



AMERICAN ACADEMY *of* ACTUARIES

Objective. Independent. Effective.™



Mortality Table Update on the 2015 VBT/CSO

Joint American Academy of Actuaries Life Experience Committee
and Society of Actuaries Preferred Mortality Oversight Group

Actuaries Club of the Southwest

November 12, 2015

Austin, Texas



Agenda & Presenter

Agenda

- 2015 VBT
- 2015 VBT Relative Risk Tables
- 2017 CSO
- 2017 CSO Preferred Structure Tables
- Underwriting Criteria Scoring Tool (UCS)

Presenters

Dieter Gaubatz, FSA, FCIA, MAAA
Chair, Underwriting Criteria Team

Thanks to

Mary J. Bahna-Nolan, FSA, MAAA, CERA
Chair, Joint American Academy of Actuaries
Life Experience Committee and Society of
Actuaries Preferred Mortality Oversight
Group



Additional information

2015 SOA Annual Meeting

October 11-14, 2015

Austin, TX

**Session 64 – Mortality Table Update on the
2015 VBT / 2017 CSO**

Session 169 – 2017 CSO Impact



Mortality Development

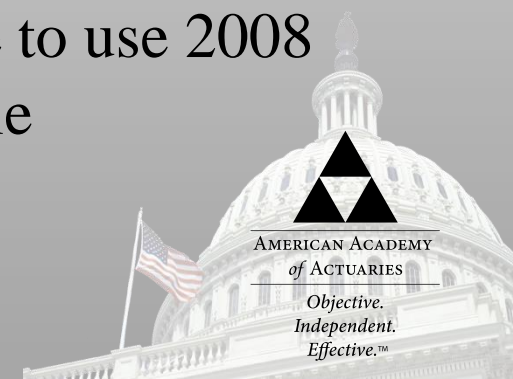
- Significant work completed to develop various mortality tables and margins to support PBR and new valuation table
- Series of presentations on the various table development and impacts from prior tables via NAIC National Meetings and can be found on NAIC website
 - VBT: Summer and Fall 2014 meetings
 - CSO: Fall 2014 and Spring 2015 meetings
 - UCS: Conference calls Summer 2015



VBT Tables and Applications - Adopted

| Table | Regulatory Use | Valuation Manual Impacts | Status |
|---|---|---|--|
| 2015 VBT Basic Tables and 2015 VBT Relative Risk Tables | <ul style="list-style-type: none"> • AG38, §8.D • AG48 • VM-20 Deterministic reserves • VM-20 Stochastic reserves | VM-M, §2 <ul style="list-style-type: none"> • Recognizes as industry table VM-20, §9.C.3.a <ul style="list-style-type: none"> • Refers to VM-M for industry table to allow use of either 2008 VBT or 2015 VBT | <ul style="list-style-type: none"> • Adopted by LATF at August meeting • Able to be used for AG48 filings in 2015 • AG38 §8.D filings require full NAIC adoption by July 1 of valuation year so likely not available until 2016 |

- 2008 VBT is still the required industry mortality table for AG38 §8.D in 2015
- No 2015 Limited Underwriting Table so continue to use 2008 VBT Limited Underwriting Table as industry table





AMERICAN ACADEMY *of* ACTUARIES

Objective. Independent. Effective.™



2015 VBT Development

Comparing VBT 2015 and 2008 tables

Male non-smoker

| Annual improvement (%) equivalent | | | | | | |
|-----------------------------------|----------|------|------|------|-------|-------|
| | Duration | | | | | |
| Issue Age | 1 | 6 | 11 | 16 | 21 | 26 |
| 25 | 5.8% | 6.9% | 4.5% | 3.5% | 2.3% | 3.6% |
| 35 | 5.3% | 1.8% | 4.0% | 3.6% | 2.2% | 4.0% |
| 45 | -0.8% | 3.5% | 3.6% | 2.3% | 2.2% | 4.0% |
| 55 | 5.7% | 3.3% | 2.5% | 2.2% | 2.3% | 2.5% |
| 65 | 2.5% | 4.1% | 3.4% | 1.7% | -0.2% | 0.3% |
| 75 | 7.6% | 4.3% | 0.1% | 0.3% | 1.1% | 1.0% |
| 85 | 10.2% | 6.4% | 1.1% | 1.0% | 0.1% | -1.2% |

Mortality decrease expressed as an annual improvement rate spread over 7 years

- A reduction in rate is shown as a positive improvement % in the above table
- The improvement rates shown show impact of a number of characteristics
- Values are NOT actual underlying systematic improvement, many other factors also included
 - These are not the improvement factors used to true up the experience to the end of the experience period..



2015 VBT and RR Tables

- Based on underlying experience from SOA's ILEC 2002-2009 data calls (51 companies)
 - Significant increase in exposure and number of claims over studies underlying both 2008 and 2001 VBT Tables

| Table | # Contributing Companies | Exposure by Count (millions) | Exposure by Amount (trillions) | Actual # Claims (millions) |
|----------|--------------------------|------------------------------|--------------------------------|----------------------------|
| 2015 VBT | 51 | 266 | \$30.7 | 2.5 |
| 2008 VBT | 35 | 75 | \$ 6.9 | 0.7 |
| 2001 VBT | 21 | 175 | \$ 5.7 | 1.2 |

Mortality Improved from 2008 VBT

| Study Period | Male | Female | Aggregate | Exposure (Trillion) | # Death Claims |
|---|--------|--------|-----------|---------------------|----------------|
| 2002-2004 (underlying 2008 VBT) | 101.1% | 100.5% | 100.9% | \$ 7.4 | 699,890 |
| 2002-2009 (underlying 2015 VBT) | 94.2% | 94.7% | 94.3% | 30.7 | 2,549,490 |
| 2002-2009 experience for common companies to 2002-2004 study | 92.3% | 94.3% | 92.8% | 19.2 | 1,940,403 |
| 2002 – 2009 100k+ | 88.3% | 89.2% | 88.5% | 26.9 | 162,095 |
| 2002 – 2009 250k+ | 84.1% | 85.4% | 84.4% | 20.6 | 46,570 |



Expected basis is 2008 VBT RR 100 Table

Source: Society of Actuaries, Individual Life Experience Reports 2002 through 2009 Preliminary



Experience Varies by Many Factors

A/E* Ratio – NS versus SM

| Smoker Status | A/E Ratio by Amount |
|----------------|---------------------|
| Non-smoker | 92.3% |
| Smoker | 97.5% |
| Unknown Status | 99.8% |
| Aggregate | 94.3% |

A/E* Ratio – By Amount

| Face Amount Band (\$) | A/E Ratio by Amount |
|-----------------------|---------------------|
| 50,000 – 99,999 | 105.6% |
| 250,000 – 499,999 | 88.6% |
| 1,000,000 – 2,499,999 | 81.9% |
| 5,000,000 – 9,999,999 | 74.1% |
| Aggregate | 94.3% |

A/E* Ratio – By Issue Age

| Issue Age | A/E Ratio by Amount |
|-----------|---------------------|
| 40 – 49 | 100.1% |
| 60 – 69 | 95.1% |
| 80 - 89** | 61.6% |

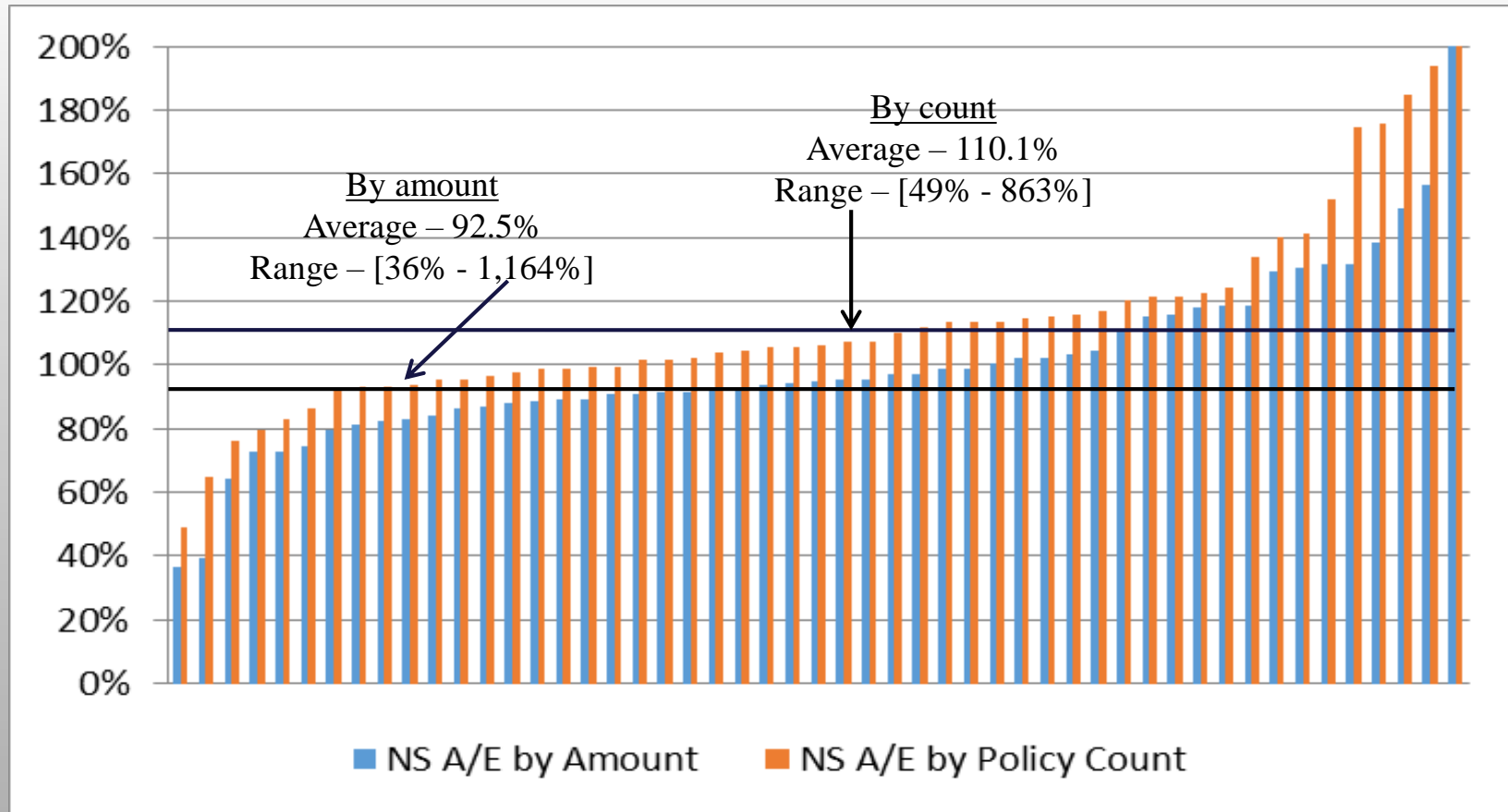
* Expected basis = 2008 VBT Primary Tables, ANB

