Actuarial Techniques in Banking

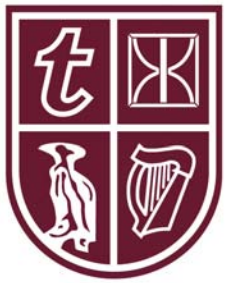
David O'Connor
Colm Fitzgerald
Marian Keane
Niamh Crowley

The Society of Actuaries in Ireland, 31 May 2010

Format for this evening

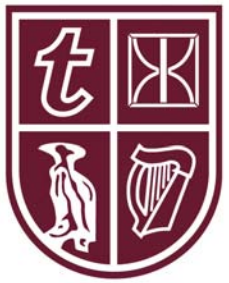
- Introduction (DO'C)
  - Overview of WP activities
  - Brief summary of activities not covered by later speakers
- Elements of Actuarial Control Cycle
  - Valuation (CF)
  - Reserving (MK)
  - Capital (NC)

Workstreams



- Data
- Risk Factors
- Pricing Methods
- Claims reserving methods for loan loss provision
- Capital
- Governance
- Application of an actuarial control cycle
- Risk Transfer
- Consumer and Regulatory Issues

Volunteers and work method



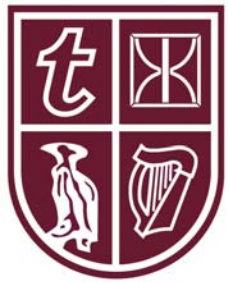
- Alisa.Timis
- Brian Foley
- Colm Fitzgerald
- Colm Fitzpatrick
- David O'Connor
- Derek.Bain
- Daragh Hayes
- Declan Lavelle
- Fergal O'Shea
- George Maher
- Jason Liyp
- John Caslin
- John Hannon
- Louise.Thomas
- Manalur Sandilya
- Marian Keane
- Niall Dillon
- Niamh Crowley
- Noel Garvey
- Paul Dalton
- Paul Duffy
- Paula Iencean
- Rjchard Murphy
- David Roberts
- Seamus Creedon
- Sinead Kiernan
- Stephen Loughman
- Steve Gardner
- Tom Barry
- Zora Law

- https://web.actuaries.ie/forum/index.php + meetings

Data

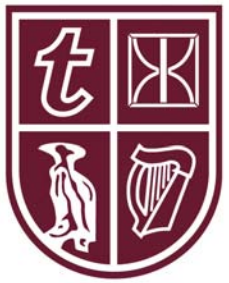
- External Data
  - Poor information on prices of assets on which loans are secured
    - Historically a lot of unrealistic guides
    - Now limited disclosure on low transaction volume
    - PTSB Index moved monthly to quarterly
    - Land and site values were derived from these data
  - Ample macroeconomic and demographic data

Data



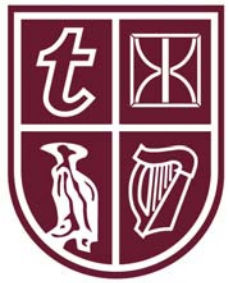
- Customer Data
  - Historically bank data had excessive financial focus (insurers were product focused)
    - Short history
    - Questions over “memory” built into data management systems
  - Data retention prospectively is now more robust
  - Sufficient for bank internal models, but may fall short of “full GLM” standard
  - Content and data retention could benefit from review

Risk Factors / Pricing



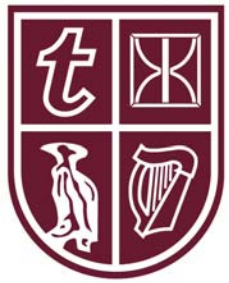
- Focus on Retail
  - Commercial assumed Case Negotiated
- Charge margin over WACC
  - Covers Expected credit losses
    - Expected Defaults (“PD”)
    - Expected Loss Severities (“LGD”)
  - Liquidity premium (lending long term, borrowing short term)
  - Prepayment risk
  - Expenses
  - Profits
- Factors for credit score (y/n) not price, except in some cases
  - Loan to Value, Debt to Income, Residential/BTL

Risk Factors / Pricing



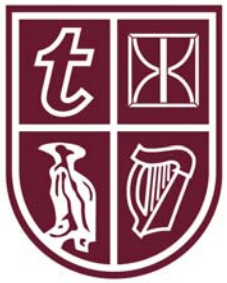
- Lack of granularity / big cross subsidies
  - Question over political / regulatory acceptability of differential pricing
  - Balance pricing flexibility vs rejection rate on loan applications
- Need to understand “sub portfolios”
- Economic Capital tracks Basel II
  - built from case by case loan classification
  - not mirrored in pricing
- Economic risks are not diversifiable
  - more concentrated than natural catastrophe

Consumer and Regulatory Issues



- Three propositions worthy of an evenings discussion in their own right
  - Deposit / insurance guarantee schemes should be defined in advance (eligibility, coverage, multiple claims etc)
  - Prudential oversight should focus to a greater degree on liabilities that are subject to deposit guarantee
  - Where investors bear the risks of default, regulation needs to focus on market transparency and criminal behaviour
- The insurance corollary is that you can no longer licence a new composite

Property Valuation in Banking – An Actuarial Control Cycle Approach



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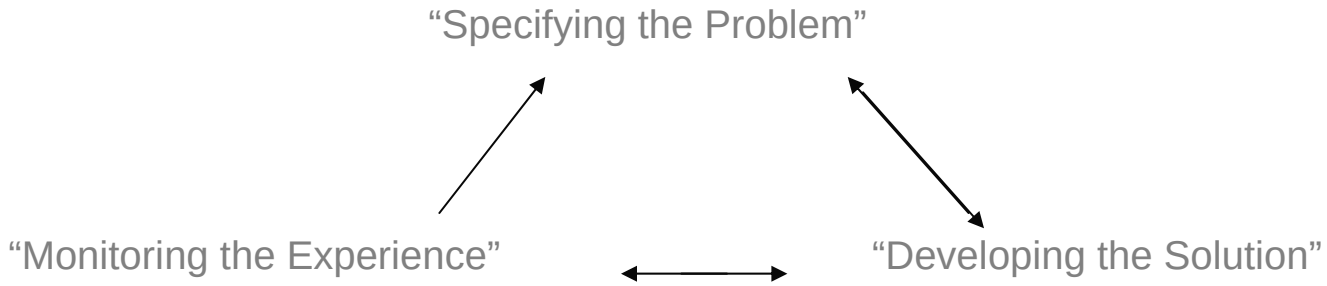
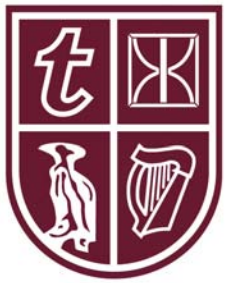
Actuarial Control Cycle



In the context of the “External Environment” & “Professionalism”

A Feedback Loop !

Specify the Problem



- What is the purpose of a property valuation?
- Is there more than one purpose?
- Is there more than one type of valuation?

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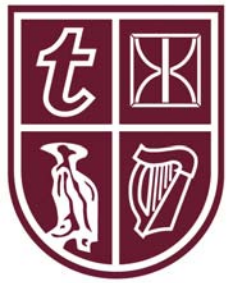
Specify the Problem



- External Environment - we have just gone through one of the biggest property bubbles (and busts) in Irish history.
- There seemed to be a lack of appreciation of anything other than ‘market values’ during this time.
- Are there other property valuation methodologies that banks could use? And that could possibly help avoid this happening again?

