

Preferred Mortality

September 21, 2009 LHATF

Valuation Table Team Update

Society of Actuaries & American Academy
of Actuaries Joint Project Oversight Group

Tim Harris, FSA, MAAA, Chair of Valuation Table Team

Agenda

- Testing of Various Loading Formulae for 2008 VBT
- Background
 - Testing of Basic Table
 - Comparison of Test Loaded Table to Experience of Contribution Companies
 - Development of Actuarially Sound Margin Methodology to Achieve Targeted Coverage of Contributing Companies
 - Guidance on Mortality Margins for PBR

Testing Completed to Date

- Comparison of CRVM reserves for 20-Year term using 2008 VBT to those produced by 2001 VBT using a Valuation interest rate of 4% (See Appendix B)
- Comparison of 20-Year Term, Whole Life and UL CRVM including AXXX reserves using 2001 CSO table to those using 2008 CSO (See Appendix A)
- Comparison of 20-Year Term and UL reserves assuming different loading formulae

Comparison of Reserves Using Different Loading Formulae

- 20-Year Term and UL with Secondary Guarantee Reserves were calculated using the 2008 table and the loading methods shown below:
 - Tim Harris formula (Described in Appendix B)
 - 20% Load
 - 10% Load
 - 3.75 extra deaths per thousand divided by the curtate expectation of life
 - Assuming a $\frac{1}{2}\%$ per year improvement in mortality
 - No loading

Assumption Summary - Term

- Term Pricing Assumptions
 - Investments into 10 year bonds purchased with a 100bps market spread over then-current treasuries. Defaults @ 25bps and investment expenses @ 5bps.
 - A single \$100,000 policy is projected with an annual \$65 policy fee
 - Level \$290 annual premium (solves for a 12% IRR at issue)
 - Acquisition Expenses
 - 10% of Premium
 - \$73.74 per Policy
 - \$1.29 per \$1,000 of Face

Assumption Summary – Term (cont'd)

- Term Pricing Assumptions (cont'd)
 - Other Expenses
 - Annual 2.5% of Premium
 - Annual \$40 per Policy
 - \$100 Per Death
 - \$20 Per Surrender
 - 130% of premium FY commissions with lapse charge back in year 1
 - Lapse Rates by Issue Year: 7%, 7.5%, 6.5%, 6.5%, 6%, 6%, 6%, 5% (ultimate)
 - CRVM reserves @ 4% Valuation Interest, X-factor = 100%

Assumption Summary - UL

- UL Pricing Assumptions
 - Investments into 10 year bonds purchased with a 100bps market spread. Defaults @ 25bps and investment expenses @ 5bps
 - A single policy with a \$100,000 Death Benefit is projected assuming starting account value is \$0 at each valuation date. This policy has a lifetime secondary guarantee
 - Level \$1,000 Annual Premium equal to the specified minimum premium (target premium = \$1,100)
 - 3% annual crediting rate equal to the minimum guarantee

Assumption Summary – UL (cont'd)

■ UL Pricing Assumptions (cont'd)

■ Loads

- \$90/policy to age 100
- 6% or premium to year 10, 4% thereafter
- \$1.68 per \$1,000 of Face years 1-10, \$0.48 to age 100, \$0 thereafter
- Surrender Charges are 100% of target premium years 1-5, grading to 0% by year 15

■ Acquisition Expenses

- 10% of FY Premium
- \$73.74 per Policy
- \$1.29 per \$1,000 of Face

Assumption Summary – UL (cont'd)

- UL Pricing Assumptions (cont'd)
 - Other Expenses
 - Annual \$50 Per Policy
 - Annual 2.5% of Premium
 - \$100 Per Death
 - \$20 Per Surrender
 - FY Commissions of 115%, 5% years 2-10, 2% thereafter
 - Lapses Rates by Issue Year: 5%, 4.8%, 4.6%, 4.4%, 4.2%, 4.0% (6-10), 2.8% (11-20), 2.2% (21-45), 2% (Ultimate)
 - CRVM reserves @ 4% Valuation Interest, AXXX methodology recognizes lapses and surrender charges, X-factor = 100%

Assumption Summary - Conditions

- Most recent VM-20 proposal has suggested a discount rate for deficiencies equal to 105% of the 1-year treasury rate from each scenario. Our results reflect the prior discount approach, which is equal to the net asset earned rate along each scenario.
- The VM-20 proposal requires iteration to solve for the initial assets such that the CTE(70) GPVAD falls within a range of +/- 2% of the initial assets. We have instead assumed initial assets are zero, and solved for CTE(70) GPVAD. To the extent that a run-off of the positive initial assets including subsequent reinvestments would produce a different aggregate net yield than that produced on a portfolio of company loans and/or negative asset purchases, our results would also vary from the proscribed method. Because of the simplified asset model we used, we do not feel this difference is material enough to justify iteration.