** 80-90 for common companies drops to 55% but credibility is limited

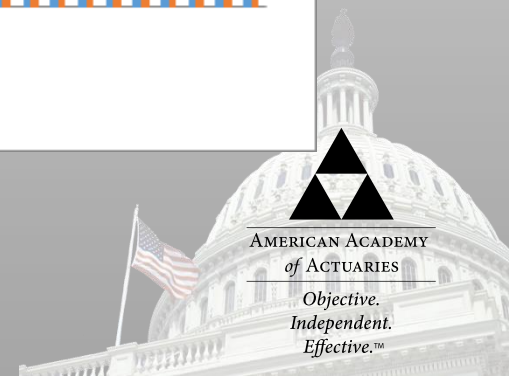


Experience Varies Significantly by Company

A/E Ratios for contributing companies – non-smoker risks

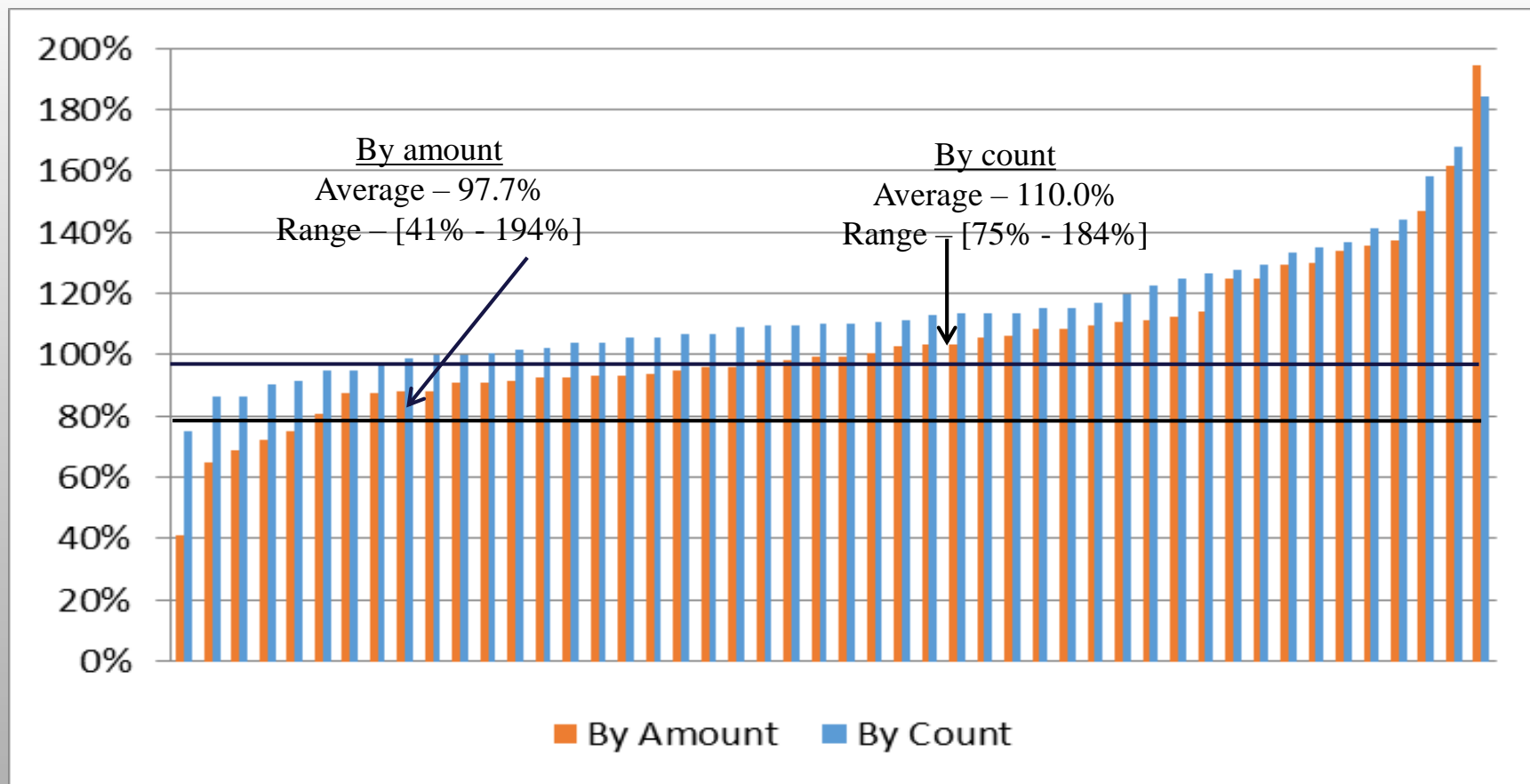


Expected basis = 2008 VBT RR 100 Table



Experience by Company, cont'd

A/E Ratios for contributing companies –Smoker risks



Expected basis = 2008 VBT RR 100 Table



2015 VBT Table Structure

VBT Primary Tables

- NS/SM/Composite
- M/F
- ANB/ALB
- Select & Ultimate, Ultimate only
- Juvenile rates on composite basis only
- Select factors vary by gender and issue age
- Omega rate of 500.0 per 1,000 at attained age 112

NS/SM used interchangeably with Non-tobacco/Tobacco – clarified via language in VM-01



Select Period

- Varies by issue age and gender
- Considered both observable as well as prospective select period
- Underlying select period independent of preferred wear-off

Select Period for Sample Issue Ages

| Issue Age | MALE | FEMALE |
|-----------|------|--------|
| 0-17 | 0 | 0 |
| 18-54 | 25 | 20 |
| 55 | 24 | 19 |
| 65 | 19 | 17 |
| 75 | 15 | 14 |
| 85 | 8 | 8 |
| 95 | 1 | 1 |
| 96+ | 0 | 0 |

Adjustments to Underlying Experience

- Adjust data to remove post level term anti-selective mortality;
- Adjust data to recognize differences in experience from different underwriting eras; and
- Improve the underlying experience to start date of table (2015)



Mortality Improvement Assumption

2015 VBT Mortality Improvement Factors from 2009-2015 Select Attained Ages

| Male Age | Improvement Factor | Female Age | Improvement Factor |
|----------|--------------------|------------|--------------------|
| 0-12 | 1.75% | 0-12 | 1.10% |
| 15 | 1.45% | 15 | 0.93% |
| 18-82 | 1.15% | 18-80 | 0.75% |
| 85 | 0.88% | 83 | 0.58% |
| 90 | 0.44% | 88 | 0.29% |
| 91 | 0.35% | 89 | 0.23% |
| 92 | 0.27% | 90 | 0.17% |
| 93 | 0.18% | 91 | 0.12% |
| 94 | 0.09% | 92 | 0.06% |
| 95+ | 0.00% | 93+ | 0.00% |



Graduation Approach

- Explored 3 separate approaches to graduating data and resulting fit
 - Generalized Additive Model (GAM).
 - Projection pursuit regression (PPR);
 - Whittaker-Henderson (WH); and
- For the ultimate date, all three models produced reasonable results;
- For the select data, the models did not perform equally - GAM approach had best fit overall with little to no loss of monotonicity
- Additional adjustments made for young adult issue ages and issue ages 70 and above



Relative Risk (RR) Table Considerations

- Number of tables
 - Same as 2008 VBT for both non-smoker and smoker
- Relativity amongst tables
 - Different from 2008 VBT for non-smokers; same for smokers
- Preferred wear-off pattern
 - Similar to 2008 VBT



2015 VBT and RR Table Structures

VBT Primary Tables

- NS/SM/Composite
- M/F
- ANB/ALB
- Select & Ultimate, Ultimate only
- Juvenile rates on composite basis only
- Select factors vary by gender and issue age
- Omega rate of 500.0 per 1,000 at attained age 112

RR Tables

- 10 NS/4 SM tables
- M/F
- ANB, ALB
- No juvenile rates or composite tables
- Utilizes preferred wear-off pattern that wears off by age 95
- RR 100 Table same as VBT Primary Table
- New UCS Calculator