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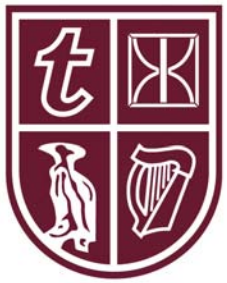
Developing the Solution



- Looking to the “External Environment” we see…
  - The EBS/DKM Affordability Index
  - Ratio of Average House Prices to Average Incomes
  - Ratio of Average House Prices to Average Disposable Incomes
  - Research from
    - EBS / DKM Economic Consultants
    - ESRI
    - Other (Irish Mortgage Brokers, PropertyWeek.ie, Peter Bacon….)

- What are the advantages and the drawbacks of each of these?

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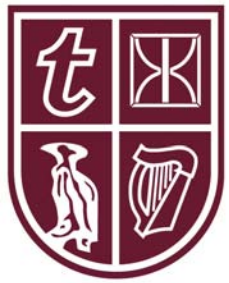
Developing the Solution



- The EBS DKM Housing Affordability Index
  - a measure of the proportion of after tax income required to meet *first year* mortgage repayments for an 'average' first-time buyer (FTB) working couple, each on average earnings. It takes into account changes in mortgage rates, changes in the level of mortgage interest relief, and is based on average earnings and new FTB house prices in Dublin and across the State as a whole

- Drawbacks
  - Mismatch by term – how affordable is paying back the entire mortgage, not just the first years repayments?
  - No use of the long term mortgage finance cost

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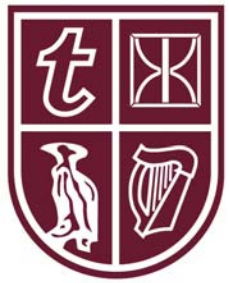
Monitoring the Solution



- Indicators were suggesting that the property market was overvalued. Despite this property prices kept going higher for nearly another 10 years.
- So we need to **feed this back** into our Specification of the Problem!

- Professionalism – recognising that others have different views and that they may be correct

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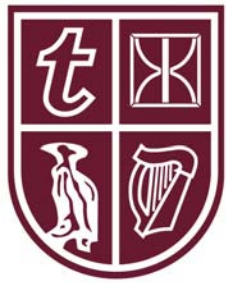
Monitoring the Solution



- Why did property prices go from ‘overvalued’ to ‘very overvalued’ and then to ‘extremely overvalued’
- One reason is the huge moves in the Irish Money Supply during this time
- This primarily came from a significant evolution of the ‘Fractional Reserve System’

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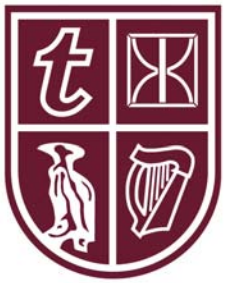
Money Supply & House Prices



- Quantity Theory of Money
  - PQ = MV
    - P = average price level
    - Q = quantity of all goods
    - M = money supply
    - V = velocity of money
- What happened in Ireland?
  - Explaining the ‘Irish Credit/Money Supply Bubble’

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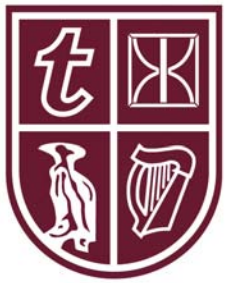
Evolution of Money Supply



- Renaissance:
  - Bank has 10 Lira - can lend 100 Lira
  - The 10 Lira was to cover liquidity and bad debts
- Late 1980s, early 1990s: Liquidity needs of the public decrease with introduction of ATMs
  - Banks need less liquidity. Bank has €9, can lend €100
- 1990s: Banks begin to use more derivatives and off-balance sheet instruments. Credit cards.
  - Banks has €8, effectively lending €125

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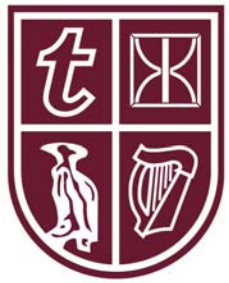
Evolution of Money Supply



- 2000s: Banks usage of derivatives and other off balance sheet instruments increases exponentially. Securitisation mushrooms. Agency Risk.
  - Banks has €7-€8, effectively lending €250
- Printing/debasement of money – to the benefit of the banks!
  - We were robbed!
- Late 2000s: Credit Bubble burst. Bank losses are say 10% of €250 = €25. They have €8 = massive insolvency.

- "When private assets go bad they usually become public assets"
  - Governments step in an take up the losses.
  - Massive increase in Government leverage (and money supply)
  - Government debt versus realistic tax generation capability
  - Governments insolvent.

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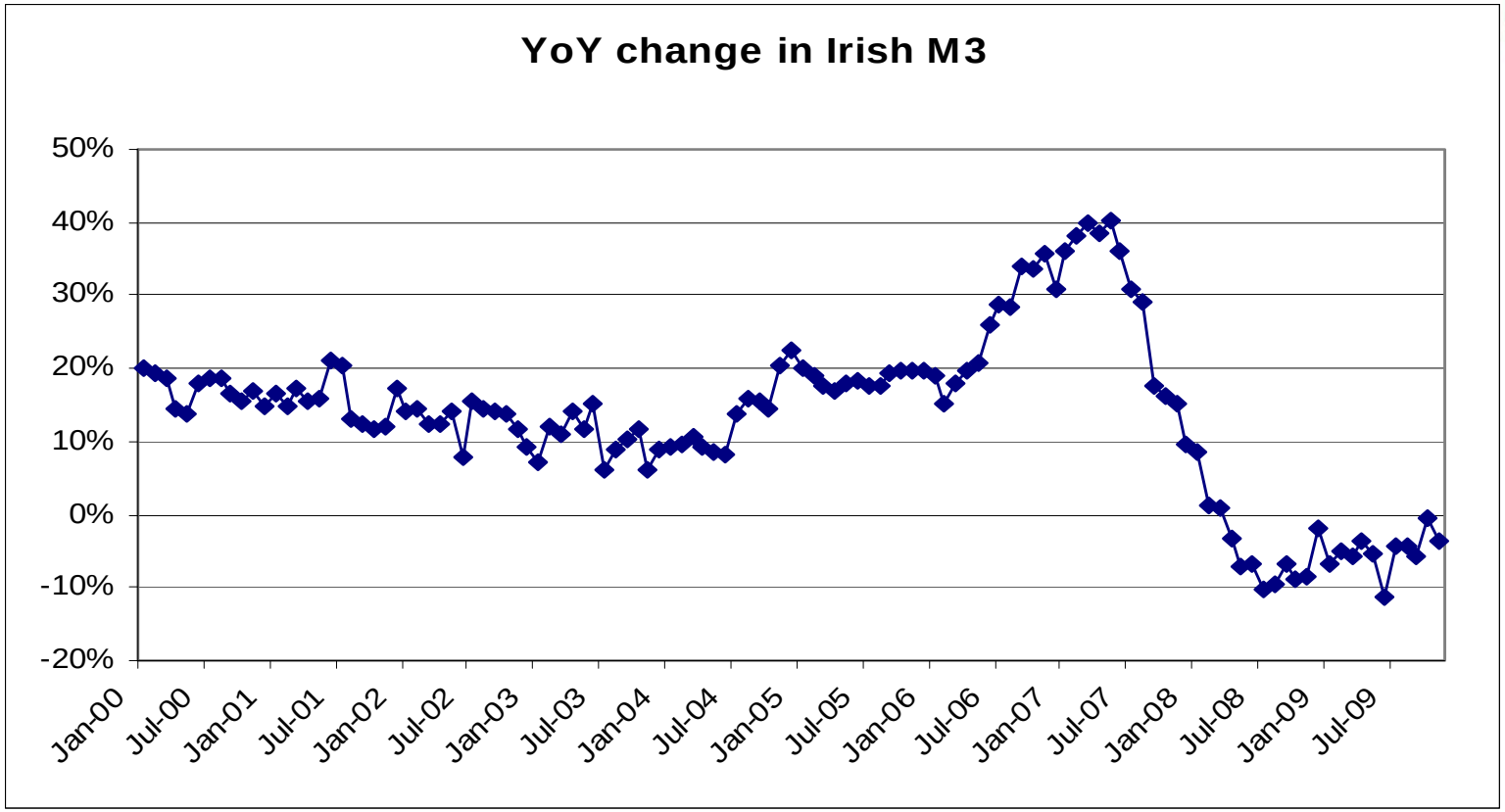
Evolution of Money Supply



