

# LOAN RATE STICKINESS: THEORY AND EVIDENCE

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## ABSTRACT

Financial deregulation in the 1980s saw the lifting of regulations on interest rates charged by banks. In general, lending rates now respond more quickly to changes in banks' cost of funds than they did in the regulated period. However, lending rates still do not always move one for one with changes in banks' marginal cost of raising funds. This paper canvasses four theoretical explanations, other than collusive behaviour, for loan rate stickiness. These theories are based on equilibrium credit rationing, switching costs, implicit risk sharing and consumer irrationality.

Using regression analysis, we also examine the degree of stickiness of Australian interest rates on secured and unsecured personal loans, credit cards, small and large business overdrafts, and housing loans. We find significant differences in the degree of interest rate stickiness among the different rates, even after allowing for lags in adjustment. The rate on credit cards is found to be the most sticky, followed by personal loan rates, the housing loan rate and the small business overdraft rate. The large business overdraft rate is found to adjust one for one with banks' marginal cost of funds. We briefly examine the behaviour of selected U.S., U.K. and Canadian interest rates. The general order and magnitude of interest rate stickiness is similar to that found for Australia. Although it is not possible to empirically discriminate between the different theories of loan rate stickiness, we interpret the results as providing strong evidence for the switching cost explanation. In addition, implicit risk sharing probably plays an important role in the stickiness of the housing loan rate.

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## 1. INTRODUCTION

The last decade has seen the re-emergence of interest in issues dealing with the operation of the financial system. This interest has taken both theoretical and empirical work in two broad directions. The first is an exploration of the links between the financial system and aggregate economic activity<sup>1</sup>. The second direction focuses on more microeconomic issues. Questions such as why do banks exist, how do they set interest rates and what type of principal-agent problems arise in banking have received considerable attention. This paper has its roots in this second area of research. It examines possible reasons, other than collusive behaviour, for the stickiness of banks' loan rates and uses data on the various lending rates of Australian banks to examine the degree and causes of interest rate stickiness<sup>2</sup>.

Price stickiness has long played a central role in macroeconomics. Paralleling the recent renewed interest in financial markets, there has been renewed interest in the causes of price stickiness. Many theories of slow or incomplete price adjustment in goods and labour markets have been suggested. These include theories based on market structure and lack of competition, on implicit risk-sharing contracts, on costs of changing prices and on consumer switching costs<sup>3</sup>. While, in the banking sector, price stickiness has often been attributed to a lack of competition (see Hannan and Liang (1991)), many of the explanations advanced to explain price stickiness in goods markets are also applicable to financial markets. For example, Hannan and Berger (1991) use the

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<sup>1</sup> See Gertler (1988) for a summary of this work.

<sup>2</sup> For a recent empirical evaluation of market structure in the Australian banking industry, see Fahrer and Rohling (1992). Testing three types of market structure, they find that the hypotheses of both perfect competition and perfect collusion can be rejected, but that Cournot oligopoly cannot be rejected by the data.

<sup>3</sup> See Blanchard and Fischer (1989) for a summary of various theories of price rigidity.

menu cost model of Rotemberg and Saloner (1987) to explain stickiness in bank deposit rates, while Klemperer (1987) suggests that his model of switching costs could also be used for the same purpose. Fried and Howitt (1980) apply the Azariadis (1976) model of implicit insurance contracts in labour markets to explain loan rate stickiness as a method of assuring risk averse lenders of a relatively constant interest rate. A number of explanations of stickiness in lending rates which take into account the special nature of a loan contract have also been advanced. Amongst these explanations, perhaps the most well known is the work of Stiglitz and Weiss (1981) which shows that in an equilibrium characterised by credit rationing, the loan rate may not move when other interest rates move.

In this paper we pay particular attention to four explanations of the stickiness of loan rates charged by banks. These explanations are based on credit rationing, switching costs, risk sharing and consumer irrationality.

The empirical work in this paper examines the behaviour of different lending rates in response to changes in various measures of the banks' cost of funds. In contrast to the bulk of studies on interest rate stickiness, we examine the behaviour of a number of different Australian lending rates. These include the rates on housing loans, secured and unsecured personal loans, business loans and credit cards. For purposes of comparison, we also examine the behaviour of a number of interest rates in other countries.

The various rates that we consider apply to loans with different risk characteristics and different switching costs. An examination of the various lending rate responses to changes in the cost of funds thus allows tentative inferences to be drawn as to the source of any observed rigidity. Our results do not, however, discriminate sharply between different hypotheses. Such discrimination is made difficult by the inability to observe the information costs involved in bank lending.

The remainder of the paper is structured as follows. Section 2 presents the four theories of loan rate stickiness mentioned above. Section 3 then

discusses the data, our empirical strategy and our results. We find a considerable degree of price stickiness in all lending rates except for the indicator rates for business loans. We interpret our results as providing some support for the switching cost explanation although we cannot rule out other explanations. Finally, Section 4 concludes and summarises.

## 2. THEORIES OF LOAN RATE STICKINESS

In the textbook world of perfect competition with complete information, price equals marginal cost and the derivative of price with respect to marginal cost equals one. When the industry moves away from perfect competition this derivative typically becomes less than one. For example, in the case of a monopolist facing a linear demand curve, the derivative of price with respect to marginal cost equals 0.5. Similarly, this derivative is generally less than one when the perfect information assumption and other implicit assumptions in the classical result are dropped. In this section, we discuss various theories as to why the price of a bank loan may not respond one for one with the cost of providing a bank loan. Specific attention is given to those explanations which consider the peculiarities of the market for bank loans.

The focus of this paper is solely on marginal pricing decisions. These decisions affect the profitability of the *marginal* loan. Overall profitability is determined by a comparison of average lending rates and the *average* cost of funds. The behaviour of the spread between these average rates is examined in some detail in Reserve Bank of Australia (1992).

## 2.1 Adverse Selection

Perhaps the most well known model concerning agency costs in banking is that developed by Stiglitz and Weiss (1981). The firm is assumed to know the riskiness of its project while the bank cannot distinguish between projects. This information asymmetry introduces problems of moral hazard and adverse selection. An increase in the interest rate at which investors borrow reduces the expected profit on all investment projects. The safer the project, the greater is this reduction in expected return. This is due to the fact that higher interest rates in states of the world in which risky projects already fail, do not reduce the firm's return in those states. Consequently, when the bank increases its loan rate, those firms with the safest projects will be the first to withdraw from the market. As a result, the mix of applicants applying for loans changes adversely (adverse selection). Alternatively, faced with higher interest rates, firms may decide to undertake riskier projects (moral hazard).

The problems induced by asymmetric information mean that an increase in the loan rate charged by the bank will not necessarily result in a proportionate increase in the expected receipts of the bank. If the probability of default rises sufficiently, the bank's expected receipts may actually fall when it increases its loan rate. Faced with this situation, the bank will elect not to increase its lending rate even if its cost of funds increase. In such an equilibrium, the bank will set the loan rate below the market clearing rate and ration credit. The interest rate will exhibit upward stickiness.<sup>4</sup>

This price stickiness result does not, however, necessarily hold up in equilibria in which credit is not being rationed. Consider a world in

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<sup>4</sup> Williamson (1987) demonstrates that a credit rationing equilibrium can exist in the absence of adverse selection and moral hazard problems, although the assumption of asymmetric information remains critical. He derives debt contracts as an optimal arrangement between borrower and lender. Lenders are assumed to face a monetary cost (for example, bankruptcy costs) of borrower default. At some point, the probability of default on a given loan increases to such a point that the expected additional bankruptcy costs outweigh the additional return. At this point, the bank will find it optimal to no longer increase its lending rate even if the costs of funds increases.

which there are two broad classes of borrowers to which a bank can lend. For the first class of borrower (such as governments), the probability of default is zero, while for the second class of borrowers, the probability of default is positive and increasing in the loan interest rate (through adverse selection or moral hazard). Assume that the bank can distinguish between the two classes of borrowers, but not between customers within each class. Further, assume that the bank is risk neutral and thus must earn the same expected return on both classes of loans. Given perfect competition, that rate must be equal to the bank's marginal cost of funds ( $R_c$ ). That is:

$$R_c = R_1 = [1 - P(R_2)]R_2 \quad (1)$$

where  $R_1$  is the rate charged on the riskless loan,  $P(\cdot)$  is the probability of default on the second class of loan and  $R_2$  is the rate charged on this loan. For the first type of loans  $\partial R_1 / \partial R_c = 1$ ; that is, changes in the bank's costs of funds get transmitted one for one into changes in the lending rate to the riskless borrower. However, provided the bank is lending to the second borrower type,  $\partial R_2 / \partial R_c > 1$  since  $\partial P / \partial R_2 > 0$ . For these loans the bank must increase the lending rate by an amount greater than the increase in the cost of funds to compensate for the decrease in the probability of repayment. At some interest rate the bank will not be able to put the rate up enough to compensate for this risk and all lending will be made to the first type of borrower. However, until this happens, the interest rate should not be sticky on the risky loans. In fact, the reverse is true; the rates on these loans should be very sensitive to changes in the banks' cost of funds.

