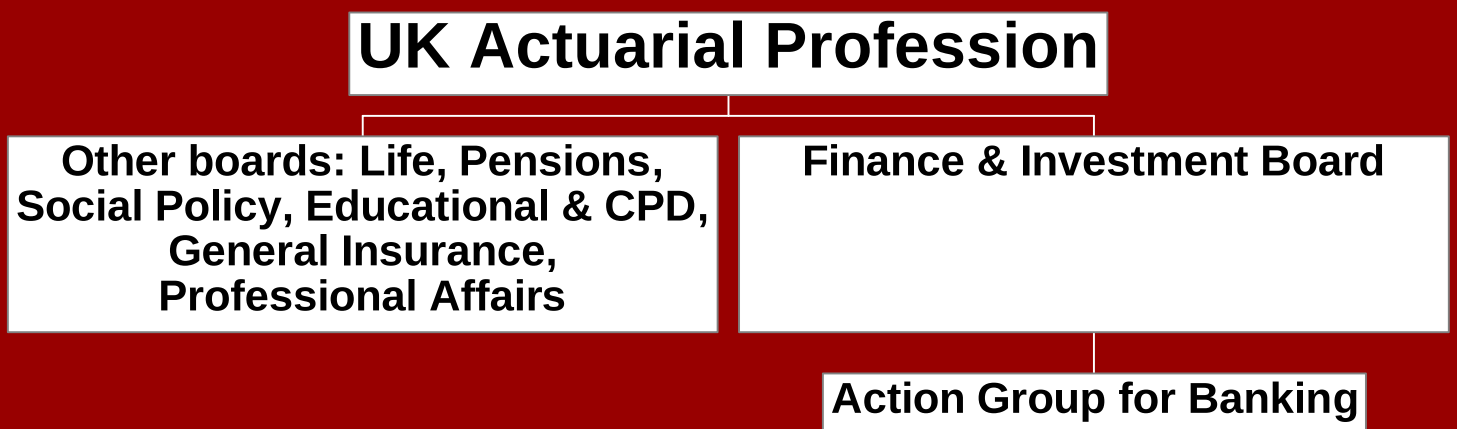
The Actuarial Profession
making financial sense of the future

A Study of Mortgage Prepayment Risk

presented by
Paul Seymour
Chairman
Action Group for Banking

The UK Actuarial Profession comprises a number of practice boards, including the Finance & Investment Board, which set up the Action Group for Banking to develop the profession's understanding of banking and facilitate the placement of actuaries at working level with banks.



Managing Mortgage Prepayment Risk

Faculty and Institute of Actuaries

Simon Perry, John Rowland, Stuart Robinson

November 12, 2001

The Actuarial Profession's Mortgage Prepayment Project

- Many of the asset and liability risks facing banks and insurance companies are similar.
- The prepayment risk faced by banks writing fixed rate mortgages is comparable with lapse risk on life and general insurance policies. But, the terminology used by banking professionals and actuaries to describe these risks is very different.
- To explore how actuarial techniques can be used to manage banking risks, we conducted a study of prepayment risk on behalf of the actuarial profession.
- Eight UK mortgage lenders, representing about 65% of existing UK mortgage lending, took part in the study.
- A report discussing the study will be published by the Institute of Actuaries (www.actuaries.org.uk)

Participants

COUNCIL of MORTGAGE LENDERS

Abbey National

Bradford & Bingley

Alliance Leicester

BRISTOL & WEST

BANK OF SCOTLAND

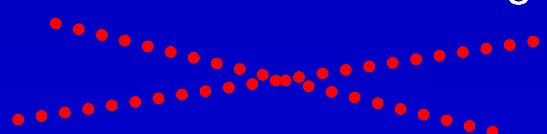
HALIFAX

BARCLAYS

Nationwide

Overview of the UK fixed rate mortgage market

- Fixed Rate Products
  - 2 Year
  - 3 Year
  - 5 Year
  - Some longer fixes
- Product Risk Management Strategies
  - Funding assumptions
  - Flat or tiered charges
  - Mark-to-market charges



