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The pass-through effect of the Reserve Bank of Australia's cash rate on deposit and lending rates

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ABSTRACT

Using a multiple-threshold regression model and monthly data (April 1982–July 2024), we analyze the Reserve Bank of Australia's cash rate pass-through effects on lending and deposit rates. For lending rates, pass-through is symmetric when the cash rate is below 4.75 %. However, at certain cash rate levels, mortgage and small business rates shoot up like rockets but fall like feathers. No asymmetry was detected in deposit rates, suggesting a symmetric response to changes in the cash rate. These findings have important implications for regulatory bodies, highlighting specific cash rate levels and corresponding lending or deposit rates that may require closer scrutiny.

1. Introduction

Australian households are now among the most indebted within OECD countries, with significant levels of debt gearing and service (Valadkhani and Worthington, 2014). Consequently, changes in lending and deposit rates can affect many mortgage holders, small businesses, and retirees who rely on interest income. The Reserve Bank of Australia (RBA) can influence lending and deposit interest rates by setting the desired policy interest rate on overnight loans in the money market, impacting the yield curve over time. Smales' (2012) study on the Australian interest rate futures market revealed asymmetric reactions, particularly at the short end of the yield curve. Numerous studies in the literature argue that when the central bank raises the policy rate, lending rates shoot up like a rocket, but when the opposite occurs, lending rates fall like feathers (e.g., Hannan and Berger, 1991). In Australia, similar asymmetric responses have been observed across various lending rates, including mortgage rates (see inter alia, Lowe, 1995; Lowe and Rohling, 1992; Valadkhani and Bollen, 2013; Valadkhani, 2013; Valadkhani and Worthington, 2014) and small business loan rates (Valadkhani et al., 2014).

The literature on interest rate asymmetry can be divided into two contrasting categories, each highlighting the distinct effects on

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lenders and borrowers, with the first category focusing on short-run asymmetries that primarily benefit lenders. Hannan and Berger (1991) pioneered this perspective, showing that banks adjust mortgage rates inconsistently in response to policy rate changes. ***Inter alia***, studies by Lowe and Rohling (1992), Lowe (1995), Hofmann and Mizen (2004), Payne (2007), and Toolsema and Jacobs (2007) all confirm the existence of downward rigidity in mortgage rates across various markets, demonstrating banks' reluctance to lower rates when the policy rate decreases and their tendency to maintain higher rates when it rises. In contrast, a second, less common category emphasizes asymmetry favoring borrowers. Frost and Bowden (1999), Liu, Margaritis and Tourani-Rad (2008), Lim (2001), and Chong, Liu, and Shrestha (2006), inter alia, illustrate that in some cases, such as in New Zealand and Australia, banks tend to pass on loan rate decreases more quickly than increases. Liu et al. (2008) found that while short-run pass-through was asymmetric, long-run pass-through was generally complete, creating a more borrower-friendly environment over time.

The present study enriches this discourse by introducing the moderating effects of both sign and size asymmetries on banks' responses to cash rate changes, offering a more nuanced understanding of interest rate dynamics that previous studies have not captured. Asymmetric responses could be sign and size dependent, varying based on the direction of changes (positive or negative) and the magnitude of the cash rate. Almost all previous studies capture different types of sign asymmetry but do not consider whether the extent of asymmetry could also depend on the magnitude (size) of the cash rate. For example, if the cash rate drops below a certain threshold, banks may be unlikely to further reduce their lending rates. Conversely, when the cash rate exceeds a particular threshold, banks may refrain from raising their lending rates due to potential unpopularity, cost-of-living pressures, and the risk of social backlash. For the first time, this study considers this possibility and contributes to the literature by accounting for the fact that asymmetric responses to changes in the cash rate may also be moderated by the level of the RBA's cash rate. Furthermore, while most studies focused on lending rates in Australia, this study considers both lending and deposit rates using the latest data.