This model can also be used to examine, more generally, the relationship between business risk and the spread between the lending rate and the marginal cost of funds. To do this, suppose that the probability of default is a function of the state of the economy as well as the interest rate. As the state of the economy worsens, the probability of loan default increases. In this case, a deterioration in the economy is likely to lead to a widening of the spread between the lending rate and the banks'



marginal cost of funds<sup>5</sup>. This can be seen from equation (1). With the marginal cost of funds ( $R_1$ ) held constant, the business lending rate ( $R_2$ ) must increase if the probability of default  $P(\cdot)$  increases. This issue is explored in greater detail in Blundell-Wignall and Gizycki (1992).

## 2.2 Switching Costs

In typical markets, say the market for oranges, the seller does not care who buys her product; one customer is the same as the next. Anyone who wants to buy oranges at the listed price can do so. This is not always the case in the bank loan market; banks are concerned with the risk profile and potential behaviour of their customers. The bank needs to find out some information about the characteristics of each and every buyer. This is a costly activity for the bank. This cost of acquiring information is often passed onto the buyer by way of a fixed up-front fee. This fee makes it costly for a buyer to switch from one bank to another.

In addition, there are the regular search costs, or "shoe leather" type costs of moving from one supply source to another. Such costs include the costs of learning the different rates and conditions on the new loan. There are also costs in filling out loan application forms, obtaining the relevant documentation, and the time involved in attending interviews with the lending agent. These "search and application" costs are often more significant in banking than in most goods markets because of the bank's need to discover the risk characteristics of its customers.

Klemperer (1987) shows that, in general, the existence of switching costs leads to market segmentation, and reduces the elasticity of demand facing each firm. Even with non-cooperative behaviour, the switching costs lead to outcomes similar to the collusive solution, with the derivative of price with respect to marginal cost being less than one. Klemperer's model, applied to the banking industry, is set out below.

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<sup>5</sup> If the adverse selection problems are sufficiently large (that is, if  $\partial P/\partial R_2$  is large) then it is possible that a deterioration in the state of the world could actually lead to a fall in the business lending rate. This outcome is, however, extremely unlikely.

Consider two banks, A and B, producing functionally identical products, such as a personal loan. Assume initially that a fraction  $\sigma^a$  of consumers are associated with bank A and the remainder  $\sigma^b (=1-\sigma^a)$  are associated with bank B<sup>6</sup>. Further assume that  $q$  consumers have reservation prices  $r$  greater than or equal to  $f(q)$ <sup>7</sup>. Because of the need to obtain information about a customer, banks charge a fee for new loan applications. In addition consumers face search costs. Assume that these search costs vary across individuals. Let  $\Gamma(w)$  be the cumulative density function of consumers whose total cost of switching (that is search costs plus establishment fees) to the other bank's loan product is less than or equal to  $w$ .  $\gamma(w) = \partial\Gamma(w)/\partial w \geq 0$  is the associated density function. Let  $h(\cdot) = f^{-1}(\cdot)$  and assume initially that  $p^a \geq p^b$ , where  $p$  is the price of the loan, or the interest rate.

The demand for bank A's loans is given by

$$q^a = \sigma^a h(p^a) - \Gamma(p^a - p^b) \sigma^a h(p^a) \quad (2)$$

and the demand for bank B's loans by

$$q^b = \sigma^b h(p^b) + \Gamma(p^a - p^b) \sigma^a h(p^a) + \sigma^a \int_{p^b}^{p^a} \Gamma(r - p^b) [-dh(r)] \quad (3)$$

The first term in equation (2) represents bank A's existing market share. Since  $p^b$  is less than  $p^a$ , some of A's borrowers (and potential borrowers) will switch to B. Borrowers will, however, only switch if their reservation prices are greater than or equal to  $p^a$  and switching costs are less than or equal to  $p^a - p^b$ . This loss in demand is given by the second term in equation (2).

Demand for bank B's loans comes from three sources. First, it sells to its own initial customers (the first term in equation (3)) and to those customers that were initially borrowing from bank A and who find it

<sup>6</sup> This association may come from having a deposit history with a particular bank.

<sup>7</sup>  $f(q)$  is the inverse demand function if there were no switching costs.

optimal to switch to bank B (the second term). It will also lend to those customers who were originally associated with bank A, but who did not borrow from it, and who now find it optimal to switch to bank B (the third term). Customers who have a reservation price ( $r$ ) between  $p^a$  and  $p^b$ , and a reservation price less switching costs greater than  $p^b$ , fall into this class.

Given these demand functions, it is possible to derive the non-cooperative price setting equilibrium. Choosing bank B, the first order condition for bank B's profit maximisation problem is given by:

$$\frac{\partial \pi^b}{\partial p^b} = q^b + \left[ p^b - \frac{\partial c^b}{\partial q^b} \right] \frac{\partial q^b}{\partial p^b} = 0 \quad (4)$$

Where  $\pi^b$  is bank B's profit function and  $c^b$  is bank B's cost function. Using equation (3), equation (4) can be rewritten,

$$0 = \sigma^b h(p^b) + \Gamma(p^a - p^b) \sigma^a h(p^a) + \sigma^a \int_{p^b}^{p^a} \Gamma(r - p^b) [-dh(r)] + \left[ p^b - \frac{\partial c^b}{\partial q^b} \right] \left[ \sigma^b h'(p^b) - \gamma(p^a - p^b) \sigma^a h(p^a) + \sigma^a \int_{p^b}^{p^a} -\gamma(r - p^b) [-dh(r)] \right] \quad (5)$$

For a symmetric equilibrium,  $p^a = p^b = p$  and  $\sigma^a = \sigma^b = 1/2$ . Equation (5) can be rewritten,

$$\frac{1}{2} \left[ h(p) + \left( p - \frac{\partial c^b}{\partial q^b} \right) (h'(p) - \gamma(0)h(p)) \right] = 0 \quad (6)$$

Suppose that all customers face some switching costs, and that switching costs are distributed uniformly over the interval  $[0, \bar{k}]$ . Thus  $\gamma(w) = 1/\bar{k}$  for  $0 \leq w \leq \bar{k}$  and  $\gamma(w) = 0$  for  $w > \bar{k}$ .

Given linear demand  $p=f(q) = \alpha - \beta q$ , and linear costs  $c^a(q) = c^b(q) = mq$ ,

equation (6) can be solved for the equilibrium price,

$$p = \left[ \bar{k} + \left( \frac{\alpha + m}{2} \right) - \sqrt{\bar{k}^2 + \left( \frac{\alpha - m}{2} \right)^2} \right] \quad (7)$$

If  $\bar{k} = 0$  there are no consumers with switching costs and equation (7) collapses to  $p=m$ . That is, price equals marginal cost. This is same outcome as that which is obtained under perfect competition.

If some consumers face infinite switching costs, (ie,  $\bar{k} = \infty$ ), equation (7) implies  $p = (\alpha + m)/2$ . This is the same as the monopoly (or collusive oligopoly) outcome. In general, the higher the switching costs, the fewer consumers are attracted to a price cut, and thus the less likely a bank is to initiate a price cut. For maximum switching costs between 0 and  $\infty$ , the pricing solution for the bank lies between the perfectly competitive outcome and the monopoly outcome.

The derivative of price with respect to marginal cost is given by:

$$\frac{\partial p}{\partial m} = \frac{1}{2} + \frac{1}{2} \left[ \frac{\frac{(\alpha - m)}{2}}{\sqrt{\bar{k}^2 + \left( \frac{\alpha - m}{2} \right)^2}} \right] \quad (8)$$

As  $\bar{k} \rightarrow 0$ ,  $\partial P/\partial m \rightarrow 1$ . Thus, if no consumers face switching costs, changes in marginal cost are translated one for one into changes in price. As  $\bar{k}$  increases,  $\partial P/\partial m$  falls and loan rates become more sticky<sup>8</sup>.

The model above describes a world where people are initially associated with a particular bank. One criticism of the model is that it assumes

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<sup>8</sup> For example, if  $\alpha=0.30$  (at an interest rate of 30%, the demand for funds is zero),  $m=0.13$  (the marginal cost of funds equals 13.0%) and  $\bar{k}=0.10$  (the maximum switching costs that anybody faces is 10.0%) then  $\partial p/\partial m = 0.82$ .

some initial exogenous market share. However, the market shares may be endogenous. That is, banks may compete more vigorously in the first period in an attempt to gain market share, thereby increasing second period monopoly power. In aggregate, however, banks cannot increase market share, but the increased competition will dissipate any second period rents.