Four topics to highlight

Analysing Trends

Predicting Behaviour

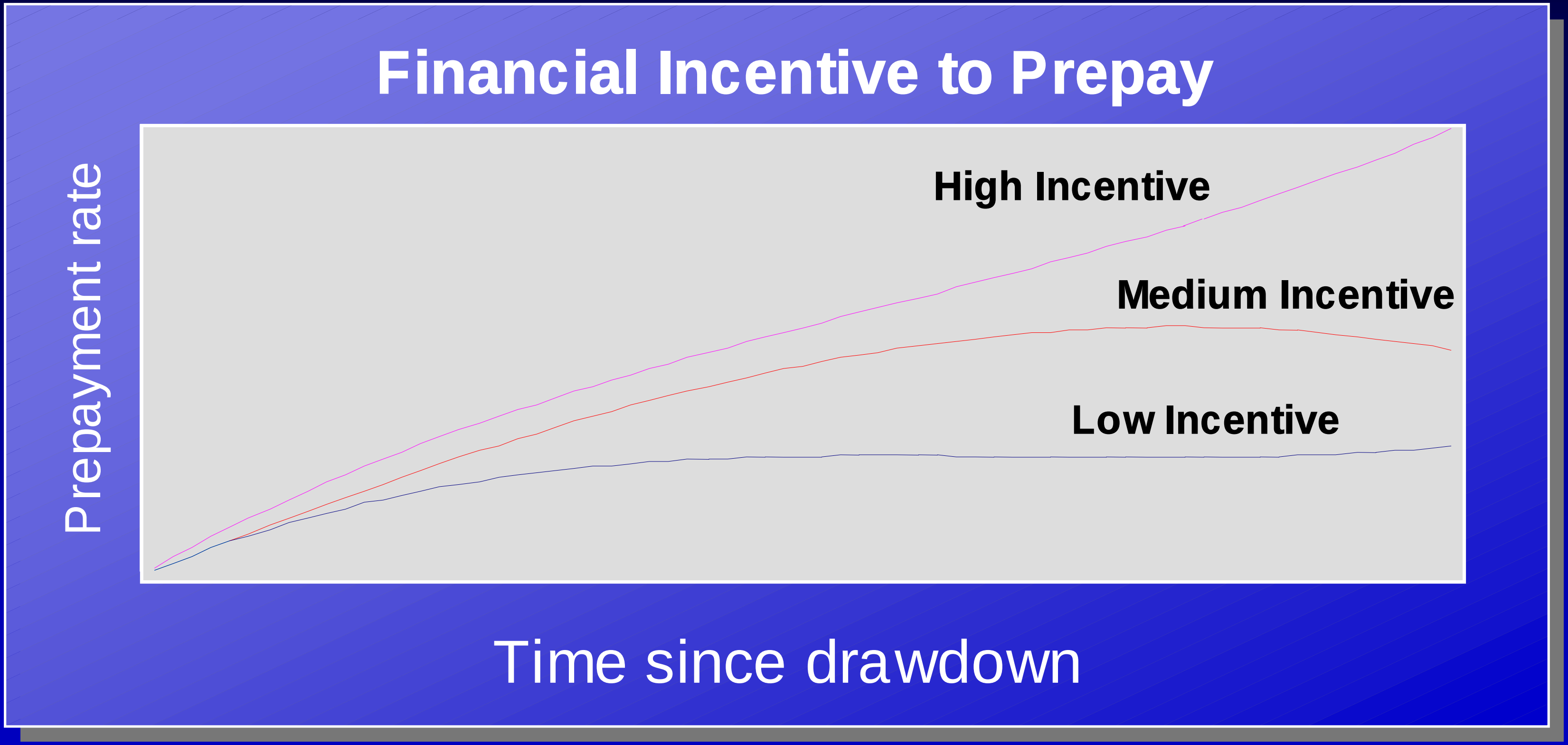
Retaining Customers

Pricing & Designing Products

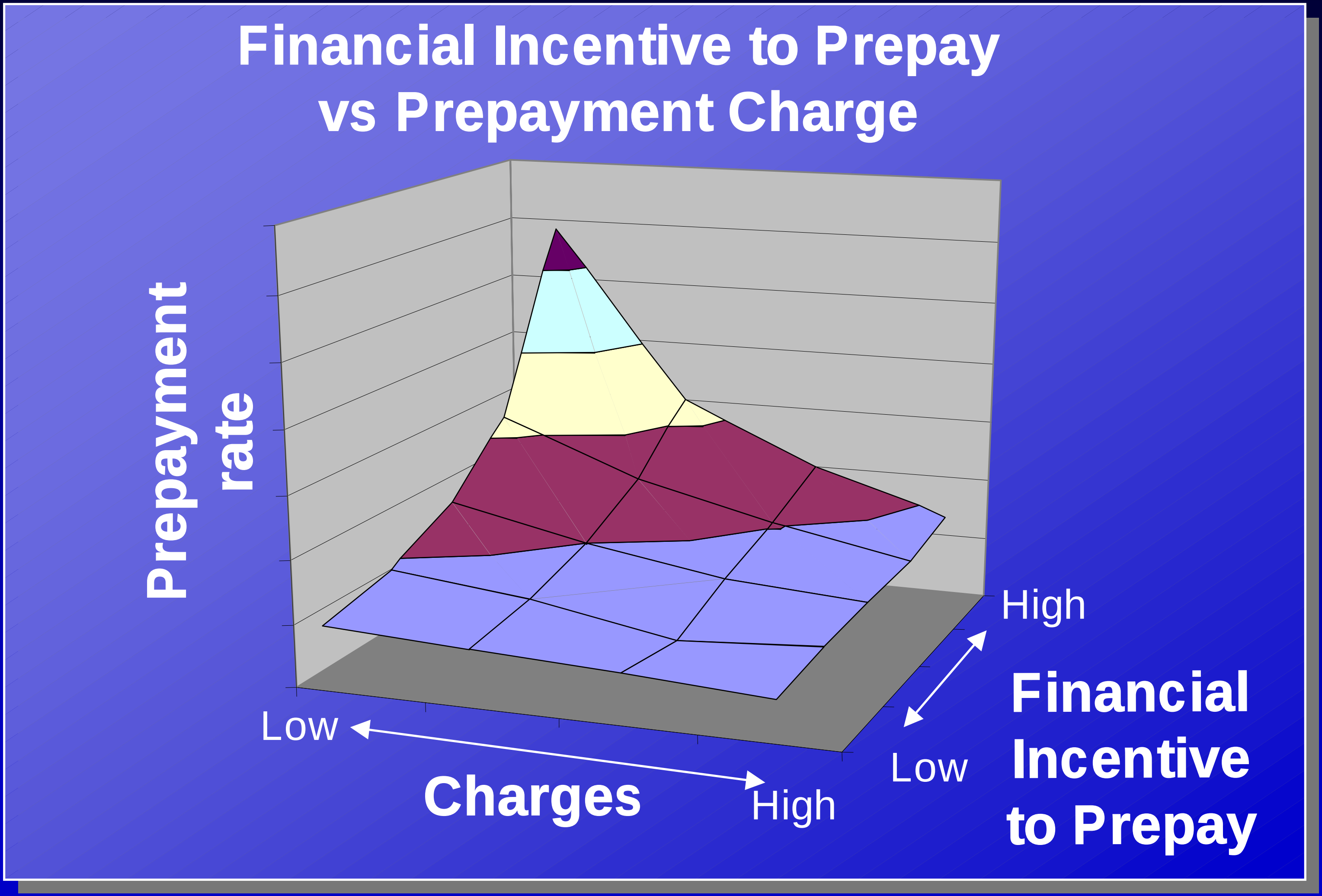
At each stage a range of analytical techniques are used

Investigation to understand the past	■ Life and general insurance policy lapse rate analysis. ■ Mortality rate investigations.
Build models of the future	■ Motor insurance pricing rate cards. ■ Household insurance pricing rate cards. ■ Retention models for life insurance policies. ■ Mortgage indemnity insurance.
Manage the business	■ Embedded value models. ■ Costing product guarantees. ■ Capital requirements. ■ Customer management.

