

Valuation Table Team

a subgroup of the

American Academy of Actuaries/SOA

Joint Preferred Mortality
Project Oversight Group

March 2008 Report

Life & Health Actuarial Task Force Orlando, FL



2008 Valuation Basic Table

- Final report released March 2008
- Final tables reflect mortality improvement to 2008
- Age nearest birthday (ANB) and age last birthday (ALB) tables
- Currently no unisex or composite tables



Table Development

- 36 ANB tables, 36 ALB tables
- 16 aggregate tables
 - Primary table (M/F, NS/SM, ANB/ALB)
 - Limited Underwriting table (M/F, NS/SM, ANB/ALB)
 - Different aggregate tables account for variations in experience by level of underwriting and market
- 56 Relative Risk (RR) tables
 - 10 non-smoker (M/F, ANB/ALB)
 - 4 smoker (M/F, ANB/ALB)



Aggregate Table Development

- Issue ages 0-90
- Select period
 - 25-years or to attained age 90, whichever is sooner
 - Minimum of 2 years for issue ages 11+
- Tables developed based on experience by amount
- Tables developed on an age nearest birthday basis
 - Used an algorithm to determine age last birthday tables

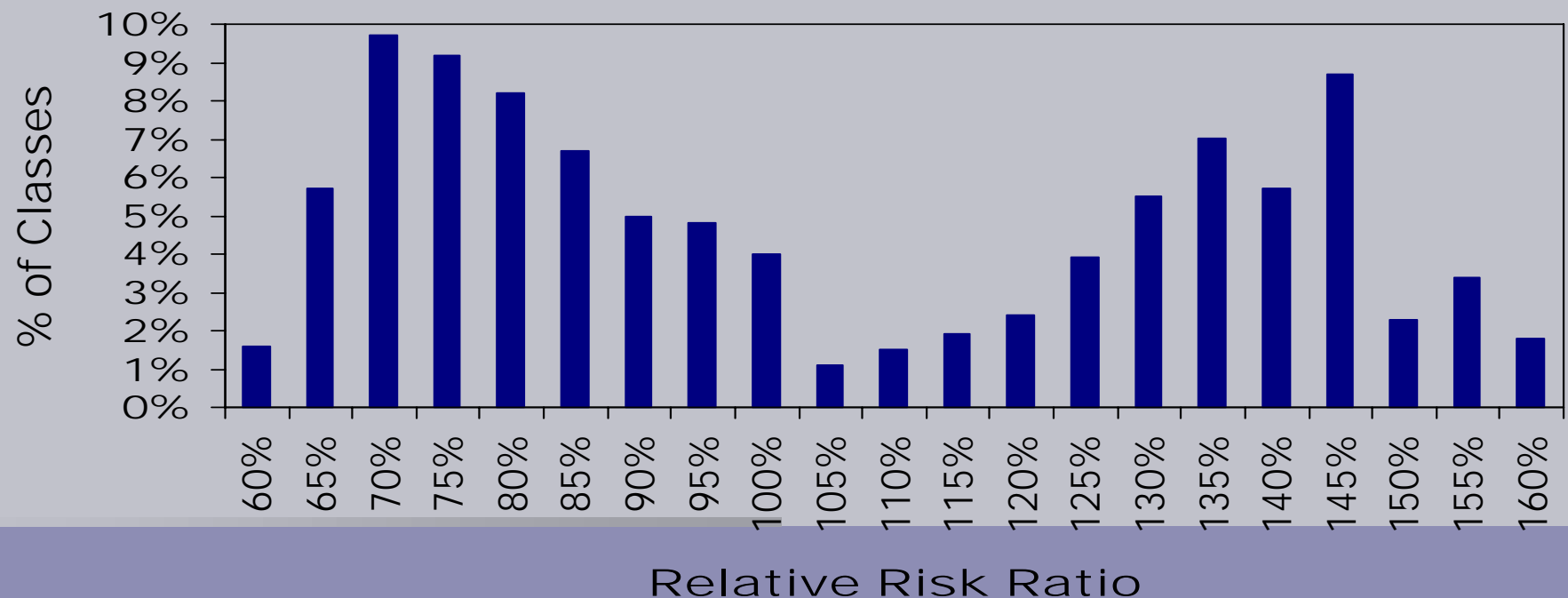


VBT Relative Risk Table Development

- RR Tables
 - Based on experience data and underwriting guidelines from 28 contributing companies that volunteered such information
 - Scoring mechanism used to generate underwriting criteria scores (UCS)
UCS scores translated to relative risk ratios (RRRs)



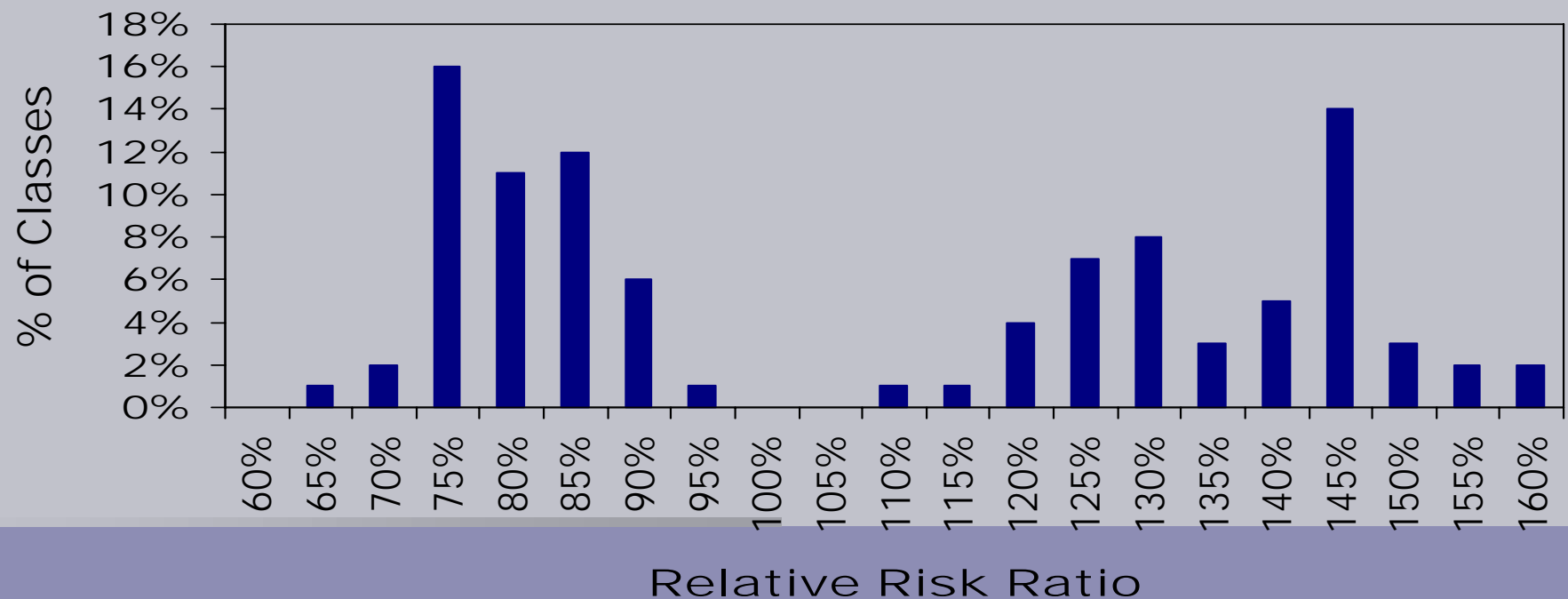
Distribution of Relative Risk Ratios for Non-smoker Risks



