What's A Valuation Actuary to Do? Mortality, Credibility and VM-20

2010 Valuation Actuary Symposium

Session 25TS – Credibility Theory

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Mortality, Credibility and VM-20

- Decide on Credibility Method
- Evaluate Your Company's Mortality
- Credibility under VM-20
- Try Different Variations on Credibility
  - Set up your techniques and try low-cost variations
  - Do results justify implementation costs?
- If the Results of the Variation(s) are Worth It …

Decide on Credibility Method

- Two Credibility Methods in Common Use
  - Greatest Accuracy Method (aka Bühlmann Empirical Bayesian Method)
  - Texts and Credibility Theory Practices point to being superior
  - Performance – Requires statistical agent, detail data from multiple companies
- Limited Fluctuation Method
  - Easy to try low-cost variations on Credibility
  - Performance – You can do with your company's data

Decide on Credibility Method

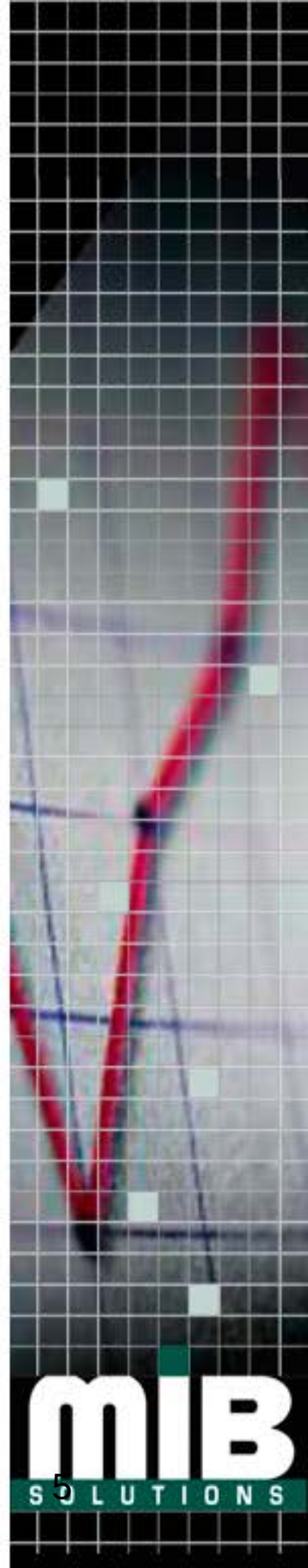
- By Count or By Amount
  - Count and amount similar mortality results? Use count
  - If different, use amount

SOA 2005-07 Individual Life Experience Report
Select Period Results based on 2001 VBT

	2002 - 2004	2004 - 2005	2005 - 2007
By Face Amount	71.5%	67.4%	66.3%
By Policy	88.2%	82.7%	80.6%

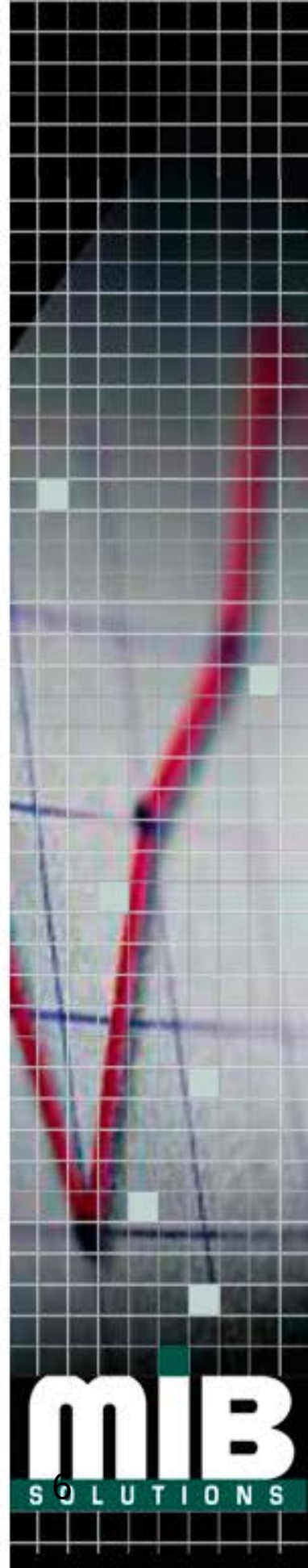
Decide on Credibility Method

- Use Limited Fluctuation Method by Amount
  - Evaluate different variations of credibility
  - Do it yourself, with your company's data and Excel file 'Limited Fluctuation Method Mortality Examples' visit http://www.soa.org/research/research-projects/life-insurance/research-credibility-theory-pract.aspx



