Interest Rate Setting Behaviour of Banks: Evidence from Australia and the US

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1 Introduction

- Knowledge about the size (i.e., how much of the policy change in the official cash rate is passed on), as well as the speed, of transmission (i.e., how quickly the policy change is passed on) is important for implementing informed monetary policy.

- In general, changes in bank rates follow changes in the official rate. But has this changed over time? And what about the recent turmoil in global credit markets?

- Little attention has been paid to the stability of bank interest rate adjustments to monetary policy in the presence of significant and persistent credit constraints because we have had little experience of interest rate behaviour during a period of significant and persistent exogenous risk averseness in credit markets.

- The aims of this paper are, therefore, twofold: 1) to implement a procedure for evaluating time-varying bank interest rate adjustments, and 2) to take advantage of the body of data available at the current date for assessing the behaviour of Australian and US banks to credit constraints and examining such behaviour in a historical context.

2 Bank Interest Rate Setting Behaviour

- A model in the vein of the Freixas and Rochet (1997) imperfect competition model

- Each bank has on the liability side - deposits D_n, and on the asset side - interbank balances M_n, and loans L_n so that the balance sheet identity is:

$$D_n = L_n + M_n, \qquad n = 1, ...N$$

- Let each bank face a cost function $C_n(D, L)$, assumed linear for simplicity:

$$C_n(D, L) = \gamma_D D + \gamma_L L, \quad n = 1, ...N$$

  where γ_L and γ_D are the marginal costs with respect to deposits and loans respectively.

- The *nth* bank's profit function is

$$\Pi_n = r_L(L_n + \sum_{m \neq n} L_m^*)L_n + r_B(D_n - L_n) - r_D(D_n + \sum_{m \neq n} D_m^*)D_n - C_n(D_n, L_n),$$

  where r_L, r_D and r_B equilibrium loan, deposit and interbank rates respectively.

- The FOCs of the model are

$$\begin{aligned}\frac{\partial \Pi_n}{\partial L_n^*} &= r_L'(L^*)L_n^* + r_L(L^*) - r_B - \gamma_L = 0,\\ \frac{\partial \Pi_n}{\partial D_n^*} &= r_B - r_D'(D^*)D_n^* - r_D(D^*) - \gamma_D = 0.\end{aligned}$$

- The Cournot equilibrium of the banking sector will be a N-tuple vectors $(D_n^*, L_n^*)_{n=1,\dots N}$ with unique equilibrium conditions, $L_n^* = \frac{L^*}{N}$ and $D_n^* = \frac{D^*}{N}$. Solving the first order conditions then gives the banking sector's optimal loan and deposit rates as

$$\begin{aligned} r_L^* &= -r_L'(L^*)\frac{L^*}{N} + r_B + \gamma_L,\\ r_D^* &= -r_D'(D^*)\frac{D^*}{N} + r_B - \gamma_D.\end{aligned}$$

- These eqns constitute the two fundamental (i.e., the long-run cointegrating) relationships sought in the empirical analysis which for later reference is rewritten as:

$$\begin{aligned} r_L^* &= \gamma_1 + \beta_1 r_B,\\ r_D^* &= \gamma_2 + \beta_2 r_B,\end{aligned}$$

$$\begin{aligned} \gamma_1 &= \gamma_L - r_L'(L^*)\frac{L^*}{N},\\ \gamma_2 &= -\gamma_D - r_D'(D^*)\frac{D^*}{N},\\ \beta_1 &= \beta_2 = 1.\end{aligned}$$