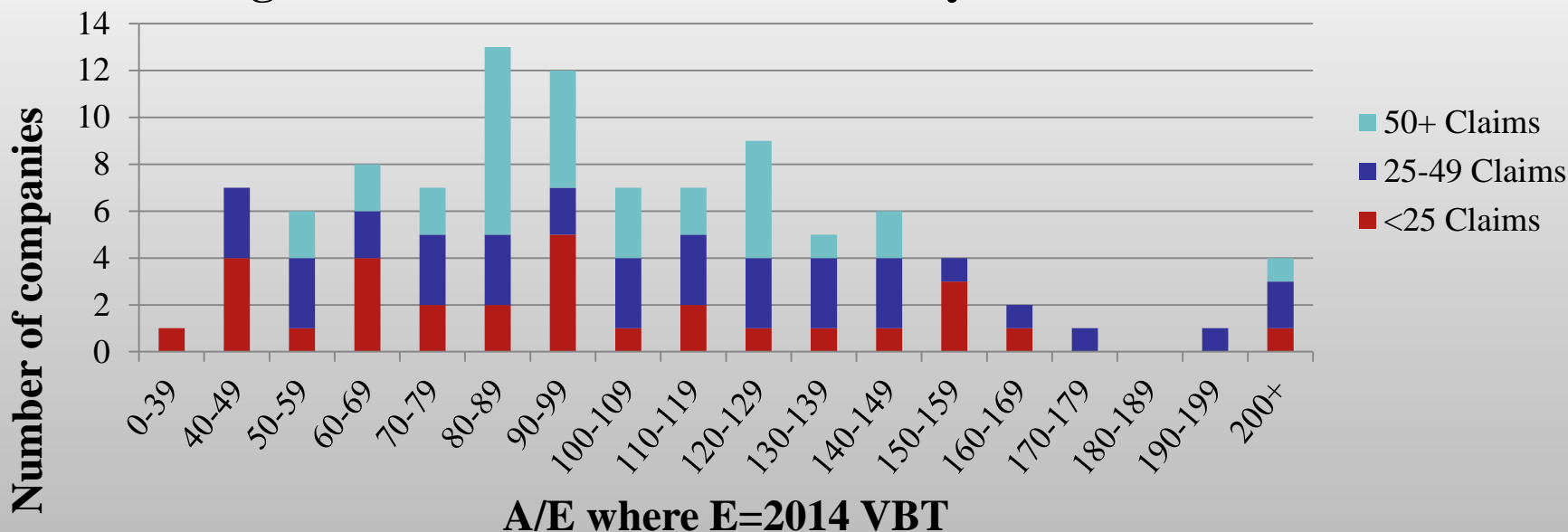


NS/SM used inter-changeably with Non-tobacco/Tobacco – clarified via language in VM-01



Determination of Relativity for RR Tables - Nonsmoker

Range of A/Es for all NS risk classes by number of claims



NS = RR 50, 60, 70, 80, 90, 100, 110, 125, 150, 175

E = 2014 VBT adjusted to remove improvement to midpoint of data period for each company



Determination of Relativity for RR Tables - Smoker

- Limited data to justify different structure or relativity from that in the 2008 VBT
- SM RR tables = RR 75, RR 100, RR 125, RR 150
- RR 100 = VBT Primary SM



Preferred Wear-off Factors

- Analyzed level of wear-off but industry experience still emerging.
- There is virtually no additional information available from the 2008 VBT analysis, which was extensive.
- The preponderance of aggregate NS data in early durations further complicated the analysis; therefore, also examined Milliman's MIMSA study.



Preferred Wear-off Factors – Select Ages

- Preferred wear-off factors are similar at most ages as those in 2008 VBT
- Grade off at age 95 (versus 90) – same as underlying select period.
- Factors used to grade from age 90 to 95 based on professional judgment.

| Issue Age | Duration | | | | | |
|-----------|----------|-------|-------|--------|--------|--------|
| | 1 | 5 | 10 | 15 | 20 | 25 |
| 25 | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 2.2% |
| 35 | 0.0% | 0.0% | 0.0% | 2.1% | 5.6% | 11.4% |
| 45 | 0.0% | 1.8% | 5.3% | 11.1% | 19.3% | 29.9% |
| 55 | 0.0% | 5.2% | 14.0% | 25.2% | 39.0% | 55.3% |
| 65 | 0.0% | 11.0% | 27.4% | 46.8% | 66.2% | 81.4% |
| 75 | 0.0% | 22.8% | 51.1% | 72.5% | 94.3% | 100.0% |
| 85 | 0.0% | 27.8% | 82.9% | 100.0% | 100.0% | 100.0% |





