

Experience Reporting Under PBR

Session 61 Experience Reporting Under PBR

Thursday, September 1, 10:00 to 11:30 AM EST

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Experience Reporting Under PBR

- Valuation Law, Valuation Manual, VM-50 and VM-51
- Pilot Program:
 - NYDFS and KID; Individual Company Reports to Regulators
 - Aggregate Results to Submitting Companies, SOA, Academy, NAIC
- Benefits of Statistical Agent Process
 - 80% of Experience Reporting is Getting Quality Data
 - Statistical Insight, Predictive Models
- Voluntary Combined with Mandatory
 - Kansas Backfill; Extended Analysis Data Call
- Future:
 - Confidentiality & Results to Industry
 - NAIC takes over from NYDFS and KID





Experience Reporting Under PBR

Valuation Law, Valuation Manual, VM-50 and VM-51

- Valuation Law for PBR is in process of state approval
- Valuation Manual can be updated annually as PBR develops
- VM-50, Experience Reporting Requirements
 - Company Experience Reporting Requirements
 - Roles and Responsibilities
 - Data Quality for Insurers and Statistical Agents
 - Reports Available from Statistical Agents: Summary
- VM-51, Experience Reporting Formats
 - Formats
 - Questionnaires



Pilot Program

NYDFS & KID

- New York Department of Financial Services (NYDFS)
 - MIB won competitive Request for Proposal
 - 2011 Call for 2009 Data
 - 2012 Call for 2010 Data
 - Limited to companies doing business in New York
- Kansas Insurance Department (KID)
 - VM-50 goal of 80% of industry experience
 - Industry-wide experience helpful to SOA
 - Joins 2013 Call for 2011 Data
- Temporary: NAIC to take over mandatory reporting

Mandatory Reporting Quantity and Quality

Quantity: Currently 88 companies in NYDFS & KID Data Call

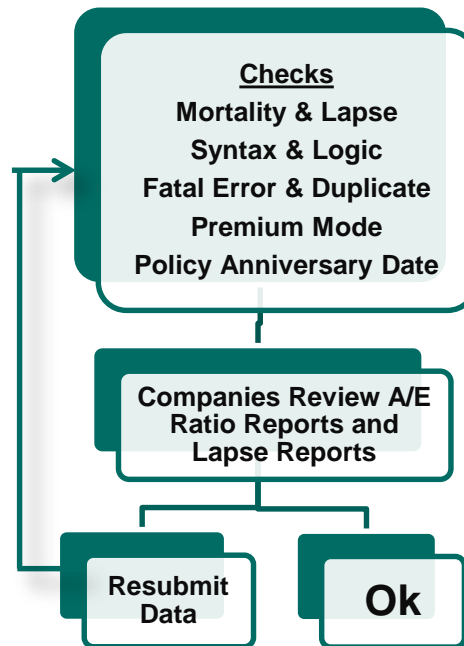
Quality: Companies provide quality data to regulators through LSS Process
80% of effort in experience reporting is getting quality data

Data Preparation

Syntax, Validation and Reasonableness (SVR) Check

Actuarial Analysis and Review (AAR)

- VM-51 Mortality and Policyholder Behavior Data Format, Questionnaires
- Supplemental Data Instructions
- Data Submission Instruction Training Video
- MIB LSS Website
- LSSDATA@MIB.COM



- MIB Actuaries review Company Correspondence, Questionnaires and SVR Reports
- Develop Special SQL Analysis and Reports
- Prepare AAR Memo with Reports, Communicate with Companies
- Individual Company A/E Ratio Reports and Lapse Reports to Regulators



