

Acadametrics

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Acadameetrics

- our people (slides 3 & 4)
- our clients (slide 5)
- studies (slide 6)
- our services (slide 7)
- consultancy (slides 8 to 22)
- house prices (slide 23)
- credit data and risk modelling (slide 24)

Our People

provide

- a powerful combination of academic and commercial expertise
- over 18 years experience in this arena pre-dating and including the last major housing crisis
- an independent and proven capability

Our People

our key personnel

Dr Stephen Satchell D.Phil The Reader in Financial Econometrics Cambridge

Dr Peter Williams was Deputy Director General Council of Mortgage Lenders

Jim Cunningham was Senior Economist Council of Mortgage Lenders

David Pickles BA Jt previously N&P BS, Experian, CACI and GMAP

Keith Bullivant BA Manchester was Royal & SunAlliance Senior Statistician

Kit Teather BA Oxon previously Legal & General DMI Information Actuary

Barbara Cotton IT Consultant Programmer and Systems Analyst

Sam Radford BA FCA ex Touche Ross now Director Venture Alliance Corporate Finance

Our Clients

comprise

- major insurers requiring data, input to structured deals and analysis of impact of economic change
- major banks in support of securitisations, revaluations and arrears/possession analysis
- mortgage lenders for their Capital Requirements Directive (Basel II) work such as Pillar 2 stress and scenario testing, model validation, benchmarking and portfolio valuation

and include:

Northern Rock plc	Financial Security Assurance
The Financial Times	Nationwide Building Society
Barclays Bank plc	Yorkshire Building Society
Co-operative Bank	HBOS plc
Standard Life Bank	Britannia Building Society
UBS	Citifinancial

Studies

we have undertaken a range of studies for individual and groups of organisations and industry bodies comprising

- house prices analysis
- forecasting MIG claims under a range of alternative scenarios
- mortgage pre-payment analysis
- scenario analysis evaluating the impact of different LTVs upon mortgage books.
- loan book valuations
- comparative mortgage risk analysis (individual books v. market)
- market studies

Satchell Chan Default Forecasts

Mortgages in Shock

Drivers and Consequences of Credit Default

Services

1. Consultancy

- predictive modelling; prepayment, default (PD) and possession (PP and LIEP) assessment
- stress and scenario testing
- supporting lender work under the Capital Requirements Directive (Basel II)
 - model validation and development
- applying unique historic PP and LIEP data from the 1980s and 1990s
 - LGD Data
- Acadametrics Prices and Transactions (monthly/house type/county/London Borough) – data for clients' own use
- confidence limits for the major lender indices
- Property Portfolio Revaluation at property type level with confidence limits

2. House Prices

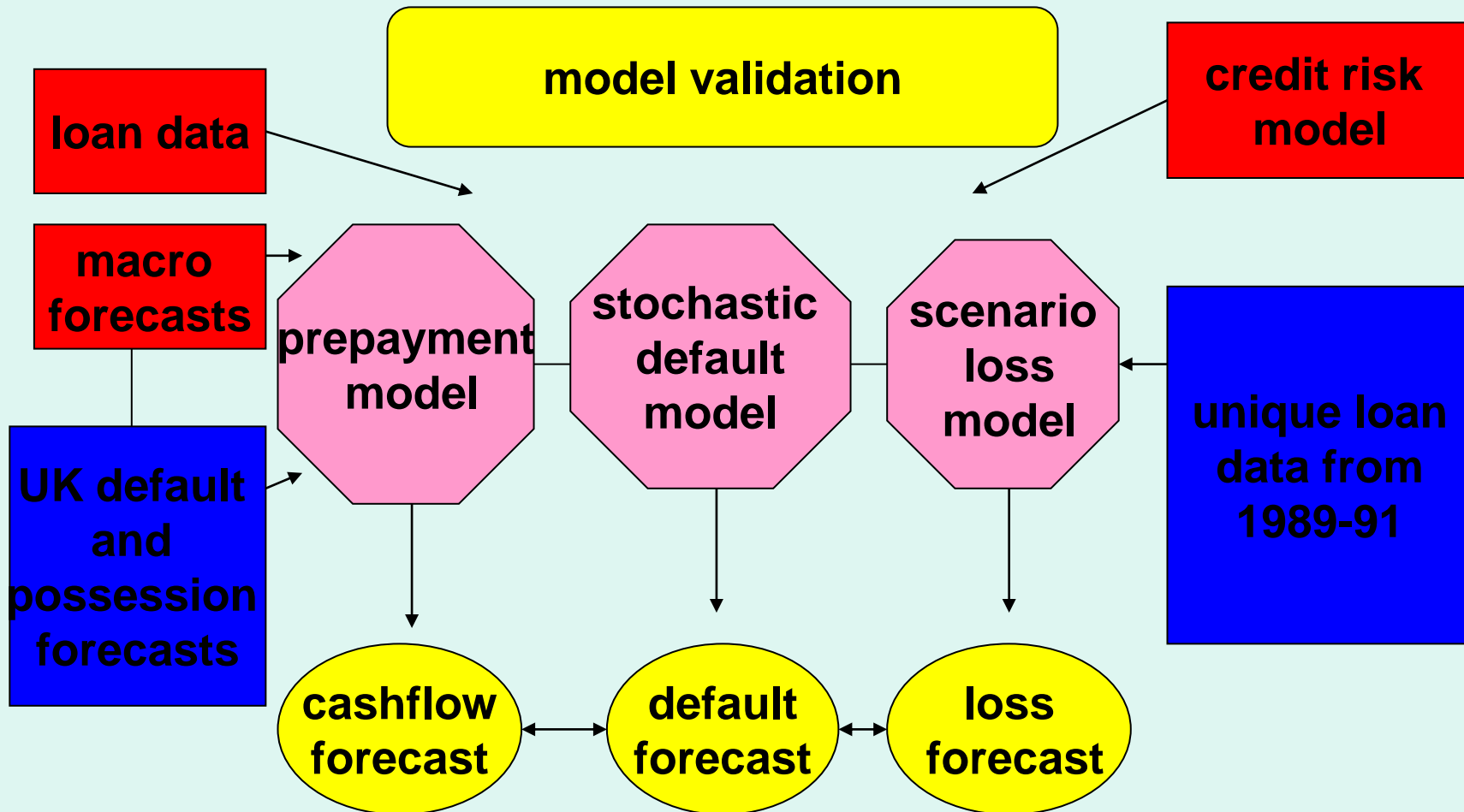
- FT House Price Index
 - published every month in the Financial Times since September 2003
 - provides the definitive source of house price data for England and Wales
 - uses every available transaction with series down to region, county and London borough

