t + Westpac\ Rate_t}{3} \right) + \beta_2 Cash\ Rate_t + \beta_3 Kiwibank\ Rate_t + \beta_4 Kiwibank\ Up_t + \varepsilon_{BNZ,t}$$

Source: Link Economics

39. The *Kiwibank Up* variable captures upward movements in the mortgage rates set by Kiwibank over the time period (June 2018 to June 2023), which Link Economics uses to test for symmetry in how other banks respond to rate changes by Kiwibank.[18]

40. Link Economics fitted these equations for each of ANZ, BNZ, Westpac and ASB for variable, 1-year and 2-year fixed advertised mortgage rates using a monthly time series. Link Economics concluded that where a variable was found to be statistically significant, that was indicative of a competitive constraint on that bank. Their findings are summarised in the table below.

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[18] Link Economics "The nature of competition for personal banking services" (2023) at [85].

Table 4: Summary of Link Economics' findings

Bank	Product	OCR	Average of either ANZ, Westpac, ASB or BNZ rates	Kiwibank	Kiwibank Up
ANZ	Variable	✓	✓	*	
	1-Year		✓		
	2-Year		✓		
ASB	Variable		✓	*	
	1-Year	*	✓		
	2-Year		✓		
BNZ	Variable	✓		✓	
	1-Year		✓	✓	✓
	2-Year		✓	✓	*
Westpac	Variable	*	✓	*	
	1-Year	*	✓		
	2-Year		✓		

Source: Link Economics (✓ indicates statistical significance at the 5% level and * at the 10% level)

41.   For example, for ANZ's variable home loan rate Link Economics found the average of rates advertised by ASB, BNZ and Westpac and the cash rate to be statistically significant. Kiwibank's rate and Kiwibank Up were found to be not statistically significant. Therefore, Link Economics concluded that ANZ faces competitive pressures from ASB, BNZ and Westpac, but not Kiwibank.[19] Link Economics then conclude that Kiwibank provides 'little to no constraint' in personal home loan products.

42.   Link Economics' results also indicate that the rates of ANZ, ASB, BNZ and Westpac primarily respond to each other's pricing and, to a lesser degree, changes in the Official Cash Rate (OCR).

43.   In contrast, our regression analysis, as shown in the next section of the report, finds both Kiwibank and other registered banks impact the rates of other banks across all personal home loan products.

44.   We have some reservations with Link Economics' methodology and findings. For instance, we would expect the OCR to statistically significantly explain most banks' advertised rates, irrespective of the level of competition for personal home lending.[20] In addition, we consider competition for home loans is likely to be characterised by dynamic interactions between firms, meaning changes in one bank's rates are likely to impact other banks' rates and vice versa. Deloitte Access Economics considers this likely dynamism needs to be explicitly incorporated in any empirical estimation procedure to test whether a certain bank's advertised rates impact others.

45.   The next section of the report presents findings from Deloitte Access Economics' empirical analysis.

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[19] Link Economics "The nature of competition for personal banking services" (2023) at [93].
[20] More precisely, even in hypothetical monopoly settings, the rate of pass-through of an industry-wide change in cost for a monopolistic firm facing a linear demand curve and a constant marginal cost would be expected to be passed through at a rate of 50% - see RBB Economics for the Office of Fair Trading "Cost pass-through: theory, measurement and potential policy implications" (February 2014) at Chapter 3.

Verification of price responsiveness

46. To verify the responsiveness of banks' advertised pricing to each other, and to test whether Link Economics' conclusion that Kiwibank provides 'little to no constraint' on personal home loan rates, Deloitte Access Economics undertook empirical analysis under an alternative model that captures the dynamic and inter-linking nature of personal home mortgage rates.

47. This analysis was based on weekly interest.co.nz data on advertised rates from 4 January 2002 to 3 November 2023. This analysis was conducted for advertised variable rate, 1-year fixed, 2-year fixed, 3 year-fixed, 4-year fixed and 5-year fixed rate personal home lending products.