2. Methodology

During the sample period, the RBA could adjust the cash rate up to 11 times annually, with meetings scheduled on the first Tuesday of each month, excluding January. Despite recent modifications to the frequency of these meetings, the use of monthly data remains appropriate for our analysis. However, it is important to note that banks, credit unions, and building societies possess the discretion to alter mortgage, business lending, or deposit rates at any given time. Acknowledging this stylized fact, Eq. (1) posits that the lending or deposit rates may be influenced by the cash rate not only contemporaneously but also with potential lags, including periods *t, t-1, t-2*, and so forth. That is:

$$\Delta R_t = \alpha + \beta_0 \Delta C_t + \beta_1 \Delta C_{t-1} + \beta_2 \Delta C_{t-2} + ... + \beta_m \Delta C_{t-m} + \varepsilon_t \tag{1}$$

Where:
α=the intercept,
ΔR_t=Monthly percentage changes in a lending (deposit) rate at time *t*,
ΔC_t=Monthly percentage changes in the RBA's cash rate at time *t*,
β_j=the effect of ΔC_t on changes in the lending (deposit) rate at time t-j ($j = 0, 1, 2, \ldots, m$),
ε_t=stochastic residual at time *t*.

One straightforward way to simplify the number of beta coefficients is to use a Koyck lag distribution. In this approach, the coefficient values decrease exponentially over time, such that $\beta_0 > \beta_1 > \beta_2 > \ldots > \beta_m$ and $\beta_m = 0$. This is logical given the expectation that lending or deposit rates are more sensitive to current (β_0) and more recent changes in the cash rate (i.e. β_1, β_2, β_3,…) rather than those from the distant past (i.e. β_{36}, β_{37}, β_{38},…). With these assumptions, Eq. (1) can be rewritten as follows:

$$\Delta R_t = \alpha + \beta \Delta C_t + \gamma \Delta R_{t-1} + \varepsilon_t \tag{2}$$

Prior studies consistently demonstrate that lending rates surge swiftly when central bank policy rates increase, yet descend slowly when policy rates decrease. Conversely, deposit rates exhibit a gradual ascent in response to rising policy rates, while they tend to decline more significantly when policy rates fall. In response, Eq. (2) can be rewritten as follows:

$$\Delta R_t = \alpha + \beta^+ \Delta C_t^+ + \beta^- \Delta C_t^- + \gamma \Delta R_{t-1} + \varepsilon_t \tag{3}$$

Eq. (3) captures this asymmetry by distinguishing the impact of positive and negative changes in the cash rate on ΔR_t. Specifically, β^+ shows the effect when the cash rate is rising, while β^- indicates the effect when the cash rate is falling or remaining unchanged from the previous period. The superscripts + and – denote the positive part and negative part of ΔC_t, respectively as defined below:

$$\Delta C_t^+ = max\{\Delta C_t^+, 0\} \Rightarrow \Delta C_t^+ = \Delta C_t \text{if} \Delta C_t > 0 \text{and} \Delta C_t^+ = 0 \text{if} \Delta C_t \leq 0 \tag{4}$$

$$\Delta C_t^- = min\{\Delta C_t^-, 0\} \Rightarrow \Delta C_t^- = \Delta C_t \text{if} \Delta C_t \leq 0 \text{and} \Delta C_t^- = 0 \text{if} \Delta C_t > 0 \tag{5}$$

However, asymmetric responses can be both sign and size dependent. While Eq. (3) captures sign asymmetry, it does not account for whether the asymmetry depends on the size (magnitude) of the cash rate. For example, if the cash rate drops below a certain threshold, such as τ_1, banks may be unlikely to further reduce their lending rates. Paradoxically, when the cash rate exceeds a particular threshold, such as τ_2, banks may refrain from raising their lending rates any further due to potential unpopularity, cost-of-living pressures, and the risk of social backlash. Eq. (6) addresses this possibility by incorporating both sign and size asymmetry into the model.