3. Credit Data and Risk Modelling

- bespoke – equity release, Predictive Mortgage Analytics, product pricing
- lifetime predictive default

Predictive Modelling

a combination of modelling capability bespoke for purpose



Stress and Scenario Testing

In developing the Acadametrics Scenario Testing model our aim was to address a series of common challenges in relation to a regulatory and risk management requirement for stress testing, namely

- cost - by developing a standard and robust model with a known cost
- variety of possible methods – clear, transparent and consistent processes
- value shifts between historic and future behaviour – standard set of variables based on historic data which can be adjusted
- choice of scenario or shock – standard model provides opportunity to develop a standard set of scenarios
- limitation in relevant time series data – uses relevant historic data and a hazard rate approach to default
- simplicity - uses commonly available data downloaded by the lender for maximum use across the mortgage lending industry

Stress and Scenario Testing

our model calculates mortgage losses under a variety of economic scenarios

- is based upon the UK mortgage book stress test model developed in 2004 for the Drivers and Consequences of Credit Default market study
- shows the impact of different macroeconomic scenarios on a mortgage lending book
- uses our own historic data to provide a standardised independent assessment
- includes a facility allowing mortgage lenders to substitute their own experience (if available)
- calculates loss at the level of the individual loan
- is an off-site solution – using data downloaded by the mortgage lender

Stress and Scenario Testing

the model calculates for each loan

- exposure at default (EAD) by taking current balance and applying
 - forecast interest rates
 - repayment assumptions from Acadametrics historic data to produce
 - arrears
- loss in the event of possession (LIEP) by taking original value and applying
 - Acadametrics Prices and Transactions for an estimate of current value
 - house price forecasts to establish value at default and deducting
 - EAD
 - forecast depreciation due to forced sale derived from Acadametrics data
 - costs of sale (fixed and variable) also from Acadametrics historic data giving
- expected loss (EL) (at portfolio level = $PP * LIEP$) with allowance for redemptions

Stress and Scenario Testing

we generate a probability of possession for each account

- the model applies probability assumptions employing hazard rates of possession and redemption which vary by macroeconomic scenario
- the hazard rates are calibrated from actual historic data
- the key drivers of hazard are original LTV and development year
- a probability of arrears can also be provided derived from the rate of possession
- and results can be shown to vary with the economic cycle for ten years into the future