48. For 2-year to 5-year fixed products, our analysis covers August 2010 onwards only due to swap rate data availability from the RBNZ.

49. While **Appendix One** provides details of the data and methodology, this section of the report provides an overview of the key aspects of our approach and presents the results.

50. Overall, the analysis indicates:

    50.1. Both the rates of Kiwibank and other registered banks are having an impact across all products and most banks.

    50.2. A degree of dynamism. For example, Kiwibank's rates have statistically significant impact on ASB's 1-year rates, which in turn impact the rates of BNZ, which in turn impacts the rates of all other participants in personal home loans analysed by Deloitte Access Economics.

    50.3. The cost benchmark is commonly statistically significant for almost all products and banks, which indicates capital markets play a key role in determining setting advertised mortgage rates for home loans.

An approach to capture the likely competitive interactions between banks

51. To assess the responsiveness of banks' personal home loan advertised rates to each other, Deloitte Access Economics employed a vector autoregressive regression (**VAR**). Under the VAR system of equations, it was assumed that a bank's advertised rates for a particular week depend on:

    51.1. A relevant cost benchmark rate as at that week (e.g., for variable rate mortgages, the 90-day bank bill rate)

    51.2. Previous weeks' advertised rates of that bank's rates

    51.3. Previous weeks' advertised rates of competing banks' rates.

52. The banks considered under the VAR system of equations estimated were ANZ, ASB, Westpac, BNZ, Kiwibank and other registered banks (**other banks**). The other banks' advertised rates were calculated as a simple average of advertised rates for personal home lending products from registered banks who are not ANZ, ASB, Westpac, BNZ and Kiwibank.

53. The approach does not specify how many previous weeks' worth of advertised bank rates are relevant. Rather, we let the data determine the number of previous weeks' worth of advertised bank rates (i.e., lags).

54. This estimation procedure explicitly recognises and accounts for the potential that changes in banks' rates may impact other bank's rates. That is, it recognises that changes in one bank's

advertised rates may impact another bank's advertised rates, which may, in turn, impact another bank's advertised rates and so on.

55.   That is, the model represents a 'system' of equations which explicitly interact with each other. This VAR estimation procedure therefore represents the potential interactions that are likely to occur between advertised rates for banks for personal home lending in New Zealand.

56.   A bank's advertised rates in one week may be impacted by another bank's advertised rates in that same week (i.e., contemporaneously impact a bank's advertised rates), in addition to previous week's advertised rates. While there are techniques to model such contemporaneous interactions between banks, they involve setting assumptions about the nature and timing of competition between banks, and in particular, the order in which changes in one bank's rates impact other bank's rates.[21] In Deloitte Access Economics' view, making such assumptions would go towards making assumptions around the nature of competition between banks itself, and we have opted not to make these assumptions.

57.   For this reason, Deloitte Access Economics continued to estimate the VAR regression with the assumption that past values of a banks' advertised rates impact rates in a particular week. Given that we used relatively high frequency weekly data, Deloitte Access Economics would expect in many instances, the past week's advertised rates would indeed impact a bank's advertised rates in the current week.

58.   Having estimated the VAR system of equations, Deloitte Access Economics was able to test and verify:

   58.1.   Whether the relevant cost benchmark is statistically significant in explaining the advertised personal home loan rates of banks.

   58.2.   Whether Kiwibank and other banks' advertised rates is statistically significant in explaining the advertised rates of ANZ, ASB, Westpac and BNZ.[22]

Our empirical analysis indicates Kiwibank and other banks play a role in explaining the advertised rates of other banks

59.   The results from our empirical analysis are summarised in the table below:

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[21] In particular, we could have estimated a structural VAR (**SVAR**) that allows for contemporaneous interactions between advertised rates of banks. However, this would require an explicit assumption be made with regards to Cholesky ordering. Essentially, this means imposing the order with which variables in the SVAR are solved as an underlying assumption. In the context of mortgage rates, this would require assuming a 'first-mover', 'second-mover' and so on, which would risk presupposing a given outcome. Therefore, we concluded that a contemporaneous model would not be suitable.
[22] We used Granger-causality to establish whether the rates of one bank are statistically significant in explaining those of another. This is discussed in further detail in **Appendix One**.