One response to this criticism is that since customers are aware that the switching costs will make them captives of the bank, and will be under possible monopoly power in the second period, they will be less tempted to purchase from a bank who has initiated a price cut in the first period. The price cut is a signal to the customer that the bank is attempting to increase its market share with a view to increasing prices in the second period. First period demand will then be less elastic than in an otherwise identical market with no switching costs. This behaviour results in price stickiness as described above. Further, in the banking industry in particular, it is not unreasonable to assume that customers who wish to borrow are initially associated with some bank; either through previous lending or the bank providing deposit facilities.

In the version of the Klemperer model presented above, the bank's need for information causes part of the switching costs. Banerjee and Summers (1987) present a model in which there are no information or search costs of switching, but firms introduce artificial switching costs as a loyalty inducing device. This enables firms to split the market and thus charge a higher price, as in Klemperer's model. Any price cut by a single firm must be greater than the switching cost before the firm begins to attract consumers from other firms. With sizeable switching costs, there is no incentive to cut prices marginally, (or chisel as in a collusive market) because it would not gain the firm any customers. Furthermore, it does not pay a firm to lower its price by enough to capture the entire market. This would leave the other firm with no customers, and in a position to lower its price below the first firm's price. The Bertrand pricing solution would result, with price equal to marginal cost.

The positive profits generated in this artificial switching cost model lead

to the question of entry. Normally, the threat of entry would force the incumbents to price at marginal cost. However, if entry of new firms is costly, it will not pay to enter, as Bertrand competition will result, leaving no profits to cover the cost of entry. Given the high costs of bank entry, especially at the retail level, banks may have some incentive to introduce artificial switching costs.

An earlier model of markets with switching costs by Von Weizsacker (1984) focuses on a firm's reputation, and is based partly on work by Klein and Leffler (1981). Given a market where there are costs of substituting between different products, customers are unwilling to enter into a long term arrangement with a firm for fear of losing rents to the firm at a future date. Firms are able to overcome consumers' reluctance by reducing the uncertainty associated with price changes by holding prices constant. In this way, firms may gain valuable reputations by acting consistently. Observed price inertia may thus be an indicator of competition, and not an indicator of collusion. However, this model assumes prices will be fixed in all periods; an unlikely occurrence. If consumers are risk neutral, an alternative outcome is that banks commit to tie the interest rate to the observable cost of funds.

### 2.3 Risk Sharing

If borrowers are more risk averse than the shareholders of the bank, there exists an implicit risk insurance argument for the stickiness of interest rates. Fried and Howitt (1980), apply the implicit labour contract model of Azariadis (1976) to model this effect. Given that the borrower is risk averse, she prefers stable interest rate payments. As a result the bank charges a less variable interest rate than its marginal cost of funds, and the bank is compensated for the additional risk by receiving a higher average rate than would be charged to risk neutral borrowers. Customers treat this difference as an insurance premium. Fried and Howitt argue that customers will not change banks when the lending rate is higher than the marginal cost of funds because of the existence of switching costs. Since both parties face these switching costs, it is mutually advantageous to maintain a long-term relationship. The result is interest rate stickiness.

## 2.4 Consumer Irrationality

Ausubel (1991) argues that search or switch costs, although present, cannot provide a full explanation of credit card rate stickiness.<sup>9</sup> He argues that there is a class of borrowers who repeatedly believe that they will pay the outstanding balance before the due date but fail to do so. These consumers are insensitive to interest rate changes, and are the class of borrowers that the banks prefer. High risk credit card borrowers, on the other hand, are more likely to be interest rate sensitive because they fully intend to borrow on their cards. A credit card rate reduction will only attract customers who fully intend to borrow (i.e., the high risk customers). This "reverse" adverse-selection problem makes banks less likely to compete on credit card rates and thus rates are likely to be sticky, especially in the downward direction.

## 3. TESTS OF LOAN RATE STICKINESS

The empirical literature on price stickiness in banking has typically focused on a single deposit or lending rate. Yet, casual observation suggests considerable variation in the degree of interest rate stickiness across different products. The interest rate charged on credit cards remains constant for long periods of time while the rate charged on overdrafts changes regularly. In this section we formally examine interest rates on a number of different types of bank loans and, by examining differences in the degree of loan rate stickiness, draw some tentative inferences concerning the cause of the stickiness.

### 3.1 Data and Estimation Procedure

Prior to the mid 1980s most bank lending rates were the subject of regulation. For most types of lending these regulations were lifted in

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<sup>9</sup> Callem (1992) argues that switching costs are important in the US credit card market. When a customer wishes to change credit cards, the new issuer may require her to pay off the balance on the existing card. This may involve several months of curtailed spending, and this constitutes a considerable switching cost. Such conditions generally do not exist in Australia.

April 1985. In the case of overdrafts the maximum rate on *all* overdrafts was set by the Reserve Bank prior to February 1972<sup>10</sup>. At that time interest rates on overdrafts drawn on limits over \$50,000 became a matter for negotiation between the banks and their customers while those drawn under limits less than \$50,000 remained regulated. In February 1976 the threshold level was increased to \$100,000 and in April 1985 all regulations were lifted.

From 1966, when personal loans were introduced, the maximum rate that banks could charge was set by the Reserve Bank. Once again, in April 1985, the controls were removed. At the same time, the maximum interest rate that could be charged on credit cards was deregulated. Prior to this time the maximum rate had been set at 18 per cent per annum.

The period of housing loan rate regulation extended beyond that for the other lending rates. Until 1973, the maximum rate that could be charged on housing loans was the same as that on overdrafts although banks typically charged a lower rate. In October 1973 banks agreed to a "consultative maximum" on housing loans which was below the overdraft rate. This was formalised in December 1980 when the maximum rate that could be charged on owner-occupied housing was set one percent below the maximum overdraft rate. The ceiling on new owner-occupied housing loans was finally removed in April 1986.

In the deregulated period, data on certain *actual* lending rates is readily available. For example, the actual rate charged on credit card loans is directly observable and is the same for all classes of borrowers. In contrast, banks generally do not publish data on rates actually charged on overdrafts. Instead, they typically quote some *base* or *reference* rate to which a margin is added to obtain the actual loan rate. These margins are determined on a case by case basis and are a function of the perceived credit worthiness of the borrower.

The quoting of reference rates for an increasing variety of lending

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<sup>10</sup> Between 1956 and 1962 a maximum for the *average* overdraft rate charged was also set.



products makes it difficult to determine the degree of stickiness of certain actual loan rates. Conclusions regarding the stickiness of the *reference* rate do not necessarily translate into conclusions regarding the stickiness of the *actual* rate charged. With this caveat in mind we examine three overdraft rates. Two of these rates are the advertised overdraft reference rates of one large Australian bank. The first of these two is the reference rate for large corporate overdrafts while the second is for small business overdrafts. The third rate used is the rate most commonly charged on small business overdrafts by another Australian bank. This rate includes the margin but it is only available for a subset of our sample period. We refer to this rate as the "standard rate". In addition to the above overdraft rates we examine the degree of stickiness in the housing loan rate, the credit card rate and a variety of personal loan rates.

As detailed above, most lending rate ceilings were lifted in April 1985. Where data permits, we begin our sample period in January 1986. This allows a period of adjustment to the deregulated environment. For the housing loan rate series, the sample period begins in July 1986, while the four personal loan rate series are only available after September 1987. The following table summarises details of the rates used for the deregulated period.

Loan Type	Rate Description	Deregulated Sample Period
Personal Loans	Minimum Rate on Secured Loans	Sept. 87 - August 91
	Maximum Rate on Secured Loans	Sept. 87 - August 91
	Minimum Rate on Unsecured Loans	Sept. 87 - August 91
	Maximum Rate on Unsecured Loans	Sept. 87 - August 91
	Rate on unsecured loans published by OECD	Jan. 86 - August 91
Housing Loans	Owner Occupied Loans	July 86 - August 91
Credit Card Loans	Rate on cards with 55 day free credit	Jan. 86 - August 91
Business Loans	Reference rate for large borrowers	Jan. 86 - August 91
	Reference rate for small borrowers	Jan. 86 - August 91
	Most common rate for small borrowers	Jan. 86 - April 90

For the period prior to deregulation we examine the unsecured personal loan series published by the OECD, the housing loan rate, the credit card rate, the minimum rate charged on overdrafts greater than \$100,000 (the prime rate) and the rate most commonly charged on small business overdrafts (the standard rate). Further details of all interest rates used are presented in Appendix 1.

A comparison of the movements of selected rates can be seen in Figure 1 for the period 1979:1 to 1985:3 and in Figure 2 for the period 1985:4 to 1991:8.

International comparisons of lending rate behaviour are made difficult by the fact that lending practices differ across countries. In particular, for a number of countries, the bulk of personal and housing lending is done by way of fixed interest loans. The response of interest rates on new loans of this type to changes in the cost of funds, will be different to that of the response of interest rates on variable rate loans. Given that in this study we use variable rate loans for Australia, the international rates that we examine are restricted to those on variable rate loans. We examine five such rates: the prime lending rates in the United States, Canada and the United Kingdom, the mortgage lending rate in the United Kingdom and the United States credit card rate. Further details of these rates, together with details of the relevant marginal cost of funds, are available in Appendix 1.

