A model of building society interest rate setting

by

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Abstract

This paper examines the interest rate setting behaviour of societies since the breakdown of the interest rate cartel in 1984. Societies have faced increasing competition in the mortgage and savings market over this period, against a backdrop of radical regulatory change. The paper develops a profit maximising model of societies. The econometric analysis suggests that societies' interest rates are driven by market rates. However, the structural changes during the estimation period make it unlikely that the relationships found are stable.

A model of building society interest rate setting

1 Introduction

Financial deregulation in the United Kingdom has brought about considerable change in the structure of the mortgage market and the pricing strategies of building societies. These changes have important implications for the transmission mechanism of monetary policy. This paper examines building societies' pricing practices since the breakdown of the interest rate cartel in 1984. It begins by outlining the changes in market structure since the 1970s, which have been a crucial influence on societies' pricing. The third section examines the changes in the building societies' pricing behaviour. Section four develops a theoretical model of building societies, on which the econometric analysis presented in section five is based. The final section draws some conclusions.

2 Changes in market structure

Building societies are mutual institutions - they are owned by investing and borrowing members - which face strict regulatory limits on their activities.(1) By statute, at least 75% of their commercial assets must be so-called 'Class 1' assets: basically first mortgage loans to owner occupiers of residential property. The majority of these loans are 25-year and totally reviewable-rate (that is, the interest rate is administered by the lender). As mortgages cannot be transferred between properties, normal housing market turnover reduces the effective maturity of these assets to about seven years.(2)

Building societies dominated the mortgage market until the early 1980s and, because the savings market was highly segmented, were largely sheltered from competition in the retail deposit market. Furthermore, competition was stifled by a cartel arrangement organised by the Building Societies Association (BSA), which "recommended" mortgage and deposit rates to its members.(3) Societies, as mutual institutions, did not in any case aim to maximise profit, but rather tried to satisfy depositors' demands for high rates and borrowers' demands for low ones by keeping rates steady (see Callen and Lomax, 1990). Typically, the deposit rate determined by the BSA was chosen to maintain competitiveness with the other major savings products (eg National Savings), with the mortgage rate set as a mark-up over the "share" deposit rate.(4)

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(1) The primary legislation now governing societies is the Building Societies Act 1986, but prior to this they operated under the Building Societies Act 1962. See Boleat *et al* (1992) for further details.

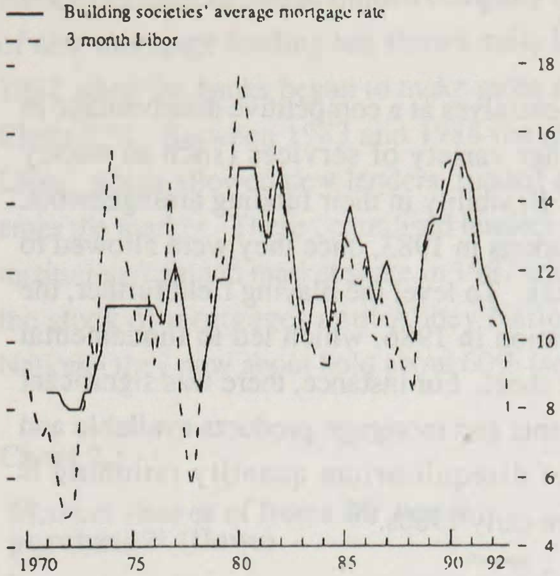
(2) See Paisley (1994) for further details.

(3) Societies did not have to join, but most non-compliance was among the smaller societies. See Boleat (1982).

(4) See Ritchie (1989). Ordinary shares are essentially retail deposits, but the holder is a "member" of the society and receives annual accounts and directors' reports, and has the right to attend and vote at general meetings. Section 8(1) of the 1986 Act prescribes that at least 50% of a societies' liabilities must be shares.

Chart 2.1

Average building societies' mortgage rate and 3 month Libor



As Chart 2.1 shows, the mortgage rate did not move closely in line with market rates, at least in the short term, during the 1970s. Societies typically faced excess demand for mortgages. Their main potential competitors, the banks, did not compete effectively in the mortgage market, in part because of controls on their balance sheets (eg the "corset"), but also as part of a deliberate policy not to compete aggressively with societies (Radcliffe Committee, 1959). Excess demand was rationed by non-price means, such as queueing or giving priority to existing customers. (See Meen, 1990.)

At the start of the 1980s, controls on banks' balance sheets were relaxed,(5) allowing them to compete more effectively in the mortgage market and encouraging greater competition for retail deposits. This broke down the traditional segmentation in the market. For example, societies began to offer interest-bearing transactions accounts and paid higher interest on accounts with a minimum balance. As more societies determined their own rates more

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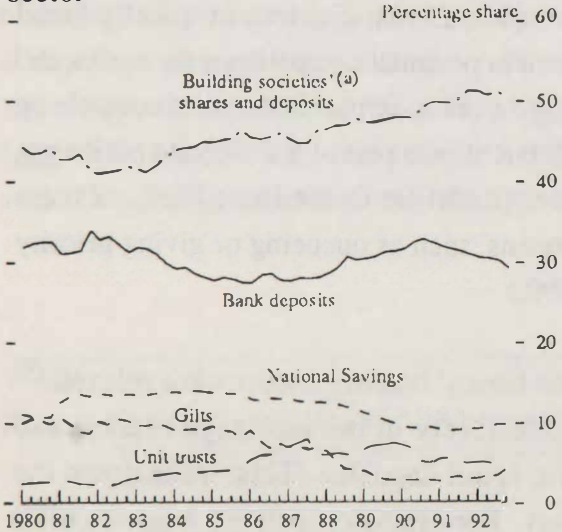
(5) Appendix 1 gives a calendar of financial deregulation. See Colwell (1990) for further details on British banks during the 1970s and 1980s.

independently, the BSA cartel came under increasing pressure, and it decided to make its rates only advisory in 1981; it ceased to make any recommendations on rates from 1984.