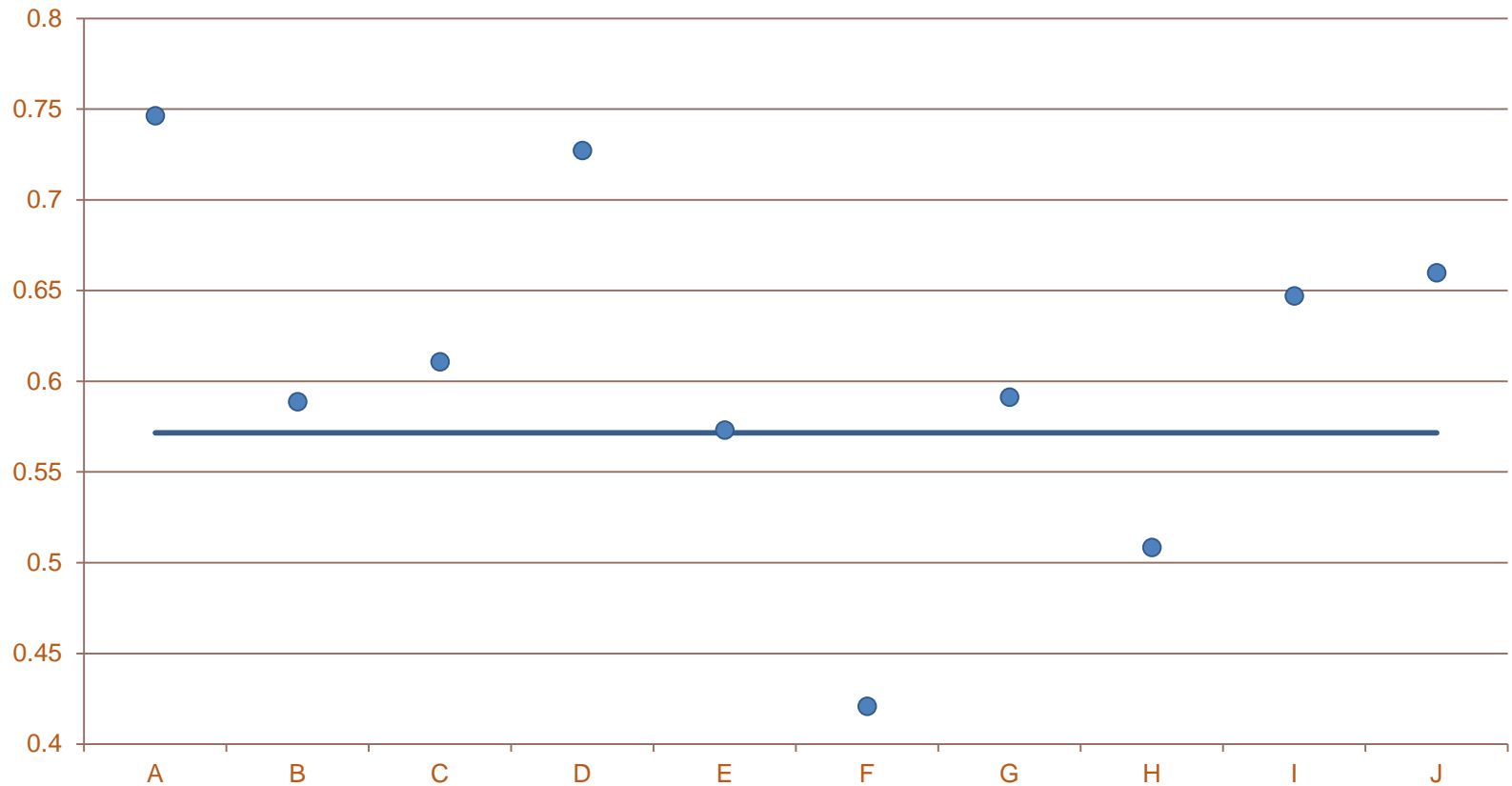
Benefits of Statistical Agent Process

Quality and Extent of Data, Statistical Insight, Predictive Models

- Quality and Extent of Data
 - Data Preparation, SVR Reports, Actuarial Analysis and Review
 - Companies work with statistical agent to give regulator accurate data
 - High quality of data on policy information that affects mortality and lapse
 - NYDFS and KID data calls cover 75% of US life insurance
- Statistical Insight
 - Company variability
 - Statistical significance
 - Predictive models and insight
 - For VM-20 mortality, Buhlmann credibility requires statistical agent