The standard price stickiness tests involve regressing the loan rate on a measure of the banks' marginal cost of funds. If price equals marginal cost, changes in the marginal cost of funds should be transmitted one for one into changes in the lending rate. It is a difficult task to measure the exact marginal cost of funds for a bank given the range of funding sources and deposit products that are available. Nevertheless, there are observable interest rates which provide satisfactory proxies. These are the bank bill rate and the certificate of deposit rate (CD rate). We also construct a third measure of the marginal cost of funds. This measure is a weighted average of the interest rates paid on fixed deposits over \$50,000, the CD rate and the bank bill rate. The weights used are the

FIGURE 1: INTEREST RATES  
Regulated Period

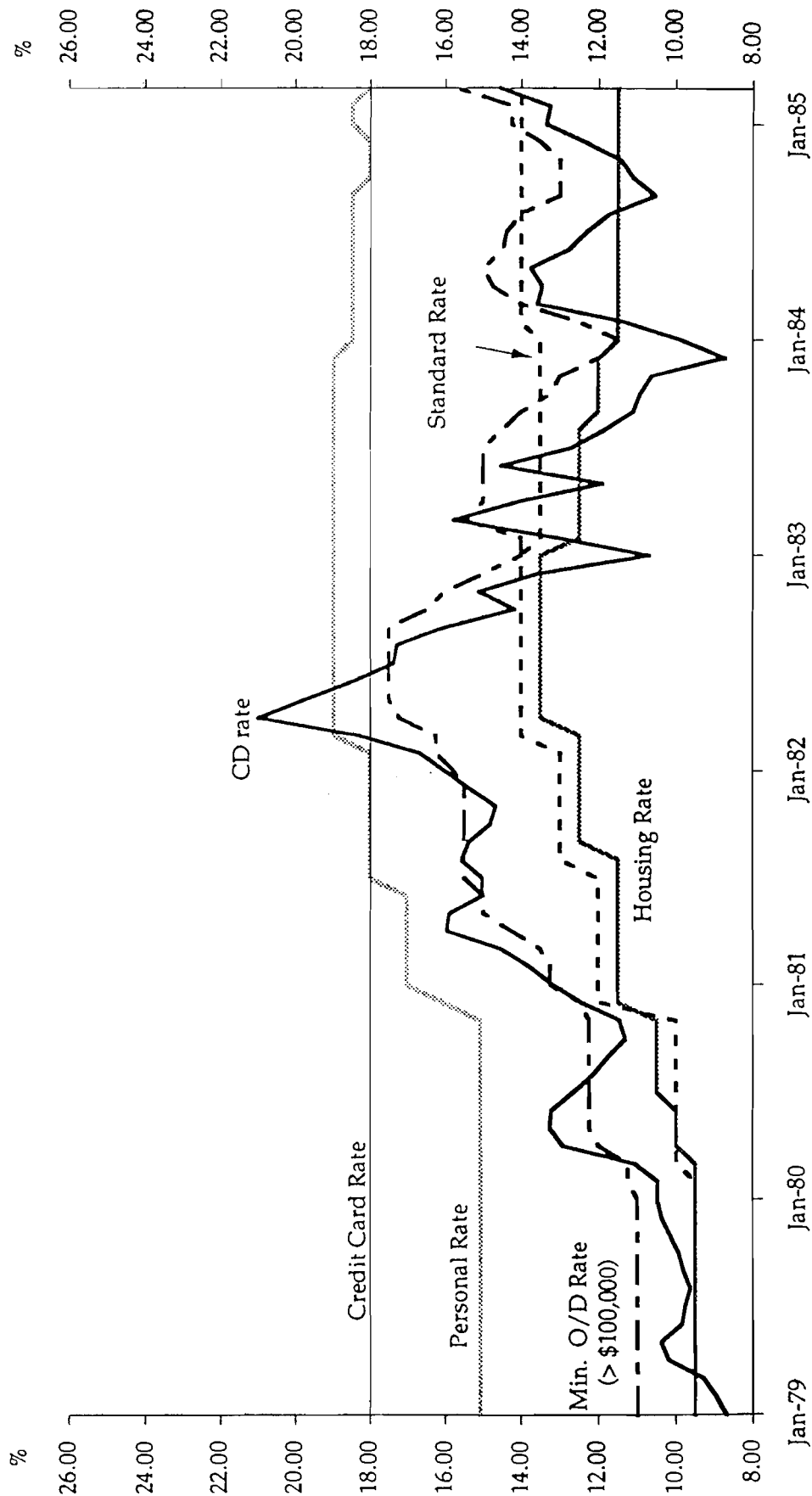
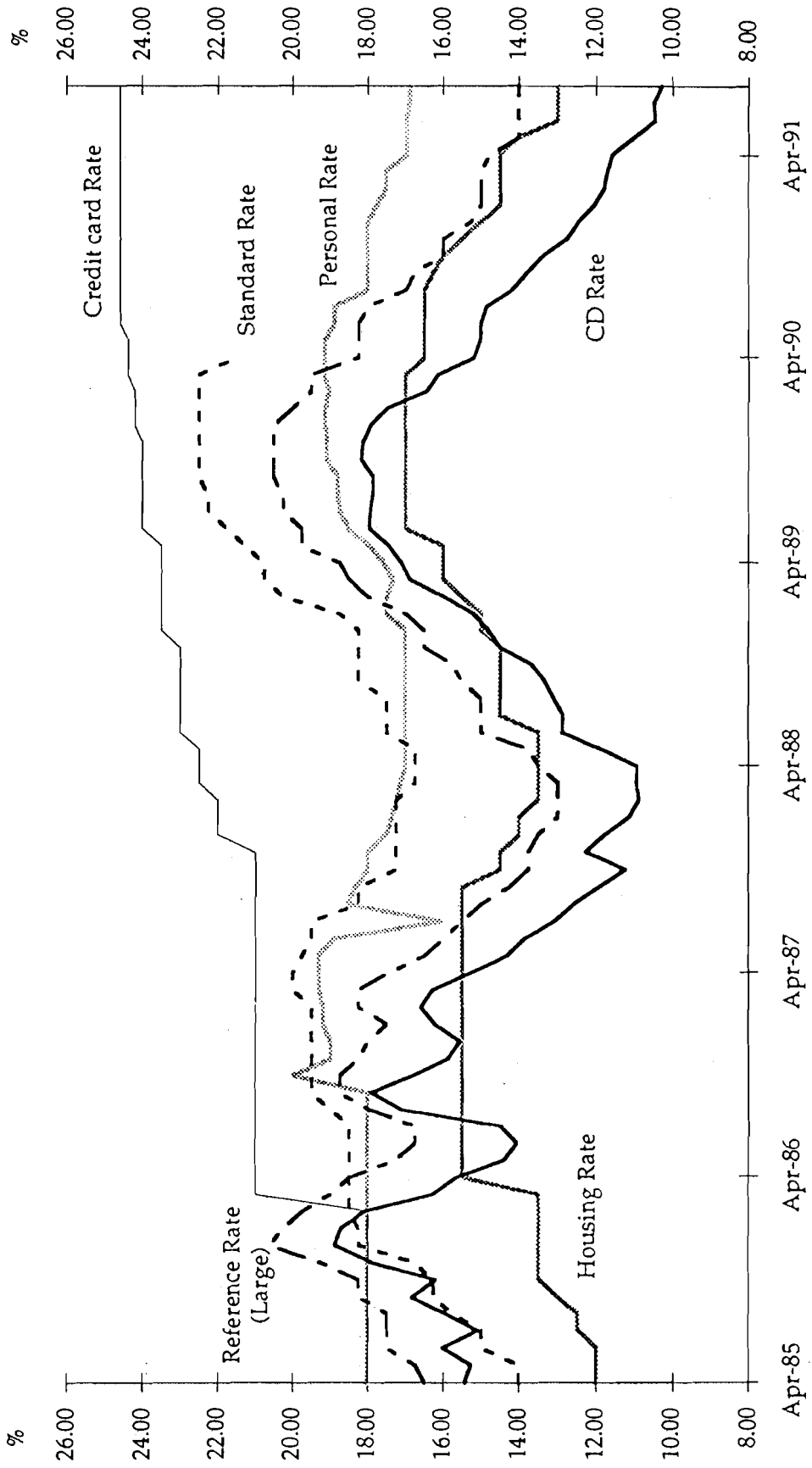


FIGURE 2: INTEREST RATES  
Deregulated Period



shares of the different liability classes in total liabilities (for further details see Appendix 1). The problem with this third measure is that using existing liability shares may not capture the true marginal cost of funds. Its advantage is that it uses a wider range of interest rates than any single interest rate measures. Our three measures of the marginal cost of funds all show very similar time profiles and our empirical tests revealed similar results for all three measures<sup>11</sup>.