- 10 Non-smoker tables in 10% increments
- 100% table reflects aggregate experience



Distribution of Relative Risk Ratios for Smoker Risks



- 4 Smoker tables in 25% increments
- 100% table reflects aggregate experience



Relative Risk Table and Corresponding UCS

Relative Risk Table		UCS
Non-smoker	70%	36
Non-smoker	80%	51
Non-smoker	90%	64
Non-smoker	100%	76
Non-smoker	110%	87
Non-smoker	120%	98
Non-smoker	130%	106
Non-smoker	140%	113
Non-smoker	150%	119
Non-smoker	160%	123

Relative Risk Table		UCS
Smoker	75%	44
Smoker	100%	76
Smoker	125%	103
Smoker	150%	119



Preferred Wear-off Factors

- Developed a methodology to reflect the wear-off of preferred underwriting
- Factors do not vary by RR table
- Grade to standard for all classes



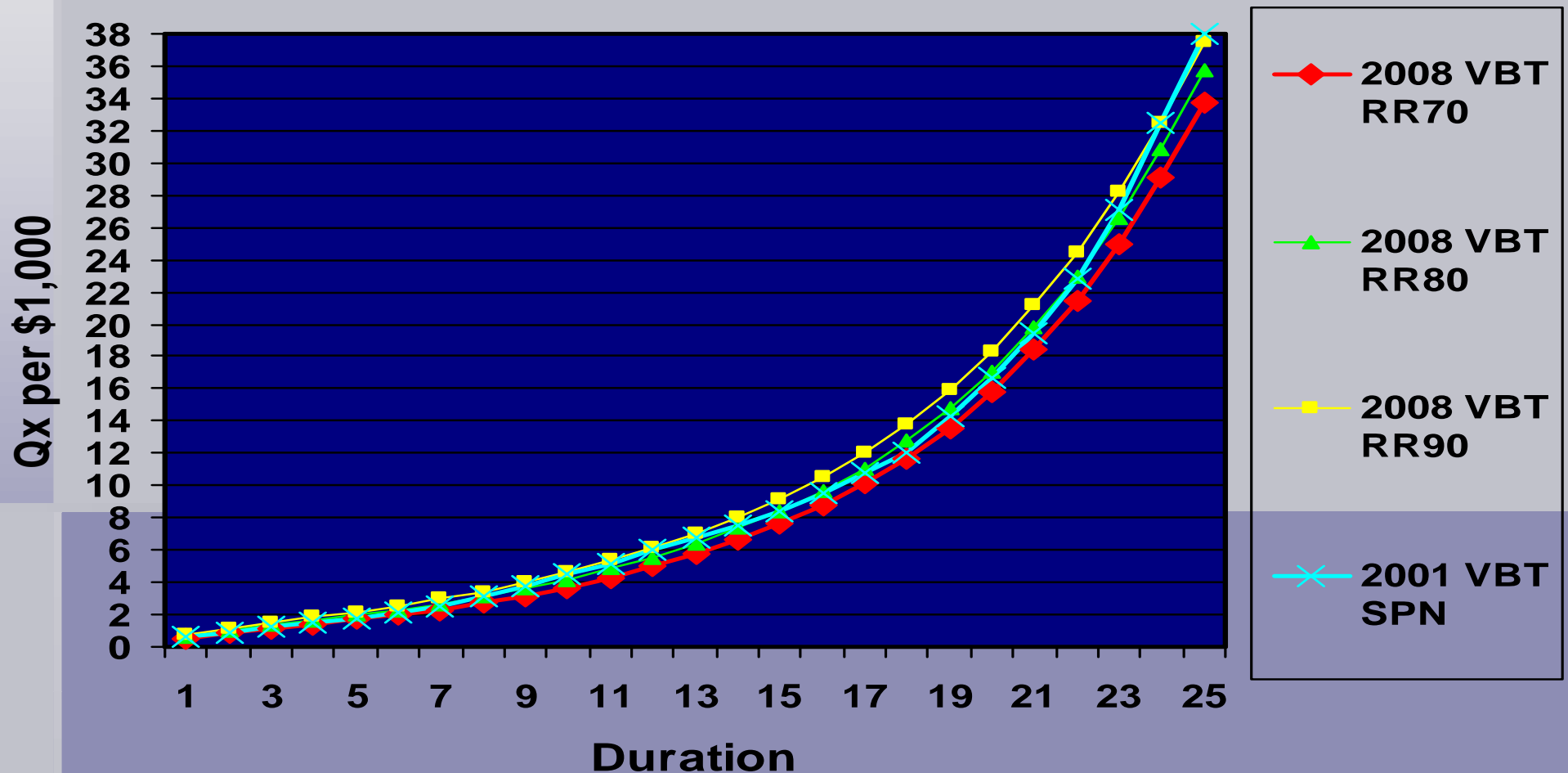
Relative Risk Table Development

- UCS/RRR relationship and preferred wear-off factors applied to the Primary Tables to determine the RR Tables
 - No risk class splits for the limited underwriting table other than smoker/nonsmoker
- Duration 1 – RRRs
- Durations 2+ - Preferred risk wear-off



Comparison between 2001 VBT Preferred Structure Table (SPNT), 2008 VBT RR70 and 2008 VBT RR90

Male, Nonsmoker, Issue Age 55 ANB



Comparison between 2001 VBT Preferred Structure Table (SPNT), 2008 VBT RR70, RR80 and RR90