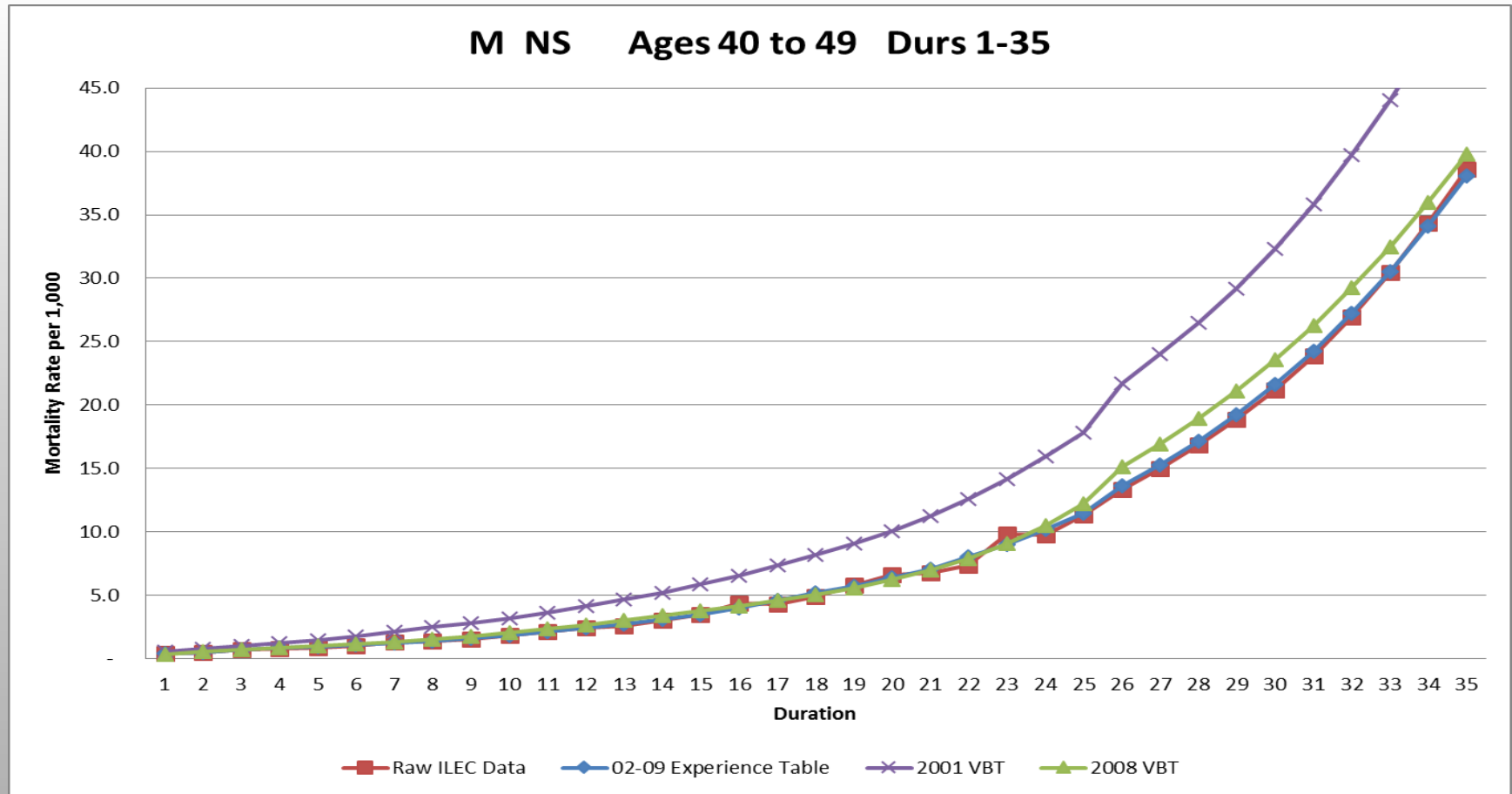
AMERICAN ACADEMY *of* ACTUARIES

Objective. Independent. Effective.™

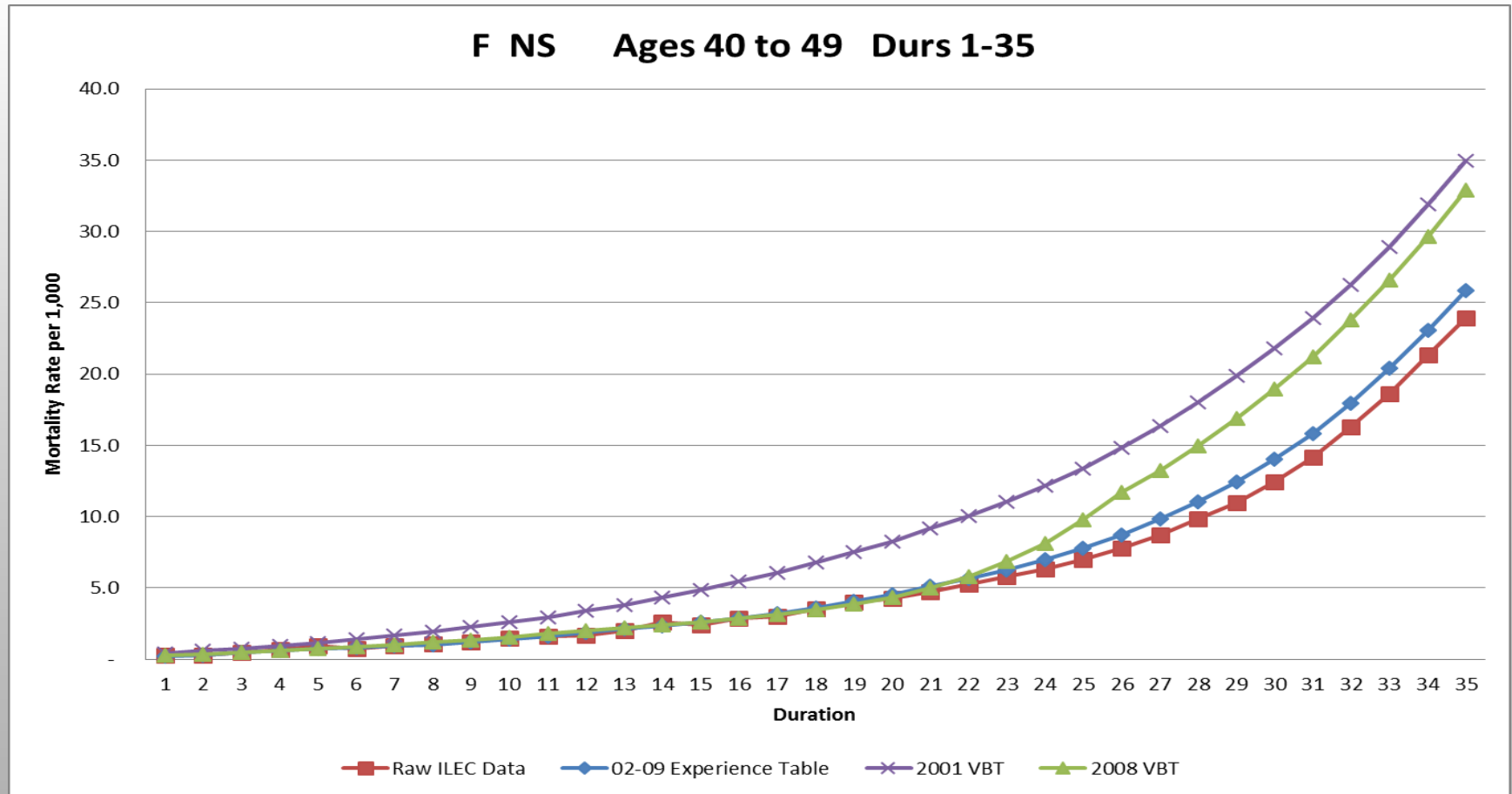


Resulting experience – Sample Ages and Durations

Resulting Experience Table



Resulting Experience Table





AMERICAN ACADEMY *of* ACTUARIES

Objective. Independent. Effective.™



2017 CSO Development

Tables and Applications – Exposed, cont'd

| Table | Regulatory Use | Valuation Manual Impacts | Status |
|--|---|--|--|
| 2017 CSO and 2017 CSO Preferred Structure Tables | <ul style="list-style-type: none"> • Net premium reserves • Tax reserves • Non-forfeiture determination* • Basis for 7702/7702A • Cap for universal life cost of insurance charges | <p>VM-00</p> <ul style="list-style-type: none"> • Allows use of 2017 CSO, per conditions in VM-20, §3 for companies that elect to defer PBR implementation <p>VM-02, §5.A.1-3</p> <ul style="list-style-type: none"> • Recognizes 2017 CSO for non-forfeiture and defines conditions for use <p>VM-M, §1.H</p> <ul style="list-style-type: none"> • Defines 2017 CSO and Preferred Structure Tables for use as a valuation table <p>VM-20, §3.A.2 and §3.C.1</p> <ul style="list-style-type: none"> • Allows use of 2017 CSO for net premium reserve determination and defines conditions for its use <p>VM-20, §6</p> <ul style="list-style-type: none"> • Points to mortality as defined in §3.C.1 and VM-M §1.H for which mortality to use in the stochastic and deterministic exclusion tests <p>VM-A</p> <ul style="list-style-type: none"> • Adds Appendix A-814 to list of references | <ul style="list-style-type: none"> • 30-day comment period expired 09/18/2015 • Report being finalized • Vote for adoption at LATF meeting on 11/17 |

* Relative risk tables are not applicable for non-forfeiture



2017 CSO

- Purpose of margin
- Target level of margin (from regulators)
- Structure of margin
- Preferred structure tables



4 Purposes for a Margin Considered

| Consideration | | Resolution |
|---------------|---|---|
| 1 | Confidence of experience study | <ul style="list-style-type: none"> Dismissed for 2017 CSO Significantly more data than in prior underlying studies 439% increase in exposure by amount |
| 2 | Variation of individual company's experience relative to the mean | <ul style="list-style-type: none"> There is variability by company A/E by amount ranges for NS risks from < 40% to > 200% |
| 3 | Random fluctuation due to smaller exposure | <ul style="list-style-type: none"> Not practical to vary loadings by size of company exposure Purpose of capital and surplus |
| 4 | Unknown variation such as catastrophic events | <ul style="list-style-type: none"> Purpose of capital and surplus |

CSO Margin Comparisons – Coverage Level

| Table | 1980 CSO | 2001 CSO | 2017 CSO |
|---|--------------------|-----------------|-----------------|
| Underlying Experience | 1970-1975 | 1990-1995 | 2002-2009 |
| Coverage % | 50% | 81% | 70.6% |
| # Companies Included | 19 | 21 | 51 |
| # Companies Covered | 10 | 17 | 36 |
| Amount of data in underlying study | | | |
| Exposure by Amount | \$0.77 trillion | \$5.7 trillion | \$30.7 trillion |
| Exposure by Count | Info not in report | 175 million | 266 million |
| Actual # Claims | Info not in report | 1.25 million | 2.5 million |
| # Common Companies to 2017 CSO | 14 | 16 | N/A |

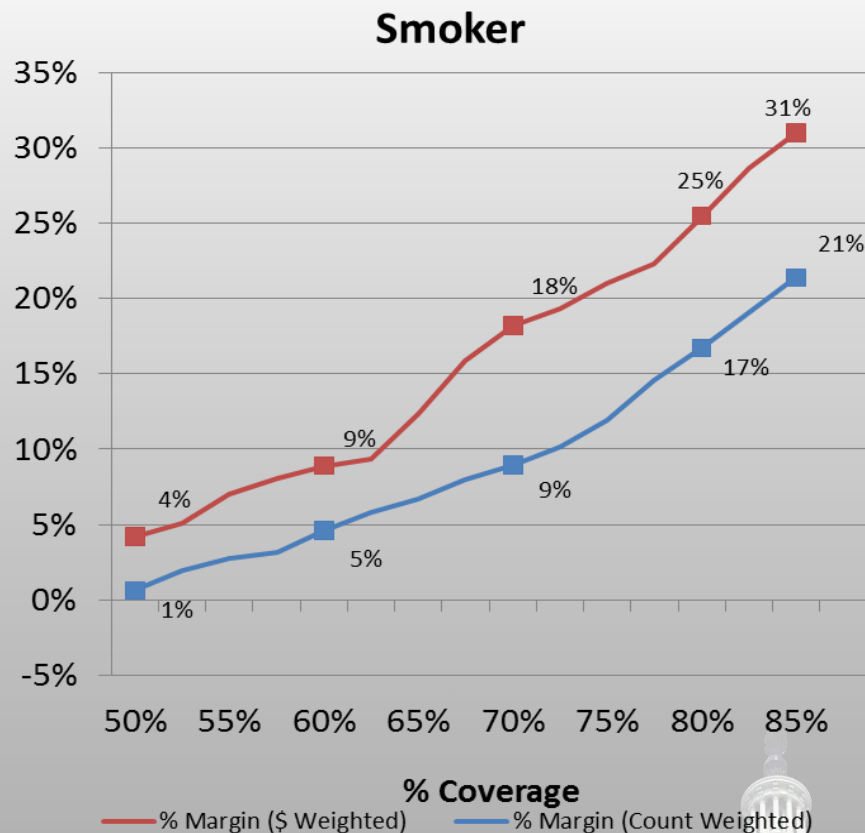
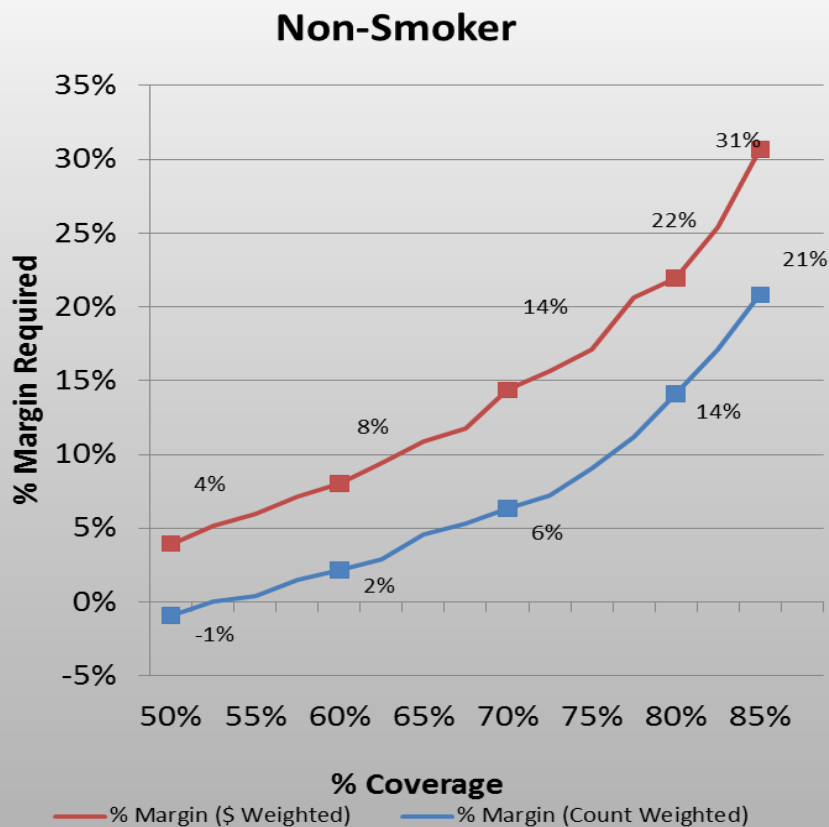