Analysing trends:
Actual prepayment rates vary considerably



Analysing trends:
Interaction between variables



Analysing trends:
Drivers that affected actual prepayment rates

- Late months in the fixed rate period
- Large financial incentive to prepay
- Small prepayment charges
- High house price inflation
- Large loans
- First time buyers
- Broker / branch acquisition channel

- Early months in the fixed rate period
- Small financial incentive to prepay
- Large prepayment charges
- Low house price inflation
- Small loans
- Existing borrowers
- Direct acquisition channels

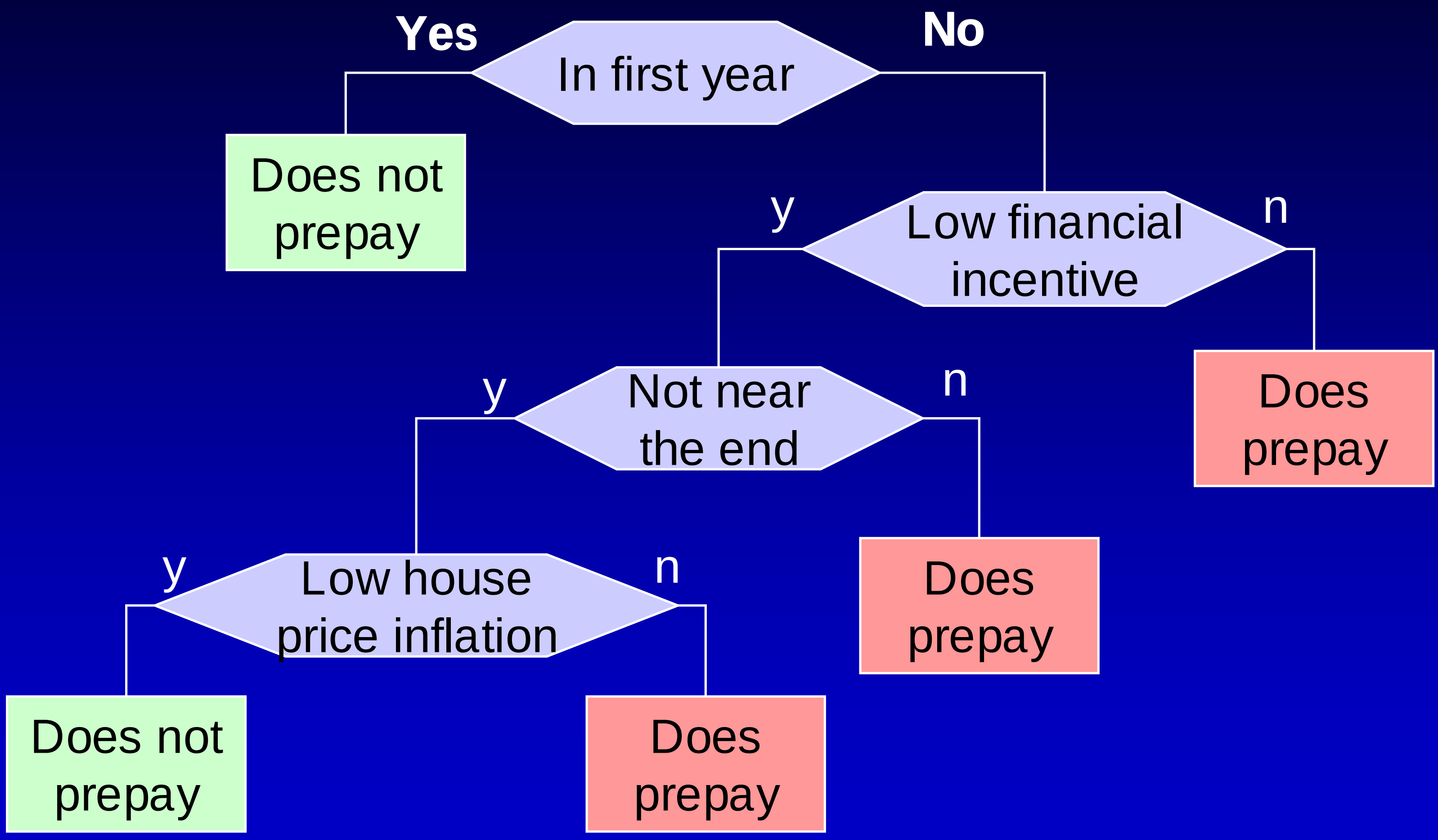
Predicting behaviour: Multiple drivers

- The profiles reflect observed prepayment rates from the mix of business actually written. But, even when sub-segments of the data are profiled, the profiles still reflect the impact of multiple drivers on prepayment rates.