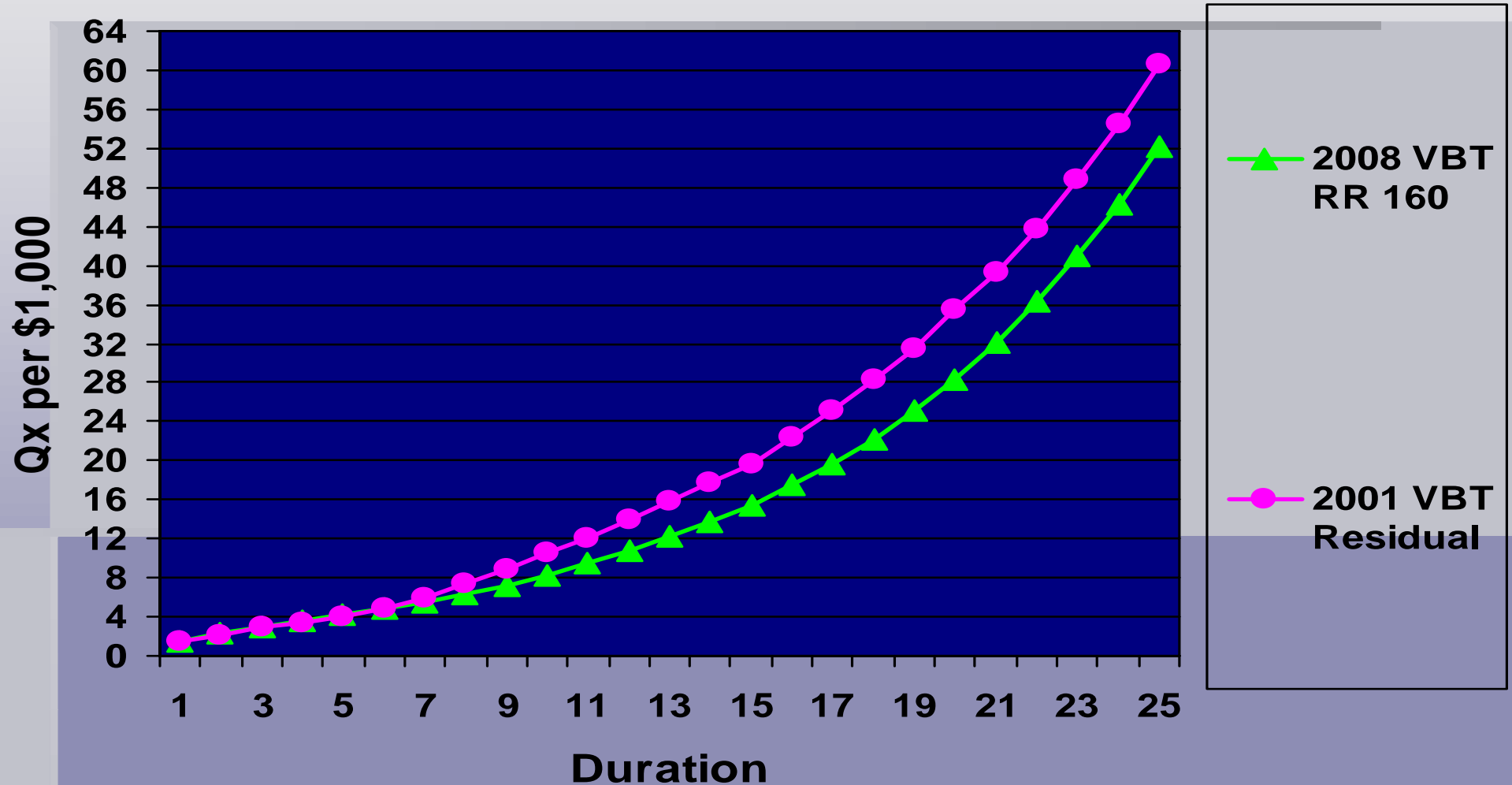
Male, Nonsmoker, Issue Age 55 ANB

Ratio of 2008 VBT RR70, RR80 & RR 90 Tables to 2001 VBT SPNT

	Duration					
	1	10	15	20	25	AA 100
RR70	90%	82%	90%	94%	89%	102%
RR80	105%	92%	100%	102%	94%	102%
RR90	118%	102%	109%	110%	99%	102%



Comparison between 2001 VBT Residual NT Table & 2008 VBT RR160 Male, Nonsmoker, Issue Age 55 ANB



Comparison between 2001 VBT Residual NT Table & 2008 VBT RR160 Male, Nonsmoker, Issue Age 55 ANB

Ratio of 2008 VBT RR 160 Table to 2001 VBT Residual NT

	Duration					
	1	10	15	20	25	AA 100
RR 160	100%	79%	79%	80%	86%	102%

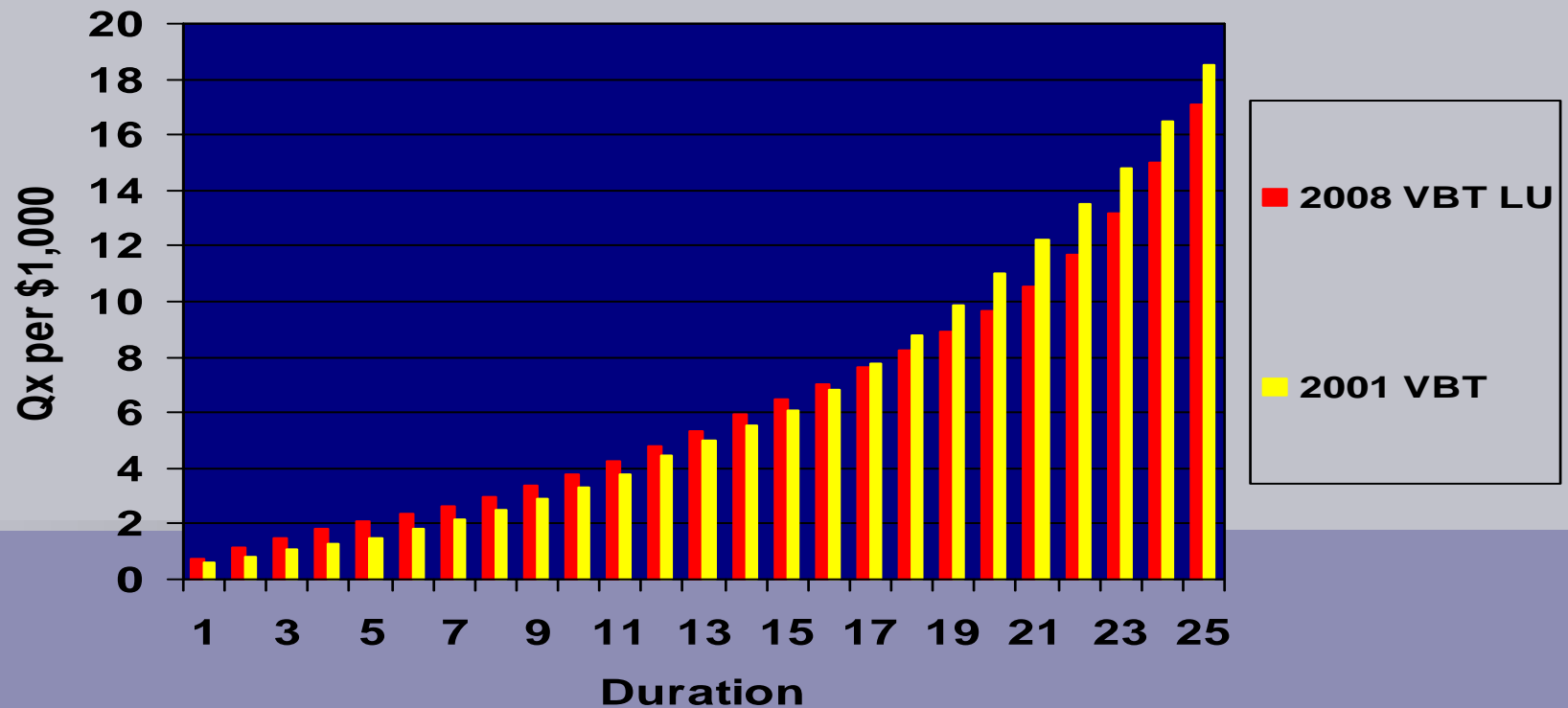


Limited Underwriting Table (LU)

- Male/Female
- Smoker/Nonsmoker
- Represents mortality for policies with limited underwriting
 - Does not represent guaranteed issue or pre-need mortality
- Blends into primary table mortality by attained age 90



Comparison between 2001 VBT & 2008 VBT LU Male, Nonsmoker, Issue Age 45 ANB



Ratio	Duration					
	1	10	15	20	25	AA 100
2008/2001	118%	116%	107%	88%	93%	102%



Valuation Table Team

Team Mission: To produce a set of valuation mortality tables with margins suitable for valuation purposes for individual life insurance products that reflect an assumed standard/preferred underwriting criteria.