NAIC LATF Guidance Regarding Margin

- Margins consistent with 2001 CSO
- To cover the claims or mortality experience from at least 70% - 79% of the contributing companies (in the underlying mortality study)
- Purpose of margin is to cover the variation of an individual company's mortality around the mean (company variation)



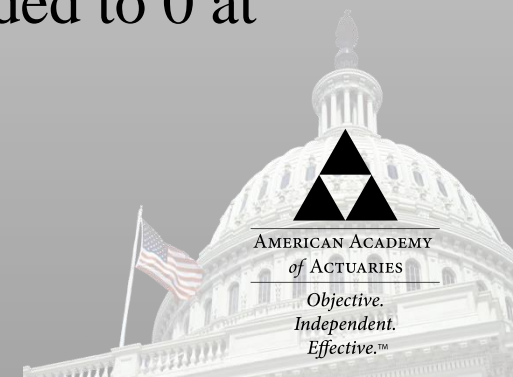
Approximate Margin to Meet Directive 15% for Non-smokers; Slightly Higher for Smokers



CSO Margin Structure Comparison

| CSO Table | Structure of Margin |
|------------------------------|---|
| 2001 CSO | $\frac{0.0056 - 0.00016(x + t) + 0.000008(x + t)^2}{e_{[x]+t}}$ |
| 2001 CSO Preferred Structure | Same as 2001 CSO |
| 2017 CSO | Graded % load varying by attained age |

- 2001 CSO margins were calculated for the composite ultimate rates and then used for both SM & NS ultimate rates.
- The formula margin for attained age 100 was graded to 0 at attained age 120.



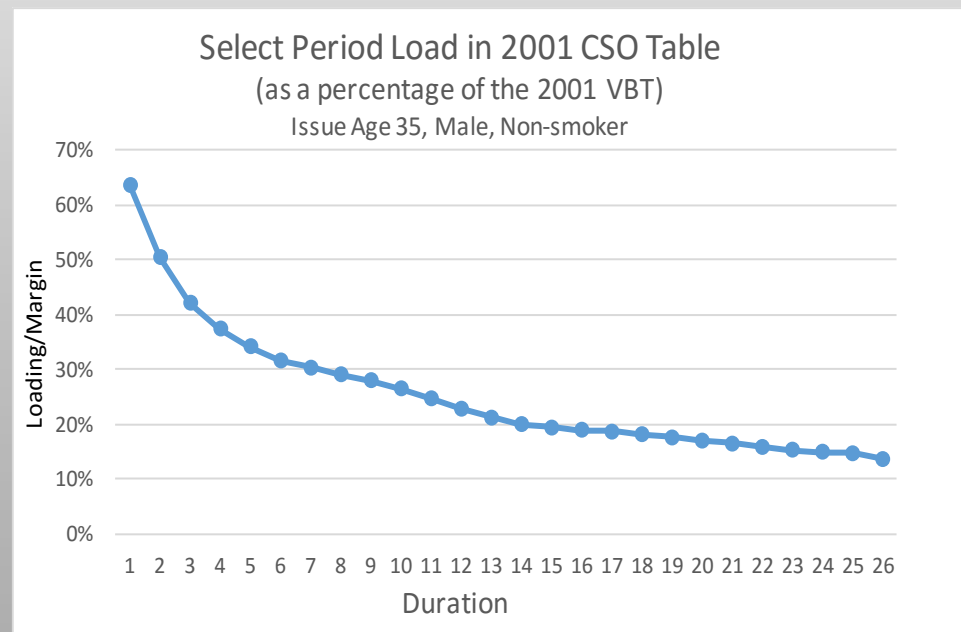
CSO Margin Structure, cont'd

3
5

Using similar structure as 2001 CSO

- Results in margins that are extremely high during the select period and issue ages where there is the highest level of credibility
 - A few potential reasons for this:
 - Based on ultimate mortality
 - Based on studies with considerably less exposure in select period

The loads underlying the 2001 CSO Table were highest in the early durations of the select period



CSO Margin Structure, cont'd

- Developed % Load that varies by attained age with the following pattern:
 - 23% below age 20, grading down to
 - 17% at age 80, and further grading down to
 - 15% at age 100, and further grading down to
 - 7.5% at age 110 and later
- Results in a percentage load that decreases by age and an absolute load that generally increases by age
- Appears to result in more intuitive pattern in load by age than other methods
- Simple to understand and administer for all the table variations
 - Easier to maintain appropriate relationships between the various tables



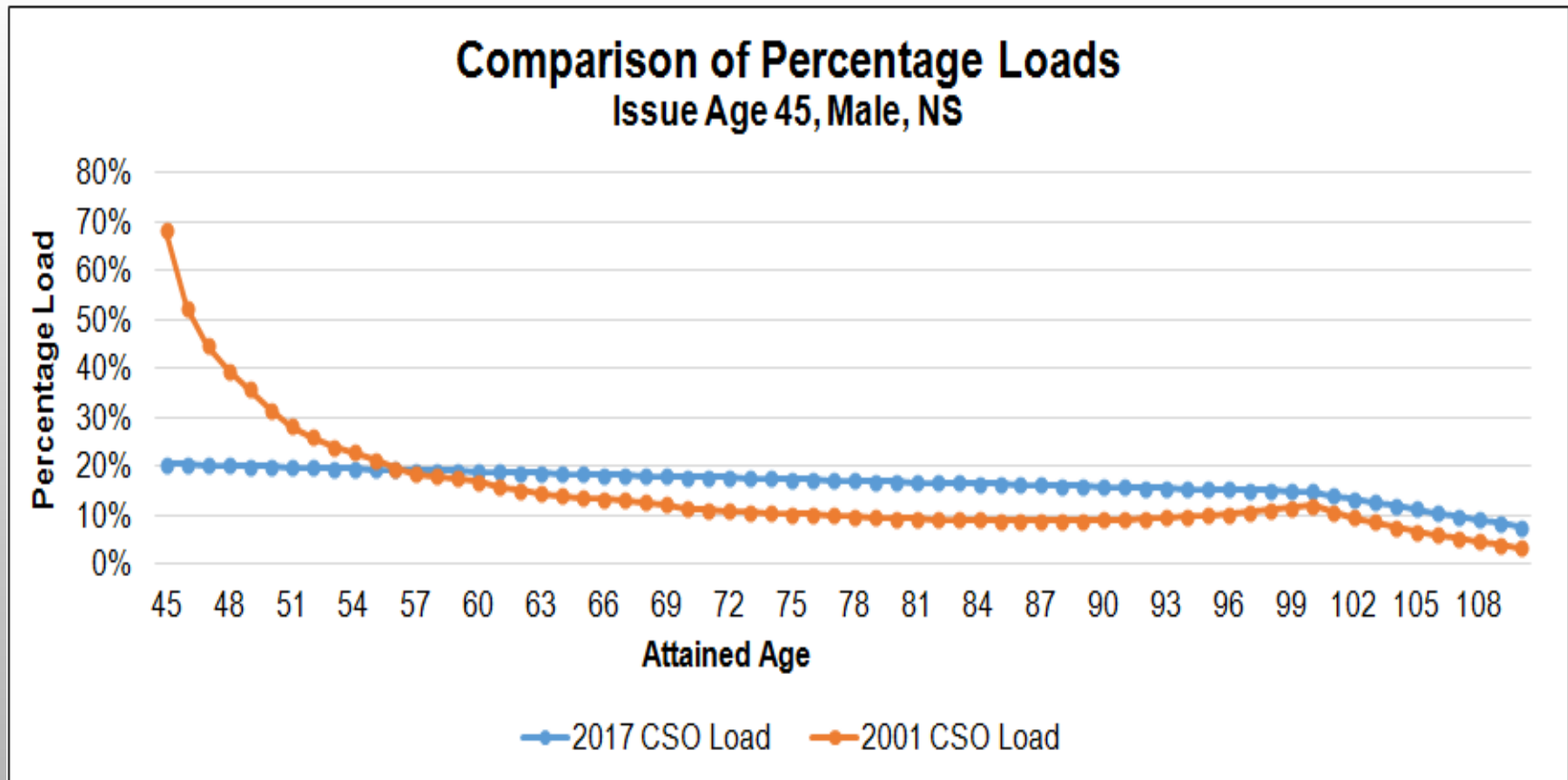
CSO Margin Structure, cont'd

- This load covers the mortality* of
 - 70.6% of companies in the study overall
 - 72.5% of companies for males; 76.5% for females
 - 71.6% of the companies for male non-smokers; 74.5% for female non-smokers
 - 74.5% of the companies for male smokers; 78.4% for female smokers
- A company's mortality was covered if its A/E ratio by amount was below 100% where E was the loaded pure experience table before any improvement to 2014 (or 2017)
- Committee believes this covers the guidance suggested by LATF to cover 70%-79% of contributing companies' experience

* The different distributions of business within each company led to variability in which companies and how many companies experience is covered by a particular load.
The coverage percentage varies by age grouping within a particular cohort.