However, building societies found themselves at a competitive disadvantage to the banks, which could offer a wider variety of services (such as money transmission services) and had more flexibility in their funding arrangements. Societies did enter the wholesale markets in 1983, once they were allowed to pay interest gross rather than net of tax. To level the playing field further, the Government introduced new legislation in 1986, which led to fundamental changes on both sides of the balance sheet. For instance, there was significant growth in the range of deposit accounts and mortgage products available and mortgage rationing in the sense of disequilibrium quantity rationing is generally thought to have ended in the early 1980s.[6]

Chart 2.2

Financial liquid assets of the personal sector



Source: Financial Statistics Table 14.8

(a) Includes Abbey National throughout.

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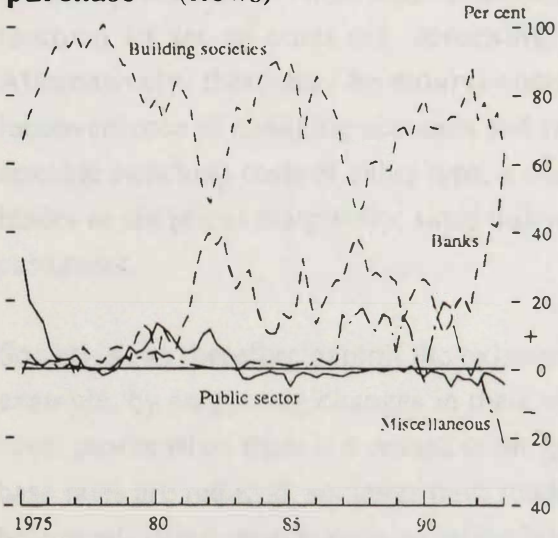
(6) For example, Meen (1990) estimates it ended as early as the end of 1980.

Societies' share of the personal sector's financial assets has remained broadly stable over the 1980s (see Chart 2.2) (which adjusts for the conversion of Abbey National to public limited company (plc) status in 1989).(7) Their share of new mortgage lending has shown quite large variation, dropping to 57% in 1982 when the banks began to make more serious inroads into the market (see Chart 2.3). Between 1983 and 1988 the mortgage rate was generally above Libor, which allowed new lenders, funded entirely from wholesale sources, to enter the market. These centralised lenders (classed as miscellaneous financial institutions) gained market share in 1987 and 1988. Societies held over 70% of the stock of mortgages until Abbey National converted; excluding Abbey National they now about hold about 60% (see Chart 2.4).

Chart 2.3

Market shares of loans for house purchase(a) (flows)



(a) Percentage share of net advances.

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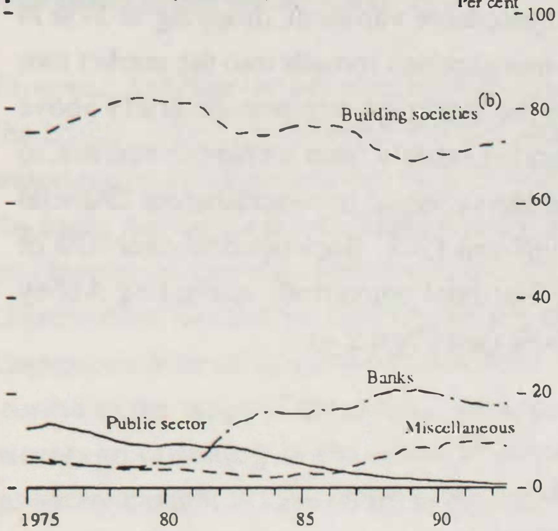
(7) A building society which converts to plc status effectively becomes a bank, and would need to gain authorisation from the Bank of England to operate as a deposit-taking institution. As Abbey National has not diversified beyond its lending activities in the housing market, it is treated as a building society in the stock data (Chart 2.4). There are insufficient data to count it as a society in the flow data.

Chart 2.4

Market shares of loans for house purchase[a] (stocks)



(a) Percentage of amount outstanding.

(b) Includes Abbey National throughout.

3 Building societies' pricing strategy

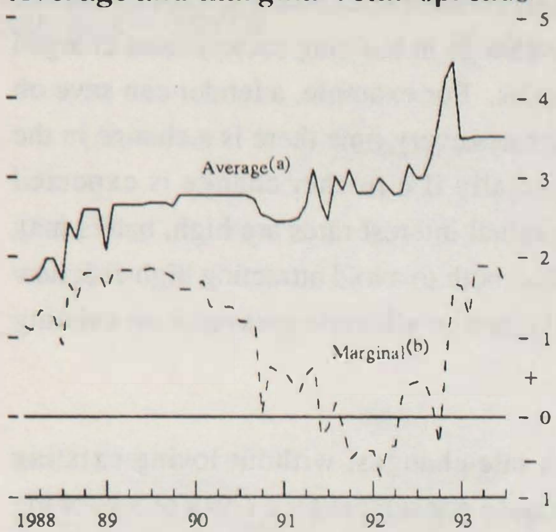
Changes in wholesale (money market) interest rates, such as Libor, will not always feed through to an immediate change in building society rates charged to borrowers and paid on retail deposits. For example, a lender can save on administrative costs by not changing rates every time there is a change in the general level of interest rates, especially if a further change is expected imminently. Alternatively, when nominal interest rates are high, banks may wish to limit increases in lending rates: both to avoid attracting high-risk new borrowers (Stiglitz and Weiss, 1981), and to alleviate pressures on existing borrowers (Fried and Howitt, 1980).

Societies can smooth their interest rate changes, without losing existing borrowers (or savers), primarily because consumers face costs of switching between institutions. These may either be imposed by a lender: for example, to cover its set-up costs (eg screening) when lending to an individual. Alternatively, there may be natural costs of switching: for example, the inconvenience of changing accounts and search costs. When borrowers face sizeable switching costs of either type, it may not be profitable for a competing lender to cut prices marginally, since this would not attract enough additional customers.