Valuation Table Team Update

- Testing of Basic Table
- Development of Actuarially Sound Margin Methodology
- Testing of Valuation Table (in process)



Testing:

- Parallel Testing
- Testing Basic Reserves (excluding Deficiency Reserves)
- Compare reserves under current methodology using 2008 and 2001 VBTs
- Then compare PBR reserves using 2008 and 2001 VBTs

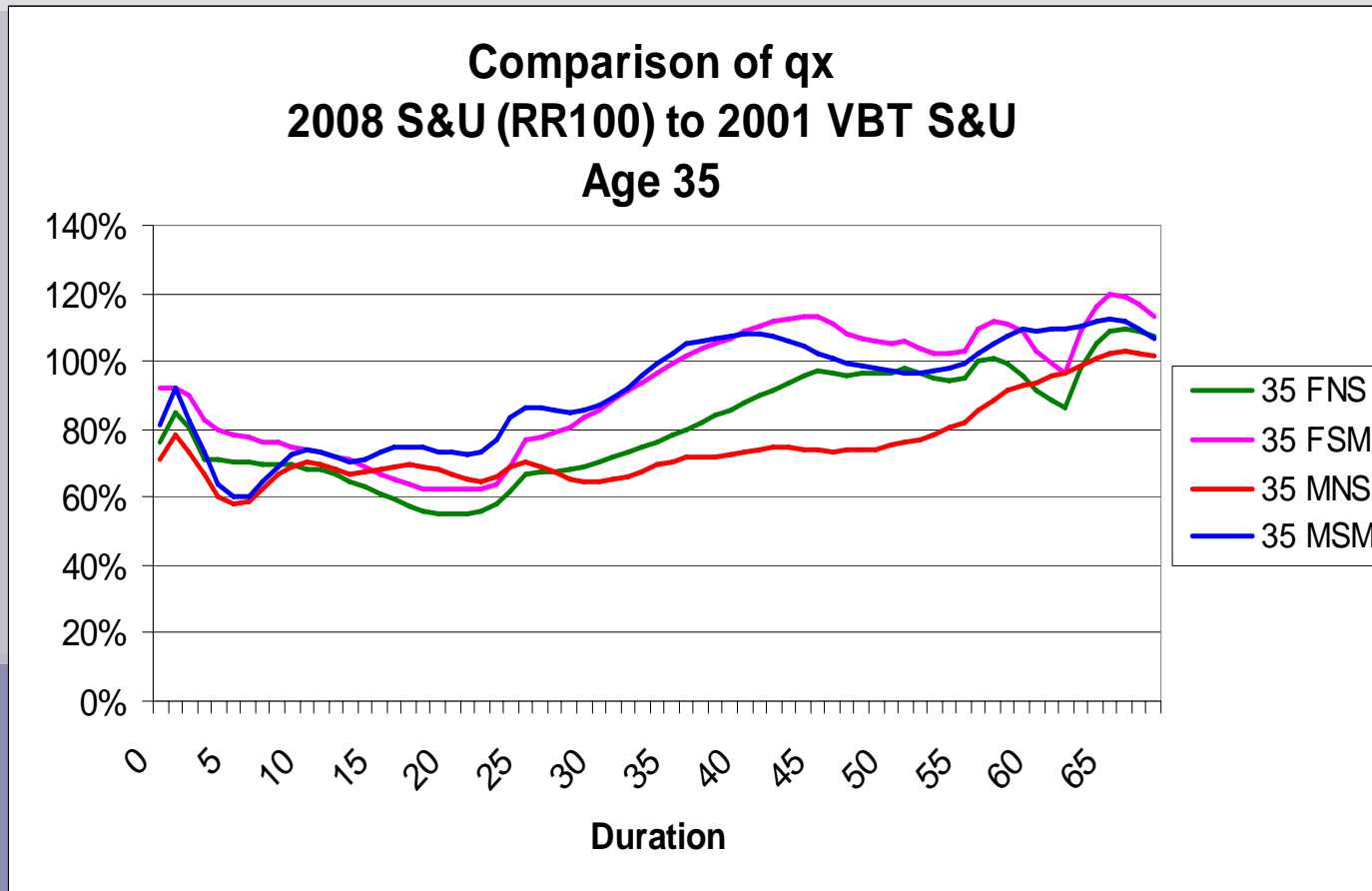


Testing Completed to Date

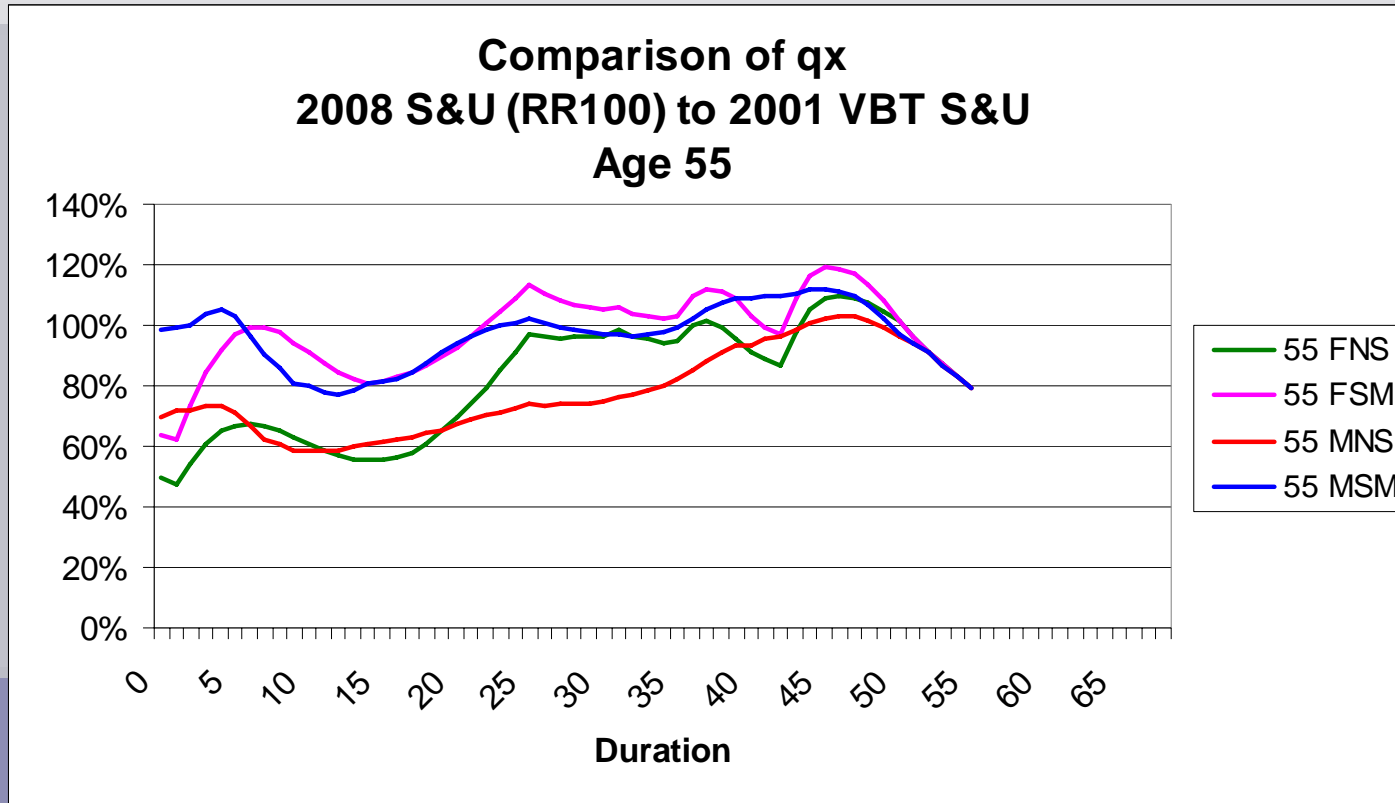
- Comparison of 2008 VBT q_x s to 2001 VBT q_x s
- Comparison of CRVM reserves for 20 yr. term to those produced by 2001 VBT
- Valuation interest rate 4%