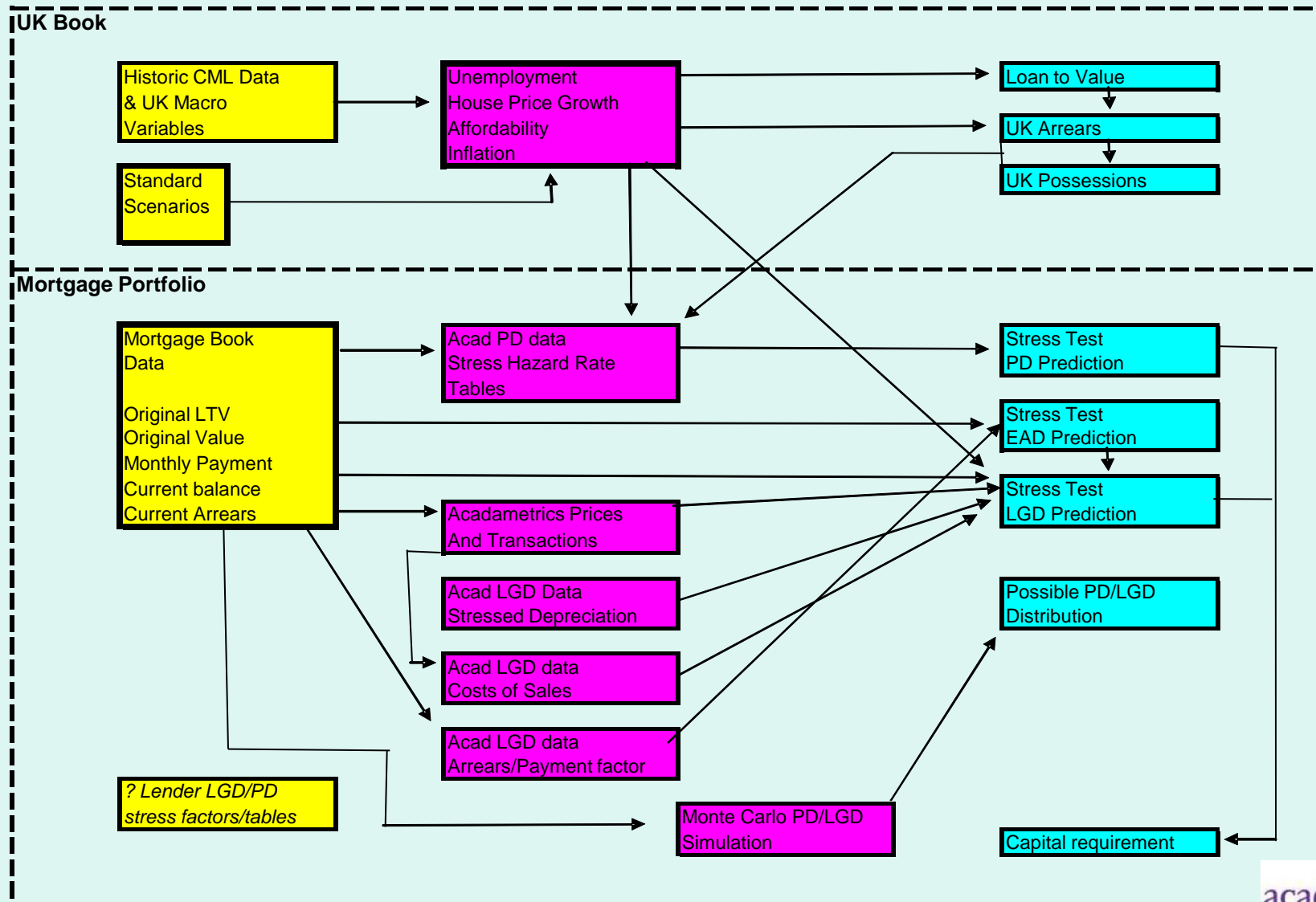
Stress and Scenario Testing

to derive probability of redemption and probability of possession we employ a hazard rate matrix as follows