$$\Delta R_t = \alpha + \gamma \Delta R_{t-1} + \varepsilon_t + \begin{cases} b_1^+ \Delta C_t^+ + b_1^- \Delta C_t^- \text{if} \mathrm{C_t} < \tau_1 \\ b_2^+ \Delta C_t^+ + b_2^- \Delta C_t^- \text{if} \tau_1 \leq \mathrm{C_t} < \tau_2 \\ b_3^+ \Delta C_t^+ + b_3^- \Delta C_t^- \text{if} \mathrm{C_t} \geq \tau_2 \end{cases} \tag{6}$$

Where τ_1 and τ_2 represent the optimal threshold values for the cash rate to be iteratively and endogenously estimated by the Bai and Perron (2003) method, where the number of breaks is determined by testing for $L + 1$ breaks versus L breaks. With a conventional trimming region of 15 %, it is still necessary to have sufficient observations (e.g., >100 monthly observations) within each sub-sample to ensure robust coefficient estimates, given the limited number of rate rises or hikes. If the Bai and Perron (2003) method statistically justifies only two breaks, Eq. (6) will produce three sets of coefficients. If this method rejects any breaks, Eq. (6) will yield only a single set of coefficients.

A Wald test is employed to investigate both the sign and size asymmetries across a number of possible scenarios in Table 1. For example, if the null hypothesis (1) is not rejected, it could be argued that there is no evidence of sign or size asymmetry, implying that interest rates rise and fall symmetrically throughout the sample, irrespective of the magnitude of the RBA's cash rate. However, if the null hypotheses (2) and (3) are rejected, it indicates that size asymmetry depends on the magnitude of the cash rate. Furthermore, if null hypotheses (4), (5) and (6) are rejected, this means sign asymmetry exists only when the cash rate falls within a specific range specified in Table 1. Under these circumstances, lending interest rates tend to "shoot up like rockets" and "fall like feathers".

3. Empirical results

Monthly data on the cash rate, two lending rates averaged across all banks (the standard variable mortgage rate and the small business overdraft variable rate), and two deposit rates (the 30-day deposit rate and the 90-day deposit rate) were downloaded from the RBA website. Table 1 indicates that the starting dates of data availability differ by series. For instance, data on the standard variable mortgage rate (owner-occupied) is available from January 1959, the cash rate from May 1976, and the thirty-day deposit rate from April 1982. However, to enable like-with-like comparisons, we have reported the mean, standard deviation, and coefficient of variation in Table 2, based on a common monthly sample of 508 observations from April 1982 to July 2024. The average cash rate was 6.39 %, while the two lending rates were higher than the cash rate, and the two deposit rates were nearly half of the lending rates. Despite this, deposit rates exhibited much greater variability than lending rates, both in absolute terms (based on standard deviations) and relative terms (based on the coefficient of variation). In fact, deposit rates were approximately two to three times more volatile, depending on which lending rate is compared. It is noteworthy that banks appear to adjust their "lower" deposit (variable) rates more frequently than their relatively "higher" lending (variable) rates. We initially considered using the RBA's aggregated personal (standard) credit card rate; however, this series only began in January 1990, and its inclusion would have significantly shortened the common sample period (April 1982 to July 2024).

Fig. 1 presents time plots of two lending rates and two deposit rates compared to the RBA's cash rate during the sample period. A quick glance at the top two graphs shows that both the standard mortgage variable rate and the small business rate are not only higher

Table 1
Possible sign and size asymmetries.