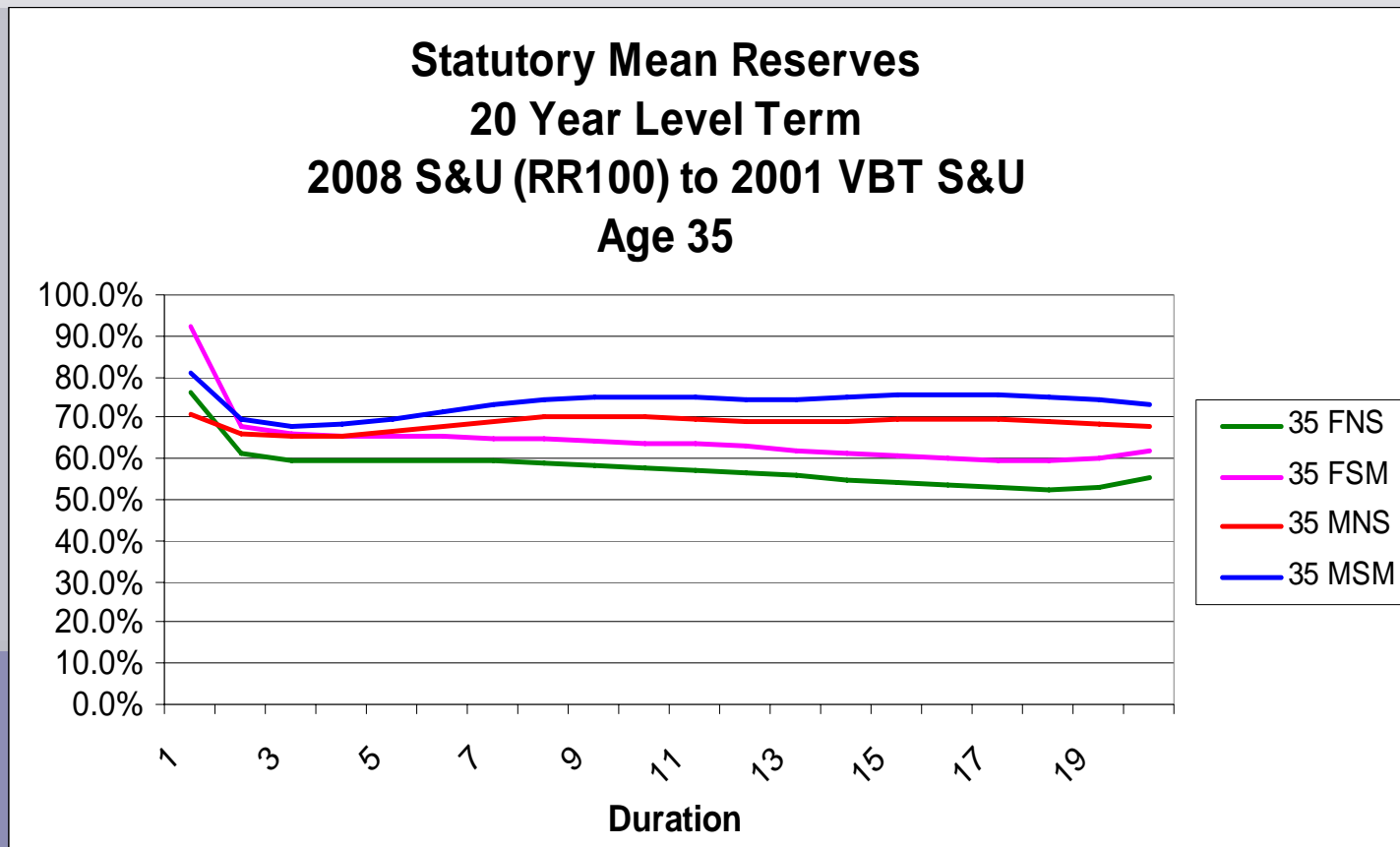
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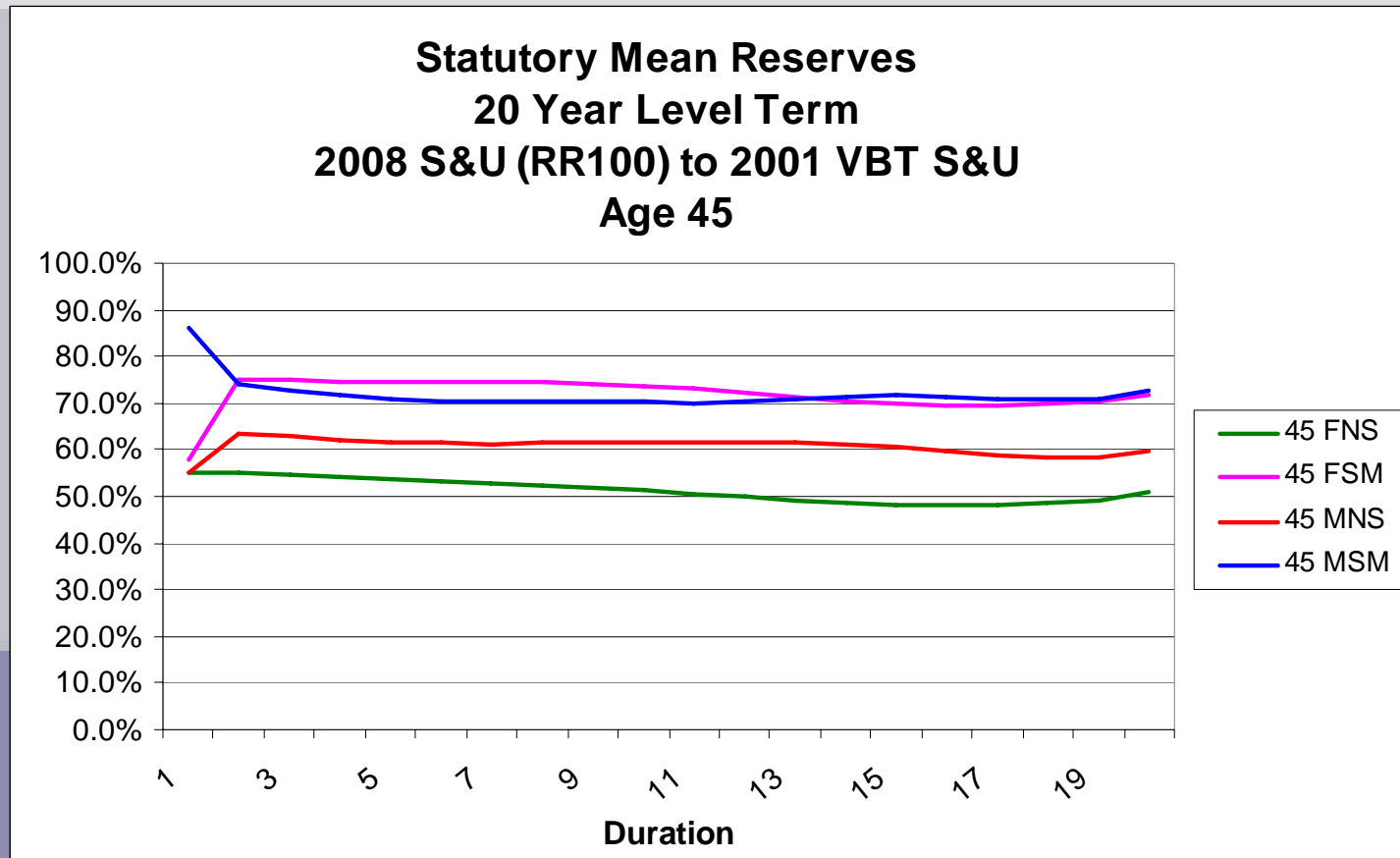
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