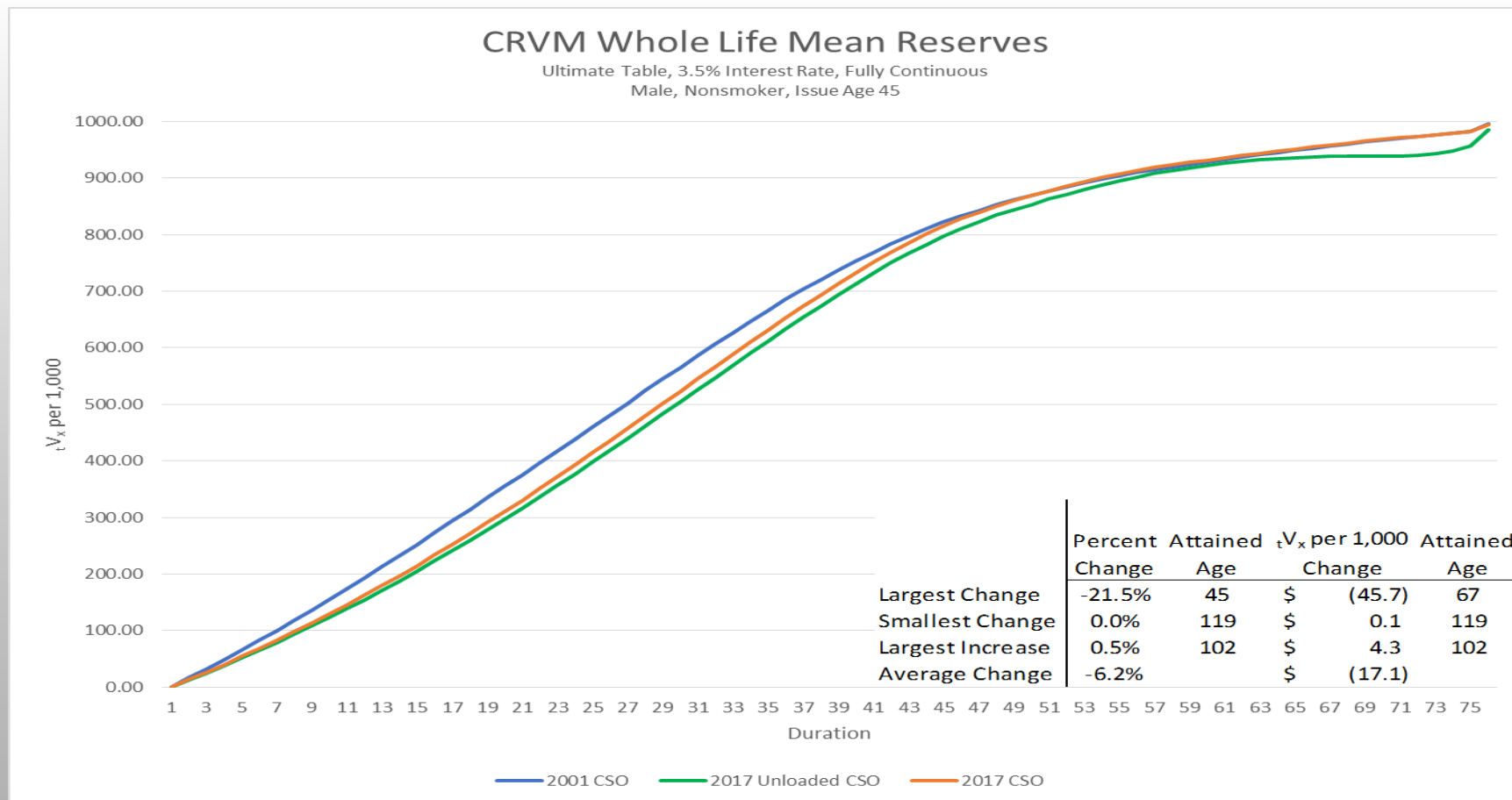


CSO Margin Structure, cont.



Whole Life Reserve Comparisons

CRVM Mean Reserves* - Male NS, Issue Age 45



* Ultimate Table, 3.5% Interest Rate, Fully Continuous



2017 CSO Development – Preferred Structure Tables

- 2015 VBT as base, projected with improvement to 2017 (referred to as Preferred Structure Basic Tables)
- Similar structure as 2001 CSO Preferred Structure Tables
 - 3 NS
 - NS and SM classes, when weighted together, equal 2015 VBT aggregate NS and SM mortality, respectively
 - Tables were subsequently improved to 2017
 - 2 SM
- Omega age of 121 – same as 2001 CSO
 - Rates grade to omega rate of 1.000
- Load structure and load level same across all the classes



Preferred Structure Loads

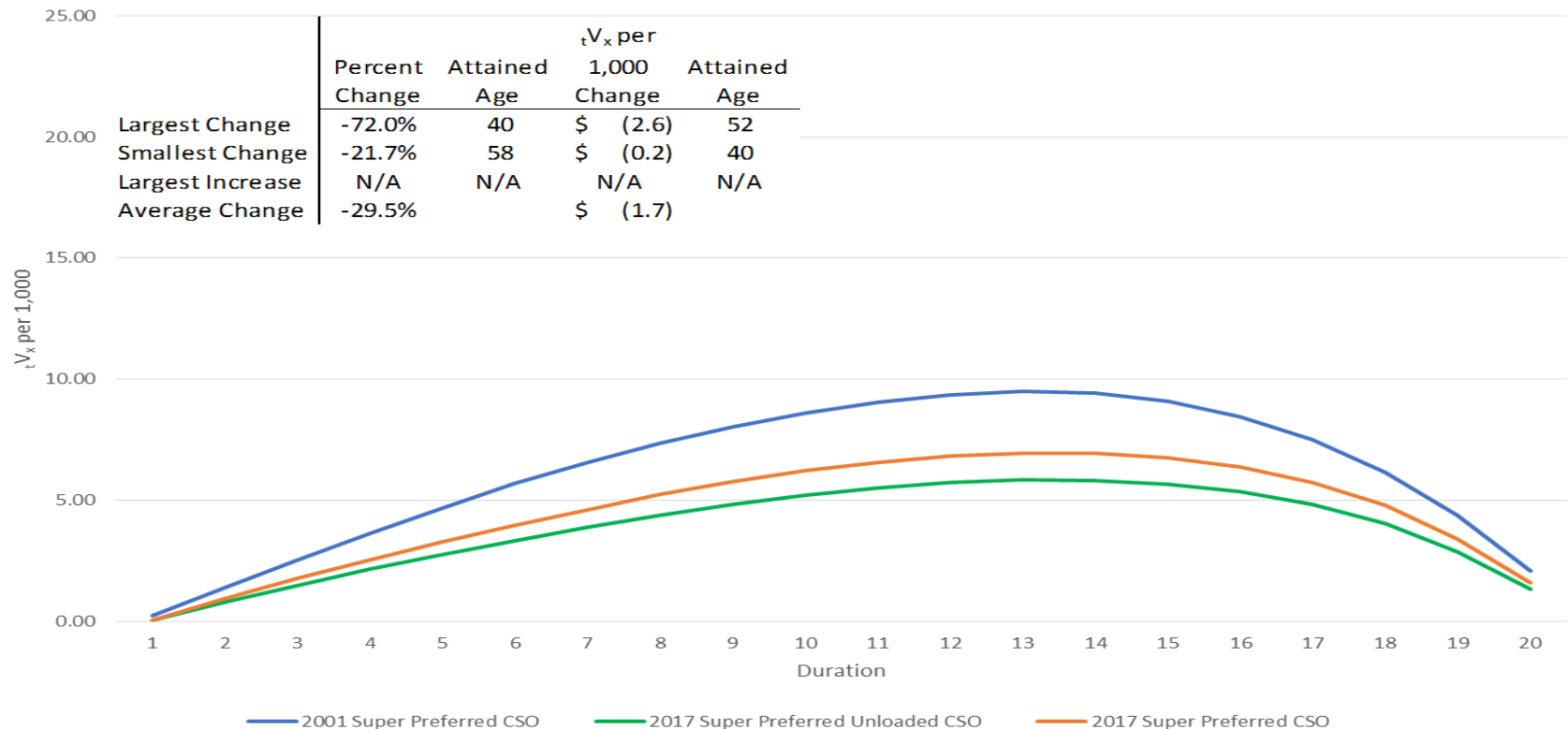
- Proposed 2017 CSO preferred structure tables have same percentage load for all tables
 - Arguments in favor of varying load by class:
 - Must ‘qualify’ to use the super preferred table, so lesser need for load
 - Resulting volatility of mortality in residual class may be higher than the aggregate CSO, suggesting potential for higher load
 - Arguments against:
 - More complicated table construction
 - Need to assure tables weight back to the aggregate CSO table



Preferred Structure Tables – Term Reserve Comparisons Super Preferred, Male, NS, Issue Age 40

Regulation XXX LT20 Mean Reserves

Super Preferred Select & Ultimate Table, 4.5% Interest Rate, Fully Continuous
Male, Nonsmoker, Issue Age 40