Evaluate Your Company's Mortality

- Look at Your Company's Mortality Study
- Examine Your Company's Pricing Assumptions
- Compare Similar Industry Experience



Look at Your Company's Mortality Study

VAL Life Insurance Company

Five Year Mortality Study

Nonsmoker Preferred Class Structure of 3 (NS PCS 3) Durations

1-10, Expected Basis 2001 VBT

Super Preferred	Preferred	Residual Standard
44.2%	58.3%	80.6%

Examine Your Company's Pricing Assumptions

VAL's Mortality Pricing Assumptions for

NS PCS 3 as % of 2001 VBT

Super Preferred	Preferred	Residual Standard
45%	60%	80%

VAL's reinsurer uses VAL's pricing mortality in its coinsurance quote

Compare Similar Industry Experience

SOA's 2005-07 Individual Life Experience Report

NS PCS 3 mortality

Durations 1-10 , Expected Basis 2001 VBT

Risk Class	1	2	3
A/E Ratio	46.4%	57.5%	79.1%

Evaluate Your Company's Mortality

- VAL's Valuation Actuary considers the results of its experience study, reinsurance agreement & SOA's 2005-07 individual life report
  - Initial assessment that VAL's NS PCS 3 probably around the three results
- Now, what's a Valuation Actuary to do with credibility under VM-20?

Credibility under VM-20

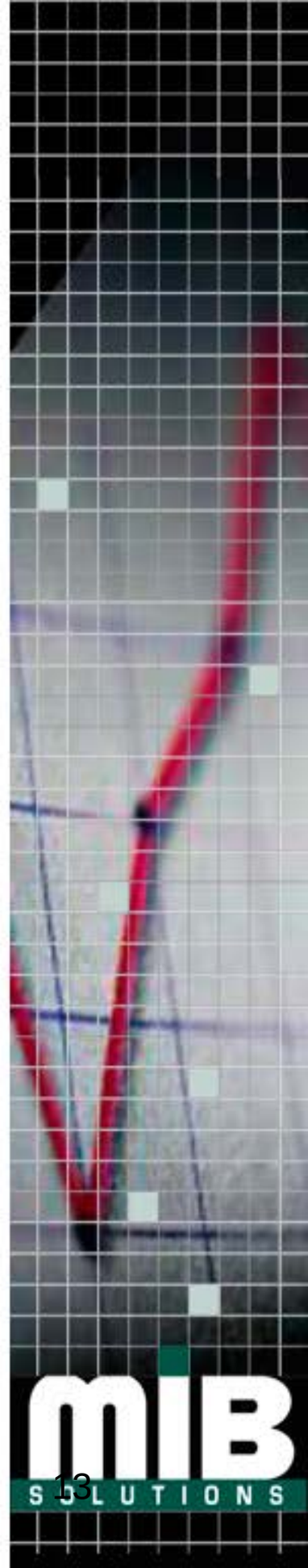
- Use Limited Fluctuation Method (acceptable under VM-20)
  - What is Credibility Segment for VM-20?
    - Apply credibility procedure to each credibility segment
    - Use most recent 3 years of experience up to 10 years of experience
    - Plans of insurance with similar underwriting and mortality experience
    - At least 30 deaths (as Stuart Klugman points out, you will need many more than that!!!)
  - Examples of Credibility Segments follow

Examples of Credibility Segment under VM-20

- VAL's Three Credibility Segments of NS PCS 3
  - Best Preferred Class
  - Preferred Class, and
  - Residual Standard
- Each Credibility Segment only has duration 1-10
- Credibility mortality limited to duration 1-10, grade to applicable industry table at durations 11+

Credibility under VM-20

- Apply credibility procedure to each credibility segment
  - Use experience data for the credibility segment
  - Use appropriate industry experience
  - Produce credibility adjusted experience
  - Examples of credibility procedures for VAL's NS PCS 3