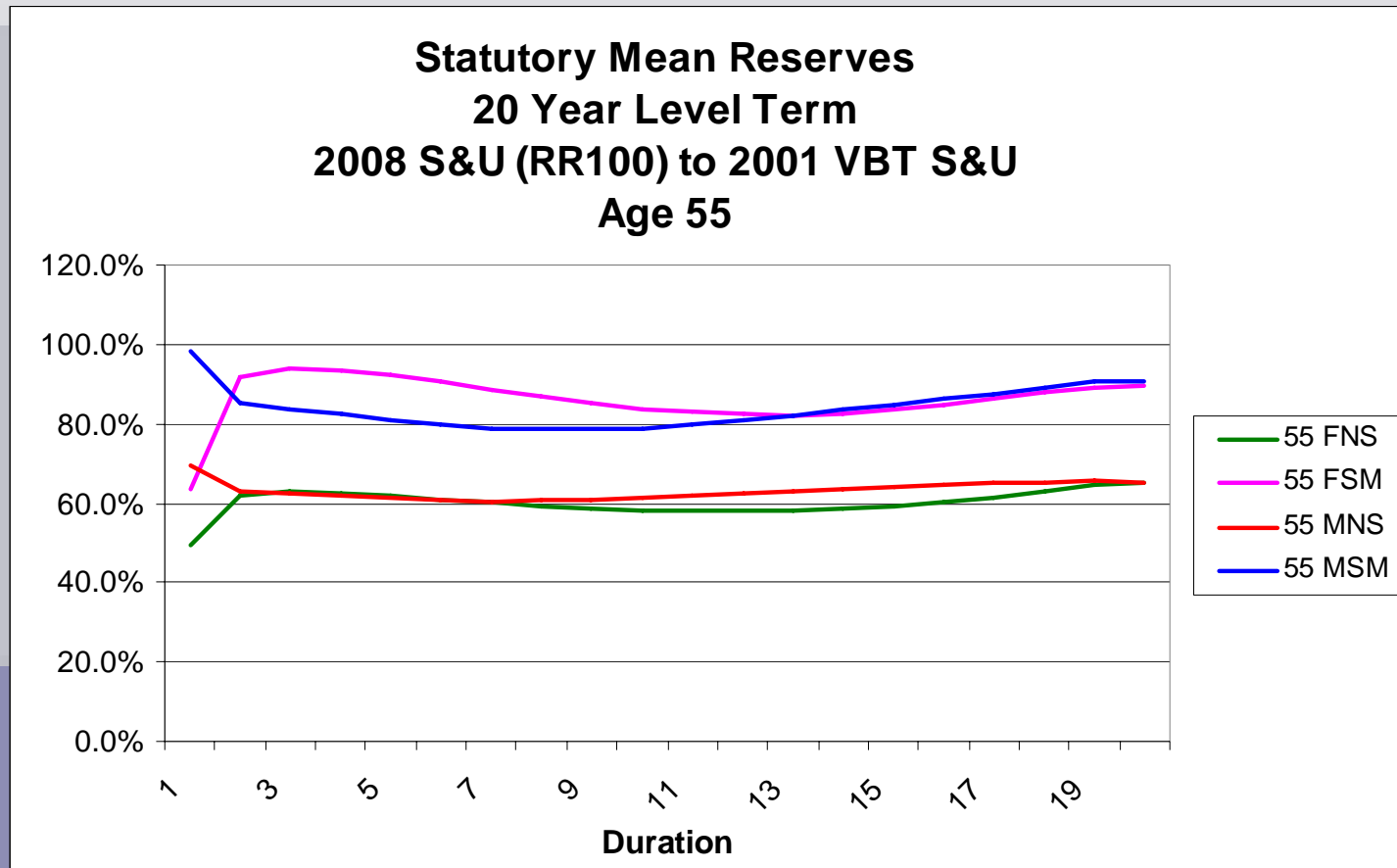
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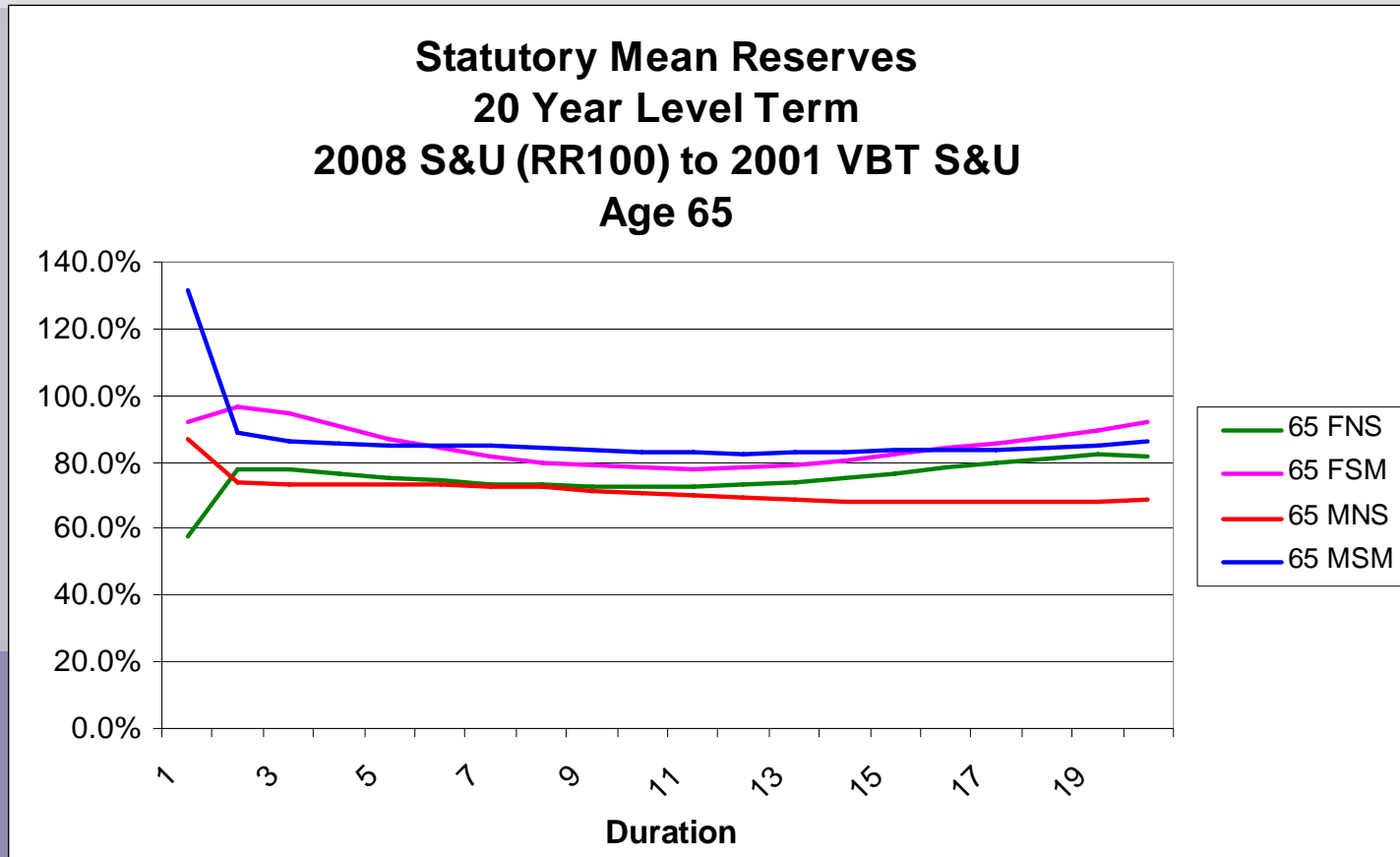
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