No	Null hypothesis	Inferences
1	Reject $H_0 : b_1^+ = b_1^- = b_2^+ = b_2^- = b_3^+ = b_3^-$	Both sign and size asymmetries
2	Reject $H_0 : b_1^+ = b_2^+ = b_3^+$	Size (upside) asymmetry
3	Reject $H_0 : b_1^- = b_2^- = b_3^-$	Size (downside) asymmetry
4	Reject $H_0 : b_1^+ = b_1^-$ vs. $H_0 : b_1^+ > b_1^-$	Sign asymmetry when $\mathrm{C_t} < \tau_1$
5	Reject $H_0 : b_2^+ = b_2^-$ vs. $H_0 : b_2^+ > b_2^-$	Sign asymmetry when $\tau_1 \leq \mathrm{C_t} < \tau_2$
6	Reject $H_0 : b_3^+ = b_3^-$ vs. $H_0 : b_3^+ > b_3^-$	Sign asymmetry when $\mathrm{C_t} \geq \tau_2$

Notes: If null hypothesis (1) is not rejected, there is no evidence of asymmetry, indicating symmetrical interest rate changes regardless of the cash rate's magnitude. Rejection of null hypotheses (4), (5), and (6) indicates sign asymmetry exists only within a specific cash rate range, causing lending rates to "shoot up like rockets" and "fall like feathers.".

Table 2
Data availability and descriptive data (April 1982-July 2024).

Variables	Data availability	Mean	Std. Dev.	Coefficient of variation (Mean/SD*100)
Cash rate	May 1976-July 2024	6.39	4.77	75
Standard variable mortgage rate	Jan 1959-July 2024	8.70	3.37	39
Small business lending rate	Feb 1976-July 2024	10.74	3.36	31
Thirty-day deposit rate	April 1982-July 2024	4.47	4.11	92
Ninety-day deposit rate	Dec 1981-July 2024	5.48	4.10	75

Notes: Based on a sample of 508 monthly observations from April 1982 to July 2024, the average cash rate was 6.39 %. Lending rates were higher than the cash rate, while deposit rates were nearly half of the lending rates. Deposit rates showed much greater variability than lending rates, both in absolute and relative terms. Specifically, deposit rates were about two to three times more volatile than lending rates. Banks tend to adjust their lower deposit rates more frequently than their higher lending rates.
Source: Reserve Bank of Australia (2024).