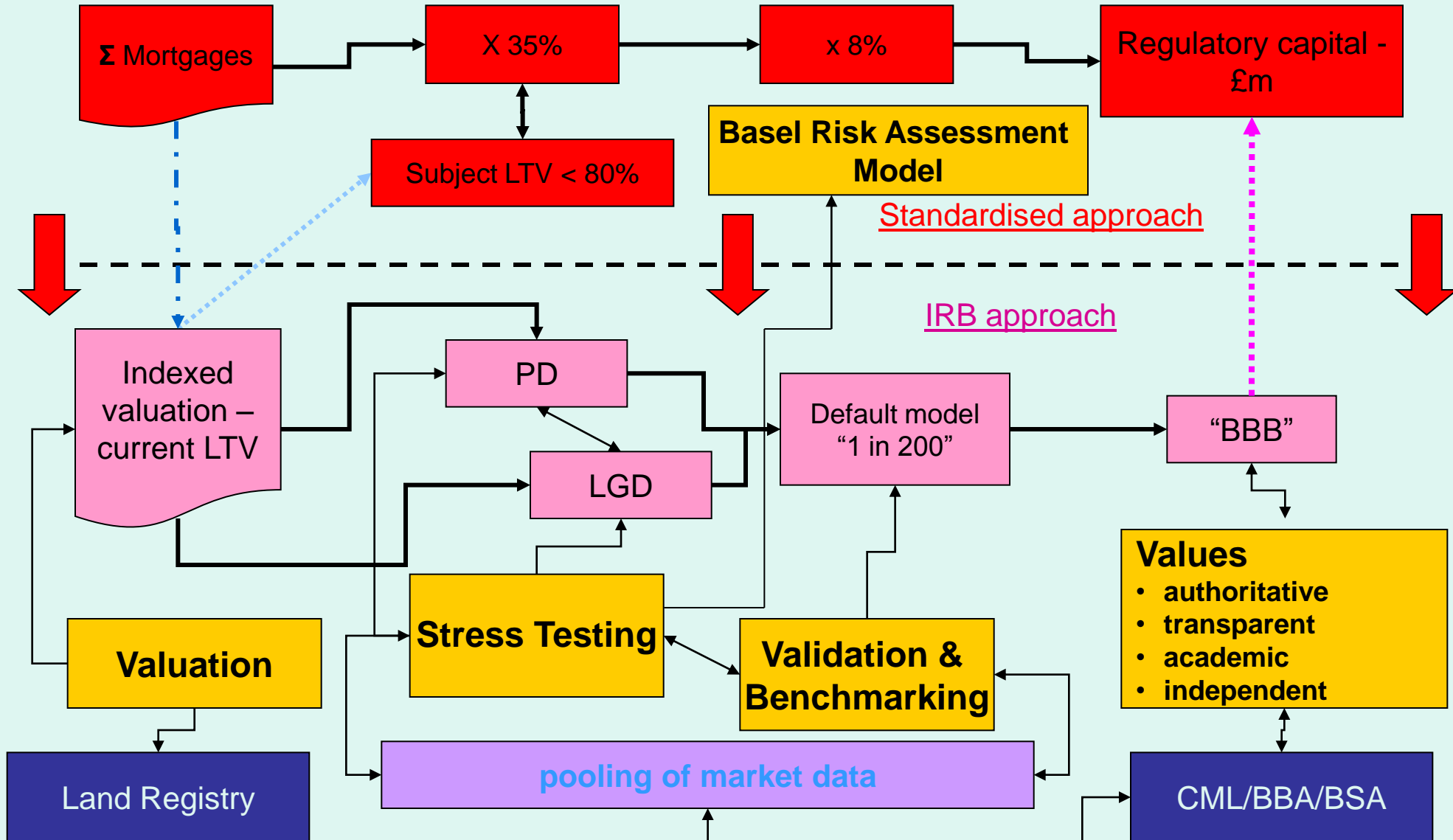
LTV	Development Year							Unconditional Probability
	0	1	2	3	4	5	6 +	
<75%	x	x	x	x	x	x	x	x
75-85%	x	x	x	x	x	x	x	x
85-95%	x	x	x	x	x	x	x	x
90-95%	x	x	x	x	x	x	x	x
95-100%	x	x	x	x	x	x	x	x
100-120%	x	x	x	x	x	x	x	x
120% +	x	x	x	x	x	x	x	x

Stress and Scenario Testing – Loss Given Default

model outline



Capital Requirements Directive (Basel II)



Consultancy - Model Validation

model validation requirements are

- FSA requirement for formal validation of internal models
- full documentation & description – capable of “white room” replication or “judicial assessment”
- rigorous validation of methodology, data & assumptions
- full integration with risk management processes & senior management decision making

issues

- no formal FSA specification of validation methodology
- uncertainties of credit risk v market risk – risk horizon, data availability, asymmetric distributions
- role of benchmarking & model replication

our experience

- for major UK lenders
- formal reports for model sign off in support of Waiver applications
- also covering issues arising from low default portfolios and use of expert judgment models