Credibility under VM-20

- Apply Credibility Procedure to VAL's Best Preferred Class credibility segment
  - X is *experience data* for VAL's Best Preferred Class credibility segment
  - H is *applicable industry experience* corresponding to VAL's Best Preferred Class credibility segment
  - Use *Excel sheet, Limited Fluctuation Method* - determine 'Z', credibility factor for VAL's Best Preferred Class
  - *Credibility mortality* for VAL's Best Preferred Class = ZX + (1—Z)H

Credibility under VM-20

- Apply Credibility Procedure to VAL's Preferred Class credibility segment
  - X is experience data for VAL's Preferred Class credibility segment
  - H is applicable industry experience corresponding to VAL's Preferred Class credibility segment
  - Use Excel sheet, Limited Fluctuation Method - determine 'Z', credibility factor for Preferred Class
  - *Credibility mortality for VAL's Preferred Class = ZX + (1—Z)H*

Credibility under VM-20

- <u>Apply Credibility Procedure</u> to VAL's Residual Standard credibility segment
  - X is *experience data* for VAL's Residual Standard credibility segment
  - H is *applicable industry experience* corresponding to VAL's Residual Standard credibility segment
  - Use *Excel sheet, Limited Fluctuation Method* - determine 'Z', credibility factor for Residual Standard
  - *Credibility mortality* for VAL's Residual Standard credibility mortality

    = ZX + (1—Z)H

Try Different Variations on Credibility

Set Up Your Techniques and Try Variations

- Techniques
  - *Excel sheet, Limited Fluctuation Method*
  - *Experience data* for each credibility segment
  - *Applicable industry experience* for each credibility segment
- Result of Technique
  - *Credibility mortality – Is the result worth the effort?*

Try Different Variations on Credibility

Try Variations – These are taken from VM-20

- Vary *Experience data* for each credibility segment
  - Your company's experience study
  - Supplemented experience – add similar experience to your experience study (Low-cost: Increase your experience study deaths and exposure by re-sampling your data!)

Try Different Variations on Credibility

Try Variations – These are taken from VM-20

Applicable industry experience set to Industry Basic Table

- UCS Industry Basic Table
  - Defined default Industry Basic Table in VM-20 by using Underwriting Criteria Score (UCS) method on credibility segment
  - UCS beyond scope of this talk
- **Plus or Minus 'X' Industry Basic Tables** from UCS Industry Basic Table
  - VM-20 Drafting Note suggests that 'X' = 2
  - Let's try **Minus 2 Industry Basic Tables** from UCS Industry Basic Table

Vary Input for Experience Data

- Credibility Adjusted Rates
  - *Your Company's Experience Study*
  - *UCS Industry Basic Table*
- Credibility Adjusted Rates from Supplemented Experience:
  - *'Supplemented experience'* (Re-sampled from your experience)
  - *UCS Industry Basic Table*
- After margin added, are Credibility Adjusted Rates from Supplemented Experience that different from Base Case UCS Method?
- Does the difference justify the cost and effort of obtaining Supplemented Experience Study?

Vary Input for Applicable Industry Experience

Credibility Adjusted Rates from Minus 2 Tables:

- *Your Company's Experience Study*
- *Minus 2 Industry Basic Tables from UCS Industry Basic Table*

Credibility Adjusted Rates from Supplemented UCS Method and Minus 2 Tables:

- *Supplemented experience'* (Re-sampled from your experience)
- *Minus 2 Industry Basic Tables from UCS Industry Basic Table*

After margin added, are these Credibility Adjusted Rates that different from Credibility Adjusted Base Case?

Would the differences justify the cost and effort of verifying/ documenting 2 Industry Basic Table difference?