Table 5: Deloitte Access Economics' results of price responsiveness (cost benchmark, Kiwibank and other banks)

99% confidence level	95% confidence level	90% confidence level			
Product	Variable	1-year	2-year	3-year	4-year	5-year

Product	Variable	1-year	2-year	3-year	4-year	5-year
Does the cost benchmark explain advertised rates?[23]	90-day bank bill	90-day bank bill	2-year swap rate	3-year swap rate	4-year swap rate	5-year swap rate
Do Kiwibank rates explain advertised rates?	ANZ ASB BNZ Other bank	ASB Westpac Other bank	ANZ BNZ Other bank	BNZ Westpac Other bank	ANZ BNZ Westpac Other bank	ANZ ASB BNZ Westpac Other bank
Do other bank rates explain advertised rates?	ANZ BNZ Westpac	ASB BNZ	ANZ BNZ Kiwibank	ANZ ASB BNZ Westpac	ANZ ASB Westpac	ANZ ASB BNZ Kiwibank

Source: Deloitte Access Economics

60.   As the table above demonstrates:

60.1.   Changes in the relevant cost benchmark for the personal home lending product (e.g., the 90-day bank bill rate for 1-year fixed mortgages) highly statistically significantly explains <u>almost all</u> bank's advertised rates across all the personal home lending products we analysed.

60.2.   Changes in Kiwibank's advertised rates statistically significantly explains the advertised rates of many, but not all, other registered banks' advertised rates across all personal home lending products we analysed.

60.3.   Changes in other banks' advertised rates statistically significantly explains the advertised rates of many, but not all, other registered banks' advertised rates across all personal home lending products we analysed.

61.   Further considering the impacts that the advertised rates of ANZ, ASB, Westpac and BNZ have on each other, as well as Kiwibank and other banks, helps develop a broader understanding of how the nature of advertised rates varies across products. Table 6 presents these results for ANZ, ASB, Westpac and BNZ.

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[23] We found that for 28 out of 30 total equations the cost benchmark was statistically significant (except for BNZ's one-year and two-year rates, for which the wholesale rate was found to not be statistically significant at any conventional significance level), whereas Link Economics found only 5 out of 12 to be significant (at the 10% level).

Table 6: Deloitte Access Economics' results of price responsiveness (ANZ, ASB, Westpac and BNZ)

	99% confidence level	95% confidence level	90% confidence level			
Product	Variable	1-year	2-year	3-year	4-year	5-year
Do ANZ rates explain advertised rates?	ASB BNZ Kiwibank Westpac Other bank	BNZ Kiwibank Other bank		Kiwibank Other bank		Other bank
Do ASB rates explain advertised rates?	ANZ BNZ Kiwibank	BNZ Other bank	ANZ BNZ Kiwibank Westpac Other bank	ANZ BNZ Kiwibank Westpac	ANZ Kiwibank Other bank	ANZ Kiwibank Other bank
Do Westpac rates explain advertised rates?	ANZ ASB BNZ Kiwibank Other bank	ANZ BNZ	ANZ ASB BNZ Other bank	BNZ Kiwibank	ANZ BNZ Other bank	ANZ ASB Kiwibank Other bank
Do BNZ rates explain advertised rates?	ANZ ASB Kiwibank Other bank	ANZ ASB Westpac Kiwibank Other bank	ANZ Kiwibank Other bank	Westpac	Westpac	Westpac

Source: Deloitte Access Economics

62. As the table above demonstrates:

62.1. A degree of dynamism in how results vary across products. For example, the results indicate that ANZ and Westpac's rates have an impact over the variable rates of every other bank, but that BNZ has an impact on the rates of every bank for the 1-year, ASB's rates on the rates of every bank for the 2-year rates and Kiwibank's rates on the rates of every bank for the 5-year rates.