3 The Econometric Model

- The econometric model of the trivariate set of interest rates under study: r^l, r^d, and r^m is specified as:

$$
\begin{aligned}
\Delta r_t^m &= \delta_{0,t} + \delta_{1,t} r_{t-1}^m + \alpha_{1,t}^m \left(r_{t-1}^l - \beta_{0,t-1}^l - \beta_{1,t-1}^l r_{t-1}^m\right) \\
&\quad + \alpha_{2,t}^m [\left(r_{t-1}^d - \beta_{0,t-1}^d - \beta_{1,t-1}^d r_{t-1}^m\right) + e_t^m
\end{aligned}
$$

$$
\begin{aligned}
\Delta r_t^l &= \delta_{0,t} + \delta_{1,t} r_{t-1}^m + \alpha_{1,t}^l \left(r_{t-1}^l - \beta_{0,t-1}^l - \beta_{1,t-1}^l r_{t-1}^m\right) \\
&\quad + \alpha_{2,t}^l \left(r_{t-1}^d - \beta_{0,t-1}^d - \beta_{1,t-1}^d r_{t-1}^m\right) + e_t^l
\end{aligned}
$$

$$
\begin{aligned}
\Delta r_t^d &= \delta_{0,t} + \delta_{1,t} r_{t-1}^m + \alpha_{1,t}^d \left(r_{t-1}^l - \beta_{0,t-1}^l - \beta_{1,t-1}^l r_{t-1}^m\right) \\
&\quad + \alpha_{2,t}^d \left(r_{t-1}^d - \beta_{0,t-1}^d - \beta_{1,t-1}^d r_{t-1}^m\right) + e_t^d
\end{aligned}
$$

- The three pivotal equations in the model may be rewritten as:

$$
\begin{aligned}
\Delta r_t^m &= \alpha_{1,t}^m r_{t-1}^l + \alpha_{2,t}^m r_{t-1}^d - \left(\alpha_{1,t}^m \beta_{0,t-1}^l + \alpha_{2,t}^m \beta_{0,t-1}^d - \delta_{0,t}\right) \\
&\quad - \left(\alpha_{1,t}^m \beta_{1,t-1}^l + \alpha_{2,t}^m \beta_{1,t-1}^d - \delta_{1,t}\right) r_{t-1}^m + e_t^m
\end{aligned}
$$

$$
\begin{aligned}
\Delta r_t^l &= \alpha_{1,t}^l r_{t-1}^l + \alpha_{2,t}^l r_{t-1}^d - \left(\alpha_{1,t}^l \beta_{0,t-1}^l + \alpha_{2,t}^l \beta_{0,t-1}^d - \delta_{0,t}\right) \\
&\quad - \left(\alpha_{1,t}^l \beta_{1,t-1}^l + \alpha_{2,t}^l \beta_{1,t-1}^d - \delta_{1,t}\right) r_{t-1}^m + e_t^l
\end{aligned}
$$

$$
\begin{aligned}
\Delta r_t^d &= \alpha_{1,t}^d r_{t-1}^l + \alpha_{2,t}^d r_{t-1}^d - \left(\alpha_{1,t}^d \beta_{0,t-1}^l + \alpha_{2,t}^d \beta_{0,t-1}^d - \delta_{0,t}\right) \\
&\quad - \left(\alpha_{1,t}^d \beta_{1,t-1}^l + \alpha_{2,t}^d \beta_{1,t-1}^d - \delta_{1,t}\right) r_{t-1}^m + e_t^d
\end{aligned}
$$

and the model estimated as:

$$\Delta r_t^m = \alpha_{1,t}^m r_{t-1}^l + \alpha_{2,t}^m r_{t-1}^d - \theta_{1,t}^m - \theta_{2,t}^m r_{t-1}^m + e_t^m$$

$$\Delta r_t^l = \alpha_{1,t}^l r_{t-1}^l + \alpha_{2,t}^l r_{t-1}^d - \theta_{1,t}^l - \theta_{2,t}^l r_{t-1}^m + e_t^l$$

$$\Delta r_t^d = \alpha_{1,t}^d r_{t-1}^l + \alpha_{2,t}^d r_{t-1}^d - \theta_{1,t}^d - \theta_{2,t}^d r_{t-1}^m + e_t^d$$