- Predictive models estimate the impact of individual factors by taking account of the interactions between variables. Unlike the profiles, they identify causal relationships.
- The predictive models built in the study were developed using generalised linear models and decision trees. These techniques are used by insurance companies to determine the relative risk of customer segments.
- For example, one application of these models would be assessing the relative risk of different drivers with different vehicles when setting motor insurance premiums.

Predicting behaviour:
Rate cards to predict prepayment rates

Base Prepayment Rate		Y%
Parameter	**Levels**	**Weight**
Time since draw down	1 2 3	75% 100% 133%
Financial incentive to repay	1 2 3	66% 100% 150%
Loan size	1 2 3 4	75% 100% 125% 150%

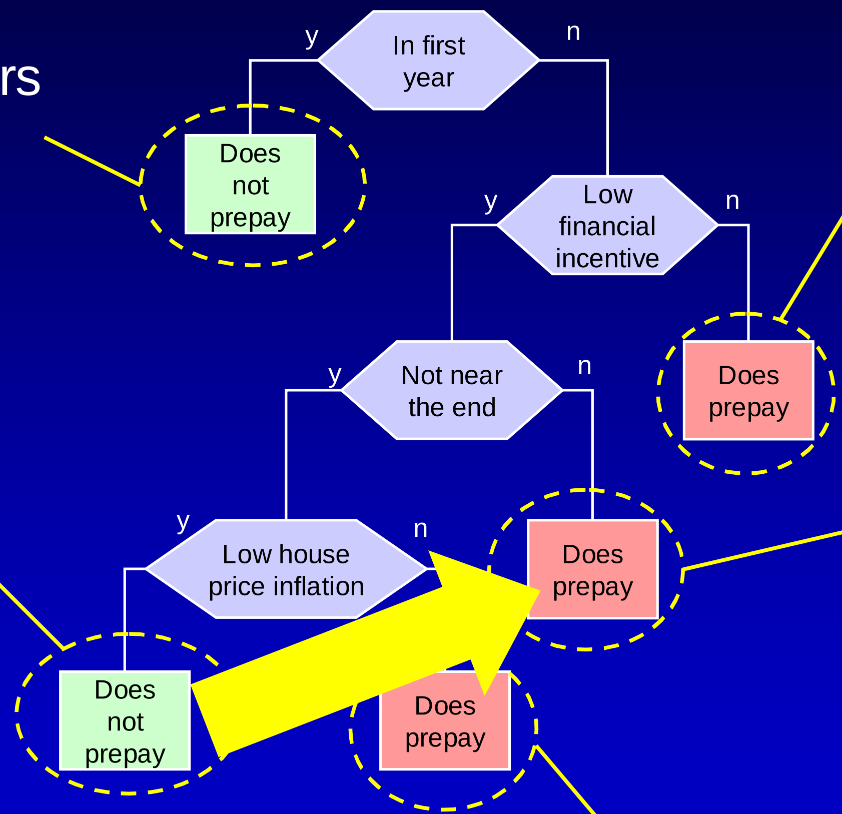
Retaining customers: Decision trees identify clusters of customers likely to prepay