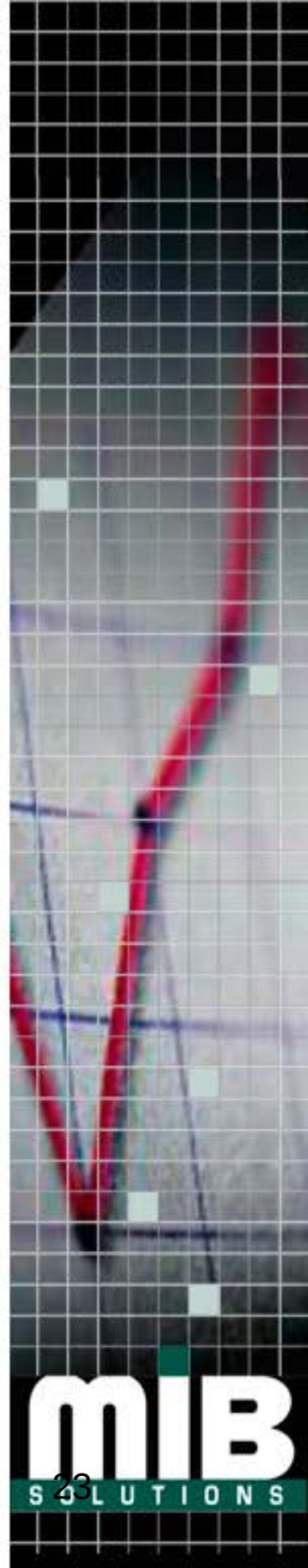
If Variation(s) Are Worth It …

- If difference in credibility adjusted rates for credibility segments do NOT justify extra cost and effort:
  - Stop. Use your company's experience and UCS Industry Basic Table
- If difference in credibility adjusted rates for credibility segments DOES justify extra cost and effort:
  - Produce supplemented experience and/or
  - Prove and document the 2 Industry Basic Table difference from UCS Industry Basic Table

If Variation(s) Are Worth It …

Produce supplemented experience

- Talk to reinsurers about providing data that is similar to your credibility segments in type of underwriting and mortality outcomes
- Sorry, a statistical agent that accumulates nationwide mortality data is not yet in operation



If Variation(s) Are Worth It …

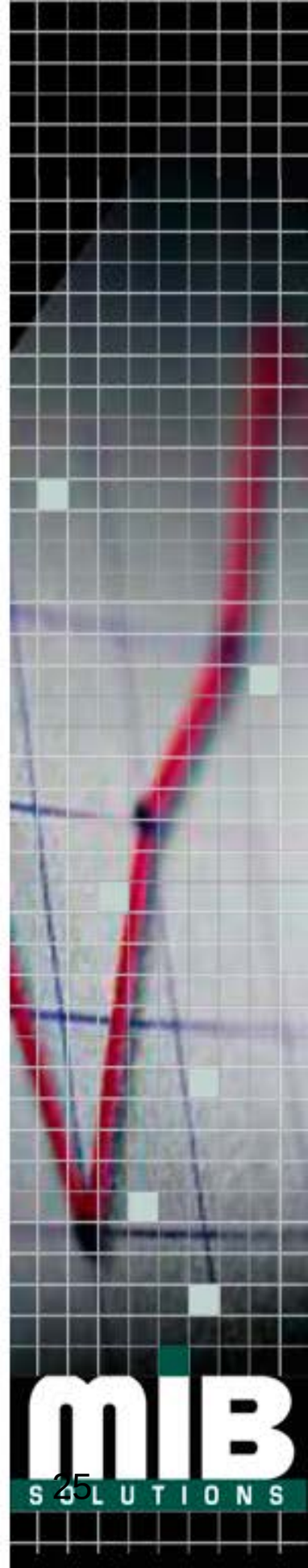
Prove/document Minus 2 Industry Basic Tables

Why might the up to 2 table difference exist?

- Market Differentiation
  - Higher Income Group
  - Occupation differences
- Underwriting Differences
  - Quality of Underwriting not captured in UCS
  - Experience Level of Underwriters/Home Office
  - Lack of Business Exceptions
- Company A/E Ratios Vary Around UCS scores

Companies' NS A/E Ratios Vary Around UCS Scores

UCS 2006 Study		
UCS Score	A/E Ratio	Deaths
26	47.0%	6
41	63.1%	21
42	71.8%	78
95	65.3%	63
96	79.3%	174
119	65.9%	230
120	72.5%	9
141	95.8%	2,231



Did I Forget to Mention in VM-20…

- Alternative to UCS method, other actuarially sound methods to determine multiple applicable basic tables. (Sounds like too much work to come up with reasons, showing applicability …)

- If no industry basic table appropriately reflects the risk characteristics, may use well-established industry table having appropriate risk characteristics.

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Questions????

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