Statistical Insight

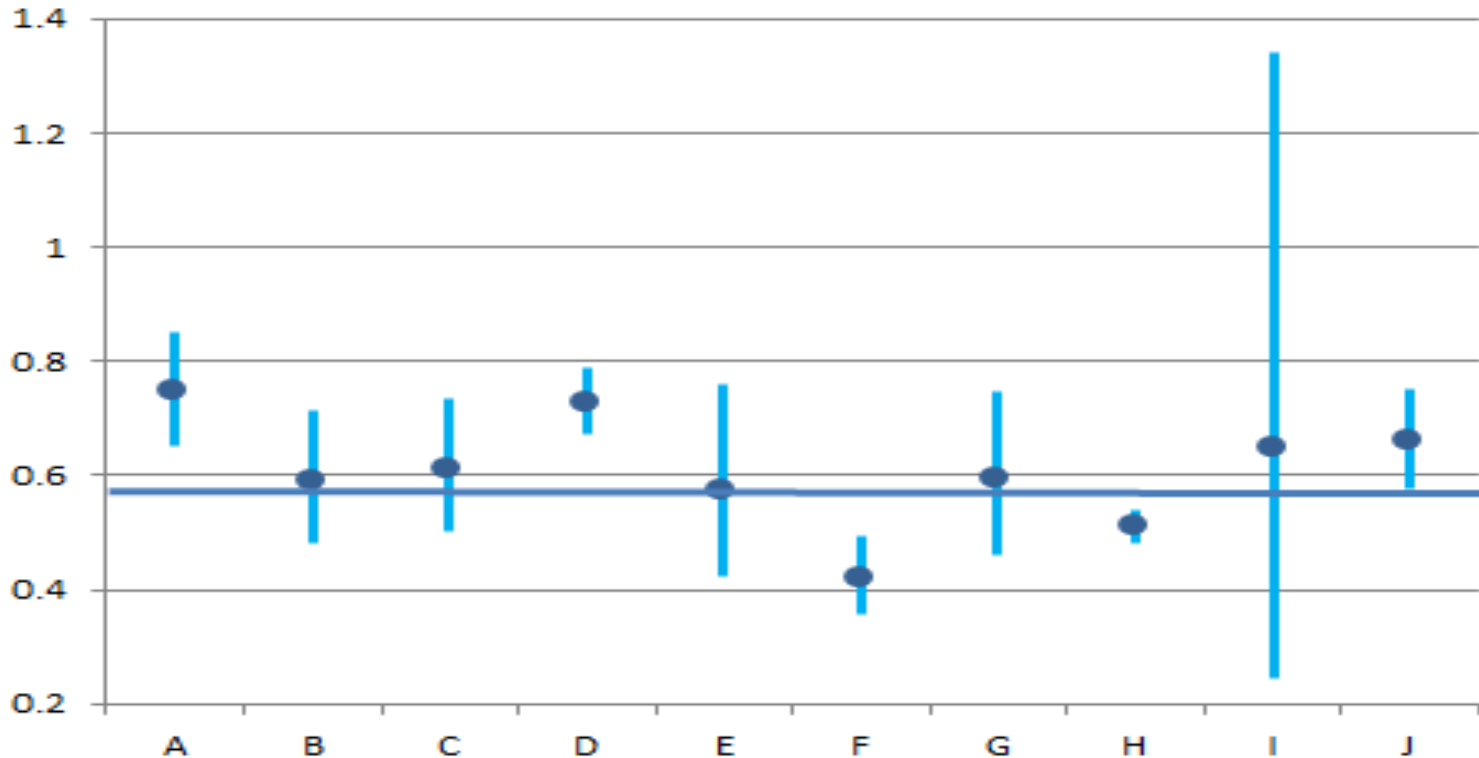
Company variability – 95% sure 95% Co not in 95% CI