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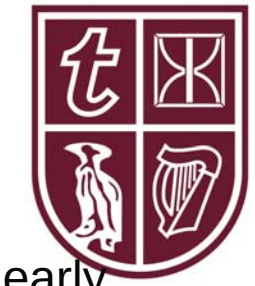
Evolution of Money Supply



- IFSRA removed the 2.5 times earnings multiple limit guidelines in early 2000s.
- From 1999 to 2007
  - Money Supply increasing by ~20% p.a.
  - Consumer price inflation was approx 3%p.a.
  - Economic Growth was ~5%-7%p.a.
- This left asset prices (in particular house prices) needing to adjust to balance the Quantity Theory of Money equation.

- Irish house prices fluctuated between 3 and 6 times average earnings from 1980 and 1997.
- In 2006/2007, Dublin Second-Hand House prices reached near 17 times average earnings

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Money Supply & House Prices

	M	V	P	Q	= M - P - Q				
	M3 Growth	**Velocity**	**CPI Inflation**	**GDP Growth**		**House Prices**	**Affordability Index**	**Salary Inflation**	**Stock Market**
1996	15.7%	?	1.7%	9.6%	4%	13%	n/a	4%	22%
1997	19.1%	?	1.4%	12.3%	5%	19%	n/a	4%	49%
1998	18.1%	?	2.4%	8.4%	7%	27%	n/a	4%	23%
1999	20%	?	1.6%	11.2%	7%	20%	n/a	4%	0%
2000	15%	?	5.6%	10.1%	-1%	15%	n/a	7%	14%
2001	17%	?	4.9%	6.8%	6%	8%	n/a	10%	0%
2002	9%	?	4.6%	6.4%	-2%	9%	n/a	4%	-30%
2003	6%	?	3.5%	4.9%	-2%	15%	n/a	4%	23%
2004	23%	?	2.2%	5.2%	15%	11%	n/a	6%	26%
2005	20%	?	2.5%	5.9%	11%	12%	21.60%	5%	19%
2006	31%	?	4.0%	6.4%	20%	12%	26.40%	6%	28%
2007	10%	?	4.9%	6.1%	-1%	3%	23.00%	4%	-26%
2008	-2%	?	4.1%	2.9%	-9%	-7%	18.20%	3%	-66%
2009	-7%	?	-4.5%			-25%	13.10%	-4%	27%
1996 to 2007	**540%**		**47%**	**145%**		**360%**		**82%**	**210%**

Sources: Central Bank of Ireland, Environ.ie, CSO, Bloomberg, DKM/EBS

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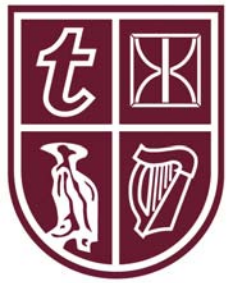
Monitoring the Solution



- So in terms of our Monitoring of the Solution, it could be argued that the money supply should be taken into account when setting property valuations.

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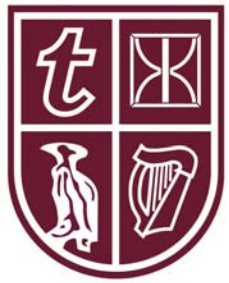
Feedback to Problem Specification



- We are looking for a Property Valuation measure which takes into account some combination of credit growth, the money supply and absolute and relative debt levels

- Or alternatively a Property Valuation measure that removes the effect from the big increases and decreases in the money supply and credit availability.

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Developing the Solution #2

- Possible solutions:
  - bring back the 2.5 times earnings multiple limit
    - It could be argued that the abolishing of this limit was one of the main contributing factors to the Irish credit bubble
  - use a model to estimate a **theoretical house price** based on the long term average ratio with average incomes and house prices, and/or some other methods – and base mortgage lending on these values
  - more complicated models
  - practical problems
  - opportunity for actuaries

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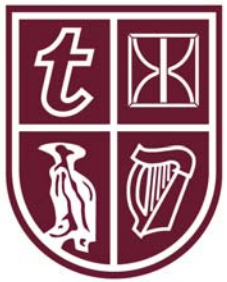
Q&A & Comments



Thank you for your attention

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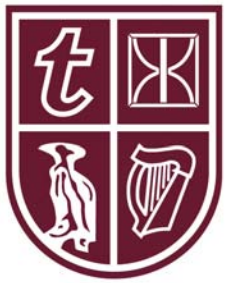
Property Valuation in Banking – An Actuarial Control Cycle Approach



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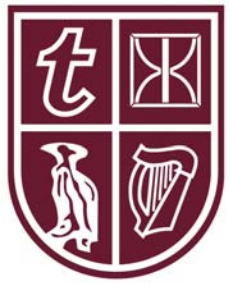
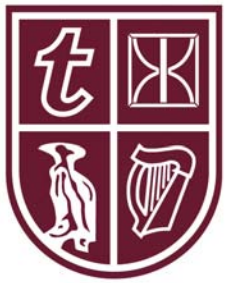


Actuarial Techniques in Banking: Loan Loss Provisioning

Marian Keane

The Society of Actuaries in Ireland, 31 May 2010

Actuarial Techniques in Banking: Loan Loss Provisioning



Agenda

- Current accounting rules (IAS 39)
- Pro-cyclicality
- Alternatives to IAS 39
- Case study – Incurred Loss vs Expected Loss
- Case for actuarial involvement