Societies can therefore exploit the existence of natural switching costs. For example, by staggering changes in their spectrum of interest rates, they can boost profits when there is a change in the general level of interest rates. When base rates are reduced, societies have tended to reduce average deposit rates before adjusting mortgage rates, allowing a temporary increase in average spreads. Also, when base rates fall, societies tend to announce immediate reductions in the mortgage rate to new customers, but allow a few months' lag before adjusting the rate offered to existing borrowers.

Chart 3.1

Average and marginal retail spreads

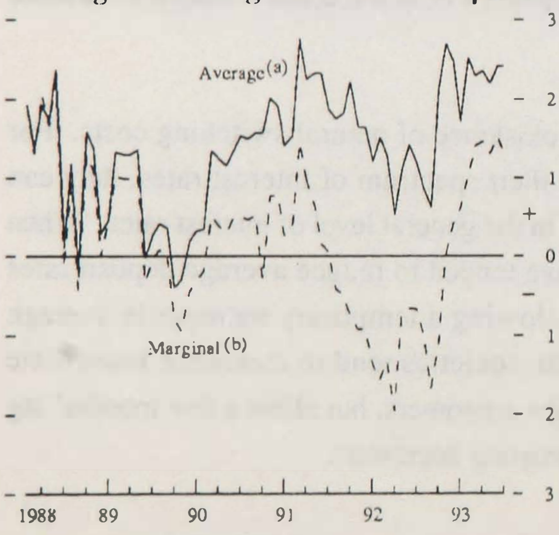


(a) Average mortgage rate minus average gross retail deposit rate.

(b) Mortgage rate to first-time buyers minus gross marginal retail deposit rate.

Chart 3.2

Average and marginal wholesale spreads



(a) Average mortgage rate minus Libor.

(b) Mortgage rate to first-time buyers minus Libor.

Charts 3.1 and 3.2 show that the spreads on average and marginal (ie first-time buyer) business have diverged. This suggests that offering first-time buyer discounts has proved an effective form of price discrimination. Moreover, even if the first-time buyer pays below marginal cost, the society will not necessarily lose money on the business overall, since it can, to some extent, cross-subsidise through the sale of other products to borrowers: the borrower might be required to take out some form of insurance in order to qualify for an interest rate discount.

There has been increasing product innovation over the 1980s. For example, Ritchie (1989) found a growing use of "tiering" of rates on the liability side, as societies chose to segment the retail savings market (see Chart 3.3). Societies now tend to raise marginal retail funds, not by increasing the highest retail rate on offer, but by launching a new product. The advantage of using a new product is that higher rates need not be paid on the existing stock of retail deposits.

Chart 3.3
Halifax Building Society interest rates on 90 day accounts

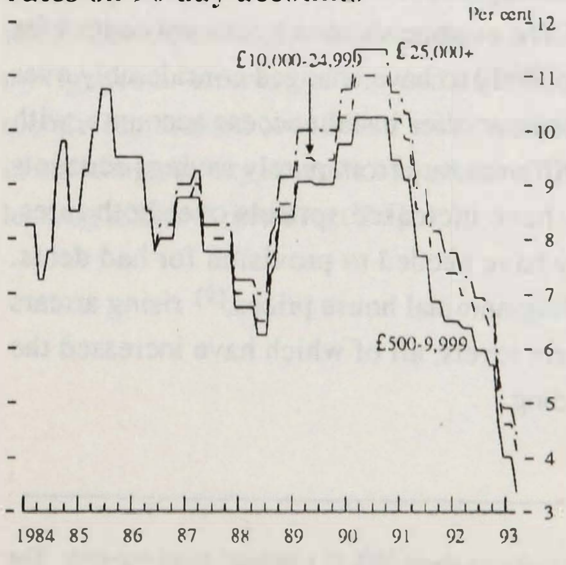
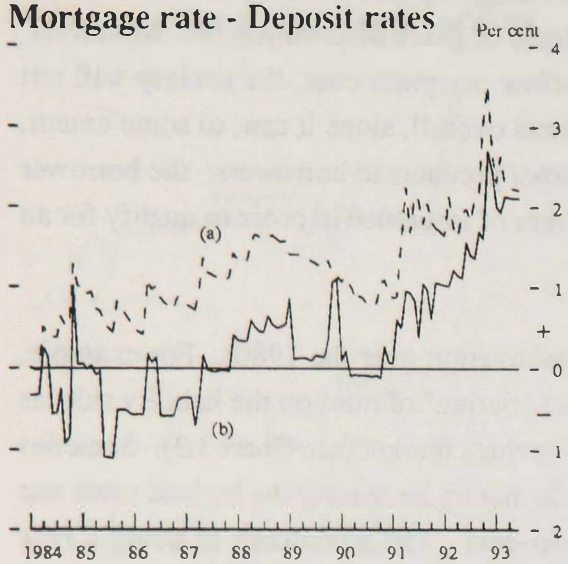


Chart 3.4

Mortgage rate - Deposit rates



(a) Halifax Building Society 90-day notice rate £25,000+ (gross).

(b) Building society average share rate (gross).

Chart 3.4 shows the spread between the average mortgage rate and two different deposit rates: the average "share" rate(8) and a rate on one particular product (Halifax Building Society 90-day notice account for £25,000+, which is the top rate shown in Chart 3.3). The average share rate does not control for non-price characteristics, which are likely to have changed considerably over this period. For example, societies now offer instant access accounts, with cheque books, which will offer a different rate from purely savings accounts (see Heffernan, 1992). Societies have increased spreads over both rates, particularly since 1991, since they have needed to provision for bad debts. This corresponds to a period of falling nominal house prices,(9) rising arrears and possessions, and record bad debt levels, all of which have increased the perceived riskiness of mortgage lending.

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(8) Average over all "shares", which make up about 90% of societies' retail deposits. The average mortgage rate is the average rate actually paid by all borrowers, as opposed to the basic rate, which applies to the majority of accounts.

(9) House prices in the United Kingdom have fallen by about 11% since the peak of the market in 1989; in the South East and London, prices have fallen by around 30%.