Statistical Insight

For Each Risk Use Appropriate Probability Distribution Function and Apply it at a Company Level

For Mortality, Poisson is an Appropriate Probability Distribution Function
Mortality's Poisson Upper and Lower Bounds





Statistical Insight

Experience Studies, Statistical Significance and Predictive Models

Determine which variables affect each risk

Do NOT use first use statistical significance and predictive models to determine variables

USE the following steps to develop useful predictive models:

First: Evaluate variables through study of experience results (Company & Industry)

Second: Select key variables

Third: Evaluate statistical significance and do predictive models



Statistical Insight

Experience Studies, Statistical Significance and Predictive Models

Applying These Steps For Mortality



1. Evaluate variables in mortality study

2. Select key variables:

Issue Age, Duration, Smoker Status, Gender, Preferred Indicator,
Face Amount Band, Age Basis

3. Evaluate statistical significance

All variables pass the t-test, which indicates that all variables
significantly impact people's mortality rate

Statistical Insight

Experience Studies, Statistical Significance and Predictive Models

Predictive Model for Deaths

Count Data Model (Poisson with log link):

$$\eta = \beta_1 \cdot IssueAge + \beta_2 \cdot Duration + \beta_3 \cdot SmokerStatus + \beta_4 \cdot Gender + \beta_5 \cdot AgeBasis + \beta_6 \cdot PreferredIndicator + \beta_7 \cdot FaceAmountBand + (Intercept)$$

$$Mean = \lambda = \exp(\eta)$$

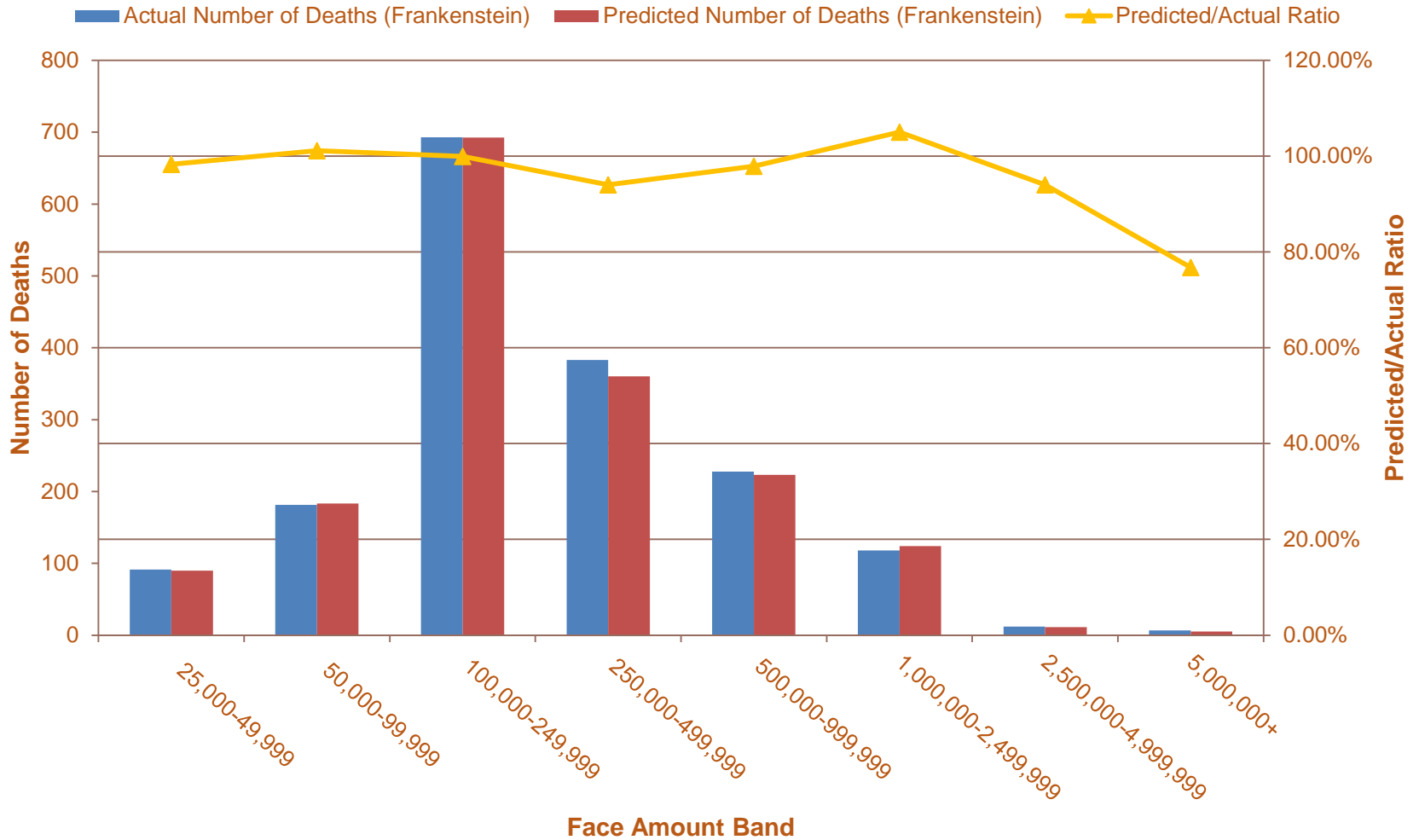
Avoid overfitting formula to data:

Train on 60% of data

Run model on 40% of data

Statistical Insight

Predictive Model on Frankensteined Data





Statistical Insight

Experience Studies, Statistical Significance and Predictive Models

Understand the factors that underlie mortality and lapse risks

Mandatory data provides:

- 75% of individual life experience
- High quality of data on policy level information that affects mortality/lapse

Companies are not homogeneous but heterogeneous

Your company's effects on mortality and lapse

- Your company's experience studies
- Your company's characteristics

Use all of this information in creating, evaluating and using Predictive Models



Statistical Insight

Principles-Based Reserves and Mortality

- Principles-Based Reserves have companies use their own experience of mortality, policyholder behavior, expense and interest
- VM-20 addresses mortality for individual life reserves
 - Company uses own mortality
 - Determines credibility of mortality
- On SOA Website under Research
 - 2009 paper 'Credibility Theory Practices' by Klugman and Rhodes
 - Provides detailed derivation of formulas for Limited Fluctuation and Buhlmann
 - Results using data
- Current version of VM-20 uses Limited Fluctuation and Buhlmann
 - Two Limited Fluctuation tables one for 2008 VBT and one for 2015 VBT
 - One Buhlmann credibility table
 - Buhlmann Z Formula



Statistical Insight

ASOP 25, VM-20 Credibility for Mortality

Actuarial Standard of Practice No 25, Credibility Procedures, procedure should be

- Expected to produce reasonable results,
- Appropriate for the intended use and purpose, and
- Practical to implement on a cost/benefit basis
- Does NOT specify any method

VM-20 Section 4. Credibility of Company Experience

- Has an actuary evaluates the credibility of subject (company) experience, blends it with other data, and is required by regulation
- Is subject to Actuarial Standard of Practice No 25, Credibility Procedures
- Includes the two most common credibility methods Limited Fluctuation and Greatest Accuracy or Buhlmann

Statistical Insight

Variance, Limited Fluctuation and Buhlmann Credibility

Total Variance = Expected Value of *Process Variance* + Variance of Hypothetical Means