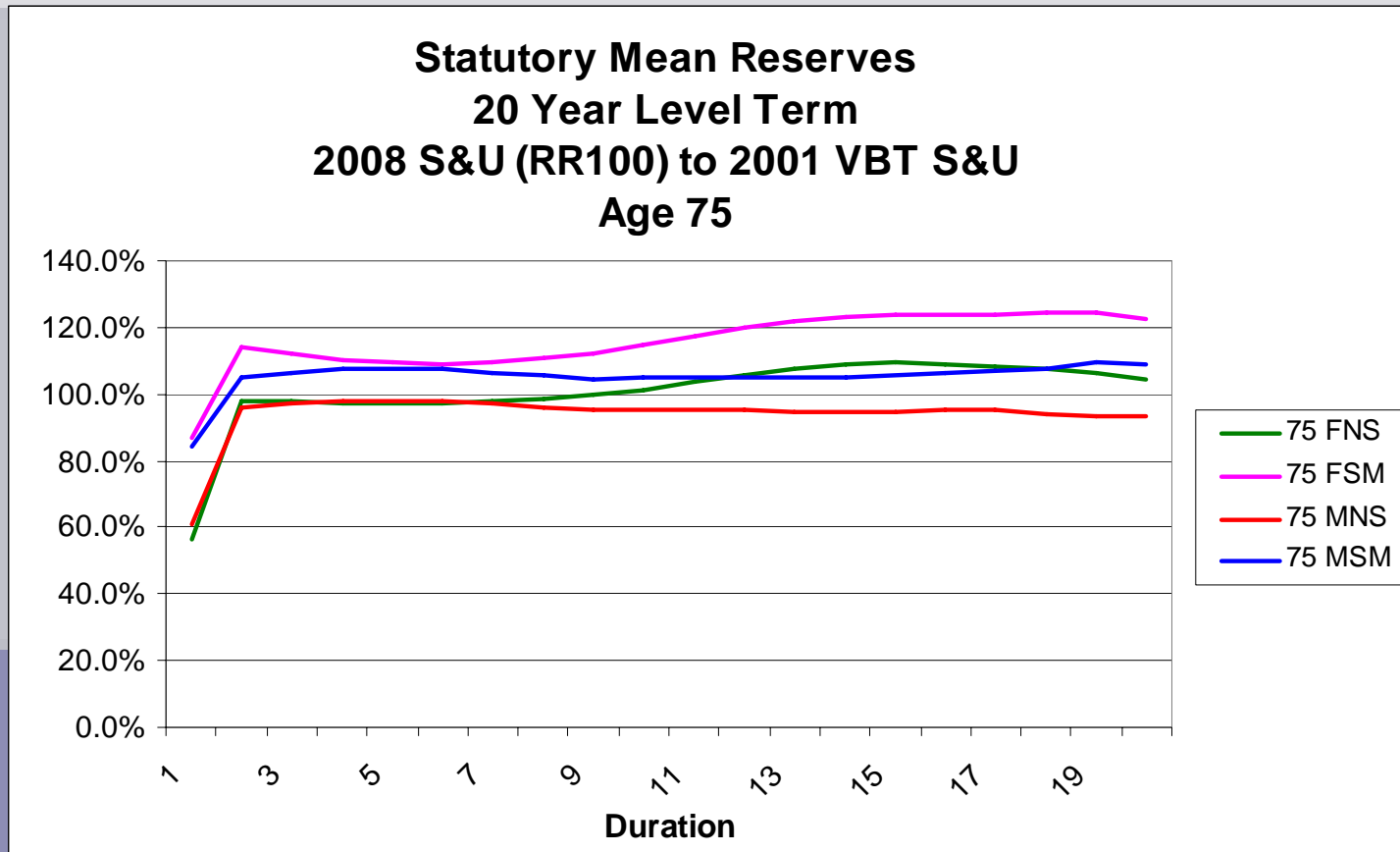
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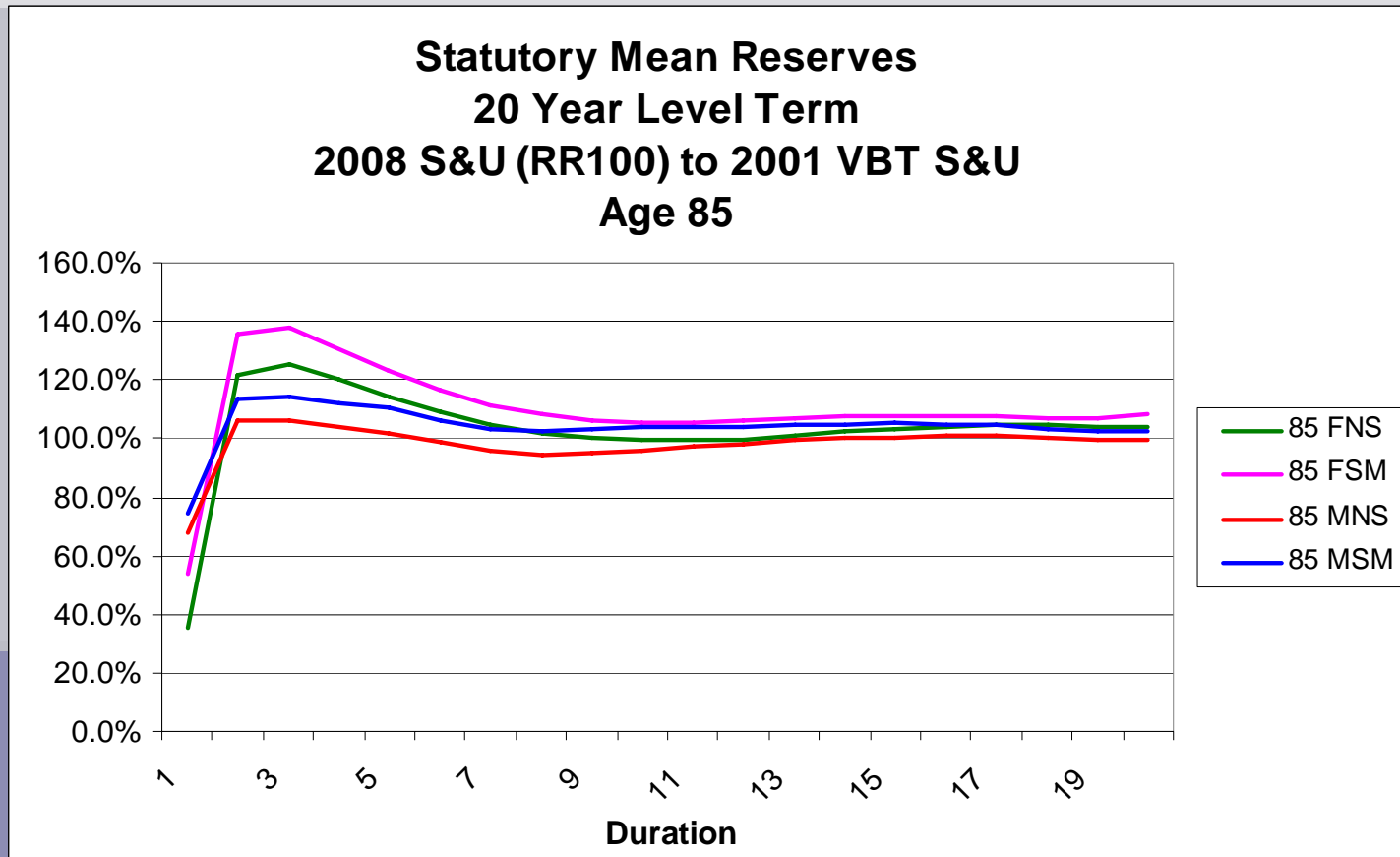
Testing (cont'd):