Chart 3.5

Possessions and long arrears as a percentage of outstanding mortgages

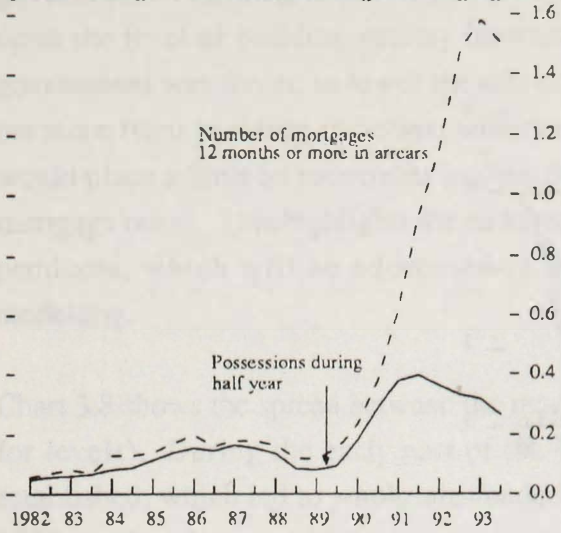
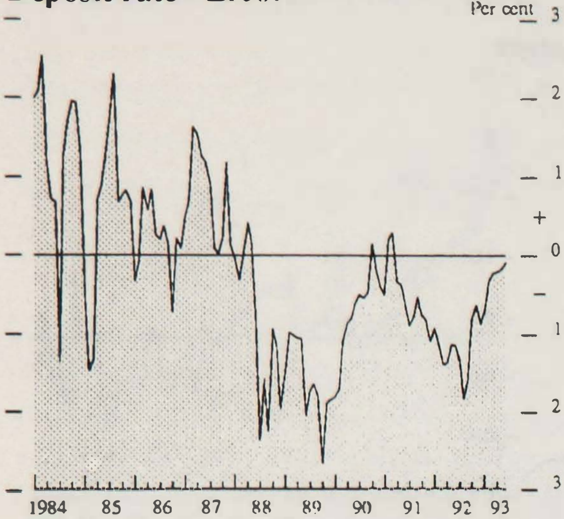


Chart 3.5 shows the unprecedented increase in mortgage arrears and possessions since 1990 as a percentage of outstanding mortgages. The average level of possessions in the 1970s was just under 3,000, a mere 4% of the 1991 total. Correspondingly, there has been a substantial increase in the number of mortgages in arrears; at the end of 1993, mortgages with arrears over six months represented over 3% of total outstanding mortgages. However, the rise in building society spreads has meant a fall in their share of new mortgage lending to banks (see Chart 2.3).

Chart 3.6

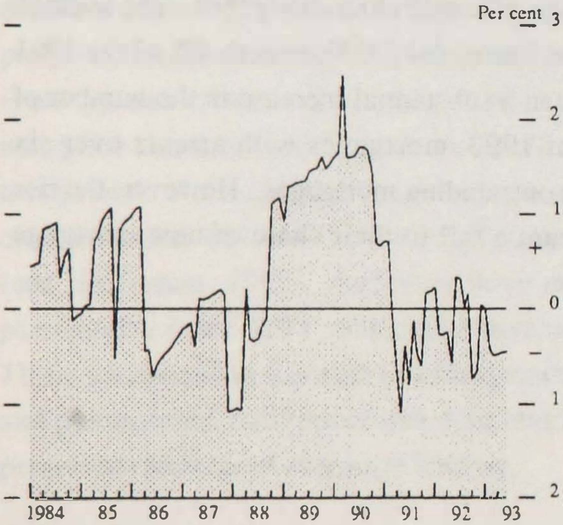
Deposit rate[(a)] - Libor



(a) Average share rate.

Chart 3.7

Deposit rate[(a)] - national savings rate



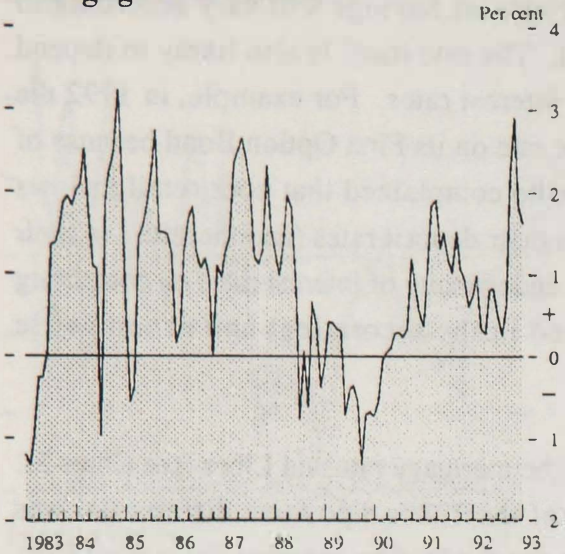
(a) Average share rate.

Chart 3.6 shows that the differential between the average share rate and Libor has narrowed over the period. Chart 3.7 plots the differential between the deposit rate and the National Savings rate.[10] The society deposit rate was particularly competitive during 1988-90, a period of government budget surplus. The competitiveness of National Savings will vary according to government's funding requirement. The rate itself is also likely to depend upon the level of building society interest rates. For example, in 1992 the government was forced to lower the rate on its First Option Bond because of pressure from building societies, who complained that poor retail inflows would place a limit on reductions in their deposit rates (and therefore in their mortgage rates). This highlights the endogeneity of interest rates on competing products, which will be addressed in the theoretical and econometric modelling.

Chart 3.8 shows the spread between the mortgage rate and Libor (see Chart 2.1 for levels). During the early part of the 1980s a positive differential was established, which led to wholesale-funded lenders entering the market from 1985 to take advantage of the large spreads. During 1988-1990, as monetary policy was tightened, lenders reduced the spreads, with Libor above the mortgage rate for much of 1989. This squeeze on margins at periods of high nominal interest rates is consistent with lenders wishing to alleviate pressures on existing borrowers (especially give the fall in value of their collateral) and not wishing to attract high-risk new borrowers. With the falls in nominal interest rates since 1990, a positive, but smaller positive differential has been re-established.