For brevity, we only report the results using the CD rate. We also report initial results using two other measures of the costs of funds. Both are weighted average interest rates that banks pay on various classes of deposits. The first rate, which is labelled AVERAGE, is the average interest rate that banks pay over all deposits. The second rate, labelled RETAIL, is a weighted average rate that banks pay on their retail deposits. A more complete description of these two rates is given in Appendix 1. Neither of these rates are likely to represent the banks' marginal cost of funds but are included for completeness and as a basis for comparison. The discussion focuses on the results obtained using the CD rate.

All estimation is carried out using ordinary least squares. All hypothesis tests are conducted with a covariance matrix which is robust to conditional heteroskedasticity and serial correlation. The covariance matrices are calculated using the Newey-West procedure with 6 lags.

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<sup>11</sup> If the marginal cost of funds is measured incorrectly then we have a classical "errors in variables" problem with the parameter estimates being biased and inconsistent. In simple one variable regression models it can be shown that (see Johnston (1972)):

$$plim \hat{\beta} - \beta = \frac{-\sigma_m^2 \beta}{\sigma_x^2}$$

where  $\sigma_m^2$  is the variance of the measurement error and  $\sigma_x^2$  is the variance of the explanatory variable (in this case the measured marginal cost of funds). It can be seen that the coefficient is asymptotically biased towards zero and that the extent of the bias is a function of the ratio of the measurement error variance to the variance in the cost of funds. To the extent that any measurement error exists in our measure of the marginal cost of funds, its variance is likely to be small relative to that of the variance of the measured cost of funds. Any asymptotic bias due to measurement error is thus likely to be small.

There is some debate over whether nominal interest rates are characterised by a stationary or by an integrated process. Unfortunately, the tests which discriminate between these two alternatives are of low power and of questionable use over sample periods as short as those used in this paper. We take the view that interest rates are stationary and thus classical inference is valid. For completeness, however, we also report in Appendix 2 selected results for regressions where the interest rates have been first differenced.

### 3.2 Results

We begin by examining the deregulated period. Table 1 presents the results of regressing the lending rates on the contemporaneous cost of funds variables. When the CD rate is used, the estimates of the coefficients on the CD rate are in all cases less than one. In almost every case the estimates are significantly less than one. All the personal loan rates, the housing loan rate, the credit card rate, the most commonly charged small business rate and the base rate for small business loans all show some degree of stickiness. For the large corporate base rate it is possible to reject the hypothesis that the coefficient equals one at the 7 per cent level of significance.

When the retail cost of funds and the average cost of funds are used, we find higher coefficient estimates overall; with the retail cost generally yielding the highest estimates. For these two cost of funds variables, the coefficient estimates are both above and below one.

In Table 2 we report marginal significance levels for tests of the hypotheses that coefficients on the cost of funds variables are equal for various pairs of lending rates. The personal loan rate, the housing loan rate and the credit card rate each exhibit significantly more stickiness than the base rates and the standard overdraft rate. We also find that there are significantly different degrees of stickiness between the three retail rates with the credit rate being the stickiest and the owner-occupied housing rate the least sticky. Although not reported, we find no statistically significant difference in the degree of price stickiness between any of the four personal loan lending rates.

TABLE 1: TESTS OF LOAN RATE STICKINESS: POST DEREGULATION

$$LENDING\ RATE_i = \alpha + \beta COST_i + \epsilon_i$$

LENDING RATES	SAMPLE PERIOD	MEASURE OF COST OF FUNDS								
		AVERAGE COST			RETAIL COST			CD RATE		
		$\alpha$	$\beta$	$\bar{R}^2$	$\alpha$	$\beta$	$\bar{R}^2$	$\alpha$	$\beta$	$\bar{R}^2$
<b>PERSONAL RATES</b>										
Secured (min.)	87:9-91:8	11.41 (1.39)	0.59 (0.11)	0.46	10.66 (1.64)	0.82 (0.16)	0.45	12.80 (1.66)	0.35 (0.11)	0.27
Secured (max.)	87:9-91:8	16.52 (0.95)	0.48 (0.08)	0.42	15.73 (1.08)	0.69 (0.11)	0.45	17.78 (1.35)	0.27 (0.10)	0.23
Unsecured (min.)	87:9-91:8	11.74 (1.26)	0.64 (0.10)	0.50	10.82 (1.42)	0.90 (0.14)	0.51	12.98 (1.51)	0.40 (0.10)	0.33
Unsecured (max.)	87:9-91:8	17.19 (0.93)	0.49 (0.08)	0.46	16.31 (0.97)	0.71 (0.10)	0.50	18.21 (1.26)	0.30 (0.09)	0.29
Personal (OECD)	86:1-91:8	14.15 (0.58)	0.36 (0.05)	0.50	13.39 (0.57)	0.53 (0.07)	0.56	14.91 (0.60)	0.22 (0.04)	0.36
<b>OVERDRAFT RATES</b>										
Standard Overdraft	86:1-90:4	8.78 (0.87)	0.96 (0.09)	0.83	6.62 (0.74)	1.43 (0.09)	0.83	10.21 (1.70)	0.61 (0.13)	0.60
Base (Small)	86:1-91:8	4.20 (0.59)	1.20 (0.60)	0.95	3.15 (0.91)	1.62 (0.11)	0.87	5.31 (0.85)	0.82 (0.06)	0.90
Base (Large)	86:1-91:8	3.03 (0.68)	1.29 (0.07)	0.95	2.09 (1.07)	1.71 (0.12)	0.84	3.88 (0.82)	0.90 (0.05)	0.94
<b>OTHER RATES</b>										
Credit Card	86:1-91:8	22.87 (2.13)	0.01 (0.20)	-0.01	23.65 (2.61)	-0.07 (0.31)	-0.01	24.34 (2.13)	-0.10 (0.15)	0.01
Housing Loans	86:7-91:8	8.82 (0.58)	0.60 (0.05)	0.84	7.92 (0.60)	0.85 (0.06)	0.85	9.56 (0.77)	0.40 (0.05)	0.69

Notes: Standard errors appear in parentheses below the coefficient estimates.

TABLE 2 : TEST OF EQUALITY OF COEFFICIENTS: POST DEREGULATION

	Personal Loan Rate (OECD)	Standard Overdraft	Base Rate (small)	Base Rate (large)	Credit Card
Standard Overdraft	0.00 0.00 0.01				
Base Rate (small)	0.00 0.00 0.00	0.02 0.18 0.10			
Base Rate (large)	0.00 0.00 0.00	0.00 0.06 0.02	0.36 0.57 0.30		
Credit Card Rate	0.10 0.06 0.06	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	
Housing Loan Rate	0.00 0.00 0.01	0.00 0.00 0.01	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00

## Notes:

1. The entries in each cell are the marginal significance levels for the tests of the hypotheses that the coefficient on the cost of funds variable ( $\beta$ ) in Table 1 are the same across the two relevant lending rates. The three entries in each cell relate to the three cost of funds variables. In order these three variables are:

1. Average cost
2. Retail cost
3. CD rate.

2. The estimations involving the standard rate are from 1986:1 to 1990:4.



Comparing the base rates for small and large business loans we are unable to reject the hypothesis that the two rates exhibit the same degree of stickiness. We are, however, able to reject the hypothesis that the standard overdraft rate is characterised by the same degree of stickiness as the base rate for large corporate loans.

In summary, the results in Tables 1 and 2 suggest the following ranking in terms of the degree of price stickiness. The credit card rate is the stickiest followed by the personal loan rate, the housing loan rate, the standard overdraft rate and finally the base rates.

The above regressions assume that adjustment of the lending rate occurs in the same period as changes in the cost of funds. Such speedy adjustment may not always take place. The transmission of the change in the cost of funds may be spread out over a number of months. Accordingly, we included a number of lags of the cost of funds in the estimated equations. Table 3 presents estimates of the sum of the coefficients on the contemporaneous and lagged variables for different lag lengths. It also reports the marginal significance levels for tests of the hypotheses that the sum of the coefficients on the lags equal one. The same number of observations have been used for all lag lengths so that the sum of the coefficients is directly comparable across different numbers of lags.