Testing (cont'd):



Testing (cont'd):



Testing to be Completed

- A spreadsheet system for comparing PBR reserves was recently developed and a preliminary review has been completed.



Margins: Topics to be Discussed

- Specifications in VM-20
- Margin Considerations for 2001 Commissioners' Standard Ordinary Table (2001 CSO)
- Comparison of 2001 CSO Margin to Canada's Guidelines
- Purposes of the Margin
- Valuation Table Team's Preliminary Views on Margins



Section E.2.7 of VM-20 Covers Mortality Margins

- Companies not meeting the minimum credibility level set the prudent (i.e., with margin) mortality assumption to the mortality rates in the commissioner's tables
- Companies with experience meeting the minimum credibility level set margin to provide for adverse deviation and estimation error plus uncertainty caused by situations including, but not limited to, the following:
 - ┆ Reliability of experience studies
 - ┆ Changes in underwriting
 - ┆ Non-homogeneous data
 - ┆ Unfavorable environmental or health developments
 - ┆ Market forces that may cause antiselection



Margin Considerations for 2001 CSO

- Reserves on loaded table should not be materially less than reserves using basic, select and ultimate mortality
- Terminal reserves on loaded table should not be significantly distorted compared with terminal reserves on basic table
- Consistency between males vs. females, smokers vs. nonsmokers, select vs. ultimate
- Should not result in unreasonable statutory premium deficiencies on term insurance plans
- Reserves and net premiums on the loaded table should not be excessive
- Margin should provide reasonable provision for possible future adverse mortality experience



Margin Considerations for 2001 CSO (cont'd)

- June 2001 presentation to LHATF
 - An average 20% margin was shown to cover mortality from at least 80% of contributing companies
 - Sample calculations on 20-year term indicated that an overall 10% mortality margin on formula reserves was roughly equivalent to 20% margin on economic reserves due to conservatism in other components of formula reserves
 - Noted that cash flow testing, RBC and “X-factor” testing were additional layers of assumption control
- LHATF recommended an overall 15% margin
- Loaded 2001 CSO table compared to mortality of contributing companies
 - ┆ Covered 15 of 21 companies (71%) in durations 1-15
 - ┆ Covered 14 of 14 companies (100%) in durations 1-25 (only these 14 companies had experience in durations 16-25)
 - ┆ Covered 11 of 14 companies (79%) in ultimate durations



Comparison of 2001 CSO Margin to Canada's Guidelines

- 2001 CSO formula is $(0.0056 - 0.00016x + 0.000008x^2)/e_x$
- Canada's guideline range is 3.75 to 15.00, divided by e_x
- Comparison of numerators

Attained Age	2001 CSO	Canada
25	10.2	3.75-15.00
45	21.1	3.75-15.00
65	38.4	3.75-15.00
85	62.0	3.75-15.00
105	92.1	3.75-15.00

- Note that in a gross premium valuation, such as Canada's system and PBR, large margins at older ages have far more effect on reserves than in a net premium valuation



Purposes of the Margin

- In its final report, the 2001 CSO Task Force discussed four purposes of mortality loads (margins)
 - Confidence of experience study – mortality should cover the “true” mortality underlying the experience study (the 1990-95 experience study was based on a large volume of data, so no margin was needed for this)
 - Variation among companies – the margin should be large enough to cover a large proportion of companies
 - Random fluctuation – margin should address random fluctuations caused by having a small number of exposures
 - Unknown variation – this covers one-time events (epidemics) and future trends (e.g., changes in general health conditions) – by definition, this cannot be quantified



Valuation Table Team's Preliminary Views on Margins – Confidence of Experience Study

- The SOA's 2002-04 experience study has a large volume of data – no margin is needed to produce sufficient confidence for the aggregate 2008 VBT
- The selection of relative risk tables based on UCS scoring is based on less data than the SOA 2002-04 study
 - However, the relative risk table assignment is, to a large extent, a split of the aggregate basic table
 - Relative risk tables grade to the aggregate table at higher attained ages, so any difference would wear off in later durations
- The Valuation Table Team does not plan to develop an explicit margin for this purpose



Valuation Table Team's Preliminary Views on Margins – Variation by Company

- If companies without credible experience use the valuation table “as is,” then the margin requirements would appear to be similar to the 2001 CSO table, i.e., cover about 80% of contributing companies in the 2002-04 experience study
- Analysis of the A/E ratio (“E” based on 2001 CSO) of 2002-04 contributing companies indicates that 80% coverage requires a margin of roughly 20% at lower ages to 10% at higher ages
 - Testing is needed, but we expect margins of this magnitude will have a large impact on reserves
 - If companies with credible experience can omit this margin, they may have significantly lower reserves than companies without credible experience
- Some of the variation by company may be caused by different mixes of preferred and residual standard underwriting classes, which may be addressed by underwriting class specific mortality



Valuation Table Team's Preliminary Views on Margins – Random Fluctuations

- The random fluctuation discussed in the 2001 CSO report considered a single year's experience
 - For PBR, we should consider the effects of random fluctuation on the present value of future mortality
 - “Present value” takes account of many years experience, so random fluctuation is reduced compared with a single year's experience
- It is not practical to have a standard valuation mortality table that varies by size of the block of business
- The Team believes that random fluctuations should be covered by surplus, not reserves



Valuation Table Team's Preliminary Views on Margins – Unknown Variation

- We believe that “one-time” events should be covered by surplus, not reserves
- This leaves unknown trends and other unknowns to be covered
 - Note that the absence of future mortality improvement in the VBT can be considered a margin vs. anticipated experience
 - The “company variation” component of margin at the higher ages may reflect an element of trend variance (where trends are caused by items such as antiselection)
 - We do not yet have a consensus view on this component – it will require testing of impact of total margins on reserves



Valuation Table Team's Preliminary Views on Margins – General Considerations

- The format used in the 2001 CSO and in Canada, where the margin has a “/e_x” component, retains some appeal
 - Produces larger percentage margin when q_x is smaller
 - Some Team members believe that margins for company variation and/or trends can be reduced, because PBR assumptions can be changed in the future
 - Note that the mechanical structure of choosing tables introduces an element of conservatism, though the magnitude is random
 - UCS scoring requires the company to “round up” to the available VBT
- For companies with some element of credible experience, selection of the valuation table is also a “rounding up” process, as the valuation table must produce reserves at least as large as using the company’s anticipated mortality plus margin



Discussion Topics

- Some Team members felt that we should go with an approach closer to the Canadian approach where the actuary recommends the margin in all cases
- Some Team members also suggested that a discounted load be used by companies that had the ability to increase premiums or reduce dividends



Follow Up

- The Valuation Table Team would like any and all comments from LHATF on the approaches that we have described for loading the 2008 Basic Table
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