(10) National Savings are one method by which the government funds its borrowing. There are a variety of products; in Chart 3.7 it is the rate offered on investment accounts.

Chart 3.8
Mortgage rate - Libor



The entry of new lenders and increasing competition in the mortgage market was associated with increasing specialisation within the market, in the sense that different types of lenders appeared to concentrate on different parts of the market.(11) Centralised lenders, who obtained business purely through introductions (eg via brokers), tended to attract high-risk borrowers. They focused on the remortgage business(12) (see Barings, 1989), offering innovative products, high loan-to-value ratios and high income-multiples. Building societies concentrated on straightforward mortgages (variable-rate endowment or repayment) often at high loan-to-value ratios. Banks, judging by their better experience of arrears and possessions over the past two years, lent at lower loan-to-value ratios and income multiples.

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(11) Unfortunately, no data are collected on the characteristics of borrowers from different lenders. Hence this is based mainly on anecdotal evidence, plus conclusions drawn from the lenders' experience of bad debts.

(12) This refers to business in which the individual pays off the original advance and takes out a new mortgage with a centralised lender.

4 A theoretical model of building societies

The first issue when modelling societies is determining their objective. In the past societies have been treated as non-profit maximising firms, which reflected the lack of competition rather than mutuality. For example, in Anderson and Hendry (1984), societies were assumed to minimise a cost function which captured a number of potentially conflicting objectives, such as maintaining the mortgage rate at a "reasonable" level and keeping advances at a given proportion of deposits in the long run. This is clearly unsuitable given the changes in their behaviour and increased competition in the market. However, mutuality does raise the issue of what societies do try to maximise. Monti (1973) distinguishes between two objectives for a bank, namely profit maximisation and deposit maximisation subject to a profit constraint. He then examines the response of the bank to monetary policy changes under these different objective functions. This type of framework could be used to test empirically the validity of a profit maximisation assumption. However, the results hinge crucially upon the size of the minimum profit constraint, which is not derived from the theory and lessens the attraction of this approach.

Profit maximisation implies that societies choose to maximise the surplus, which feeds through to next period's reserves. This may seem a plausible objective for larger societies, which borrow in the capital markets, and are rated by credit-rating agencies; they need therefore to maintain a high rating in order to minimise the cost of their wholesale funds, which implies that there are pressures to maximise profits. However, it is more plausible that there would be pressures to maximise reserves/assets ratio. An alternative objective might be maximisation of the size of the balance sheet, subject to a minimum capital ratio (eg for prudential reasons). In the model below, this objective is shown to be equivalent to profit maximisation.

Most of the literature on financial firms' behaviour is based on portfolio management models, with their interest rates set as an optimal mark-up on an exogenous interest rate.(13) The literature highlights the importance of

(13) Santomero (1984) and Baltensperger (1980) provide good surveys.

deciding which interest rates are truly exogenous, when modelling the pricing behaviour of a representative financial institution. In the model below, the only exogenous interest rates are the cost of wholesale funds and the rate on liquid assets, both of which are likely to be closely related to the rate set by the central bank. The rates on competing assets (that is, retail deposits) are treated as endogenous. For example, the pressure on the government to withdraw its National Savings First Option Bond in 1992 is clear evidence of the feedback from building societies' pricing to the Government's pricing.

A one-period model of a representative building society is developed below. This does not deal with issues of the resource cost of producing different types of deposit, nor with risk (although this could be dealt with by inclusion of a proxy of risk in the econometrics). The model may be summarised as follows.

(1) $$M + LA = D + W + R$$

(2) $$r_m M + r_l LA = r_g D + r_w W + SR + E$$

(3) $$ln(D^d) = \alpha_0 + \alpha_1 r_g \qquad \alpha_0, \alpha_1 > 0$$

where $\alpha_0 = \alpha_0 (y, \Delta p, r_c)$

(4) $$ln(M^d) = \beta_0 - \beta_1 r_m \qquad \beta_0, \beta_1 > 0$$

where $\beta_0 = \beta_0 (hp, \Delta hp, \Delta p, y)$

M	stock of mortgages	r_m	mortgage rate
LA	stock of liquid assets	r_g	rate on deposits
D	stock of retail deposits	r_w	cost of wholesale funds (exog)
W	stock of wholesale deposits	SR	surplus (flow)
R	stock of reserves (predetermined)	E	management expenses (fixed)
M^d	mortgage demand	r_l	return on liquid assets (exog)
D^d	deposit demand	hp	house prices
y	real disposable income	Δhp	expected house price
Δp	inflation	r_c	yield on competing assets

Condition (1) is the balance sheet constraint. A building society can invest in two types of asset: mortgages *(M)* and liquid assets *(LA)*. Funds are raised either from retail deposits *(D)* or wholesale deposits *(W)*. Their reserves *(R)* consist of accumulated past profits. It is assumed that capital consists solely of reserves (that is, we exclude the possibility of a society issuing PIBs[14] and subordinated debt). Reserves are required to overcome a short-run squeeze on margins and to enhance a society's ability to repay shares in the event of losses on their asset portfolio. At time t, reserves are predetermined.

Equation (2) is the income and expenditure constraint. Societies earn the mortgage rate, r_m, on mortgages and a return, r_l, on liquid assets. On the expenditure side they pay out a deposit rate, r_g, on the retail deposits and r_w on their wholesale deposits. Surplus *(SR)* (or profit) is the difference between income and expenditure. Management expenses *(E)* are assumed to be fixed. Any surplus will feed into the society's reserves, which can be written as:

(5) $\Delta R = SR\ (1\text{-}TAX) = \Pi_t\ (1\text{-}TAX)$

We assume semi-log linear demand functions of retail deposits (3) and mortgages (4), which implies constant semi-elasticities of demand. The (log of the) demand for deposits (3) is positively related to the deposit rate; the (log of the) demand for mortgages[14] is related negatively to the mortgage rate. Other demand variables are excluded directly, but could be considered to affect the parameters α_0 and β_0, which would influence the demand for deposits and mortgages. In this model, the first-order conditions are unaffected either by including the cost of alternative finance in the mortgage demand function or the return on competing assets in the deposit demand function. However, these other rates may shift the positions of the demand curves, M^d and D^d, and will therefore affect α_0 and β_0. The functions α_0 and β_0 are basically determined by the preferences of the household sector. We assume that all mortgage demand is satisfied, that is $M^d = M^s$, and that all deposits are accepted.