In all cases adding lags increases the sum of the coefficients, suggesting some delay in adjustment of lending rates. However, in general, the basic conclusions drawn from using only the contemporaneous rate remain unchanged. For the housing, credit cards and personal loan rates, the ranking in terms of the degree of stickiness is maintained. Even after nine lags are included the sum of the coefficients on all three of these rates remain significantly less than one. The same is true for the standard overdraft rate. In the case of the small business base rate it is possible to reject the hypothesis that the sum of the coefficients on the contemporaneous and lagged cost of funds equal one when only one lag is included, but it is not possible to do so when three or more lags are included. For the large loan base rate the sum of the coefficients

TABLE 3: TEST OF LAG SIGNIFICANCE: POST DEREGULATION

LENDING RATE	Sum of Coefficients (marginal significance level for hypothesis test that $\Sigma\beta=1$ )				
	Number of Lags				
	0	1	3	6	9
Personal Loans	0.26 (0.00)	0.28 (0.00)	0.31 (0.00)	0.38 (0.00)	0.43 (0.00)
Standard Overdraft	0.75 (0.00)	0.76 (0.00)	0.81 (0.01)	0.85 (0.04)	0.83 (0.04)
Base (small)	0.85 (0.01)	0.87 (0.01)	0.91 (0.06)	0.94 (0.26)	0.94 (0.35)
Base (large)	0.92 (0.16)	0.93 (0.20)	0.96 (0.46)	0.98 (0.69)	0.97 (0.66)
Credit Card	0.003 (0.00)	-0.01 (0.00)	0.005 (0.00)	0.04 (0.00)	0.04 (0.00)
Housing Loans	0.45 (0.00)	0.48 (0.00)	0.52 (0.00)	0.57 (0.00)	0.63 (0.00)

## Notes:

1. The estimation period for these regressions is from 1986:10 to 1991:8 for all rates except the housing rate, which is estimated from 1987:4 to 1991:8, and the standard rate, which is estimated from 1986:10 to 1990:4.
2. The marginal significance levels are in parenthesis below the coefficient estimates.

generally increases with the addition of lags, however, it is not possible to reject the hypothesis that the sum of the coefficients equals one even when no lags are included.

If interest rates are sticky, declines in the banks' costs of funds will not be passed completely into lending rates. This incomplete pass-through during the interest rate reduction phase has sometimes led to the claim that banks are exploiting their customers by increasing their lending rates when the cost of funds increase, but not reducing their rates when the cost of funds declines<sup>12</sup>. One way to test such a claim is to estimate the stickiness equations with separate parameter estimates for the cases when the cost of funds decrease and increase. This is done by defining two dummy variables, one of which takes a value equal to one when the cost of funds declines, and the other takes a value equal to one when the cost of funds remains the same or increases. The cost of funds is then multiplied by each of the dummy variables to obtain two new variables which replace the original cost of funds variable in the estimated equation.

The results are reported in Table 4. For the majority of the interest rates examined it is possible to reject the hypothesis that interest rates respond symmetrically to cost of funds increases and decreases. However, in all cases the coefficient on the cost of funds is higher when the cost is decreasing. There is no evidence that banks are consistently slower to bring down their lending rates than they are to increase them. If anything, the reverse is true. For the personal lending rates, the reference rates and the home loan rate, the coefficient on the cost of funds variable is significantly greater when the cost of funds is falling than when it is increasing. However, the differences in the speed with which rates are adjusted up and down are quite small. For the credit card and the standard overdraft rate, there is no significant difference between the two coefficients.

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<sup>12</sup> For example, when monetary policy was eased in November 1991, some consumers complained banks were not passing on the interest rate cuts fully to mortgage rates. See Gittins (1991) for an account of the debate.

TABLE 4: TESTS OF SYMMETRICAL RESPONSES  
 $LENDING\ RATE_t = \alpha + \beta_1 UP + \beta_2 DOWN + \varepsilon_t$

LENDING RATES	SAMPLE PERIOD	$\alpha$	$\beta_1$	$\beta_2$	$\bar{R}^2$	SIG LEVEL $H_0: \beta_1 = \beta_2$
<b>PERSONAL RATES</b>						
Secured (min.)	87:9-91:8	12.06 (0.96)	0.30 (0.06)	0.45 (0.06)	0.65	0.00
Secured (max.)	87:9-91:8	17.11 (0.56)	0.23 (0.05)	0.37 (0.03)	0.68	0.00
Unsecured (min.)	87:9-91:8	12.27 (0.86)	0.35 (0.05)	0.50 (0.05)	0.67	0.00
Unsecured (max.)	87:9-91:8	17.61 (0.75)	0.26 (0.05)	0.39 (0.05)	0.66	0.00
Personal (OECD)	86:1-91:8	14.68 (0.56)	0.20 (0.04)	0.25 (0.04)	0.50	0.00
<b>OVERDRAFT RATES</b>						
Standard Overdraft	86:1-90:4	10.20 (1.64)	0.59 (0.12)	0.63 (0.14)	0.62	0.21
Base (Small)	86:1-91:8	4.99 (0.68)	0.80 (0.04)	0.87 (0.04)	0.94	0.00
Base (Large)	86:1-91:8	3.67 (0.74)	0.89 (0.05)	0.93 (0.05)	0.96	0.00
<b>OTHER RATES</b>						
Credit Card	86:1-91:8	24.33 (2.12)	-0.10 (0.15)	-0.10 (0.15)	-0.01	0.96
Housing Loans	86:7-91:8	9.15 (0.59)	0.39 (0.04)	0.45 (0.04)	0.80	0.00

Notes:

- Standard errors appear in parentheses below the coefficient estimates.
- UP is a dummy variable (1 when the CD rate increases) multiplied by the CD rate.  
DOWN is a dummy variable (1 when the CD rate decreases) multiplied by the CD rate.

In Table 5 we report the results of the tests of interest rate stickiness for the pre-deregulation period commencing in January 1979 and ending in March 1985. Although there were ceilings on all lending rates (with the exception of the prime rate) before 1985, these ceilings moved to some extent with the cost of funds. Figure 2 shows the movement of the various lending rates.

As expected, the results in Table 5 show that the prime lending rate is again the most flexible interest rate. However, it is less flexible than in the deregulated period. Even when nine lags are included, the full effect of changes in the marginal cost of funds is not translated into the prime rate. The personal loan rate, the housing rate and the standard overdraft rate all show the same degree of stickiness. Again, when lags are included, the sum of the coefficients increases, but for all three interest rates the sum is always less than 0.5. The credit card rate is constant at 18 per cent through the entire sample. Comparing the pre- and post-deregulation periods, we find no change in the stickiness of the personal loan rate. We do, however, find that the housing rate and the standard overdraft rate are more flexible in the deregulated period. For the standard overdraft rate this difference is particularly pronounced. In summary, a comparison of the pre- and post-deregulation results suggests that deregulation has meant that rates on housing and business loans now move more closely with the cost of funds. In contrast, the rates on personal loans and credit cards do not appear to be more flexible in the deregulated period.

As one final exercise, we examine the behaviour of a number of lending rates in other countries. The results are reported in Table 6. The degree of loan rate stickiness in the other countries examined is similar to that for Australia. In all three cases, the coefficient on the prime rate exceeds 0.9. For the U.S. and the U.K., it is not possible to reject the hypothesis that the coefficient on the cost of funds is different from one. While the hypothesis can be statistically rejected for the Canadian prime rate regression, the coefficient is economically close to one. As is the case in Australia, the housing rate in the U.K. exhibits considerably more stickiness than the prime rate; the hypothesis that the coefficient equals one can be easily rejected. Similarly, the credit card rate in the U.S.

TABLE 5: TESTS OF LOAN RATE STICKINESS: PRE-DEREGULATION  
JANUARY 1979 - MARCH 1985

$$\text{LENDING RATE}_t = \alpha + \sum \beta_i \text{CD RATE}_{t-i} + \varepsilon_t$$

LENDING RATE	No Lags		Sum of Coefficients {marginal significance level for hypothesis test that $\sum_i \beta_i = 1$ }			
	$\alpha$	$\beta_1$	Number of Lags			
			0	3	6	9
Personal Loan (OECD)	13.27 (1.62)	0.31 (0.10)	0.21 {0.00}	0.29 {0.00}	0.39 {0.00}	0.44 {0.00}
Standard Overdraft	7.63 (1.90)	0.36 (0.12)	0.23 {0.00}	0.29 {0.00}	0.39 {0.00}	0.43 {0.00}
Overdrafts over \$100,000	5.17 (0.87)	0.66 (0.06)	0.62 {0.00}	0.71 {0.00}	0.76 {0.00}	0.78 {0.00}
Credit Card	18.0 (0.00)	0.00 (0.00)	0.00 {0.00}	0.00 {0.00}	0.00 {0.00}	0.00 {0.00}
Housing Loan	7.01 (1.03)	0.34 (0.07)	0.28 {0.00}	0.36 {0.00}	0.45 {0.00}	0.48 {0.00}

Notes:

1. Standard errors are in parentheses () below coefficient estimates, and marginal significance levels are in curly brackets {} below summed coefficient estimates.
2. The parameters in the first two columns are estimated using monthly data over the period January 1979 to March 1985. For all estimation in which lags are included, the sample begins in October 1979.
3. The credit card rate is constant over the pre-deregulation sample.