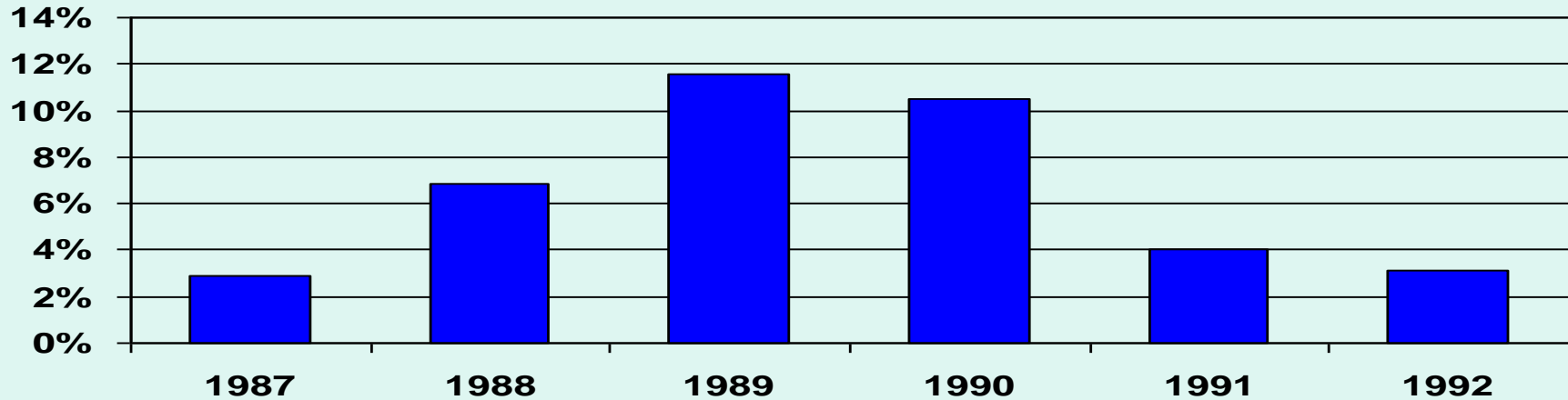
Consultancy - Model Validation

the model validation process involves

- review of model documentation – completeness and level of detail that is sufficient to facilitate an independent review and to provide exact replication
- model theory – establishes whether the appropriate statistical and economic theory has been used in the development of the models
- review and validation of data input and assumptions – consideration will include e.g. historic data aspects and that data used are representative of their application to the business
- model code and mathematics
- model results – consideration will include e.g. the clarity of the output and the degree of understanding by decision makers
- formal validation report

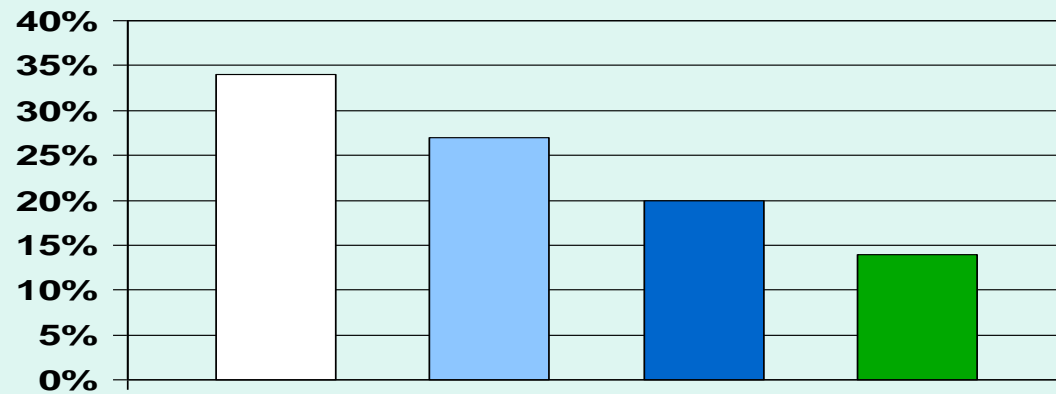
Historic Downturn Default Data

probability of possession in the 1989-91 UK recession



■ Default frequency (% of original loans)

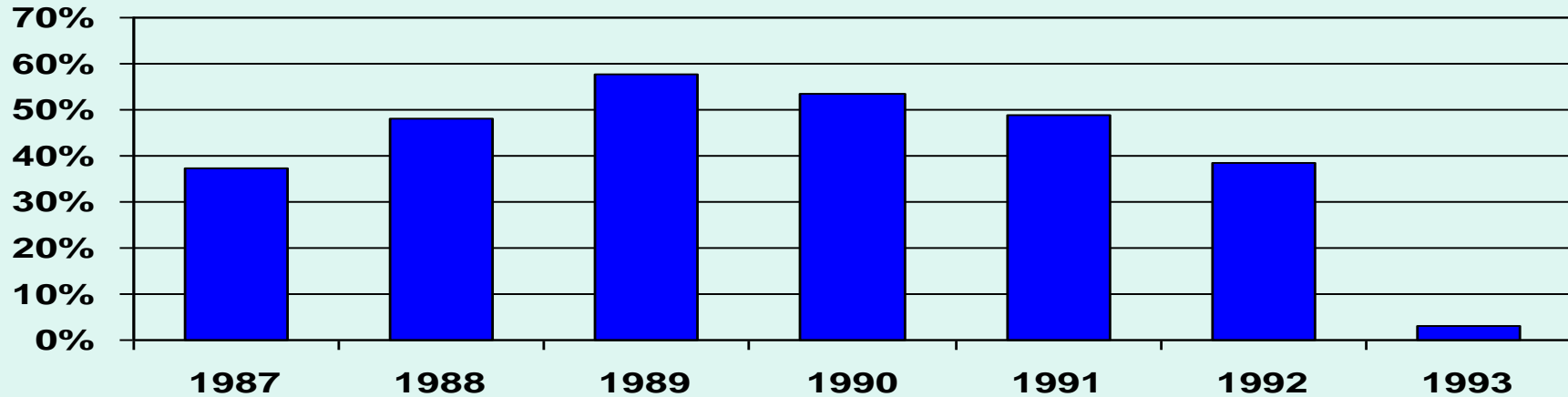
Default frequency is the number of possessions per hundred mortgage originations. The graph shows 1989 was the worst mortgage origination year emerging at a BBB “stress” as defined by the Fitch MBS rating model. It should be noted that 100% lending and low start/self certified products defaulted at twice the average for all loans which is shown on the graph. (Data Source: Acadametrics)