- The time-varying parameters are specified as first order stochastic processes of the form:

$$\alpha_{k,t}^j = \alpha_{k,t-1}^j + \tilde{\alpha}_{k,t}^j$$

$$\theta_{k,t}^j = \theta_{k,t-1}^j + \tilde{\theta}_{k,t}^j$$

- Given estimates of $\{\alpha_{1,t}^m,\ \alpha_{2,t}^m,\ \alpha_{1,t}^l,\ \alpha_{2,t}^l,\ \alpha_{1,t}^d,\ \alpha_{2,t}^d\}$ and $\{\theta_{1,t}^m,\ \theta_{2,t}^m,\ \theta_{1,t}^l,\ \theta_{2,t}^l,\ \theta_{1,t}^d,\ \theta_{2,t}^d\}$ estimates of $\{\beta_{0,t-1}^l,\ \beta_{0,t-1}^d,\ \beta_{1,t-1}^l,\ \beta_{0,t-1}^d,\ \delta_{0,t},\ \delta_{1,t}\}$ for each time period may be obtained using the following projections:

$$\begin{bmatrix} \alpha_{1,t}^m & \alpha_{2,t}^m & 0 & 0 & -1 & 0 \\ 0 & 0 & \alpha_{1,t}^m & \alpha_{2,t}^m & 0 & -1 \\ \alpha_{1,t}^l & \alpha_{2,t}^l & 0 & 0 & -1 & 0 \\ 0 & 0 & \alpha_{1,t}^l & \alpha_{2,t}^l & 0 & -1 \\ \alpha_{1,t}^d & \alpha_{2,t}^d & 0 & 0 & -1 & 0 \\ 0 & 0 & \alpha_{1,t}^d & \alpha_{2,t}^d & 0 & -1 \end{bmatrix} \begin{bmatrix} \beta_{0,t-1}^l \\ \beta_{0,t-1}^d \\ \beta_{1,t-1}^l \\ \beta_{1,t-1}^d \\ \delta_{0,t} \\ \delta_{1,t} \end{bmatrix} = \begin{bmatrix} \theta_{1,t}^m \\ \theta_{2,t}^m \\ \theta_{1,t}^l \\ \theta_{2,t}^l \\ \theta_{1,t}^d \\ \theta_{2,t}^d \end{bmatrix}$$

4 Empirical Results

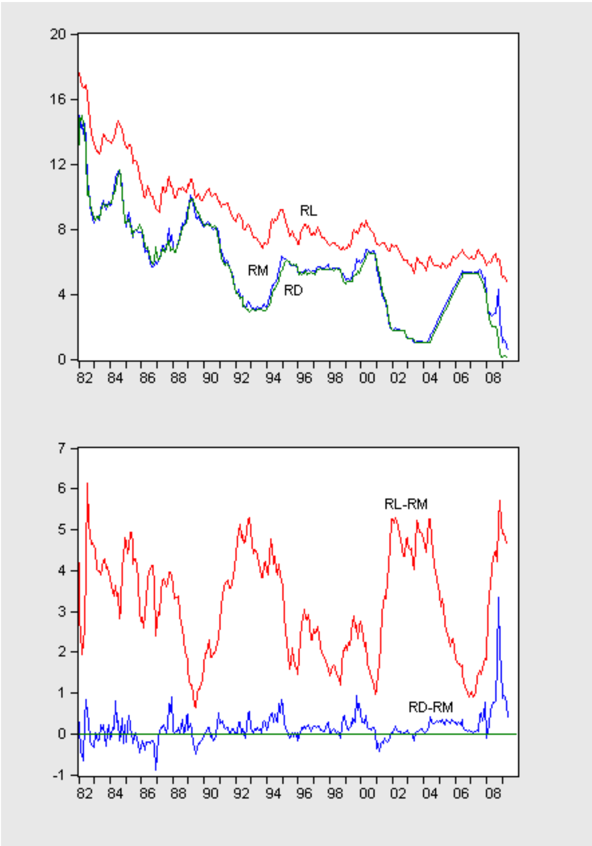
4.1 US Case

- Data:

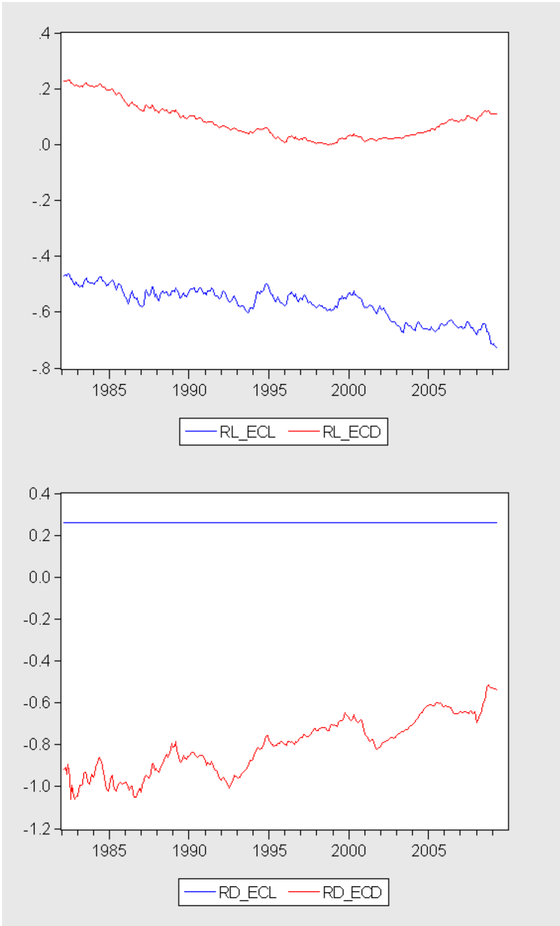
  Indicator lending rate: 30-yr, fixed-rate conventional home mortgage commitments

  Indicator deposit rate: Average rate on 3-month negotiable certificates of deposit (secondary market)

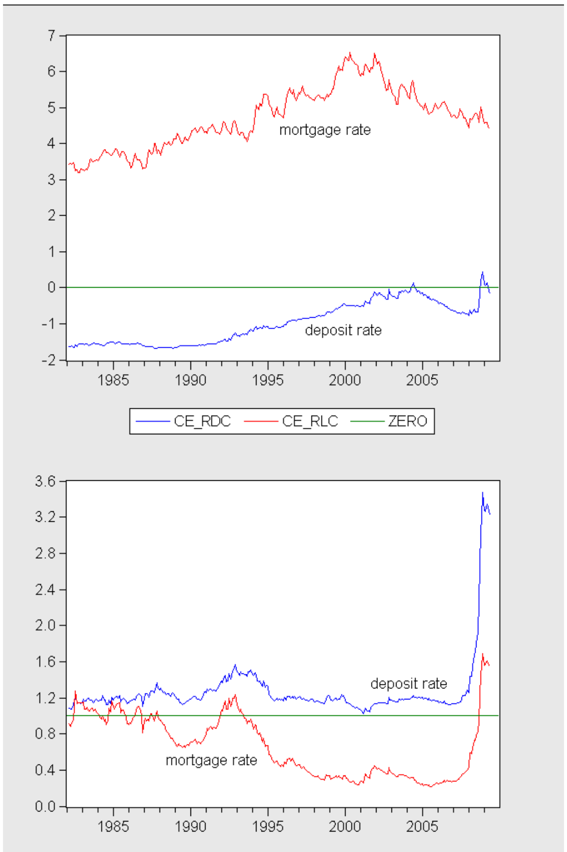
  Indicator reference rate: Federal funds effective rate