TABLE 6: TESTS OF LOAN RATE STICKINESS: OTHER COUNTRIES

$$\text{LENDING RATE}_t = \alpha + \beta \text{COST}_t + \varepsilon_t$$

LENDING RATES	SAMPLE PERIOD	$\alpha$	$\beta$	$\bar{R}^2$
UNITED STATES				
Prime	85:1-91:8	2.41 (0.81)	0.96 (0.10)	0.86
Credit Card	85:2-91:8	17.97 (0.40)	0.03 (0.07)	-0.03
UNITED KINGDOM				
Prime	85:1-91:8	0.27 (0.27)	0.99 (0.02)	0.98
Housing	85:1-91:8	4.10 (0.72)	0.73 (0.06)	0.78
CANADA				
Prime	85:1-91:8	2.11 (0.25)	0.91 (0.02)	0.96

Notes:

1. Standard errors appear in parentheses below the coefficient estimates.
2. The U.S. credit card rate equation is estimated using quarterly data.

exhibits extreme stickiness, bearing virtually no relationship to the marginal cost of funds; again a similar result to the Australian case.

### 3.3 Discussion

Clearly, there are different degrees of flexibility in the loans rates of various lending products. While our tests do not allow us to distinguish accurately between the different theories of loan rate stickiness discussed in Section 2, the results do suggest a number of conclusions.

First, the fact that the minimum and maximum secured and unsecured personal loan rates all exhibit the same degree of stickiness, suggests that the credit rationing argument is not solely responsible for the stickiness of personal loan rates. If the credit rationing argument were correct, then one would expect that the maximum rate on unsecured loans would exhibit greater stickiness than the minimum rate on secured loans. The maximum unsecured rate is charged to those customers whose "type" the bank is most unsure of. In contrast, the bank is more likely to be able to observe the type of customers who provide the bank with collateral and are charged the minimum rate. Thus, if any class of borrowers were to be credit rationed, it should be those customers paying the highest rate. There is no evidence that the interest rate charged to these customers responds any differently than that charged to other personal loan customers. While the possibility exists that all personal loan customers are credit rationed and thus all rates behave in the same manner, we view this as unlikely. Instead, we regard switching costs, especially search costs, as the likely explanation of the stickiness in personal loan rates.

We suggest a similar explanation for the stickiness in housing loan rates. Housing lending is considered to be amongst the safest forms of bank lending. Banks are able to inspect and value the collateral for these loans, and the actions of the borrower are unlikely to prejudice the value of the collateral or the "outcome of the project". Neither are there significant problems in working out the type of the borrower, as most projects (i.e., houses) are of similar risk. Thus, we view the credit



rationing explanation as being an unlikely source of the stickiness in the owner-occupied housing rate.

As discussed above, the switching costs of moving from one housing loan to another are high, especially when mortgage stamp duty is taken into account. Mortgages typically have had loan establishment fees which vary according to the size of the mortgage. For a \$100,000 mortgage loan establishment fees have typically exceeded \$1,000 although in recent times there appears to have been some reduction in these fees. In addition, to move a mortgage of \$100,000 from one bank to another costs approximately \$340 in stamp duty<sup>13</sup>. Furthermore, some banks charge an early repayment fee amounting to one months interest payment if the loan is paid out early. Finally, there are the standard search and information costs of applying for a new housing loan. All these various costs make it a costly exercise for the borrower to switch banks. The theory presented in Section 2 suggests that these costs cause stickiness in the housing rate.

The risk sharing argument may also play some role in explaining the stickiness of the housing rate. The household sector is, in all likelihood, more risk averse than shareholders of the banks. As discussed in Section 2, the stickiness of the loan rate on owner-occupied housing may be, in part, due to an implicit insurance contract between the bank and its customers. Conditional upon the CD rate being the appropriate marginal cost of funds for housing lending, the implicit ex post risk premium does not seem to have been very large. Over the period January 1987 to August 1991 the housing rate was, on average, 1.13 percentage points above the CD rate, while the prime rate was 2.03% above the CD rate<sup>14</sup>.

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<sup>13</sup> The establishment fee on mortgages is based on the amount of the loan with the fee increasing with the loan size but at a decreasing rate. The stamp duty is calculated as \$7.50 on the first \$16,000 and \$4.00 on each \$1,000 thereafter. Some banks also charge a registration fee, a discharge fee, and a title search fee. These fees amount to approximately an additional \$100.00.

<sup>14</sup> The National Australia Bank's submission to the "Martin Inquiry" (1991) into the banking industry, stated "we see housing lending as involving a long term relationship with customers and the household sector preferring a degree of stability in the interest rates which they face."

In recent times, competition in the housing and business lending sector has seen reductions in switching costs. At least one bank has waived the usual establishment fee for business customers of another bank. It has also promised to pay the government stamp duty and financial institutions duty on opening a new account. Such developments, if they become more widespread, should ensure that interest rates follow the cost of funds more closely.

However, there is the possibility that these policies may only be an attempt to increase market share, with the special discounts being removed in the second period when the bank has "captured" its new customers. Second period prices can then be increased without fear of losing customers. If consumers anticipate this behaviour, then these first period cost reducing policies will be of limited success in gaining market share.

The credit card industry is another market where both search and switching costs are likely to be present. Consumers face some information costs when determining the lowest interest rate offered by banks on their credit cards. They also face the costs of time and effort of applying for a card, and the cost of the time lag between applying for a card and receiving one. These costs are, however, small compared to those incurred in switching a mortgage from one bank to another.

Ausubel (1991), using U.S. data, finds that switching costs are not large enough to be the sole explanation for the credit card rate stickiness. Instead, he argues consumer irrationality may exist, leading to the reverse adverse selection problem described in Section 2. Ausubel presents some evidence from a respected consumers survey report indicating that the majority of consumers *say* that they fully pay the outstanding balance on their credit card. However, bank data on credit card usage indicates that the number of accounts incurring credit card rate charges is in excess of 75 per cent. Consumers, in effect, say one thing but do another. Some *prima facie* evidence for reverse adverse selection can be found by looking at Figure 2. Over the period of study, credit card interest rates have monotonically increased, even though the cost of funds has both increased and decreased over the same period.

If reverse adverse selection characterises the credit card market, then in certain circumstances, there may exist a role for government to encourage lower rates of interest on cards. If a *single* bank attempts to lower its credit card rate unilaterally, it will primarily attract the interest sensitive customers. These customers represent high risk borrowers. Thus, when a single bank reduces its credit card rate, it worsens its pool of customers. In this case, declines in the marginal cost of funds may not be translated in changes in credit card rates as no bank wishes to move first. In such an environment, a co-ordinated reduction in interest rates may be desirable. This co-ordination could come through government initiatives.

The evidence on the base rates suggest that the small business rate may move slightly more slowly than the large rate, although the differences are statistically insignificant. They both appear to move in line with the CD rate. On the other hand, the standard rate is considerably more sticky. This apparent contradiction can be partially resolved by recalling that the base rate is the rate offered to the bank's best small business borrowers. The standard rate is the rate applicable to the bank's average small business borrowers. The fact that the average rate is sticky suggests that some of the rates across the spectrum of a banks small business customer base are sticky. One would expect the banks to be lending at or near the base rate to their best business customers. This implies the remaining, (higher risk) borrowers face stickier interest rates. This result is not inconsistent with credit rationing. Because of information and monitoring problems, the riskier small business borrowers are more likely to be credit rationed, causing their interest rates to be sticky.

The move to quote all business lending rates as a margin over a base rate may have caused lending rates to all business groups to move more closely in line with the marginal cost of funds; that is, there may have been a change in the pricing policy of banks. Given the lack of appropriate data we are unable to test this hypothesis.

#### 4. SUMMARY AND CONCLUSIONS

This paper examines the degree of price stickiness in the market for bank loans. In the classical world of perfect competition, changes in marginal costs are translated into similar changes in the price of the product. We find that complete pass-through of changes in banks' marginal cost of funds only occurs with the base or reference overdraft rates to large and small business borrowers. For credit cards, personal loans, owner-occupied housing loans and the standard overdraft rate, changes in the banks' marginal cost of funds have not been translated one for one into the contemporaneous lending rates.

We discuss four explanations for the stickiness of most of the lending rates. The first explanation relies on the existence of equilibrium credit rationing. In such an equilibrium, banks will be unwilling to increase the lending rate, even when the cost of funds increase, for fear of reducing their expected return. The second explanation relies on the fact that the nature of a bank loan requires the bank to obtain information about each and every customer. The incidence of these information costs falls on the borrower in terms of upfront fees and search costs. These costs reduce the elasticity of demand, giving the bank some market power. Third, the stickiness in the loan rate may be the result of an implicit risk sharing contract between the bank and its customers. Finally, we discuss a form of consumer irrationality in the credit card market.

The results presented in this paper do not allow us to distinguish sharply between these different hypotheses. To do this would require extensive data on the cost of information collection by both banks and customers. Evidence on the notoriously difficult to measure degrees of risk aversion and consumer rationality would also be required. Nevertheless, the results point in particular directions.

We find little support for credit rationing being the explanation of loan rate stickiness. For the housing loan rate, switching costs and risk sharing appear to be important causes of the interest rate stickiness. For the personal loan rate, switching costs are again likely to play a role; however, the failure of the behaviour of the personal loan rate to adjust

after deregulation may reflect a lack of competition in this market. Evidence from the standard or most commonly charged rate to small business borrowers suggests some interest rate stickiness.