□ AAA □ AA ■ A ■ BBB

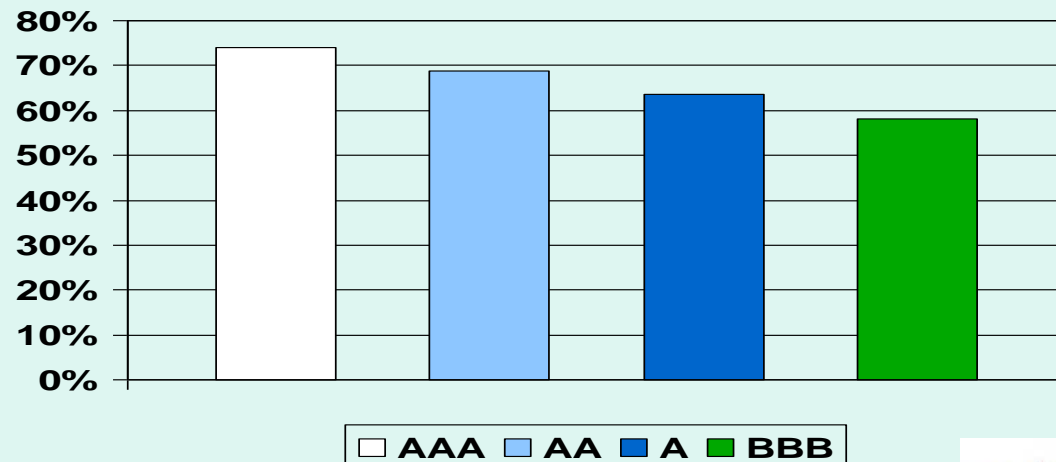
Historic Downturn Default Data

loss given default (LGD) in the 1989-91 recession



The loss given default is the deficit following sale of the repossessed property shown as a proportion of the original loan by mortgage origination year. It should be noted that these losses were exacerbated by poor asset disposal following repossession. 1989 was the worst year of lending at BBB level of stress as defined by the Fitch MBS rating model. (Data Source: Acadametrics)

■ Loss following default (% of loan)



□ AAA ■ AA ■ A ■ BBB

LGD Data

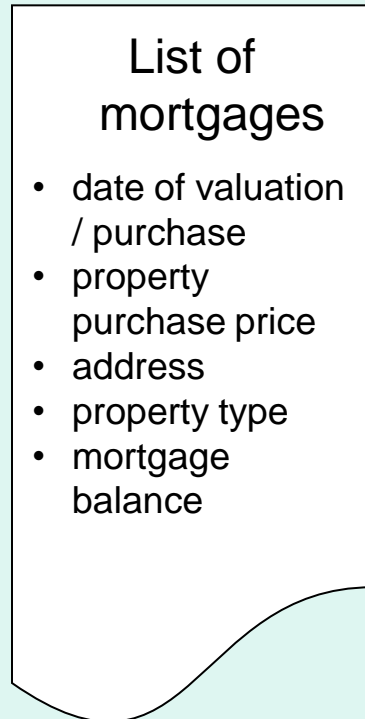
an example of LGD Data

“Discount”, “Distress” or “Forced Sale Discount” . An analysis on repossessed properties sold during the period 1991-1995 of the difference between the sale price and indexed value using the Acadametrics database.