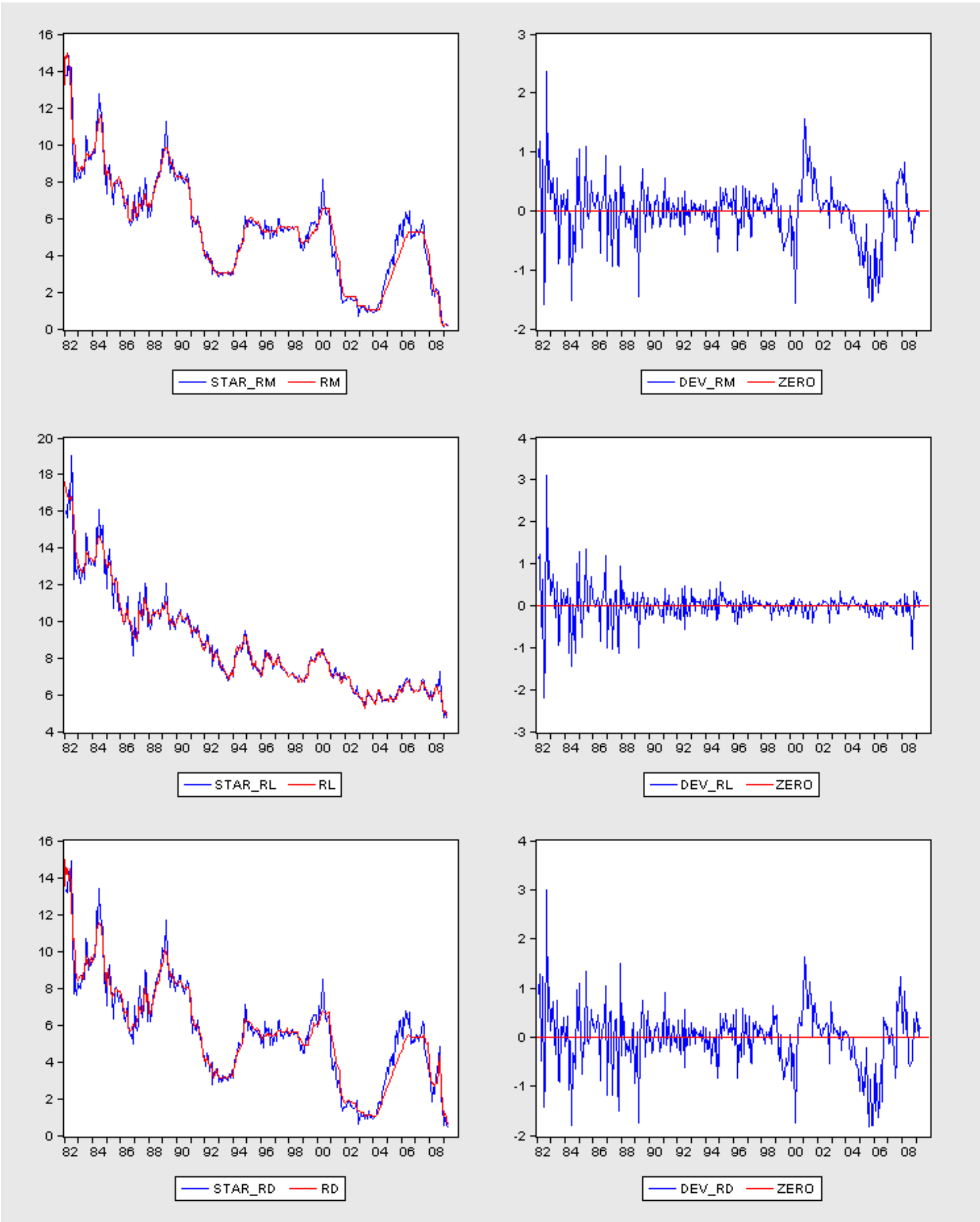


- Adjustment process



- Underlying/Long-run Relationships

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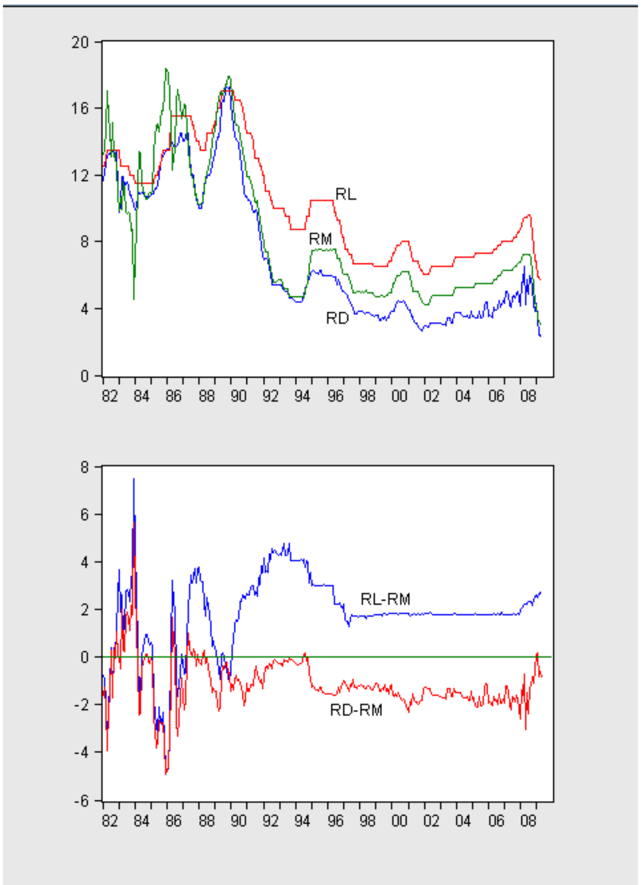