62.2. These results may be explained by varying strategic focusses for each bank or a preference from customers for particular products. Regardless, they indicate that pricing responses are not only dynamic across different products, but there are a large number of different causal relationships.

63. Deloitte Access Economics considers this empirical analysis indicates that changes in Kiwibank and other registered banks' advertised rates do indeed impact the advertised rates for ANZ, ASB, Westpac and BNZ. While the impact the advertised rates of Kiwibank and other registered banks provide on those of ANZ, ASB, Westpac and BNZ is not uniform according to our analysis, we consider it does indicate the rates of Kiwibank and other banks do have a role in explaining the advertised rates for these banks for personal home lending products in New Zealand.

64. As a final comment, unlike Link Economics, the analysis finds that the cost-benchmark statistically significantly explains pricing for almost all banks across all products, and the results indicate the competition is dynamic and responses occur across many relationships and not just limited to ANZ, ASB, Westpac and BNZ.

Appendix One – VAR estimation procedure

65. Deloitte Access Economics considers that regression analysis of how banks set mortgage rates needs to leverage a model of a 'system' of equations which explicitly interact with each other. We decided that a VAR model would be a suitable choice, as it allows us to model how a set of endogenous (determined within model) variables interact with, and explain, each other as well as any exogenous (determined outside of model) variables. Specifically, a VAR model means modelling each bank's mortgage rates as a function of the lagged values of its own past rates, lagged values of past competitor rates, and any additional explanatory variables exogenous to the system.

66. As noted previously, it is acknowledged that a bank's advertised rates in one week may be impacted by another bank's advertised rates in that same week (i.e., contemporaneously impact a bank's advertised rates), in addition to previous week's advertised rates. While there are techniques to model such contemporaneous interactions between banks, they involve setting assumptions about the nature and timing of competition between banks, and in particular, the order in which changes in one bank's rates impact other bank's rates.[24] We consider that making such assumptions would go towards making assumptions around the nature of competition between banks itself (i.e., presupposing the order of how each banks advertised rates respond to those of other banks).

67. For this reason, Deloitte Access Economics continued to estimate the VAR regression with the assumption that past values of a banks' advertised rates impact rates in a particular week. In addition, given that we applied relatively high frequency weekly data, Deloitte Access Economics would expect in many instances, past week's advertised rates would indeed impact a bank's advertised rates in the current week.

Mortgage rate dataset

68. Deloitte Access Economics used advertised personal home loan mortgage rates obtained from interest.co.nz to undertake our analysis. Interest.co.nz maintains a database of advertised rates by product and institution (including registered banks, brands of registered banks and non-bank financial institutions) as at Friday of each week, from January 2002 to November 2023. This dataset is also shared with the Reserve Bank of New Zealand, and is therefore considered as a credible dataset.

69. For 2-year to 5-year fixed products, our analysis covers August 2010 onwards only due to swap rate data availability from the RBNZ.

70. This dataset contains, for each institution, their 'best rate'. This may take the form, for example, of a discounted rate for borrowers with a loan-to-value (**LVR**) ratio below 80%. In 2022, 92% of new residential mortgage commitments by value had an LVR of 80% or below.[25] This means that

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[24] In particular, we could have estimated a SVAR that allows for contemporaneous interactions between advertised rates of banks. However, this would require an explicit assumption be made with regards to Cholesky ordering. Essentially, this means imposing the order with which variables in the SVAR are solved as an underlying assumption. In the context of mortgage rates, this would require assuming a 'first-mover', 'second-mover' and so on, which would risk presupposing a given outcome. Therefore, we concluded that a contemporaneous model would not be suitable.

[25] Deloitte Access Economics analysis of RBNZ "New residential mortgage lending by LVR – C30 (Aug 2013 - current", available at https://www.rbnz.govt.nz/statistics/series/lending-and-monetary/new-residential-mortgage-lending-by-loan-to-valuation-ratio

the 'best rate' is likely to capture more of the market than a 'standard rate'. Importantly, it also means the dataset is like-for-like and consistent.