Retaining customers: Retention strategies can then be developed

These customers are unlikely to leave - **wait**

These customers are unlikely to leave - **wait**



These customers are looking for better rates - **consider offering them a new rate now.**

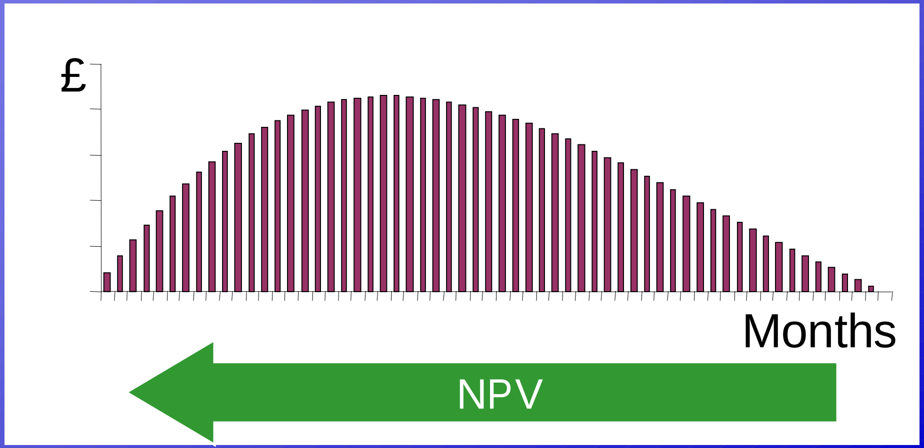
These customers will be looking for a new mortgage soon - **offer them a new product now**