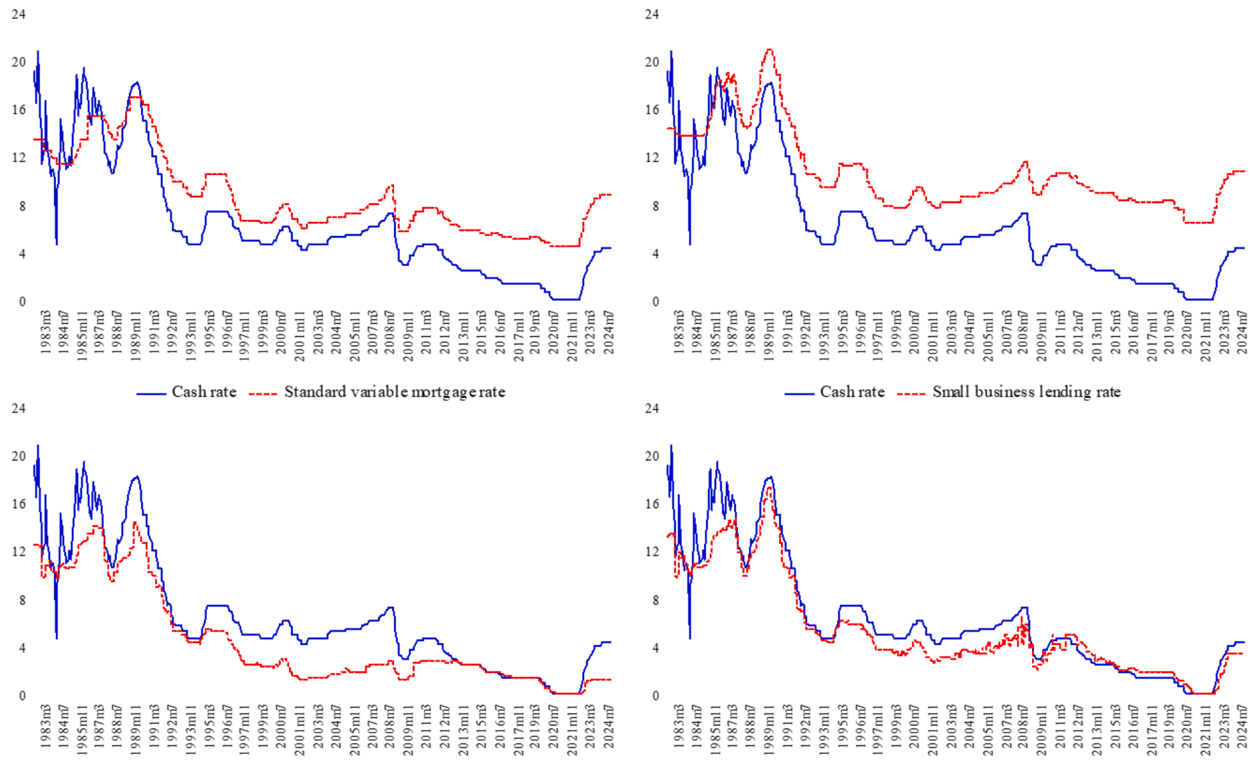

Fig. 1. Time plots of lending and deposit rates compared to the cash rate. Notes: These graphs show time plots of two lending rates and two deposit rates compared to the RBA's cash rate (all in %). The top graphs reveal that both the standard mortgage variable rate and the small business rate are higher than the cash rate, with the gap widening over time. In contrast, the 30-day and 90-day deposit rates are mostly below or close to the cash rate.

than the cash rate but also that the gap between the cash rate and each lending rate is widening over time. In contrast, the two deposit rates (i.e., 30-day and 90-day deposit rates) are, for most of the sample period, well below the cash rate or very close to it. The four scatterplots in Fig. 2 illustrate the relationship between the cash rate and each of the four lending and deposit rates. As the cash rate on the *x*-axis rises from left to right, the scatter dots fan out conspicuously, suggesting possible shifts in the pass-through parameters. This provides a strong justification (motivation) for using threshold regression analysis. Therefore, we infer that the magnitude of the cash rate can also impact the coefficients in Eqs. (2) and (3), necessitating the estimation of Eq. (6) only if the break points are statistically significant based on the Bai and Perron (2003) method.

We present the estimation results of Eqs. (6) and (3) for each lending and deposit rate below. For both lending rates, the two breaks were statistically significant, so we proceeded with Eq. (6). However, for both deposit rates, no break was significant, so we estimated Eq. (3) instead. We briefly discuss the estimation results for two lending rates below.

Standard variable mortgage rate:

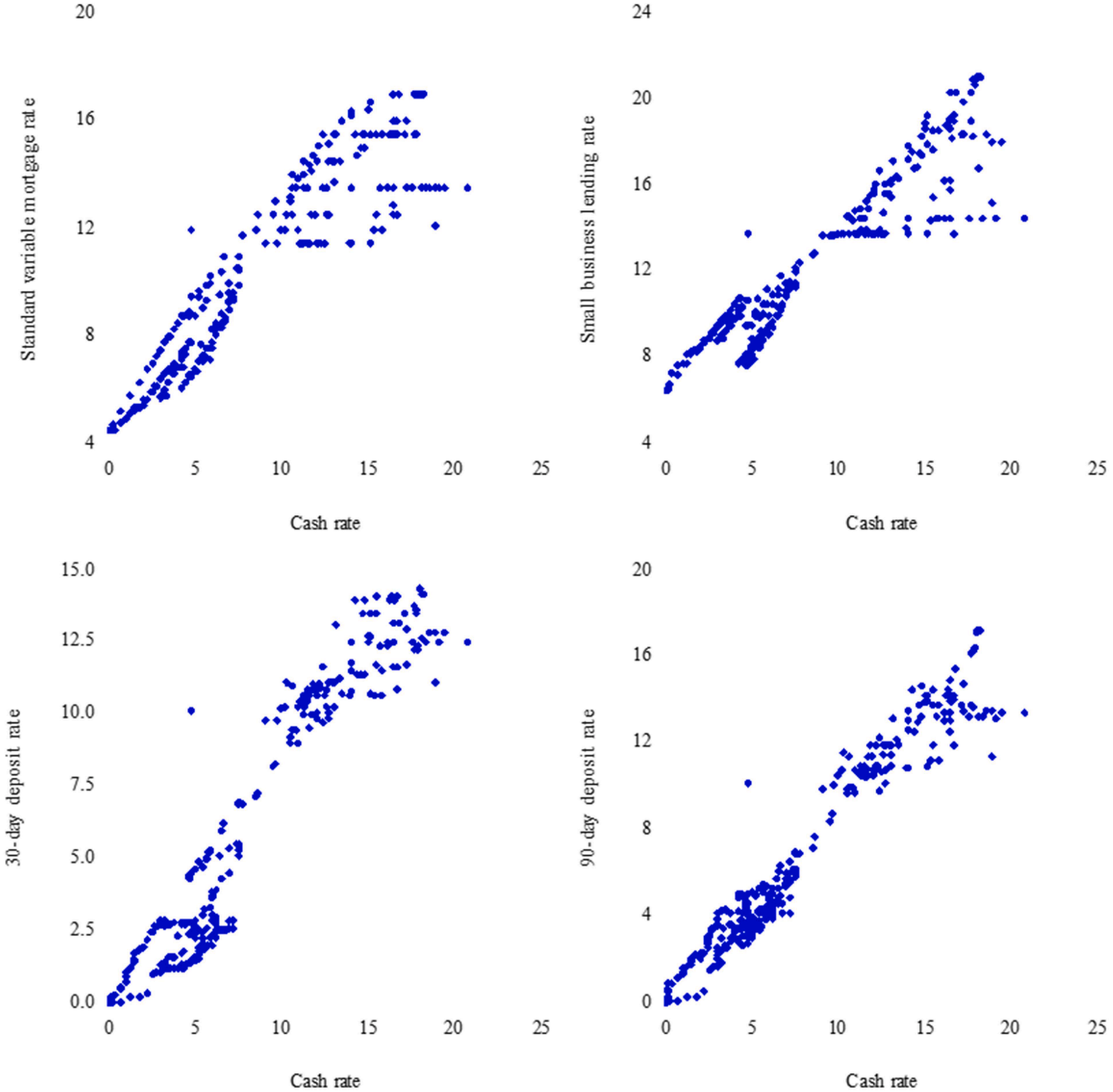

Fig. 2. Scatterplots of Lending and Deposit Rates vs. Cash Rate. Notes: The scatterplots show the relationship between the cash rate and four lending and deposit rates (all in %). As the cash rate increases, the scatter dots spread out, indicating shifts in pass-through parameters, which justifies using threshold regression analysis.

$$\begin{array}{c} \Delta R_t = \\ t: \end{array} \begin{array}{c} -0.017 \\ (-1.70) \end{array} \begin{array}{c} +0.176\Delta R_{t-1}+ \\ (5.60) \end{array} \begin{cases} \begin{array}{cc} 0.959\Delta C_t^{+}+ & 0.823\Delta C_t^{-} \\ (13.67) & (11.88) \end{array} \text{if} \mathrm{C_t} < 4.76 (n = 235) \\ \begin{array}{cc} 0.779\Delta C_t^{+}+ & 0.081\Delta C_t^{-} \\ (5.59) & (1.01) \end{array} \text{if} 4.76 \leq \mathrm{C_t} < 8.64 (n = 158), R^2 = 0.315, DW = 1.98 \\ \begin{array}{cc} 0.020\Delta C_t^{+}+ & 0.000\Delta C_t^{-} \\ (0.76) & (0.02) \end{array} \text{if} \mathrm{C_t} \geq 8.64 (n = 115) \end{cases}$$