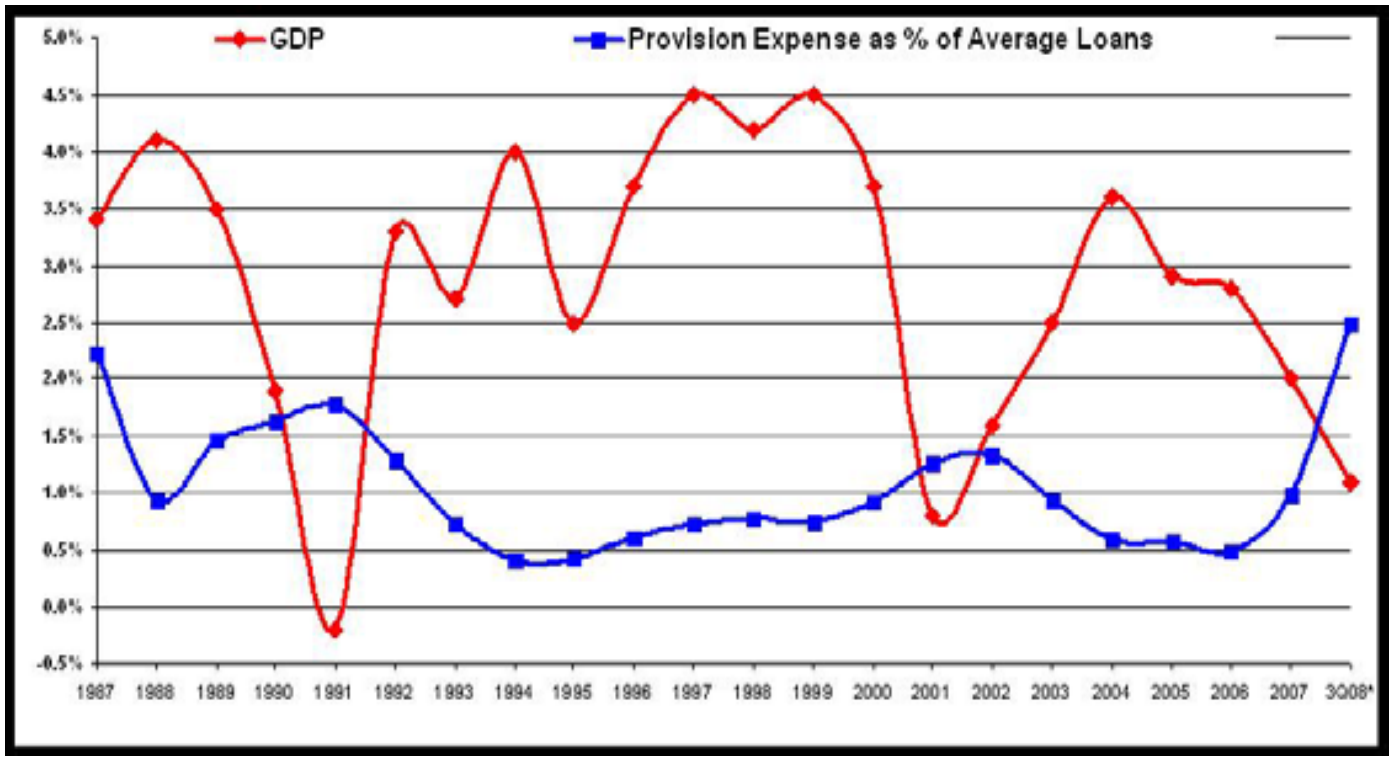
Loan Loss Provisioning: IAS39 – Incurred Loss Model

"International Accounting Standard (IAS) 39 requires that there is objective evidence of impairment and that the loss has been incurred.

The Standard does not permit the recognition of expected losses, no matter how likely these expected losses may appear."

(Bank of Ireland Annual Report year-end 31 Mar 2009)

Loan Loss Provisioning: Pro-cyclicality of Incurred Loss Method



US Nationally-chartered Banks: Loss Provisioning and GDP growth.

Source: Report of the Financial Stability Forum Working Group on Provisioning, March 2009

Loan Loss Provisioning: Alternatives to Incurred Loss Model

Desirable features:

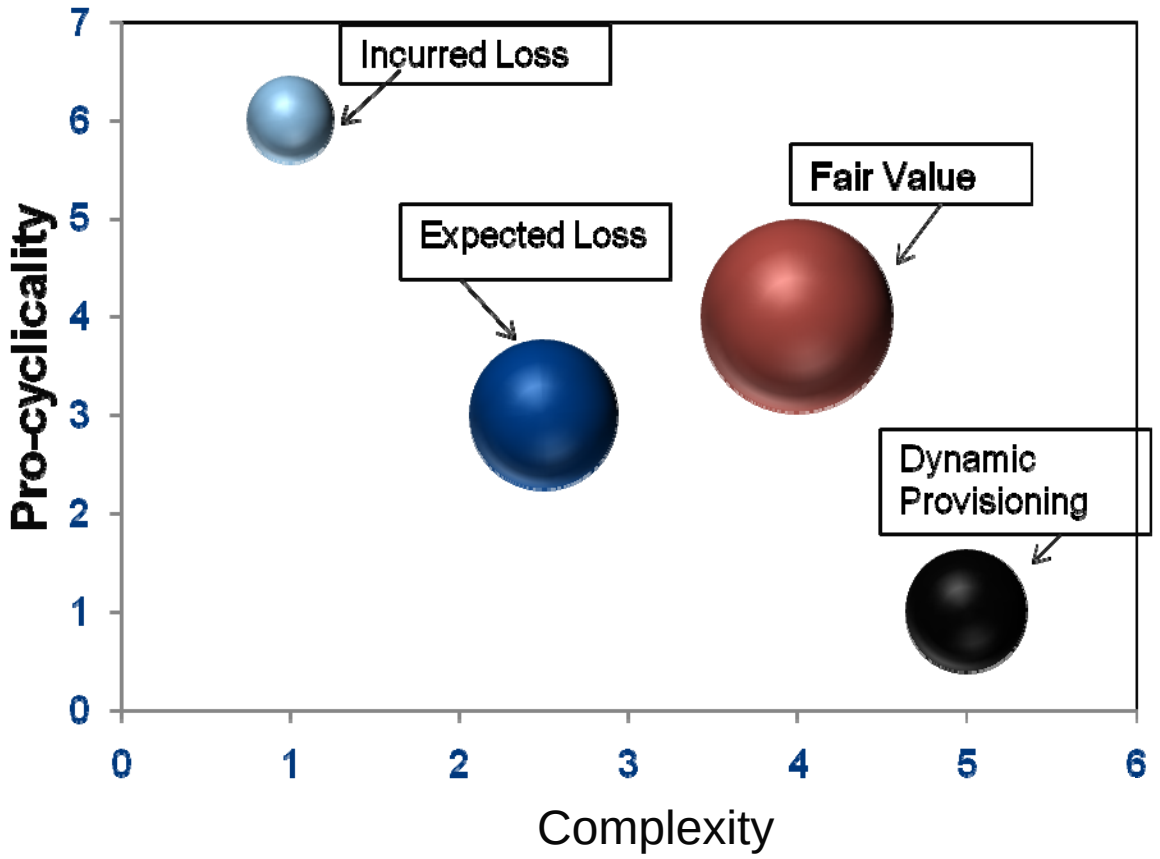
-Robust

-Not open to manipulation

-Not pro-cyclical

-Consistent with other relevant calculations

-Data available, methodology not overly complex

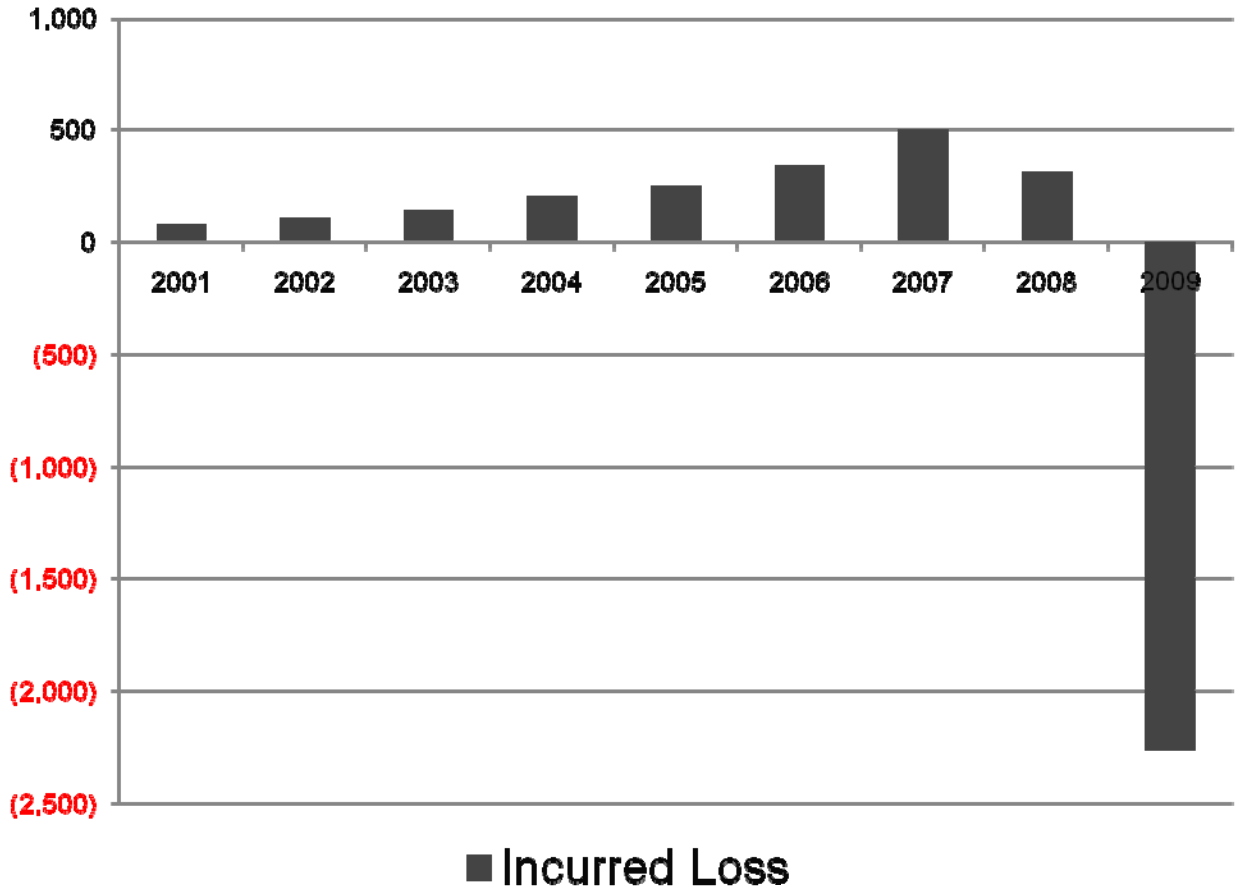


(note: size of bubble represents subjectivity)

Loan Loss Provisioning:
Expected Loss Method - Case Study

<u>XYZ bank pre-tax results €m</u>:

Scenario 1 – using Incurred Loss method

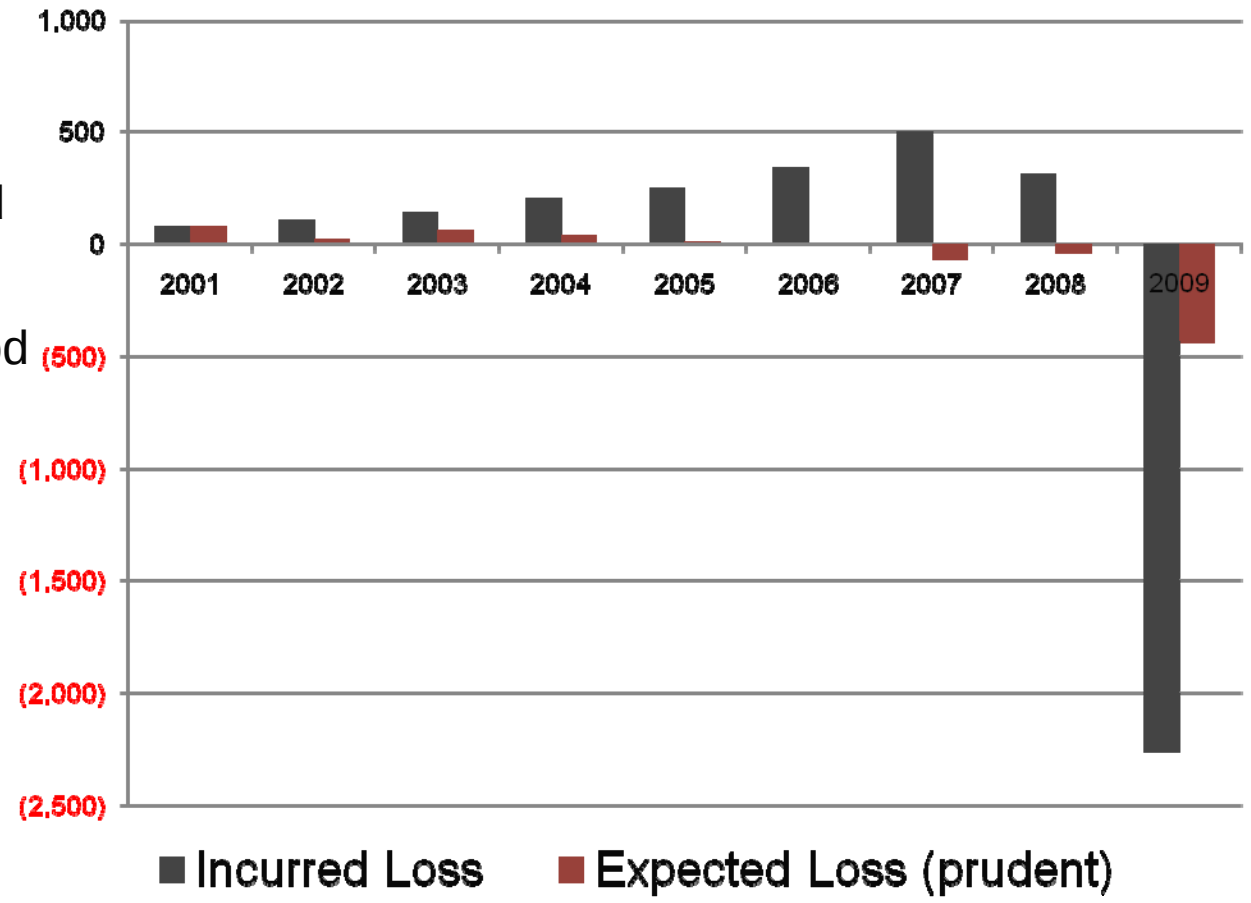


Loan Loss Provisioning: Expected Loss Method: Case Study

XYZ bank pre-tax results €m:

Scenario 1 – using Incurred Loss method

Scenario 2 – using Expected Loss method (prudent basis)