Number of records		Year of Sale				Total
		1991	1992	1993	1994/5	
Vintage						
	1986					
	1987					
	1988					
	1989					
	1990					
	1991					
	1992					
	1993					
	1994					
	Total					

Acadameetrics Prices and Transactions

property revaluation process



provides period over which property "value" needs to be indexed

identifies whether Acadameetrics Prices and Transactions Regional or House Type Within County/London Borough should be used

current & historic loan to value ratio are calculated by application of the House Prices

July 1998
£98,500

+

terraced house
"index movement"



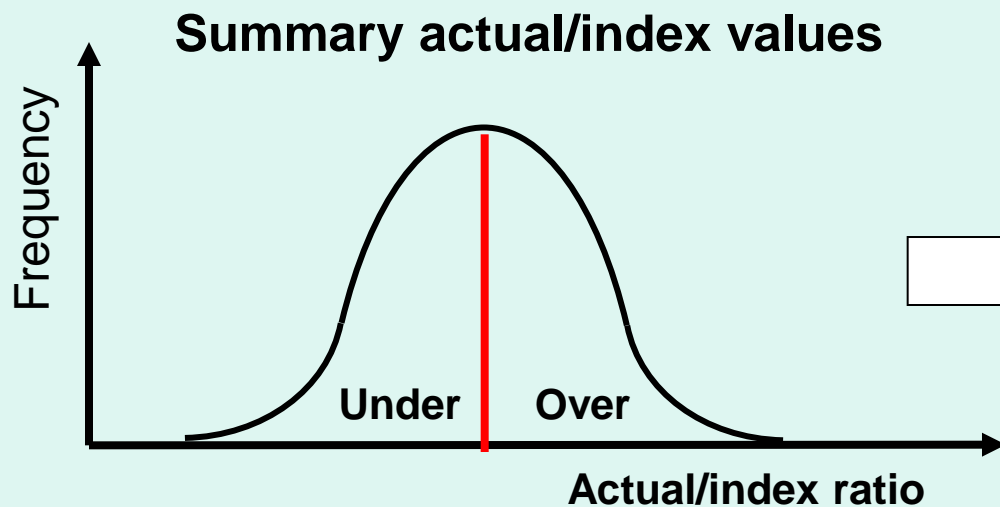
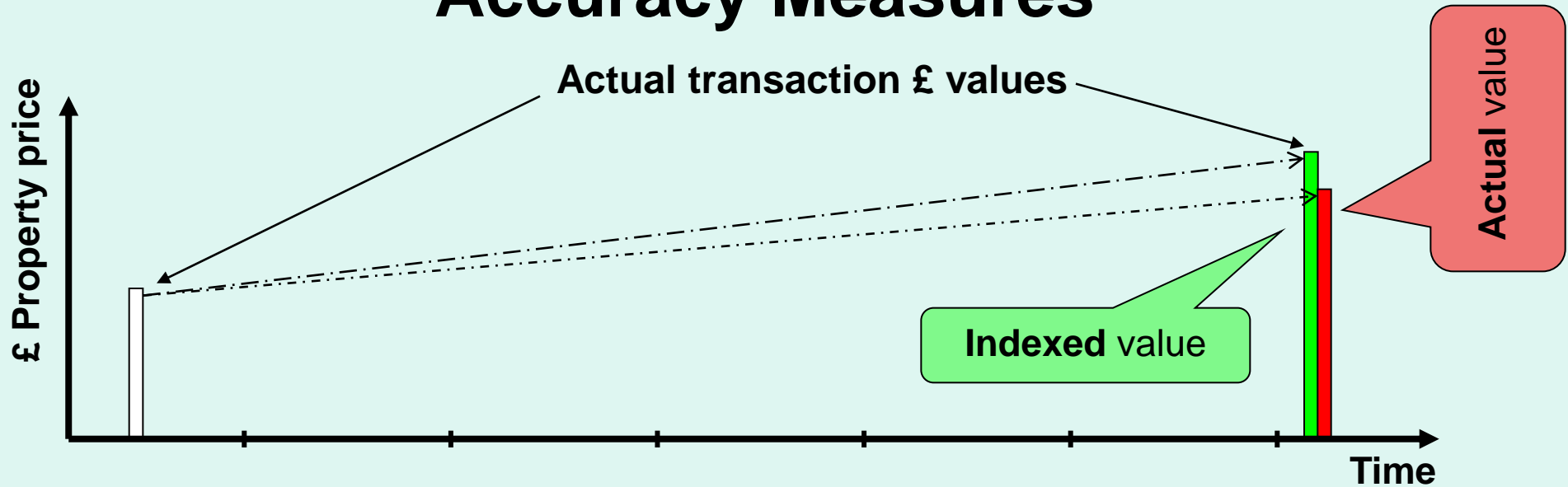
current price:
£183,750

=

loan to value:

- *historic* – 91.4%
- *current* – **48.9%**

Acadameetrics Prices and Transactions Accuracy Measures



- “back-check” accuracy of indexation
- duplicate sales from Land Registry
- calculation of mean difference and confidence limits