71. Deloitte Access Economics undertook cleaning and reformatting of this database to obtain a time series of rates by institution and product duration which was used to fit our regression models. Although we had data for non-bank institutions, we decided to consider only registered banks at this stage. The rates of registered banks other than ANZ, ASB, Westpac, BNZ and Kiwibank were averaged into an 'other bank' variable.[26]

Model specification and robustness testing

72. Table 7 shows the VAR equation specifications:

Table 7: VAR equations

Regression equations estimated

$$ANZ\ Rate_t = \alpha_0 + \alpha_1 ANZ\ Rate_{t-1} + \alpha_2 ANZ\ Rate_{t-i} + \alpha_3 ASB\ Rate_{t-1} + \alpha_4 ASB\ Rate_{t-i} + \alpha_5 Westpac\ Rate_{t-1} + \alpha_6 Westpac\ Rate_{t-i}$$
$$+ \alpha_7 BNZ\ Rate_{t-1} + \alpha_8 BNZ\ Rate_{t-i} + \alpha_9 Kiwibank\ Rate_{t-1} + \alpha_{10} Kiwibank\ Rate_{t-i} + +\alpha_{11} Other\ banks\ Rate_{t-1}$$
$$+ \alpha_{12} Other\ banks\ Rate_{t-i} + \alpha_{13} Cost\ benchmark_t + +\alpha_{13} Cost\ benchmark_t + \varepsilon_t$$

$$ASB\ Rate_t = \alpha_0 + \alpha_1 ANZ\ Rate_{t-1} + \alpha_2 ANZ\ Rate_{t-i} + \alpha_3 ASB\ Rate_{t-1} + \alpha_4 ASB\ Rate_{t-i} + \alpha_5 Westpac\ Rate_{t-1} + \alpha_6 Westpac\ Rate_{t-i}$$
$$+ \alpha_7 BNZ\ Rate_{t-1} + \alpha_8 BNZ\ Rate_{t-i} + \alpha_9 Kiwibank\ Rate_{t-1} + \alpha_{10} Kiwibank\ Rate_{t-i} + +\alpha_{11} Other\ banks\ Rate_{t-1}$$
$$+ \alpha_{12} Other\ banks\ Rate_{t-i} + \alpha_{13} Cost\ benchmark_t + +\alpha_{13} Cost\ benchmark_t + \varepsilon_t$$

$$Westpac\ Rate_t = \alpha_0 + \alpha_1 ANZ\ Rate_{t-1} + \alpha_2 ANZ\ Rate_{t-i} + \alpha_3 ASB\ Rate_{t-1} + \alpha_4 ASB\ Rate_{t-i} + \alpha_5 Westpac\ Rate_{t-1} + \alpha_6 Westpac\ Rate_{t-i}$$
$$+ \alpha_7 BNZ\ Rate_{t-1} + \alpha_8 BNZ\ Rate_{t-i} + \alpha_9 Kiwibank\ Rate_{t-1} + \alpha_{10} Kiwibank\ Rate_{t-i} + +\alpha_{11} Other\ banks\ Rate_{t-1}$$
$$+ \alpha_{12} Other\ banks\ Rate_{t-i} + \alpha_{13} Cost\ benchmark_t + +\alpha_{13} Cost\ benchmark_t + \varepsilon_t$$

$$BNZ\ Rate_t = \alpha_0 + \alpha_1 ANZ\ Rate_{t-1} + \alpha_2 ANZ\ Rate_{t-i} + \alpha_3 ASB\ Rate_{t-1} + \alpha_4 ASB\ Rate_{t-i} + \alpha_5 Westpac\ Rate_{t-1} + \alpha_6 Westpac\ Rate_{t-i}$$
$$+ \alpha_7 BNZ\ Rate_{t-1} + \alpha_8 BNZ\ Rate_{t-i} + \alpha_9 Kiwibank\ Rate_{t-1} + \alpha_{10} Kiwibank\ Rate_{t-i} + +\alpha_{11} Other\ banks\ Rate_{t-1}$$
$$+ \alpha_{12} Other\ banks\ Rate_{t-i} + \alpha_{13} Cost\ benchmark_t + +\alpha_{13} Cost\ benchmark_t + \varepsilon_t$$