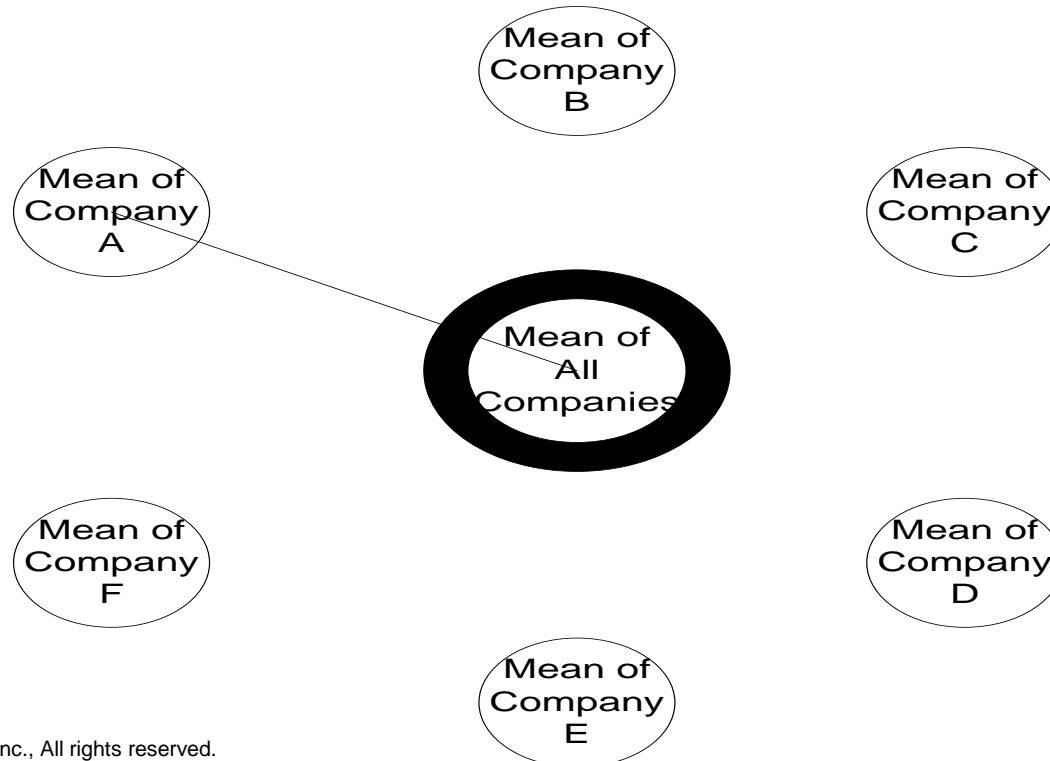
- Limited Fluctuation uses ***Process Variance***
 - Only requires own company data
 - Assumes VBT table is correct (changes with VBT table change)
 - Company can do in-house with own experience & Excel files from Credibility Practices Report
- Bühlmann uses both **Expected Value of Process Variance + Variance of Hypothetical Means**
 - Requires all companies' data for calculation
 - Statistical Agent required for confidentiality
 - Company can do in-house with own experience and Buhlmann Z Formula