House Prices

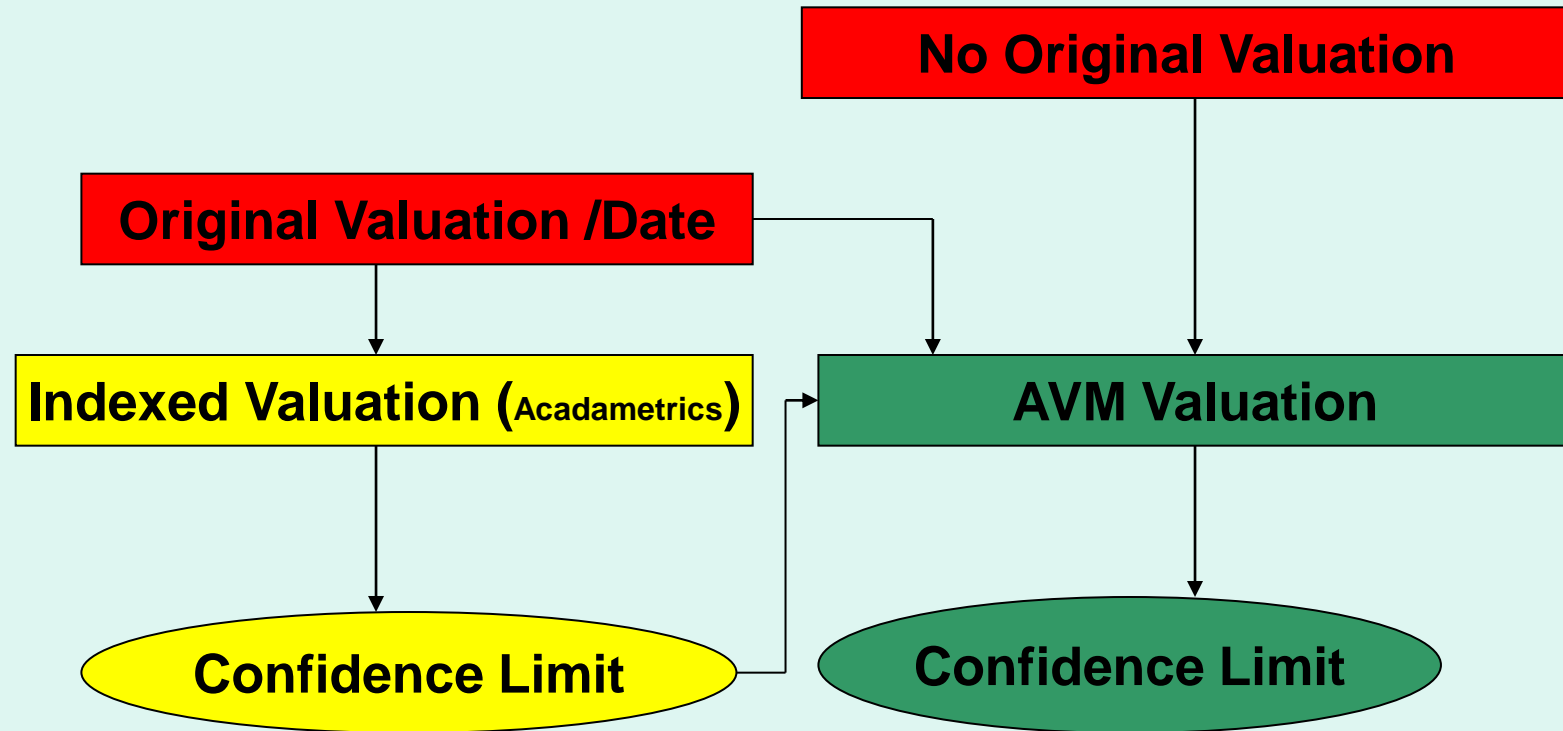
the Acadametrics House Price Index

What is a house price? At individual property level, the answer is easy-peasy. Within geographies, a house price is a matter for an index and the picture is far from clear!

Websites make it easy to find the price which a neighbour paid for the house next door. But, even in an estate, such matters as the view and additions of bedrooms and bathrooms can make a price at street level a moveable feast. By the time anyone asks the price of an average house, nationally, such further factors as: "does national mean England, England & Wales, with or without Scotland and Northern Ireland?"; "is an average or a 'standardised' price required?"; "is the price to be based upon prices at which houses are offered by estate agencies; prices from Halifax and Nationwide using the surveyor valuations upon which their mortgage offers for the month were based; mortgage completion values; transacted prices recorded at the Land Registry?". The monthly Acadametrics House Price Index is based upon transacted data and is authoritative with regard to England& Wales.

Bespoke Solutions

a hybrid of an index valuation series and an AVM that matches value and need



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