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(14) Permanent interest bearing shares - perpetual and deeply subordinated shares - that can count as 'core' (or 'Tier 1') capital. See Bolcat *et al.* (1992).

Liquid assets are held because the society needs to meet deposit changes, which it knows only in a probabilistic form. A one-period model cannot adequately capture liquidity risk since there is no stochastic deposit withdrawal. In a multi-period model, societies would chose to hold liquid assets up to the point at which the marginal cost of holding liquid assets (an opportunity cost because $r_l < r_m$) is equal to the marginal benefit. The optimal condition will depend upon their estimation of the density function of deposit outflows. For simplicity, it is assumed that societies follow a simple rule of thumb and they fix liquid assets as a proportion of deposits [condition (6)].

$$(6) \quad LA = j\,D \qquad\qquad j>0$$

The proportion of wholesale funding which societies can raise is limited by statute to 40%. In effect, with prudential limits set at nearer 30%, societies only tend to use wholesale funds to meet marginal funding needs, acting as a form of buffer which fluctuates according to mortgage demand. In this model, wholesale funding is treated as the residual, derivable from the balance sheet constraint (1) after optimal stocks of the other components have been derived.

As already outlined, it is not clear exactly what a society's objective is, since mutuality protects it from hostile takeovers. One possibility is that a society aims to maximise balance sheet size, subject to a minimum capital adequacy requirement that the ratio of reserves to assets be at least k. In this case the objective function would be:

$$(7) \quad Max\; M + LA$$

$$s.t.\; R \,/\, (M + LA) \geq k$$

If the constraint is binding it can be rewritten as:

$$(8) \quad R_t = k\,(M_t + LA_t) = R_{t-1} + (1\text{-}TAX)\,\Pi_t$$

where R_{t-1} is predetermined at time t. (8) shows that maximising balance sheet size $(M + LA)$ implies maximising profits (Π), or additions to reserves.

Hence, even if it is not obvious why a society should wish to maximise profit, this could be justified on the basis of a society maximising the size of the balance sheet subject to a minimum reserve requirement.

Expressing the model in terms of profit we get the following maximisation problem:

$$(9) \quad Max\,\Pi = r_m M + r_l LA - r_g D - r_w W - E$$

$$s.t.\ M + LA - D - W - R = 0$$

The constraint can be dealt with by substituting $(M + LA - D - R)$ for W. Given equations (1) - (8), with r_m and r_g as the decision variables and r_l and r_w, exogenous, write the optimisation problem:

$$\underset{r_m, r_g}{Max}\,\Pi = (r_m - r_w)\, exp[\beta_0 - \beta_1 r_m] + (j\, r_l - r_g + (1 - j)\, r_w)\, exp[\alpha_0 + \alpha_1 r_g] + r_w R - E$$

The first-order condition for the deposit rate is:

$$d\Pi/dr_g = (\alpha_1 [j\, r_l - r_g + (1 - j)\, r_w] - 1)\, exp[\alpha_0 + \alpha_1 r_g]$$

A maximum requires that the second derivative be negative,(15) which will occur if $(j\, r_l + (1 - j)\, r_w) - r_g < 2/\alpha_1)$, which is assured since $\alpha_1 > 0$ and:

$$(10) \quad r_g^* = (j\, r_l + (1 - j)\, r_w) - 1/\alpha_1$$

The optimal deposit rate in (10) is a weighted average of the rate on liquid assets and the wholesale rate, minus an inverse elasticity term, $1/\alpha_1$. An increase in the elasticity α_1 makes deposits more responsive to a change in the deposit rate. The larger the elasticity, the higher the deposit rate; as α_1

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(15) $\quad d^2\Pi/dr_g^2 = (\alpha_1^2 [j\, r_l - r_g + (1 - j)\, r_w] - 2\alpha_1)\, exp[\alpha_0 + \alpha_1 r_g].$

approaches infinity, r_g becomes simply a weighted average of the two exogenous interest rates. The positive relationship between the rate on liquid assets and deposit rate arises because the society increases its deposits and liquid assets in line [condition (6)].

The first-order condition for the mortgage rate is:

$$d\Pi/dr_m = exp(\beta_0 - \beta_1 r_m)\,[1 - \beta_1 (r_m - r_w)] = 0$$

A maximum requires that the second derivative is negative,[16] which is satisfied if $r_m - r_w < 2/\beta_1$; this is assured since:

$$(11) \quad r_m^* = r_w + 1/\beta_1$$

The optimal mortgage rate, given by (11), is related positively to the wholesale rate, plus an inverse elasticity term, $1/\beta_1$. An increase in the elasticity β_1 makes mortgage demand more responsive to a change in the mortgage rate. As β_1 approaches infinity, r_m converges to the wholesale rate; the mark-up goes to zero.

Combining (10) and (11) gives us the mark-up of the mortgage rate over the deposit rate:

$$(12) \quad r_m^* - r_g^* = 1/\beta_1 + 1/\alpha_1 + j\,(r_w - r_l)$$

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(16) $\quad d^2\Pi/dr_m^{\,2} = \beta_1\, exp(\beta_0 - \beta_1 r_m)\,[\beta_1 (r_m - r_w) - 2]$

5 Econometric results

(i) Methodology and data

The theoretical considerations in Section 4 yield several testable propositions which are examined in this section. Estimation begins in 1984, since this marks the breakdown of the cartel. Estimation using data back to the early 1970s was tried, but the results were very poor. This was largely because the interest rates set during the 1970s were non-market-clearing rates, which frequently were not changed over the course of a year, and which were set without the aim of matching supply and demand. Not only does this violate the assumption that $M^d = M^s$ (see Section 4), but the interest rates set in the 1970s are limited-dependent variables, needing different econometric analysis.(17)

The empirical analysis was based on a two-stage estimation approach, using OLS estimation in the first stage to identify a cointegrating vector, having established the orders of integration of the variables. In the second stage the residuals from this vector (lagged one period) were included in a dynamic equation (see Engle and Granger, 1987).