Loan Loss Provisioning: Expected Loss Method: Case Study

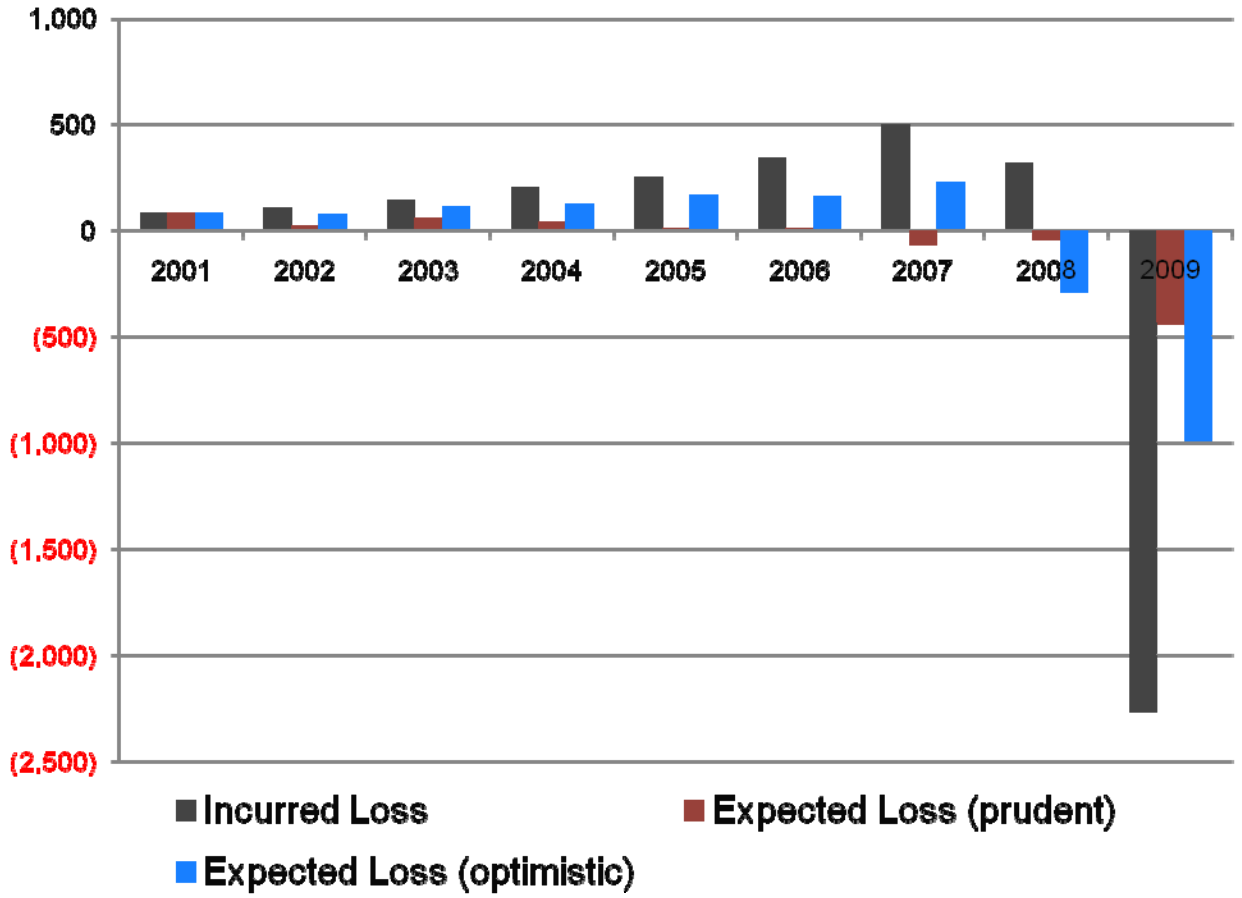
<u>XYZ bank pre-tax results €m</u>:

Scenario 1 – using Incurred Loss method

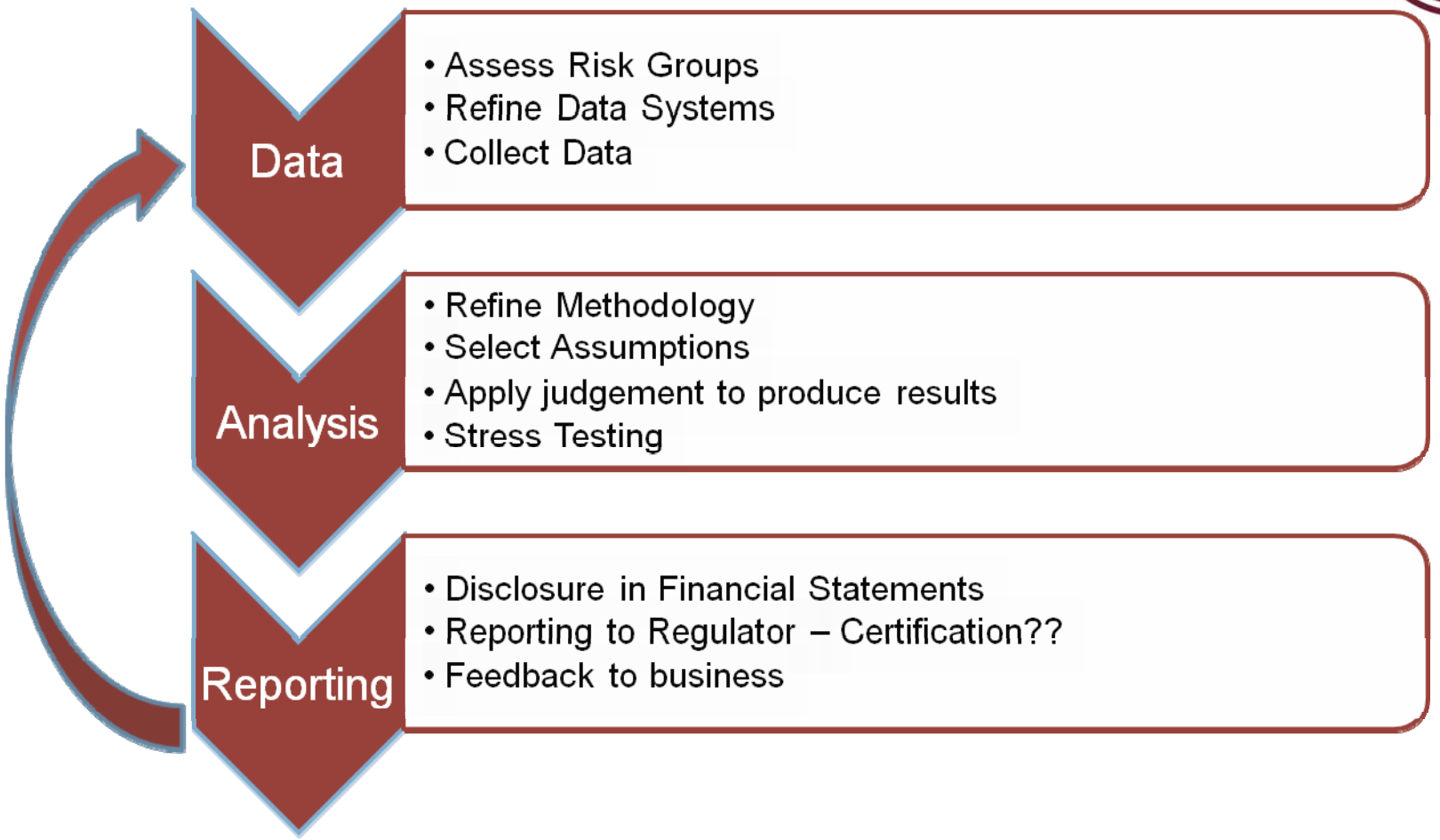
Scenario 2 – using Expected Loss method (prudent basis)

Scenario 3 – using Expected Loss method (optimistic basis)

Conclusion: Careful selection of assumptions is essential



Loan Loss Provisioning: Where can actuaries add value?