These customers may decide to move again - **wait for them to approach you**

Pricing: Costing prepayment under different interest rate scenarios

Illustrative

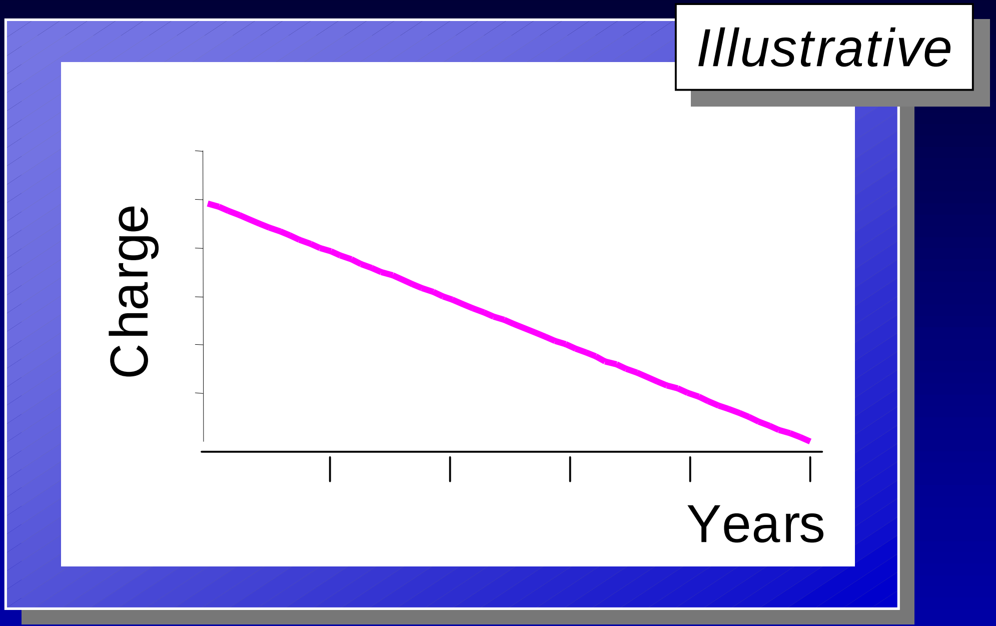
Monthly cost of prepayment



Expected cost of prepayment under two interest rate scenarios

Interest rate scenario	1% Fall now	2% Fall now
Cost as a % of balance	0.6%	1.9%

Pricing:
Designing products to reduce prepayment risk

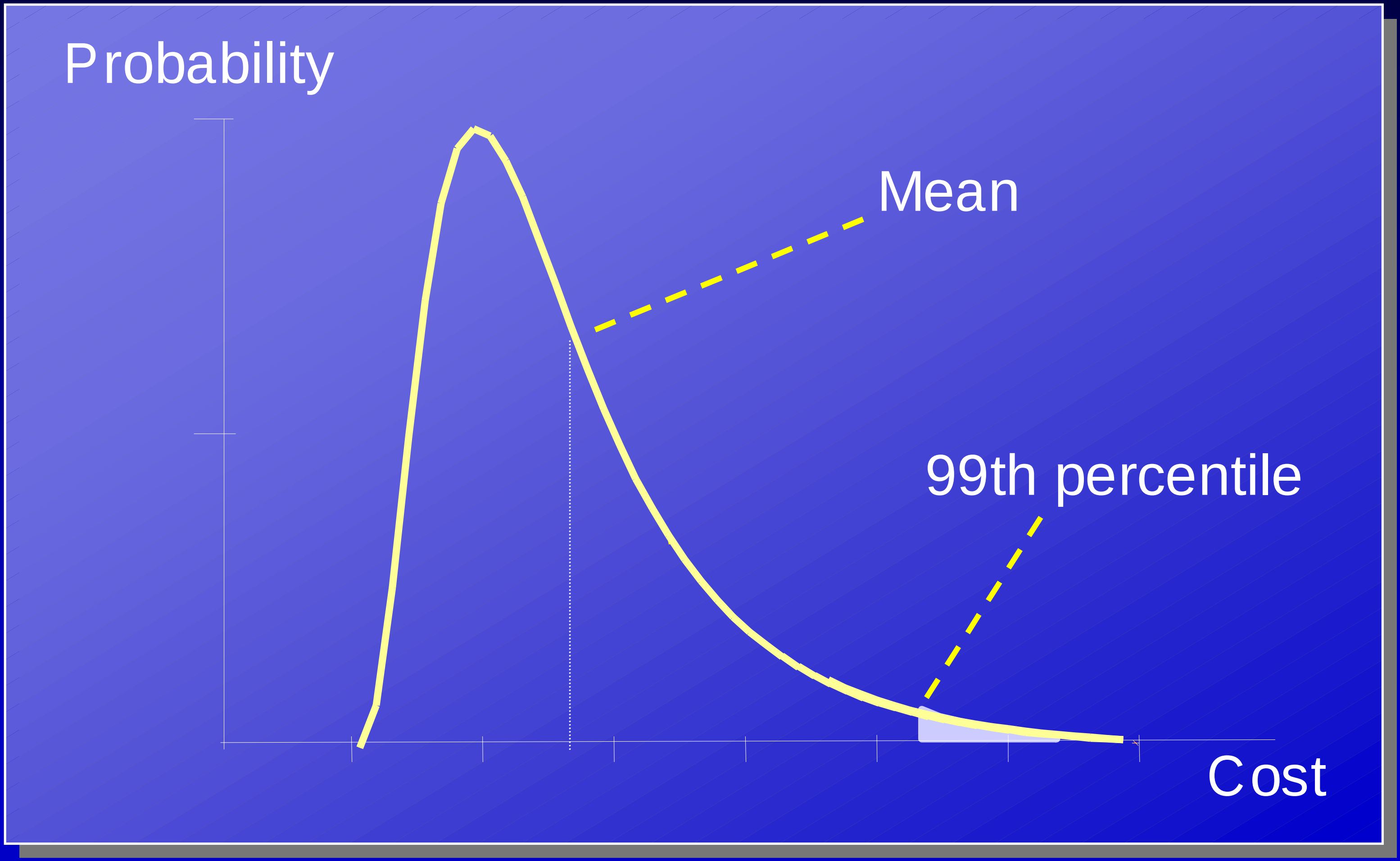


A CAT standard charge of 1% per annum of outstanding fixed term

Expected cost of prepayment under two interest rate scenarios

Interest rate scenario	1% Fall now	2% Fall now
Cost as a % of balance	-0.1% (was 0.6%)	0.6% (was 1.9%)