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(17) Details are available from the author.

Table 1: Unit Root Tests, 1984M1 - 1993M6

Variable	Without trend ADF1	Without trend ADF4	With trend ADF1	With trend ADF4	Conclusion
r_m	-1.16	-1.20	-1.10	-1.03	I(1)
Δr_m	-6.25	-4.87	-6.48	-5.28	I(0)
r_g	-0.78	-0.83	-1.25	-1.27	I(1)
Δr_g	-6.13	-4.86	-6.27	-5.15	I(0)
r_l	-1.50	-1.09	-1.43	-0.87	I(1)
Δr_l	-7.40	-4.87	-7.51	-5.12	I(0)
r_g-r_w	-3.05	-2.45	-4.22	-3.80	I(0)
r_m-r_w	-4.38	-3.22	-4.42	-3.33	I(0)
r_w-r_l	-4.48	-2.71	-5.70	-3.85	I(0)

95% critical value:

	Without trend	With trend
ADF(1)	-2.89	-3.45
ADF(4)	-2.89	-3.45

The table indicates that the levels of interest rates are $I(1)$, at least over the sample period used [although there are theoretical problems with the assumption that interest rates are $I(1)$]. The difference terms are all $I(0)$, as are the interest rate differentials.

(ii) Deposit rate

The theoretical results suggest that the deposit rate ought to be a weighted average of the rate on liquid assets and the rate on wholesale funds. The crucial question is how to model the inverse elasticity. The process of increasing competition is likely to increase the elasticity of supply, which justified inclusion of a time trend to capture this. When equation (10) was estimated directly, there was a high degree of serial correlation and large coefficients, which did not make sense theoretically. This suggested that there might be a problem stemming from the high degree of collinearity between Libor (r_w) and Libid (r_l) (the correlation is 0.99). If the spread between r_l and r_w was constant:

$$r_l = \delta + r_w$$

and this is substituted into the deposit rate equation, (10) becomes:

$$r_g^* = (j(\delta + r_w) + (1 - j) r_w) - 1/\alpha_1$$

$$= r_w + \phi_1$$

where $\phi_1 = j\,\delta - 1/\alpha_1$

The empirical results were much improved by dropping the interest rate on liquid assets and including δ in the constant.

Table 2: OLS Estimation, Long Run Solution Deposit Rate, 1984 M1 - 1993 M6

$$r_g = 3.53 + 0.79\, r_w - 0.021 \text{ trend}$$

$\text{Radj}^2 = 0.87$
$\text{DW} = 0.57$

A restriction of unity on the coefficient on r_w was rejected. The long-run solution fits with the theoretical prediction, except that the trend has a negative sign - which implies that the market has become less competitive. This may be a reflection of the fact that the deposit rate chosen was the average over all shares, which as was argued in Section 3, does not control for non-price characteristics; the improvement in these may have been sufficient to compensate for the decline in interest rate competitiveness. Moreover, it may be that the average share rate has become less competitive relative to Libor (as shown in Chart 3.6), but that relative to National Savings it has maintained its competitiveness (Chart 3.7). It is most likely that the trend would be positive if there were a longer sample of data [see Section (iii) for a further discussion].

The dynamics were determined by a general to specific methodology, testing down for a preferred parsimonious representation (Hendry, 1986), which is given in Table 3.

Table 3: OLS Estimation, Deposit Rate, 1984 M1 - 1993 M6

$$\Delta rg = \underset{(0.06)}{-0.17\,RES1_{-1}} \underset{(0.06)}{+0.16\,\Delta rw} \underset{(0.07)}{+0.21\,\Delta rw_{-1}} \underset{(0.06)}{+0.12\,\Delta rw_{-2}}$$

$$\underset{(0.33)}{-1.09\,D84M4} \underset{(0.36)}{+1.43\,D84M8} \underset{(0.34)}{-1.12\,D85M9} \underset{(0.33)}{-1.02\,D86M4}$$

where

D84M4 = Dummy variable, taking the value 1 in 1984 (4) and 0 everywhere else
D84M8 = Dummy variable, taking the value 1 in 1984 (8) and 0 everywhere else
D85M9 = Dummy variable, taking the value 1 in 1985 (9) and 0 everywhere else
D86M4 = Dummy variable, taking the value 1 in 1986 (4) and 0 everywhere else
RES1 = r_g - 3.53 - 0.79 r_w + 0.021 trend

$R^2 = 0.66$	SE of Regression = 0.32
$Radj^2 = 0.64$	Serial Correlation $\chi^2(12) = 13.35$
DW =2.21	Normality $\chi^2(2) = 4.15$
	Heteroscedasticity $\chi^2(1) = 0.29$

Standard errors are reported in parentheses.

A negative sign on the lagged residuals confirm that the equation is stable. The deposit rate dynamics were most influenced by contemporaneous and lagged changes in Libor, suggesting that societies adjust their interest rates over a period of at least three months. For example, societies may alter the rates on the highest paying accounts, which are likely to be the most price sensitive, before adjusting rates on current accounts. This is consistent with the evidence given in Section 3. The dummy variables in 1984 and 1985 corresponded to months in which there were particularly large changes in the deposit rate (and mortgage rate in 1984M4), despite no corresponding change in Libor (see Chart 3.6 which shows the volatility of the spread between the deposit rate and Libor). Part of the reason for the large swings in the spread in 1984 is the change in the taxation when full corporation tax was imposed on capital gains from gilts trading. This would have reduced societies' profits, making them keen to widen margins. They cut deposit rates in April 1984 by 1.4% points (Libor only fell 0.05% points), which explains the negative sign on the dummy, D84M4. However, the average share rate was increased by 2.2% points in August (corresponding to D84M8), following a rise in Libor of 2.06% points in July. Of course, it is not surprising that there should be outliers in the early years, since 1984 was the first completely non-cartelised year. The dummy variable in 1986 corresponded to a change in the composite tax rate.