$$Kiwibank\ Rate_t = \alpha_0 + \alpha_1 ANZ\ Rate_{t-1} + \alpha_2 ANZ\ Rate_{t-i} + \alpha_3 ASB\ Rate_{t-1} + \alpha_4 ASB\ Rate_{t-i} + \alpha_5 Westpac\ Rate_{t-1} + \alpha_6 Westpac\ Rate_{t-i}$$
$$+ \alpha_7 BNZ\ Rate_{t-1} + \alpha_8 BNZ\ Rate_{t-i} + \alpha_9 Kiwibank\ Rate_{t-1} + \alpha_{10} Kiwibank\ Rate_{t-i} + +\alpha_{11} Other\ banks\ Rate_{t-1}$$
$$+ \alpha_{12} Other\ banks\ Rate_{t-i} + \alpha_{13} Cost\ benchmark_t + +\alpha_{13} Cost\ benchmark_t + \varepsilon_t$$

$$Other\ banks\ Rate_t = \alpha_0 + \alpha_1 ANZ\ Rate_{t-1} + \alpha_2 ANZ\ Rate_{t-i} + \alpha_3 ASB\ Rate_{t-1} + \alpha_4 ASB\ Rate_{t-i} + \alpha_5 Westpac\ Rate_{t-1}$$
$$+ \alpha_6 Westpac\ Rate_{t-i} + \alpha_7 BNZ\ Rate_{t-1} + \alpha_8 BNZ\ Rate_{t-i} + \alpha_9 Kiwibank\ Rate_{t-1} + \alpha_{10} Kiwibank\ Rate_{t-i}$$
$$+ +\alpha_{11} Other\ banks\ Rate_{t-1} + \alpha_{12} Other\ banks\ Rate_{t-i} + \alpha_{13} Cost\ benchmark_t + +\alpha_{13} Cost\ benchmark_t + \varepsilon_t$$

- Where "Other banks Rate" is a simple average of all other registered banks' advertised rates

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Source: Deloitte Access Economics

73. While using a VAR model for response analysis or forecasting requires that the underlying data be stationary and not cointegrated, it is possible to perform causality testing within a VAR model where the underlying data is possibly non-stationary and even cointegrated.

73.1. Hiro Toda and Taku Yamamoto's 1995 paper outlines this in more detail,[27] but essentially by including additional lags equal to the maximum expected order of integration in the

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[26] The rates for brands operated by ANZ, ASB, Westpac, BNZ and Kiwibank (e.g., ASB's former BankDirect) were included in 'other bank'.
[27] Hiro Y Toda and Taku Yamamoto "Statistical inference in vector autoregressions with possible integrated processes" (1995) 66 Journal of Econometrics 225-250

model, and then ignoring the coefficients on these additional lags (as Deloitte Access Economics assumed them to be zero), we ensure that standard asymptotic theory remains valid.

73.2. The VAR model obtained under the Toda and Yamamoto methodology is only valid for statistical inference. It should not be used for forecasting or IRF analysis.

74. Using the system of equations outlined in Table 7, we fitted a VAR model for floating, 1-year, 2-year, 3-year, 4-year and 5-year mortgage rates. The lag length was initially determined using STATA's varsoc command,[28] and was increased as required to resolve any autocorrelation. We refer to this model as the 'underlying VAR'.

75. Deloitte Access Economics then undertook a series of robustness and goodness of fit tests on the underlying VAR models, including stationarity and white noise testing of residuals and ensuring the VAR model was stable. The results of this testing indicated that the models were robust, stable and not impacted by autocorrelation or missing explanatory variables.