4.2 Australian Case

- Data:

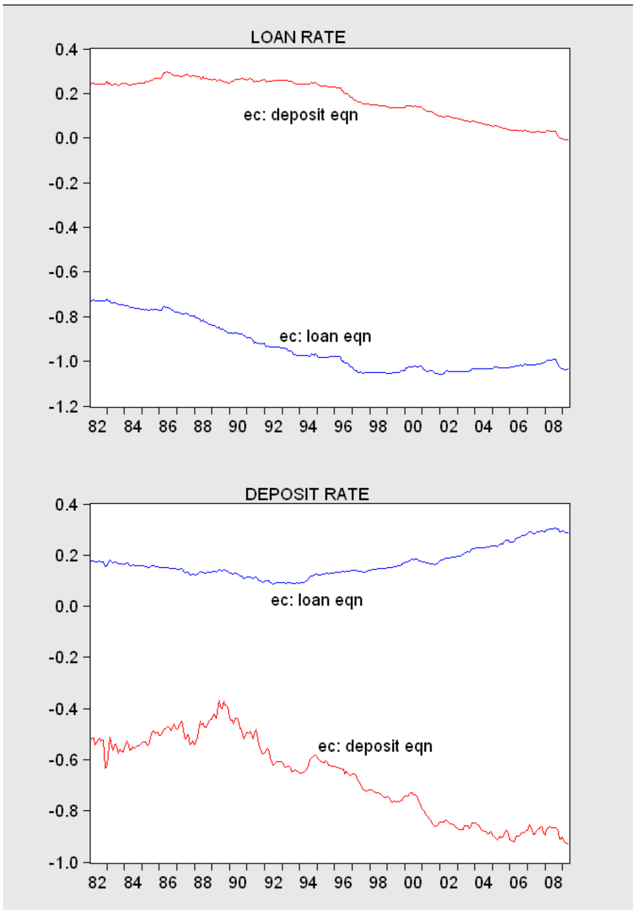
  Indicator lending rate: Std variable home loan

  Indicator deposit rate: 3-mth term deposit ($10,000)