In summary, there are solid reasons for bank lending rates not moving one-for-one with the banks' marginal cost of funds. Incomplete adjustment of lending rates does not necessarily imply collusive behaviour amongst the banks. The peculiar nature of a banking contract, in which the seller (the bank) acquires information about the buyer (the borrower) but is not able to control either the buyer's actions, or determine her true type, can help explain incomplete pass-through. While little can be done about "switch costs" which arise directly from the costs of information gathering, reducing artificial switch costs is likely to reduce any market power that banks enjoy. This could be done by eliminating mortgage stamp duty and by banks providing more extensive and accessible information about the terms and conditions of various loans.

**APPENDIX 1: DATA****INTEREST RATES****(A) Personal lending rates**

Personal lending rates were obtained from two sources. The first source is from the OECD Financial Statistics, (Part 1, Section 2: Domestic Markets - Interest Rates). The rate shown is the predominant rate charged by major banks, as at the end of the month. It is an effective or reducing rate, not a flat rate. The second source is the maximum and minimum variable personal loan rates, secured and unsecured, obtained from a major Australian bank.

**(B) Overdraft Rates****(i) Standard Rate**

This rate, obtained from internal RBA sources, is reported by one of the major Australian banks. It is the most commonly charged rate to borrowers for overdrafts of less than \$100,000, typically small business borrowers. In May 1990, a retail index rate was introduced. Loans to small businesses are expressed as the retail index rate plus a margin.

**(ii) The Rate on Overdrafts of \$100,000 and Over**

The minimum of a range of indicator rates reported by major banks. This rate is used for the pre-deregulation period. RBA Bulletin, Table F.3.

**(iii) Reference Rate for Large Borrowers**

The National Australia Bank Benchmark Rate applies to the Corporate Clients accounts. End month or near end-month figures obtained from the Monday edition of the Australian Financial Review.

**(iv) Reference Rate for Small Borrowers**

The National Australia Base Rate applies to the retail and commercial accounts. End month or near end month figures are obtained from the Monday edition of the Australian Financial Review.

**(C) Credit Card Lending Rates**

This rate is from internal RBA sources, and is an average of rates reported by the major banks on a bankcard with 55 day free credit facility.

**(D) Housing Loan Rate**

The housing loan rate to individuals for owner occupation is from the RBA Bulletin, Table F.3. This is a predominant rate on variable interest rate loans.

**BANKS' COST OF FUNDS**

We have constructed three different measures of costs of funds; retail, wholesale and total. The "retail rate" is a weighted average interest rate of current deposits, fixed deposits less than \$50,000, passbook, statement and investment accounts and "Other" (Cash management accounts). The "wholesale rate" is a weighted average interest rate of fixed deposits greater than \$50,000, certificates of deposits and foreign currency deposits. The broadest measure is the total weighted average deposit rate. This rate takes into account all the major deposit sources available to a bank.

The deposit categories and corresponding interest rates, along with their source are listed below.

## ELEMENTS OF COST OF FUNDS MEASURES

LIABILITY	COMMENTS	INTEREST RATE	COMMENTS
Current: Not bearing interest	Table D.1 plus gov't deposits, Table B.2. Prior Jan. 1989, gov't from TB liab. Table C.1	0 rate applied	
Current: bearing interest	As above	Current account rate	Supplied by a major Australian bank
Trading Bank Fixed: less than \$50,000	The breakdown of trading bank fixed deposits, including government, into large and small are available from internal RBA sources, prior to January 1989. From this date, All bank fixed divided using last available proportions	3 month to maturity rate, Table F.3	This is the most common maturity period. Data is unavailable for further breakdown
Trading Bank Fixed: over \$50,000	As above	Fixed deposit, weighted avg. Table J.3 (discontinued Dec 88), and Table F.3	Weighted average rate available to Dec. 1988. From this date, the 3 month to maturity is most common
Savings Bank Fixed	Prior to January 1989, from Table E.1 (Discontinued). Includes gov't deposits. Now in All Bank Liab. Table B.2	3 month to Maturity, less than \$50,000, Table F.3	Assumes all S.B. fixed deposits are less than \$50,000
Investment	As above, Table B.2	Investment accounts, Table F.3	Average of min and max rates
Statement	As above, Table B.2	Statement accounts, Table F.3	Predominant rate
Passbook	As above, Table B.2	Passbook accounts, Table F.3	Average of min and max rates
"Other"	Internal RBA sources indicate these deposits are Cash Management Accounts. Table B.2	CMA rate	Internal RBA sources
Certificates of Deposits	Table B.2. Prior Jan. 1989, from Table C.1	CD rate Table F.3	Weighted average issue yield
Foreign Currency	Foreign currency liabilities, Table B.1	90 day bank bill rate	No rate is available. Assume earn market rates



## INTEREST RATES: OTHER COUNTRIES

### UNITED STATES

#### **Prime Rate**

The prime rate is from the Federal Reserve Bulletin, Table 1.33, "Prime rate charged by banks on short-term business loans". The interest rates are recorded on the date when they change, allowing an end-month series to be constructed.

#### **Credit Card Rate**

The credit card rate is from the Federal Reserve Bulletin, Table 1.56, "Terms of Consumer Installment Credit", item 4, Credit card. The series is available on a quarterly basis only.

#### **Certificate of Deposit**

The cost of funds measure is from the Federal Reserve Bulletin, Table 1.35, "Interest Rates Money Market and Capital Markets", item 12, Certificates of Deposits, secondary market, 3-month.

### UNITED KINGDOM

#### **Prime Rate**

The prime or base rate is from Central Statistical Office, Finance Statistics, published by the Government Statistical Service, England, Table 13.10 "Selected Retail Banks: Base Rates". The prime rate is recorded on the date when they are changed, allowing an end-month series to be constructed.

#### **Housing Lending**

The variable mortgage rate on housing lending is from the OECD Financial Statistics, Monthly, Part 1 Section 2. Table R.2/17. "Lending and Borrowing Rates". Item III 1(c) Building society mortgage loans, nominal rate.

#### **Certificates of Deposit**

The cost of funds measure is the Sterling certificates of deposits 3

months, from Central Statistical Office, Finance Statistics, published by the Government Statistical Service, England, Table 13.8 "Short Term Money Rates: Last Friday of the Period". The minimum of the range of rates is used.

## CANADA

### **Prime Rate**

The prime rate is from the Bank of Canada Review, Table F1 "Financial Market Statistics", Chartered Banks Administered Interest Rates - Prime Business. Figures are the last Wednesday of the month.

### **Banker's Acceptances**

The measure of the cost of funds is from the Bank of Canada Review, Table F.1 "Financial Market Statistics". As no Certificate of Deposit rate is available, we use the Banker's Acceptances rate, 1 month. Figures are the last Wednesday of the month.

## APPENDIX 2

REGRESSIONS USING THE CHANGE IN INTEREST RATES  
1986:1 1991:8

$$\Delta \text{Lending rate}_t = \alpha + \sum \beta_i \Delta \text{CDrate}_{t,i} + e_t$$

LENDING RATE	No Lags		Sum of Coefficients {marginal significance level for hypothesis test that $\Sigma\beta=1$ }			
	$\alpha$	$\beta_1$	Number of Lags			
			0	3	6	9
Personal (OECD)	-0.01 (0.04)	0.07 (0.08)	0.12 {0.00}	0.31 {0.00}	0.35 {0.00}	0.40 {0.00}
Standard	-0.003 (0.07)	0.30 (0.10)	0.43 {0.00}	0.81 {0.03}	0.86 {0.16}	0.90 {0.42}
Base (Small)	-0.02 (0.05)	0.45 (0.09)	0.54 {0.00}	0.88 {0.01}	0.92 {0.09}	0.89 {0.06}
Base (Large)	-0.02 (0.04)	0.66 (0.07)	0.71 {0.00}	0.93 {0.14}	0.96 {0.46}	0.92 {0.16}
Credit Card	0.05 (0.02)	0.001 (0.02)	0.003 {0.00}	0.001 {0.00}	-0.02 {0.00}	-0.01 {0.00}
Housing Loans	-0.03 (0.05)	0.18 (0.09)	0.28 {0.00}	0.46 {0.00}	0.51 {0.00}	0.59 {0.00}

## Notes:

1. Standard errors are in parentheses () below coefficient estimates, and marginal significance levels are in curly brackets {} below summed coefficient estimates.
2. The parameters in the first two columns are estimated from 1986:1 to 1991:8 for except for the standard rate, which is estimated from 1986:1 to 1990:4 and the housing rate, which is estimated from 1986:7 to 1991:8. For all estimation in which lags are included, estimation is 1986:10 to 1991:8, except for the housing rate, which begins in 1987:4, and the standard rate, which is estimated from 1986:10 to 1990:4.

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