Table 8: Underlying VAR specification

	Floating	1-year	2-year	3-year	4-year	5-year
Lags	8 lags	9 lags	3 lags	4 lags	4 lags	4 lags
Exogenous variable	90-day bank bill yield	90-day bank bill yield	2-year swap rate	3-year swap rate	4-year swap rate	5-year swap rate
Stability	Satisfied varstable[29] stability test	Satisfied varstable stability test	Satisfied varstable stability test	Satisfied varstable stability test	Satisfied varstable stability test	Satisfied varstable stability test
Outcome of residual testing[30]	Residuals of each equation stationary and pass white noise test	Residuals of each equation stationary and pass white noise test	Residuals of each equation stationary and pass white noise test (noting other bank residual only passes at 1% level)	Residuals of each equation stationary and pass white noise test (noting other bank residual only passes at 1% and 5% level)	Residuals of each equation stationary and pass white noise test (except ASB which fails at conventional levels – we note the residuals are still stationary and visually appear robust)	Residuals of each equation stationary and pass white noise test (except ASB which fails at conventional levels – we note the residuals are still stationary and visually appear robust)

Source: Deloitte Access Economics analysis of interest.co.nz data

76. Deloitte Access Economics concluded from these tests that our model is likely to be robust. The white noise test on the residuals indicated that autocorrelation is likely not impacting the model. We note that the ASB residuals for the 4-year and 5-year models did not pass a Portmanteau white noise test. However, every other residual did, and these passed stationarity tests and upon visual inspection appeared suitable. Therefore, we do not believe this raises significant concerns about the underlying model.

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[28] STATA "Varsoc – Obtain lag-order selection statistics for VARs and VECMs", available at https://www.stata.com/manuals/tsvarsoc.pdf
[29] STATA "Varstable – Check the stability condition of VAR or SVAR estimates", available at https://www.stata.com/manuals/tsvarstable.pdf
[30] Stationarity of residuals was tested using STATA's dfuller command, while white noise was tested using the wntestq command (Portmanteau test) and results are tested against all significance levels unless noted otherwise.

Causality testing

77.   Because a VAR model represents a system of interacting equations, it is not possible to simply examine the variable coefficients and their respective statistical significance to determine whether an endogenous variable is statistically significant in explaining another. Instead, a test which accounts for how variable values flow through the entire VAR system is required to further test whether there are causal relationships in our model.

78.   As per the Toda and Yamamoto methodology, Deloitte Access Economics then added extra lags to the underlying VAR equal to the maximum expected level of integration (which we determined to be one). This allows us to undertake statistical inference on our VAR model, despite the data being potentially non-stationary or cointegrated.

79.   The VAR model with an additional lag was used for Granger causality testing.

80.   Intuitively, Bank X's rates can be said to Granger-cause those of Bank Y if Bank Y's rates can be better predicted by a model incorporating the histories of both X and Y than Y alone. The null hypothesis of a Granger-causality test is that X **does not** Granger-cause Y. Therefore, rejection of the null indicates that X **does** Granger-cause Y.

   80.1.   For this analysis, Deloitte Access Economics concluded that if the null hypothesis can be rejected at conventional significance levels, then our model is indicating that there is likely a causal relationship. If Bank X is concluded to Granger-cause the rates of Bank Y, then our model is indicating that historically Bank X has had an impact on Bank Y's rates – at least with regards to advertised rates.

   80.2.   This allows comparison with the findings of Link Economics of what variables are statistically significant in determining mortgage rates.

Limitations of analysis

81.   Interpretation of the results and making inferences from them about the nature of competition requires careful consideration of what our VAR analysis does and does not model.

82.   The VAR model captures historical trends in how the mortgage rates advertised by each bank are related to the rates advertised in the past by both the bank being modelled and other banks, as well as an exogenous wholesale rate benchmark. Therefore, it provides a one-dimensional view of competition and price setting.

83.   We note that our analysis does not consider the relative impact of changes in Kiwibank and other banks' rates on the rates set by ANZ, ASB, Westpac and BNZ. The analysis provides evidence on whether there is a relationship but not the magnitude of it.

84.   As we note earlier in this report, banks also compete on many other dimensions (e.g., discounted rates, quality of service, reputation etc.) which are not captured by this model. Banks may respond to competitive factors across different dimensions.

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