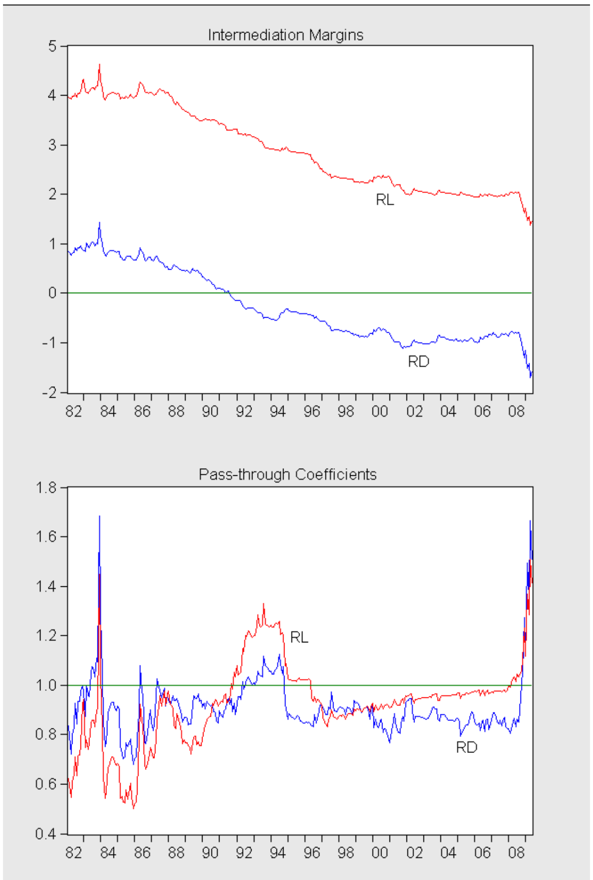
  Indicator reference rate: average money market rate

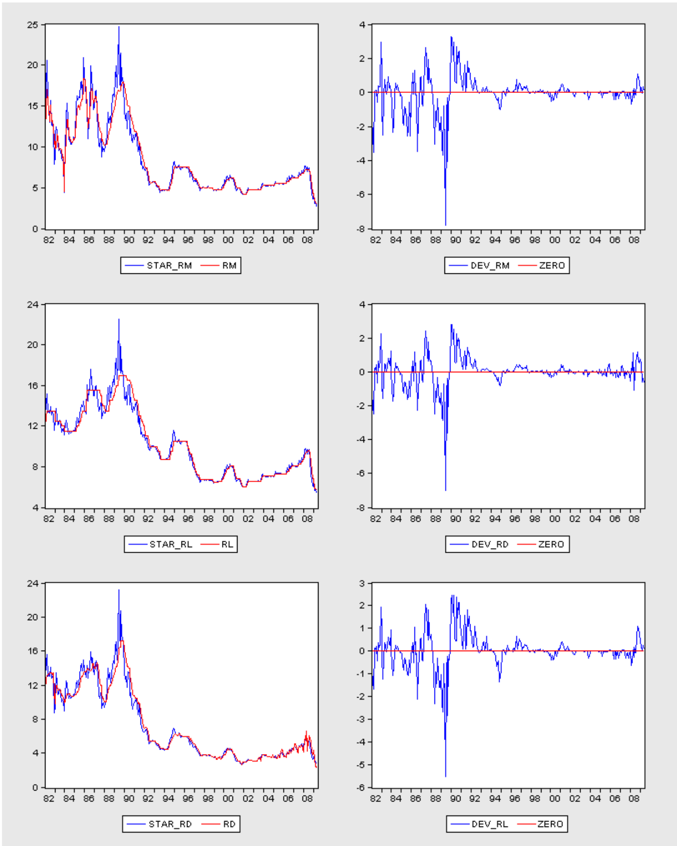


- Adjustment process



- Underlying/Long-run relationships

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5 Concluding Remarks

This paper has examined the interest setting behaviour of Australian banks with a view to ascertaining the fundamental relationships between bank rates and money-market rates and the speeds of adjustments between these rates over various episodes of monetary policies.