* Select & Ultimate Table, 4.5% Interest Rate, Fully Continuous

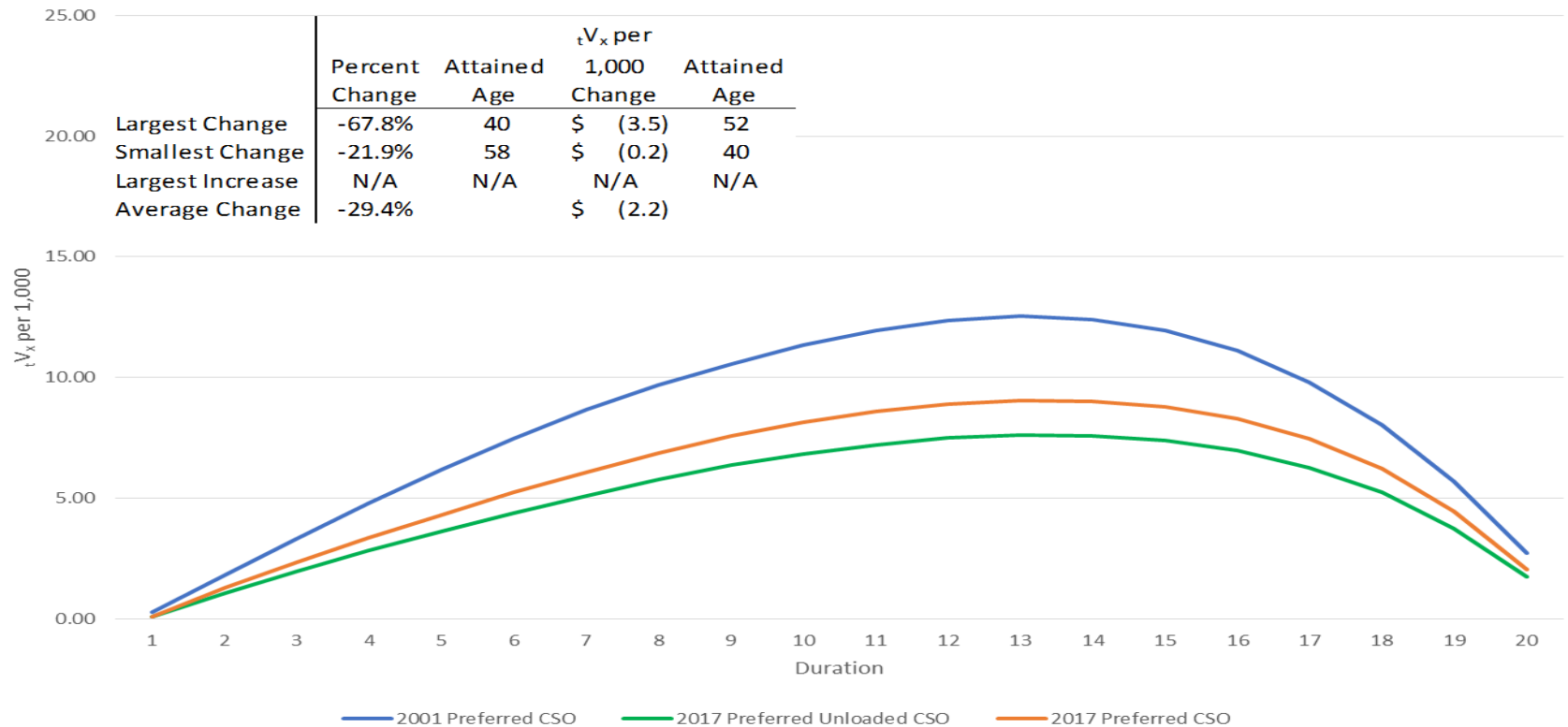


Preferred Structure Tables – Term Reserve Comparisons

Preferred, Male, NS, Issue Age 40

Regulation XXX LT20 Mean Reserves

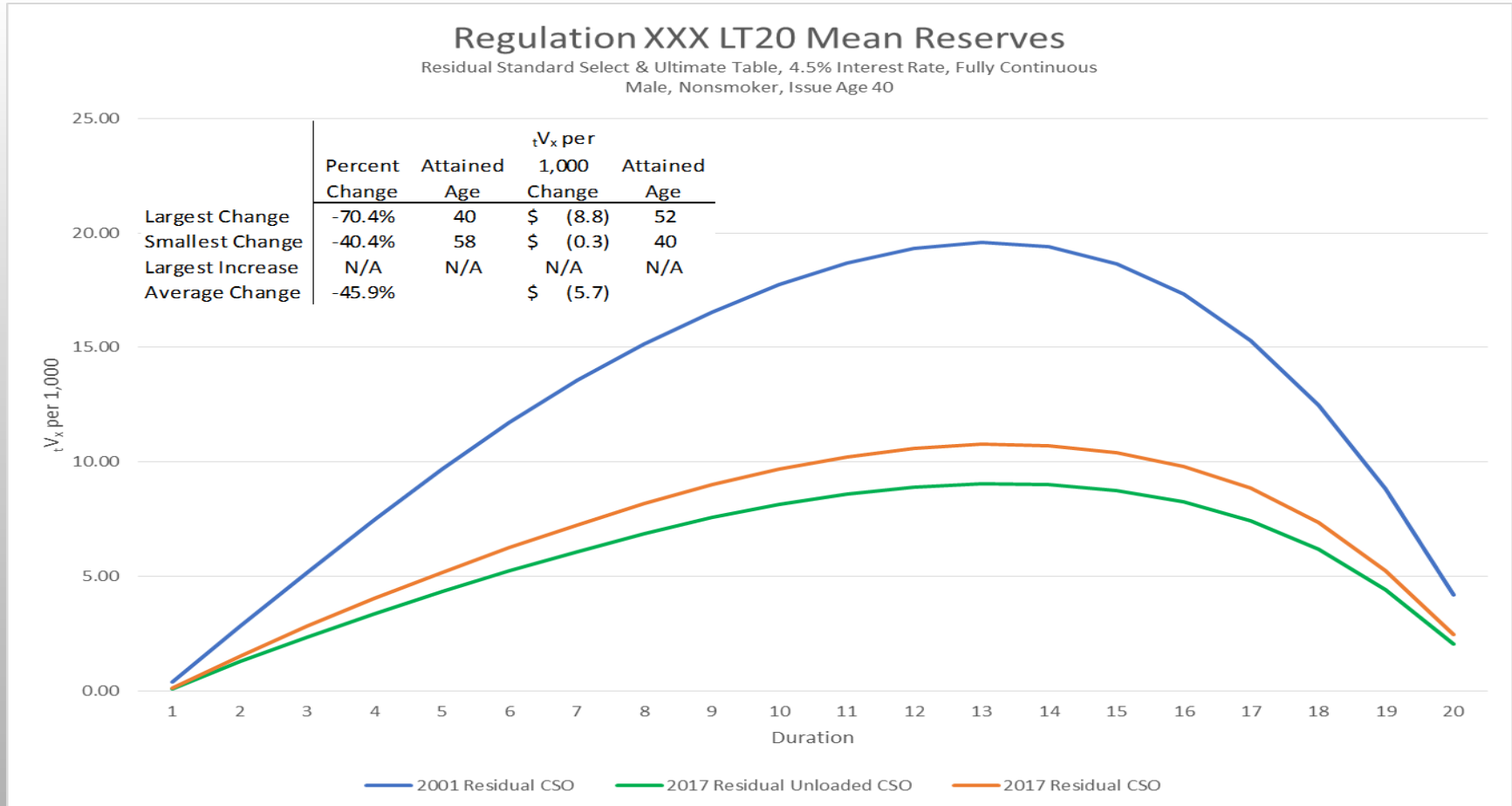
Preferred Select & Ultimate Table, 4.5% Interest Rate, Fully Continuous
Male, Nonsmoker, Issue Age 40



* Select & Ultimate Table, 4.5% Interest Rate, Fully Continuous



Preferred Structure Tables – Term Reserve Comparisons Residual Standard, Male, NS, Issue Age 40



* Select & Ultimate Table, 4.5% Interest Rate, Fully Continuous





AMERICAN ACADEMY *of* ACTUARIES

Objective. Independent. Effective.™



Underwriting Criteria Score Calculator

Tables and Applications – Adopted

- New UCS Calculator is a tool to assist companies in mapping preferred risk classes to corresponding RR tables based on their preferred underwriting criteria

| Table | Regulatory Use | Valuation Manual Impacts | Status |
|----------|--|--|---|
| UCS Tool | <ul style="list-style-type: none"> • Used in conjunction with VBT tables to map the relative risk tables to a company's preferred underwriting criteria | VM-20, §9.C.3.d <ul style="list-style-type: none"> • Added link to UCS tool and instructions • By way of APF, exposing tool itself | <ul style="list-style-type: none"> • Adopted • Full written report with demonstration of testing still in development – expected October • Web-based tool still in development |



What Is It Used For?

2015 VBT Relative Risk (RR) Tables

- Used in the calculation of AG-38 reserves

RRRs (Relative Risk Ratios)

- Used to determine which RR table to use for each risk class in structure



Output

Provide an specific RRR for each risk class to determine which table to use

| Output Results | | | | | |
|----------------|--------|--------|--------|--------|----------|
| NT | | | TB | | |
| NT Class | RRR | Prev | RRR | Prev | TB Class |
| Super pref NT | 72.0% | 25.00% | 83.0% | 70.00% | Pref TB |
| Pref NT | 98.0% | 40.00% | 139.7% | 30.00% | Std TB |
| Std NT | 122.3% | 35.00% | | | |



What's New in the 2015 Version

With the new UCS, the levels are based on actual math / science / research related to each of the criterion. The prior approach was based on formulas and assumptions developed using much more professional judgment.