Small business lending rate:

$$\begin{array}{l} \Delta R_t = \;\; -0.011 \;\; +0.356\Delta R_{t-1}+ \\ t: \quad (-1.36) \qquad (5.97) \end{array} \begin{cases} \underset{(9.26)}{0.779\Delta C_t^+} + \underset{(11.52)}{0.820\Delta C_t^-} & \text{if} \mathrm{C_t} < 4.75 (n = 203) \\ \underset{(6.07)}{0.739\Delta C_t^+} + \underset{(1.04)}{0.056\Delta C_t^-} & \text{if} 4.75 \leq \mathrm{C_t} < 7.75 (n = 188) \\ \underset{(2.10)}{0.087\Delta C_t^+} + \underset{(1.84)}{0.084\Delta C_t^-} & \text{if} \mathrm{C_t} \geq 7.75 (n = 117) \end{cases}, R^2 = 0.431, DW = 2.08$$

When the cash rate is below approximately 4.75 %, both the standard variable mortgage rate and the small business lending rate exhibit symmetric responses to positive and negative changes in the cash rate. For the mortgage rate, the upside passthrough (0.959) exceeds the downside passthrough (0.823), but this difference is not statistically significant (Wald test: $F = 1.45$, p-value=0.15). Similarly, for the small business lending rate, the difference between the upside passthrough (0.779) and downside passthrough (0.820) is also not statistically significant (Wald test: $F = 0.147$, p-value=0.70). Consequently, the null hypothesis 4 in Table 1 is not rejected for either rate, indicating that banks tend to pass on rate cuts and rate hikes to both mortgage holders and small businesses in a symmetric way.

However, the situation shifts when the cash rate is within the intermediate ranges. For the mortgage rate, when the cash rate is between 4.76 % and 8.64 %, a 1 % increase in the cash rate leads to a 0.779 % rise in the mortgage rate, whereas a 1 % decrease results in only a 0.081 % reduction (Wald test: $F = 4.35$, $p = 0.00$). For the small business lending rate, when the cash rate is between 4.75 % and 7.45 %, a 1 % increase in the cash rate leads to a 0.739 % rise, while a 1 % decrease results in only a 0.056 % reduction (Wald test: $F = 27.35$, $p = 0.00$). These findings strongly reject the null hypothesis 5 in Table 1 for both lending rates, indicating that within these ranges, interest rates "shoot up like a rocket and fall like a feather," warranting closer scrutiny by regulatory bodies such as the ACCC and APRA. Once the cash rate exceeds the upper thresholds (8.64 % for mortgage rates and 7.75 % for small business lending rates), the pass-through effects—both upward and downward—become small or statistically insignificant. This indicates that the relationship between the cash rate and mortgage rates breaks down, while for small business lending rates, the connection weakens substantially.

Finally, the results for both the 30-day and 90-day deposit rates are presented below, and since no structural break was statistically significant at the 5 % level, we proceeded with the estimation of Eq. (3).

30-day deposit rate:

$$\begin{array}{lccccl} \Delta R_t = & -0.010 & +0.327\Delta R_{t-1} & +0.076\Delta C_t^+ & +0.096\Delta C_t^-, & R^2 = 0.178, DW = 2.08 \\ t: & (-1.39) & (4.93) & (2.17) & (2.20) & \end{array}$$

90-day deposit rate:

$$\begin{array}{lccccl} \Delta R_t = & -0.015 & +0.045\Delta R_{t-1} & +0.142\Delta C_t^+ & +0.136\Delta C_t^-, & R^2 = 0.073, DW = 2.16 \\ t: & (-1.12) & (0.32) & (2.36) & (2.47) & \end{array}$$

Since the null hypothesis H_0: $\beta^+=\beta^-$ is not rejected for either the 30-day ($F = 0.18$, $p = 0.67$) or 90-day ($F = 0.01$, $p = 0.94$) equations, it can be concluded that the RBA's rate cuts and hikes are equiprimordially passed onto depositors, although the pass-through parameters, compared to lending rates, remain relatively low. This is not surprising, given that the highest adjusted R^2 statistics were observed for lending rates, while the lowest were for deposit rates.