Pricing: Assessing risk over different interest rate scenarios



Four topics to highlight

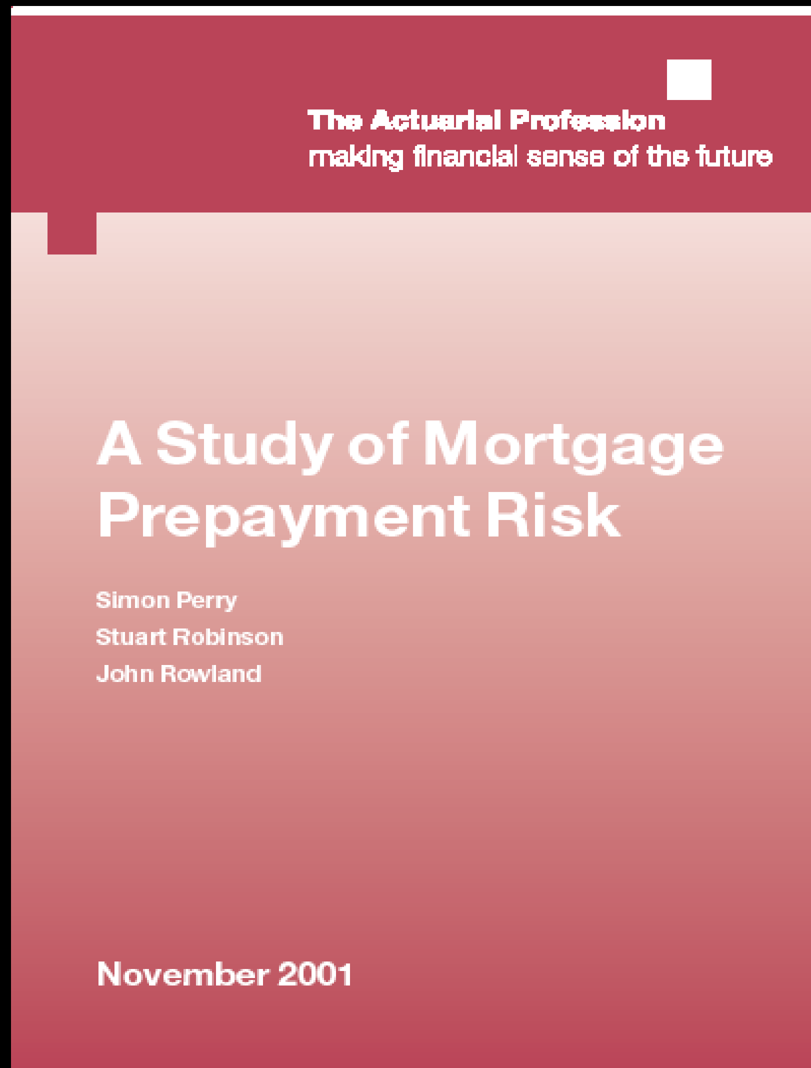
Analysing Trends

Predicting Behaviour

Retaining Customers

Pricing & Designing Products

All these topics are expanded on in the paper



USEFUL WEB ADDRESSES

UK Actuarial Profession
www.actuaries.org.uk

Paul Seymour
Chairman, Action Group for Banking
paul.seymour@mathon-lodge.fsnet.co.uk

A Study of Mortgage Prepayment Risk
www.actuaries.org.uk/finance_invest/mort_prepay_rpt.pdf

Banking Group Newsletter
www.actuaries.org.uk/finance_invest/banking_newsletter_winter01.pdf

CPD Handbook
www.actuaries.org.uk/cpd/cpd_handbook.html

Financial Condition Assessment
www.actuaries.org.uk/sessional/sm0103.pdf

Equity Release Mechanisms
www.actuaries.org.uk/equity_release/rpt.pdf