Inputs

Revised structure

Criteria expansion

Logic

Improved KO and DC formulas

Assumptions

Each criterion has its own relative risk and prevalence assumption spectrum



More

Assumption creation

Based on actual experience obtained from various sources

Assumption structures

More consistent with reality
Allows for recognition of “J” and “U” mortality relationships

Age range

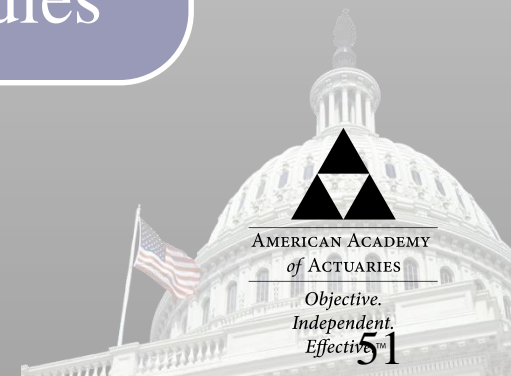
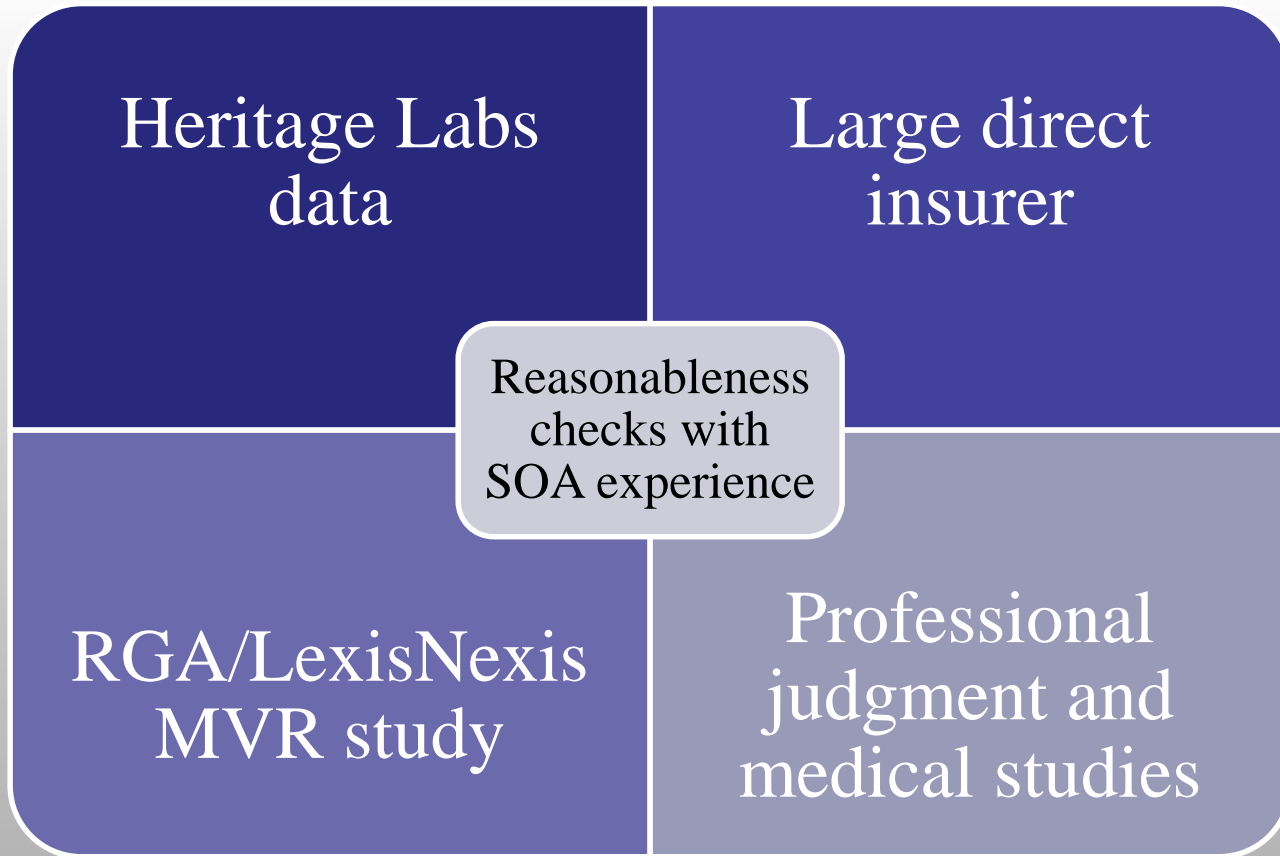
Allows different criteria for various age ranges for all criteria

Define “standard”

Adjustments to total mortality if a company has a more liberal or conservative structure in their definition of standard risk



Assumptions Source of Data



Additional Comments

Not a pricing tool

- Designed for valuation
- Assumptions are based on portfolio averages
- Assumptions do not vary by gender, smoking status, age
- Overlapping impact across criteria not recognized

Environment differences not considered

- Target market
- Distribution method
- Claims practices
- Underwriting for standard/substandard
- And others

Excel-based tool

- No macros
- SOA requirement
- Not most efficient programming environment
- SOA web based version in development

Too complicated, but too simple

- Very large program
- Does not reflect all criteria used by some companies
- Does not recognize well logic relationships used by some companies



AMERICAN ACADEMY *of* ACTUARIES

Objective. Independent. Effective.™



Questions?

Contact Information

Mary J. Bahna-Nolan, MAAA, FSA, CERA
Executive Vice President, Head of Life R&D
SCOR Global Life

Mbahna-nolan@scor.com

(312) 544-5029

Dieter Gaubatz, MAAA, FSA, FCIA
2nd Vice President, Client Liaison
Munich Re

DGaubatz@munichre.com

(770) 350-3278



AMERICAN ACADEMY *of* ACTUARIES

Objective. Independent. Effective.™



Supplementary information

Comparing VBT 2015 and 2008 tables

Male non-smoker

| Annual improvement (%) equivalent | | | | | | |
|-----------------------------------|----------|------|------|------|-------|-------|
| | Duration | | | | | |
| Issue Age | 1 | 6 | 11 | 16 | 21 | 26 |
| 25 | 5.8% | 6.9% | 4.5% | 3.5% | 2.3% | 3.6% |
| 35 | 5.3% | 1.8% | 4.0% | 3.6% | 2.2% | 4.0% |
| 45 | -0.8% | 3.5% | 3.6% | 2.3% | 2.2% | 4.0% |
| 55 | 5.7% | 3.3% | 2.5% | 2.2% | 2.3% | 2.5% |
| 65 | 2.5% | 4.1% | 3.4% | 1.7% | -0.2% | 0.3% |
| 75 | 7.6% | 4.3% | 0.1% | 0.3% | 1.1% | 1.0% |
| 85 | 10.2% | 6.4% | 1.1% | 1.0% | 0.1% | -1.2% |

Mortality decrease expressed as an annual improvement rate over 7 years

- A reduction in rate is shown as a positive improvement % in the above table
- The improvement rates shown show impact of a number of characteristics
- Values are NOT actual underlying systematic improvement, many other factors also included



Comparing VBT 2015 and 2008 tables

Female non-smoker

| Annual improvement (%) equivalent | | | | | | |
|-----------------------------------|----------|-------|-------|-------|-------|-------|
| | Duration | | | | | |
| Issue Age | 1 | 6 | 11 | 16 | 21 | 26 |
| 25 | 1.2% | 1.4% | 0.8% | -0.7% | 1.2% | 5.7% |
| 35 | 7.9% | -0.4% | 3.0% | 2.2% | 0.8% | 4.9% |
| 45 | 3.0% | 1.5% | 3.2% | 1.6% | 0.9% | 5.7% |
| 55 | 5.1% | 0.6% | 1.7% | 1.2% | 2.4% | 4.4% |
| 65 | 3.3% | 3.2% | 1.8% | 0.0% | 0.0% | 0.5% |
| 75 | 4.9% | 4.2% | 0.7% | 0.5% | -1.1% | -1.1% |
| 85 | 0.4% | 7.5% | -1.1% | -1.1% | -0.5% | -1.2% |

Mortality decrease expressed as an annual improvement rate over 7 years

- A reduction in rate is shown as a positive improvement % in the above table
- The improvement rates shown show impact of a number of characteristics
- Values are NOT actual underlying systematic improvement, many other factors also included



Comparing VBT 2015 and 2008 tables

Male smoker

| Annual improvement (%) equivalent | | | | | | |
|-----------------------------------|----------|-------|-------|------|------|-------|
| | Duration | | | | | |
| Issue Age | 1 | 6 | 11 | 16 | 21 | 26 |
| 25 | 4.5% | 3.1% | 3.3% | 1.3% | 1.4% | 5.1% |
| 35 | 5.6% | -0.1% | 2.8% | 2.0% | 1.9% | 3.7% |
| 45 | 6.0% | 2.7% | 3.0% | 1.0% | 0.6% | 3.7% |
| 55 | 6.2% | 0.3% | -0.2% | 0.3% | 1.5% | 4.0% |
| 65 | 5.9% | 0.8% | 1.7% | 1.3% | 2.2% | 2.9% |
| 75 | 6.6% | 0.2% | 2.9% | 2.9% | 3.7% | 2.9% |
| 85 | 2.7% | 7.5% | 3.7% | 2.9% | 0.2% | -1.2% |

Mortality decrease expressed as an annual improvement rate over 7 years

- A reduction in rate is shown as a positive improvement % in the above table
- The improvement rates shown show impact of a number of characteristics
- Values are NOT actual underlying systematic improvement, many other factors also included



Comparing VBT 2015 and 2008 tables

Female smoker

| Annual improvement (%) equivalent | | | | | | |
|-----------------------------------|----------|-------|-------|-------|-------|-------|
| | Duration | | | | | |
| Issue Age | 1 | 6 | 11 | 16 | 21 | 26 |
| 25 | 7.2% | 0.4% | -0.8% | -2.0% | 1.4% | 3.5% |
| 35 | 3.6% | -1.5% | 1.0% | 1.4% | 1.7% | 2.6% |
| 45 | 3.2% | 1.9% | 2.0% | 1.0% | 0.1% | 3.3% |
| 55 | 5.8% | 1.7% | 0.2% | -0.5% | 1.7% | 4.3% |
| 65 | 6.5% | -0.8% | -0.8% | -0.5% | -0.4% | 0.1% |
| 75 | 6.6% | -2.6% | -1.6% | 0.1% | -0.4% | 0.9% |
| 85 | -0.5% | 3.6% | -0.4% | 0.9% | -0.5% | -1.2% |

Mortality decrease expressed as an annual improvement rate over 7 years

- A reduction in rate is shown as a positive improvement % in the above table
- The improvement rates shown show impact of a number of characteristics
- Values are NOT actual underlying systematic improvement, many other factors also included