It is important to note that all four equations presented above were estimated using data from the same adjusted sample period (June 1983-July 2024), comprising 506 monthly observations. No parameter was estimated with fewer than 115 observations (refer to the number of observations n next to each equation above). To ensure the robustness of our results, we employed both OLS and the Newey-West (1987) HAC (Heteroskedasticity and Autocorrelation Consistent) method, which provides consistent estimators in the presence of heteroskedasticity and autocorrelation of unknown form. Both estimation methods yielded the same inferences. We also re-estimated the equations above by excluding observations where the cash rate remained unchanged. In other words, in addition to Eq. (5), we also considered the following equation, but the results changed very little:

$$\Delta C_t^- = min\{\Delta C_t^-, 0\} \Rightarrow \Delta C_t^- = \Delta C_t \text{if} \Delta C_t < 0 \text{and} \Delta C_t^- = 0 \text{if} \Delta C_t > 0$$

In addition, the Lagrange multiplier test for autocorrelation showed no serial correlation in the residuals. All series used in the estimation equations were stationary. These results are available from the author upon request.

The policy implications of this study highlight the urgent need for regulatory bodies, such as the ACCC and the Australian Prudential Regulation Authority (APRA), to closely monitor banks' behavior, particularly concerning lending rates at specific cash rate thresholds. The study reveals a significant asymmetry in how banks adjust their lending and deposit rates. Specifically, within certain ranges, RBA rate hikes have a significantly stronger impact on mortgage and business lending rates compared to rate cuts. Given the rising cost of living and the reliance of retirees on their deposits, along with small businesses' heavy dependence on bank loans, such anti-competitive practices adversely affect Australian households and small enterprises.

4. Conclusion

We examine the pass-through effects of changes in the RBA's cash rate on two lending rates (i.e., the standard variable mortgage rate, small business overdraft rate) and two deposit rates (i.e., the 30-day and 90-day deposit rate). We explore potential structural breaks in the relationships between these rates and the cash rate, focusing on asymmetric pass-through dynamics. The findings reveal that for lending rates, when the cash rate is below 4.75 %, the pass-through to both lending rates is symmetric. However, within the ranges of 4.75 % to 8.64 % for mortgage rates and 4.75 % to 7.45 % for small business rates, banks increase their lending rates rapidly (like rockets) but reduce them slowly (like feathers). This asymmetric behavior disappears when the cash rate exceeds the upper thresholds. In contrast, no asymmetry was detected for deposit rates. The results of this study carry significant implications for policymakers and regulatory authorities. They underscore the necessity for heightened scrutiny of specific cash rate thresholds and their corresponding impacts on lending and deposit rates. This nuanced understanding is crucial for informed decision-making and effective regulatory oversight.

A limitation of the present study is that it relies on two aggregated lending rates and two aggregated deposit rates sourced from the RBA, which may mask individual variations across different banks. Future research could address this limitation by utilizing consistently-defined monthly data on standard variable mortgage interest rates, variable business lending rates, and deposit (savings) rates for each of the 39 authorized deposit-taking institutions in Australia, available from www.canstar.com.au (Valadkhani, 2014). This approach would allow for more specific results and facilitate a more detailed examination of anti-competitive behavior across individual banks.

CRediT authorship contribution statement

Abbas Valadkhani: Writing – review & editing, Writing – original draft, Validation, Supervision, Software, Methodology, Investigation, Formal analysis, Conceptualization. **Barry O'Mahony:** Writing – review & editing, Writing – original draft, Validation, Supervision, Methodology, Investigation, Formal analysis, Conceptualization.

Declarations of competing interest

None.

Data availability

Data will be made available on request.

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