Actuarial Techniques in Banking: Loan Loss Provisioning

Summary

- New accounting rules will require greater judgement
- Actuaries can add value

Actuarial Techniques in Banking: Capital Modeling

Niamh Crowley

The Society of Actuaries in Ireland, 31 May 2010

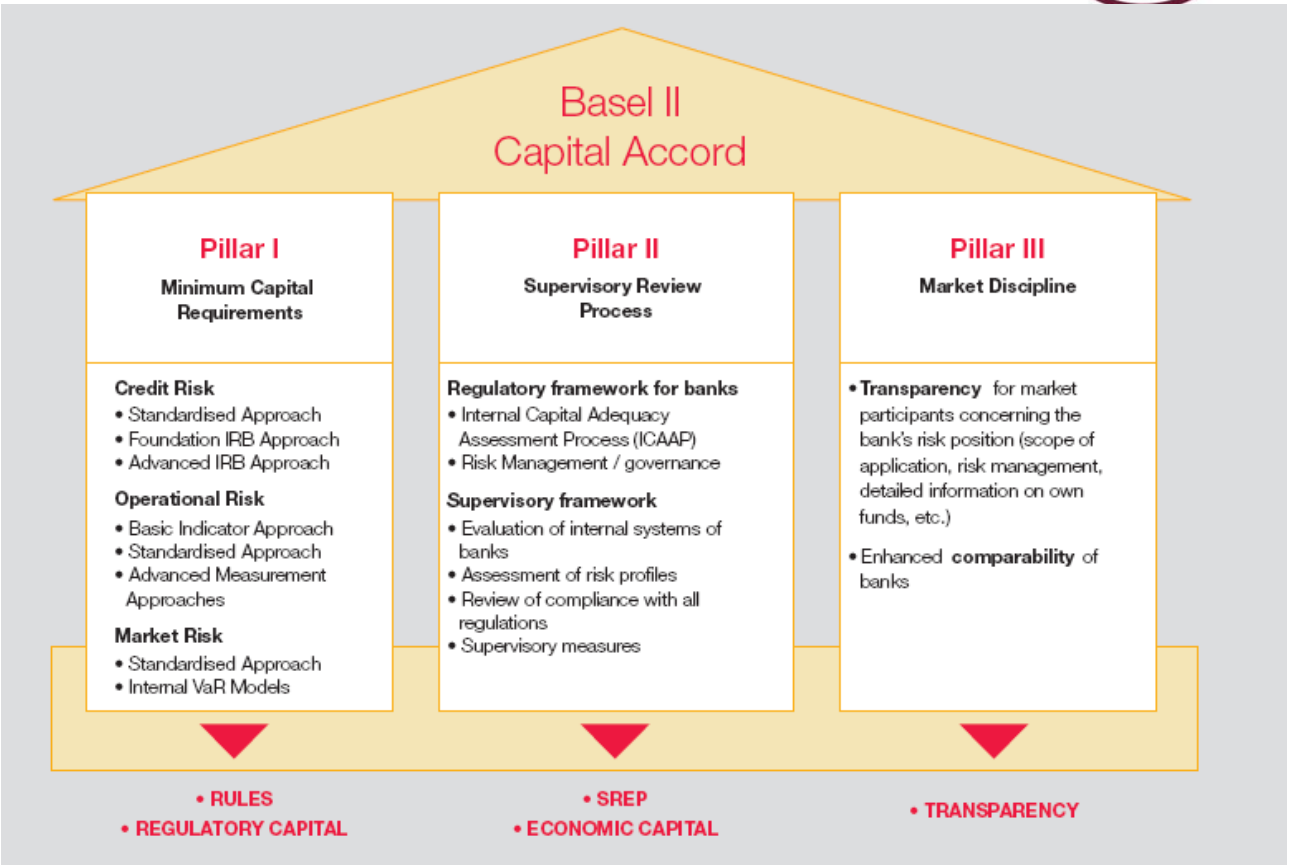
Capital Modelling

Agenda

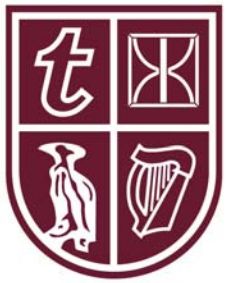
- Basel II – Background and Ideals
- Capital - Core Calculations
- Basel II Deficiencies
- Current Developments
- A role for actuaries?

Basel II – Banking Equivalent of Solvency II

- Similar “three pillars” concept
- Minimum Capital
- Supervisory Review
- Market Discipline

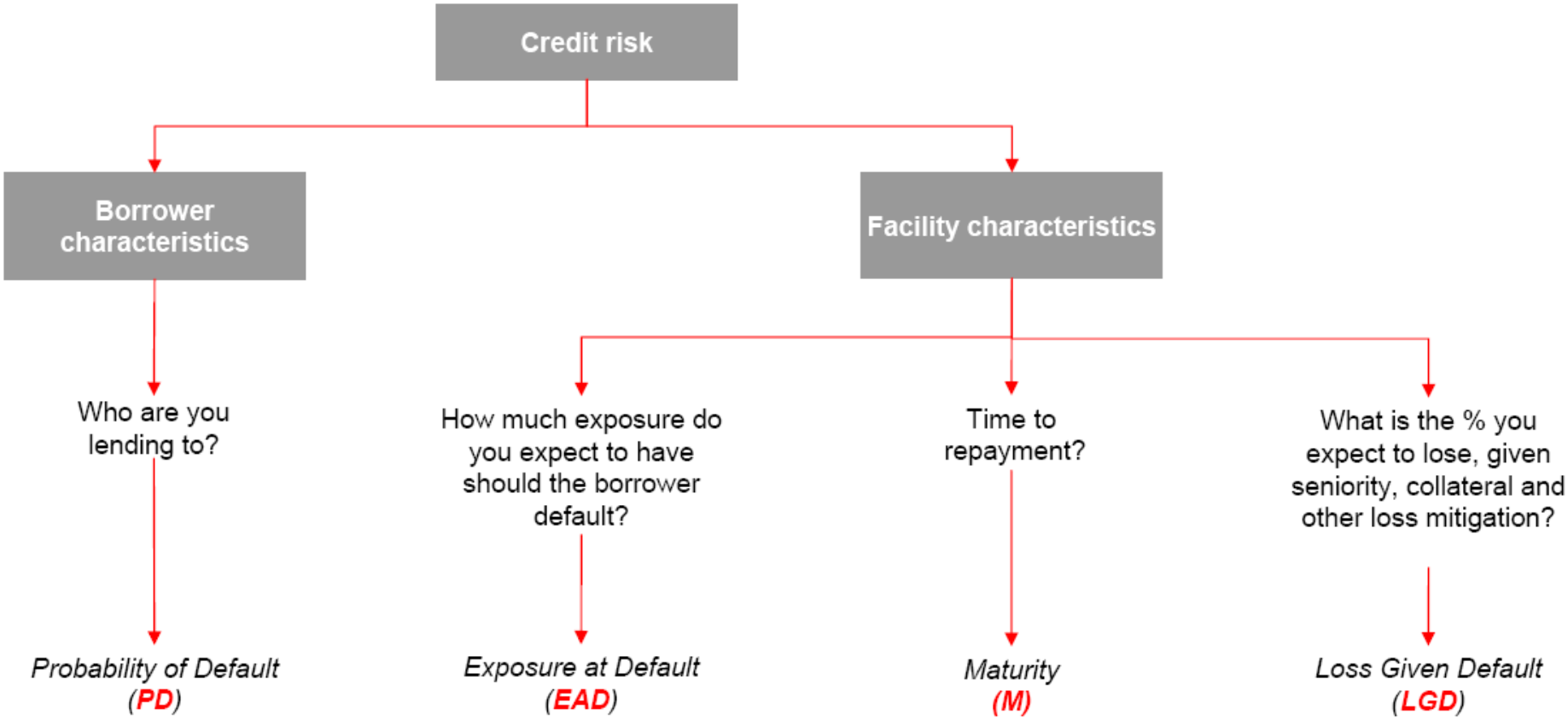


Basel II Ideals



- Align required capital with risk
- More sophisticated risk management
- Embed a risk culture
- Allowance for other risks (operational etc)
- Integrate global financial system
- Expectations of capital reduction! (pre crisis)