(iii) Mortgage rate

The theoretical results suggest that the mortgage rate ought to be related to the rate on wholesale funds and the inverse elasticity of demand. Although building society market share variables might have captured the effect of increasing competition on the elasticity of demand, the stock variables were corrupted by the conversion of Abbey National to a plc status in 1989. A trend was included to allow for time variation in the elasticity of demand.

Table 4: OLS Estimation, Long Run Solution Mortgage Rate, 1984 M1 - 1993 M6

$$r_m = 4.79 + 0.70\, r_w - 0.007 \text{ trend}$$

$\text{Radj}^2 = 0.85$
DW = 0.70

As in the deposit rate equation, a restriction of unity on the coefficient on r_w was rejected. The negative sign on the trend term conforms with an increasing price elasticity of demand for mortgages - a result which would be expected in an increasingly competitive market. The same methodology was used to obtain the preferred dynamic mortgage rate equation given in Table 5.

Table 5: OLS Estimation of the Mortgage Rate Equation, 1984 M1 - 1993 M6

$$\Delta rm = -\underset{(0.06)}{0.20}\, RES2_{-1} + \underset{(0.07)}{0.23}\, \Delta rw_{-1} + \underset{(0.07)}{0.21}\, \Delta rw_{-2} - \underset{(0.08)}{0.13}\, \Delta rm_{-1}$$

$$+ \underset{(0.32)}{1.49}\, D84M8$$

where RES2 $= r_m - 4.79 - 0.70\, r_w + 0.007$ trend

$R^2 = 0.64$	SE of Regression = 0.29
$Radj^2 = 0.63$	Serial Correlation $\chi^2(12) = 15.23$
DW = 2.15	Normality $\chi^2(2) = 2.36$
	Heteroscedasticity $\chi^2(1) = 2.40$

Standard errors are reported in parentheses.

The mortgage rate dynamics were mostly influenced by lagged changes in the wholesale rate. The lagged mortgage rate term captures "smoothing" by building societies, which is again consistent with the evidence presented earlier on the existence of large administrative costs and switching costs. In addition, as the mortgage rate used is the average rate actually paid by borrowers, timing differences in changes to the rates charged to first-time buyers and existing borrowers might also explain the significance of the lagged term.

The equations were estimated over the period until October 1992 and then were used to forecast (one step ahead) over the remaining eight months. Both equations passed the predictive failure tests easily.

6 Conclusions

This paper has examined the interest rate setting behaviour of building societies since 1984. Regulatory changes have induced societies to become far more competitive, which is evident in their pricing strategies. Although building societies, as mutual institutions, do not face the same external constraints which other profit maximising firms do, a profit-maximising framework was theoretically the most appealing and provided a useful analytical framework for modelling their behaviour.

There are two particular candidates for further research on building societies (and banks). First, incorporating some measures of risk explicitly into the theoretical work would benefit the econometric analysis, in particular the interpretation of margins. Second, research could usefully explore the role of non-interest income, which provides scope of cross subsidisation and may therefore distort the pricing decisions. Although it is unlikely to have been a major distortionary factor during this period of estimation, it is likely to become more so as societies attempt to increase the proportion of income from non-interest sources (for example, via bancassurance arrangements).

The empirical analysis indicates that Libor drives the pricing on both sides of the balance sheet. The performance of the estimated equations was fairly good, especially given the regulatory and behavioural change of the institutions and the turbulence in the housing market over this period. It is interesting that a role for real side variables - such as house price volatility and unemployment - were found to be in significant over the period of estimation.

APPENDIX 1

Timetable of financial deregulation affecting building societies

1979 - Memorandum of Agreement between Government and Building Societies Association (BSA) lapses. Government gives up the right to influence mortgage rates independently of market rates.

1980 - The "Corset" (Supplementary Special Deposits Scheme) abolished, allowing banks to compete more freely in mortgage and other lending markets.
- Building Societies allowed to issue sterling negotiable bonds.

1981 - BSA restrict the recommendation of interest rates to ordinary shares and base rates only.

1983 - Building societies allowed to pay interest gross of tax, enabling them to access the wholesale money markets.
- Sterling time deposits and CDs introduced by building societies.
- BSA ceases to recommend interest rates - instead they "advise" rates.

1984 - BSA ceases to advise rates, but keeps a role in co-ordinating timing of interest rate changes.
- Full corporation tax payable on societies gilts trading.

1985 - Building societies permitted to issue sterling Eurobonds.

1986 - BSA ceases to co-ordinate the timing of interest rate changes.
- Mortgage lending guidance withdrawn.

1987 - Building Societies Act, 1986 comes into force, widening scope for building society business. Maximum limit of wholesale funding set at 20 per cent of the total (with provision for increase to 40 per cent by secondary legislation).

1988	-	Maximum wholesale funding limit for building societies raised to 40 per cent.
	-	Building societies allowed to issue subordinated debt.
	-	Building societies allowed to provide banking, investment and insurance services.
1989	-	Banks and building societies permitted to issue sterling commercial paper.
	-	Abbey National achieves plc status and becomes a bank.
	-	Building societies allowed to provide a wider range of money transmission services.
1991	-	Building societies permitted to issue permanent interest-bearing shares.
	-	Abolition of composite tax rate. Deposit accounts to be charged at basic rate of income tax (for income tax payers).

APPENDIX 2

Data

rg	the average interest rate on building society deposits grossed up at the basic rate of income tax (averaged across all types of deposit). Source: Financial Statistics (ajnm.m).
rm	mortgage rate. Source: Financial Statistics (ajnl.m)
rw	3 month Libor rate. Source: Financial Statistics
rl	3 month Libid rate. Source: Financial Statistics

Δ denotes first difference

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