Statistical Insight

Variance, Limited Fluctuation and Buhlmann Credibility

Limited Fluctuation Method

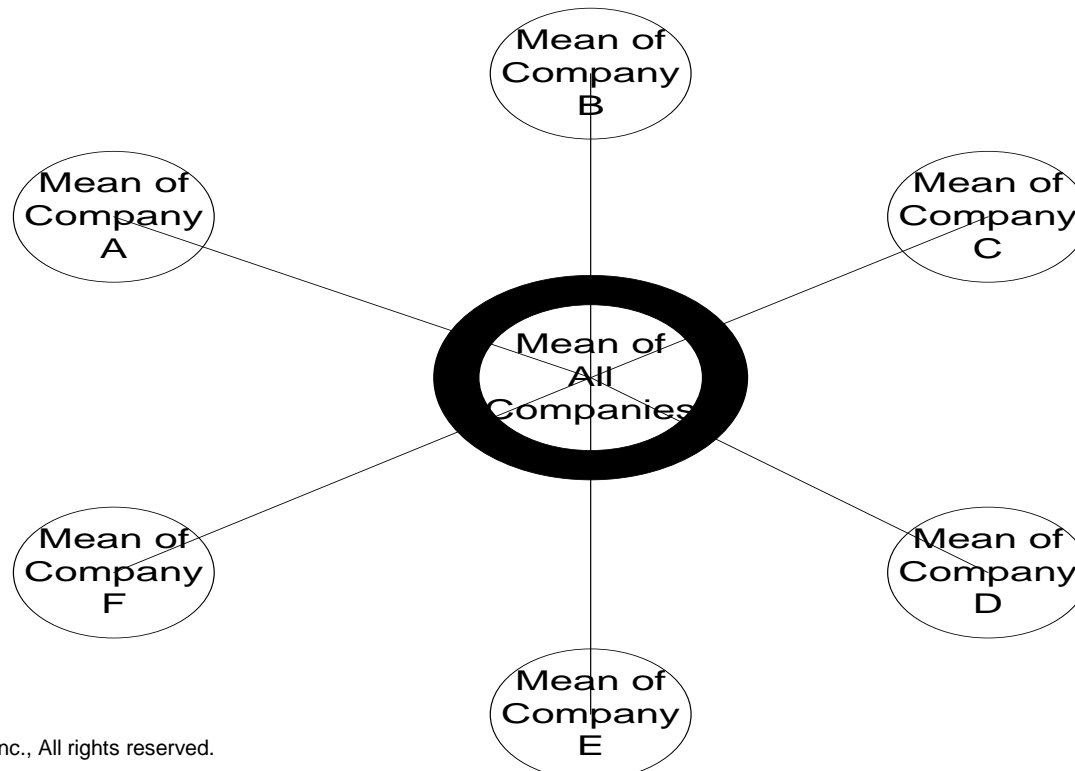
Uses the variation of a Co A's observations about Co A's mean & the variation between Co A's mean and the overall mean
Overall Mean is assumed correct, e.g., based on the 2008 VBT or 2015 VBT



Statistical Insight

Variance, Limited Fluctuation and Buhlmann Credibility

**For Company A's Credibility Factor
Bühlmann empirical Bayesian Method
Uses the variation of a Co A's observations
about Co A's mean & the variation
between each Co's mean and overall mean**



Credibility Results for Mortality by Face Amount

| Company | Limited Fluctuation Credibility | Buhlmann Credibility |
|---------|---------------------------------------|-------------------------|
| A | 0.708 | 0.935 |
| B | 0.285 | 0.678 |
| C | 0.254 | 0.757 |
| D | 0.219 | 0.623 |
| E | 1.000 | 0.986 |
| F | 0.236 | 0.704 |
| G | 0.020 | 0.033 |
| H | 0.409 | 0.863 |
| I | 0.833 | 0.963 |
| J | 0.453 | 0.865 |

From Pages 24 and 32 of 'Credibility
Theory Practices' by Klugman and
Rhodes; On SOA website in Research



Statistical Insight

Comparison of Credibility Results

In General:

- When Buhlmann credibility is .95 or greater, Limited Fluctuation credibility is 1.00
- Larger companies tend to have higher credibility
- When Buhlmann credibility $< .95$, Limited Fluctuation credibility can be much lower than Buhlmann Credibility
- Smaller companies tend to fit the profile of Limited Fluctuation credibility much lower than Buhlmann Credibility

Statistical Insight

VM-20 mortality and Buhlmann Z Formula

MIB worked with the SOA and the Academy developed the Buhlmann Z Formula based on companies' data submitted to study

$$\text{Buhlmann Z} = \frac{A}{A + \frac{(109\% \times B) - (120.4\% \times C)}{(0.019604 \times A)}}$$