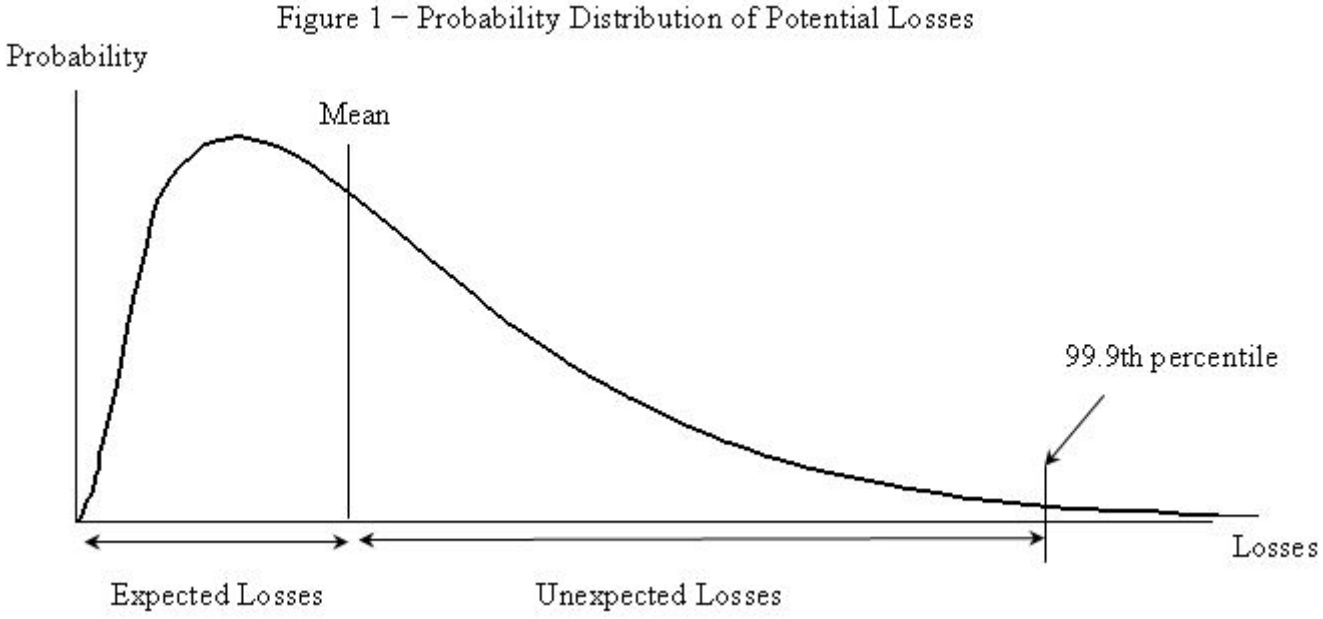
Core Calculation – Parameters of Each Loan



Core Calculation – Capital

Credit Risk

- Expected Loss (EL) = PD * LGD * EAD
- Unexpected Loss ~ Vasicek distribution @ 99.9%
- Required Capital = Expected Loss + Unexpected Loss



Market Risk: VAR Operational Risk: ~ Income

Parameterisation Issues

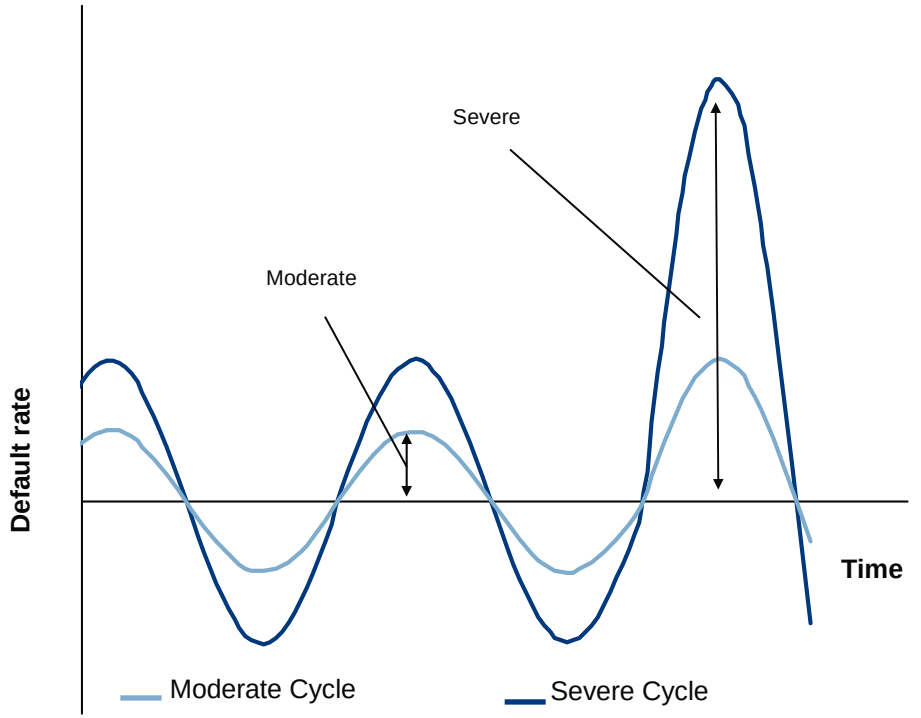
- Internal Models
  - PDs, LGDs – over optimistic?
  - Relatively benign pre 2008 historic data
  - Lack of conservatism?

- Standardised Approach
  - PDs based on Credit Ratings (S&P, Moodys etc)
  - How reliable have these been?

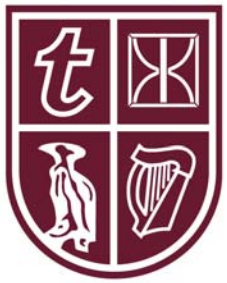
- Different “ratings philosophy” in different banks – different capital requirements for the same risk!

Procyclicality

- Crisis-aggravating and upturn-reinforcing
- PD, LGD rise in downturn
- Increasing capital requirement
- Bad time to raise capital
- Exacerbates credit crunch
- Blanket increases do not remove this cyclicality

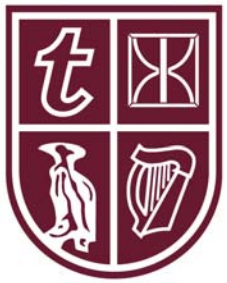


Pillars 2 and 3 not embedded



- Pillar 1 – a **minimum** capital requirement
- Pillar 2 envisioned significant stress testing
- Extra capital cushion if required
- Deficient Enforcement?
  - Inconsistencies
  - Regulatory oversight
  - Senior management engagement
  - Failure against “use test”?

Addressing the Deficiencies



- Basel Committee are reviewing Basel II
  - 2012 target implementation
- Counter-cyclical capital buffers – in development
- Some quick win refinements issued in July 2009
- Greater emphasis on Pillar 2 internal capital adequacy assessment (ICAAP)
- Sound stress testing principles
- Even greater Pillar 3 disclosure requirements

How can actuaries add value?

- Actuarial experience in:
  - assumption setting
  - modelling
- Pricing methods
- ERM leaders (aim of profession)
  - Pillar II risk management training
  - “Agency Risk” Awareness
- Lessons can be taken into and from Solvency II
- Actuarial Control Cycle\Risk culture

We also recognise that there are very capable non-actuarial specialists who are suitable for these fields