Theoretically, Variance of Hypothetical Means and the Buhlmann Z Formula should be recalculated to include company that did not submit study data

Pragmatically, adding smaller companies will not substantially change the Variance of Hypothetical Means and they can use their own data and the Buhlmann Z Formula without change

Next change to Buhlmann when mandatory statistical agent data covering 75% of US business is used for Buhlmann Z Formula

Statistical Insight

Credibility: Limited Fluctuation, Buhlmann and VM-20

- ASOP 25 does not specify credibility method
- Limited Fluctuation is commonly used
 - Does not use all of the variance
 - Works
- Buhlmann
 - Statistically valid
 - Preferred by Joint SOA/Academy Committee
 - Buhlmann Z Formula makes it easy for company to use
- Current VM-20
 - Includes only Limited Fluctuation or Buhlmann credibility approaches
 - Discussion on whether amendment to include only one credibility approach

Mandatory Statistical Agent Results

Confidentiality & Results to Industry

- MIB Webinars to Companies Mandatorily Submitting Data
 - Upcoming Webinar to Submitting Companies
 - Sept 22nd, 1 to 2 PM EDT & Sept 24th, 3 to 4 PM EDT
 - 2009 through 2012 Results compared to 2015 VBT
 - Predictive Modeling Results
- Aggregated 2009 through 2012 Data Provided to
 - SOA will publish this information
 - Then results can be presented at SOA meetings



Voluntary Combined with Mandatory Kansas Backfill

- In pilot project, NYDFS had two calls before KID joined
 - 2011 Call for 2009 Data
 - 2012 Call for 2010 Data
- SOA wanted more complete industry data
 - Target companies that submit data to KID
 - Voluntary Data Call for 2009 and 2010 Kansas Backfill Data (MIB as compiler)
 - Individual company results not given to regulators
 - Aggregated backfill and mandatory results given to SOA



Voluntary Combined with Mandatory Extended Analysis Data Call

- VM-51 format data items deemed necessary for regulators
- SOA wants to study subsets of data
 - Cause of death, Conversions, Substandard
 - SOA simplified voluntary data call
 - Contains additional data items and key fields
 - MIB does Match/Merge of voluntary and mandatory
 - SOA analyzing results for a future report



Future: Expanded Data Call Under Discussion

- As of August 31, the following is under discussion and NOT definite
- Policyholder Behavior Including ULSG
 - Data items would need to be modified/added to existing VM-51 format
 - Modify existing items to apply to plans other than Level Premium Term
 - Adding new items related to ULSG
 - Additional 3 items needed for Expense units
- Expense
 - Aggregate expenses collected separately from existing seriatim format
 - Regulator concern on both acquisition and renewal expenses
 - Company concern that should only cover items related to reserves
 - SOA expense study discontinued due to lack of company contributions

Future: NYDFS & KID; SOA; NAIC

MIB Supports SOA Voluntary Data Calls

MIB as compiler for:

- 2015 VBT
- Private Placement Bonds
- Individual Payout Annuities
- Structured Settlements
- Group Life
- Group LTD

There are many other SOA Voluntary Data Calls






Future: NAIC Takes Over from NYDFS & KID

Principle-Based Reserving Implementation (EX) Task Force is to:

“Determine the role of a statistical agent(s) and recommend procedures, funding and a process for data reporting “



Larry Bruning, NAIC Life Actuary, and Daniel Schelp, NAIC Managing Counsel, on March 14, 2014 proposed ‘PBR Statistical Agent Process’

Life Statistical Agent (EX) Working Group to be established

Legal concern of NAIC’s authority, and funding of statistical agent is a roadblock

As of August 31, 2015, the NAIC work for the establishment of Experience Reporting process and statistical agent is continuing

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