Assumption Summary – Conditions (cont'd)

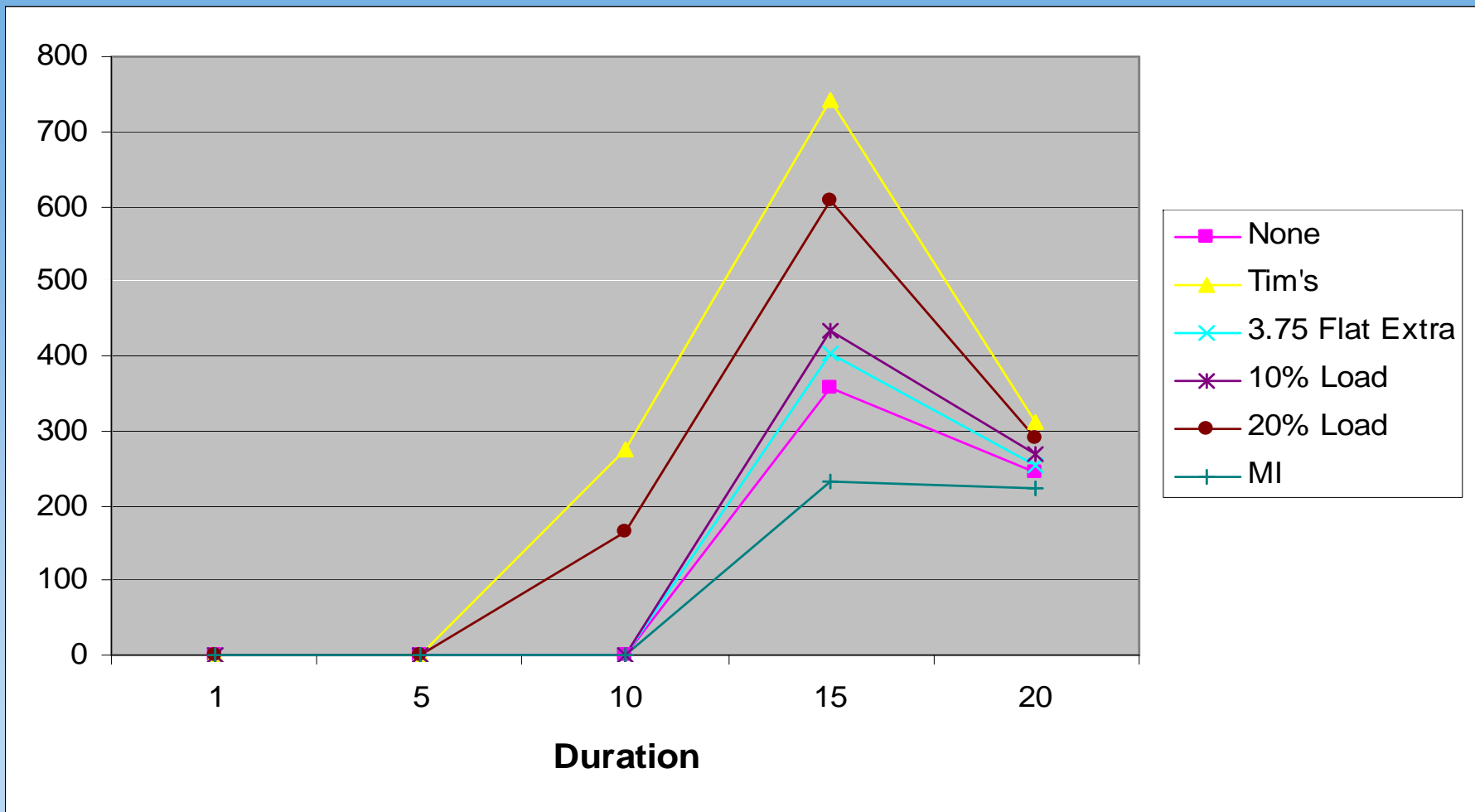
- We did not attempt to project a deterministic reserve calculation nor did we perform the stochastic exclusion test.
- Our assumptions have not been reviewed to determine whether they would qualify as prudent best estimates for a typical life insurance company.
- Since our UL model was projected with a fixed crediting rate (3%) that was not tied to the performance of the simulated investment portfolio, there will be less variation in the results and therefore the PBA reserve produced from our model is likely less conservative than it would be had we modeled credited rates as (NIER - spread).

UL Premium and Secondary Guarantee Assumptions

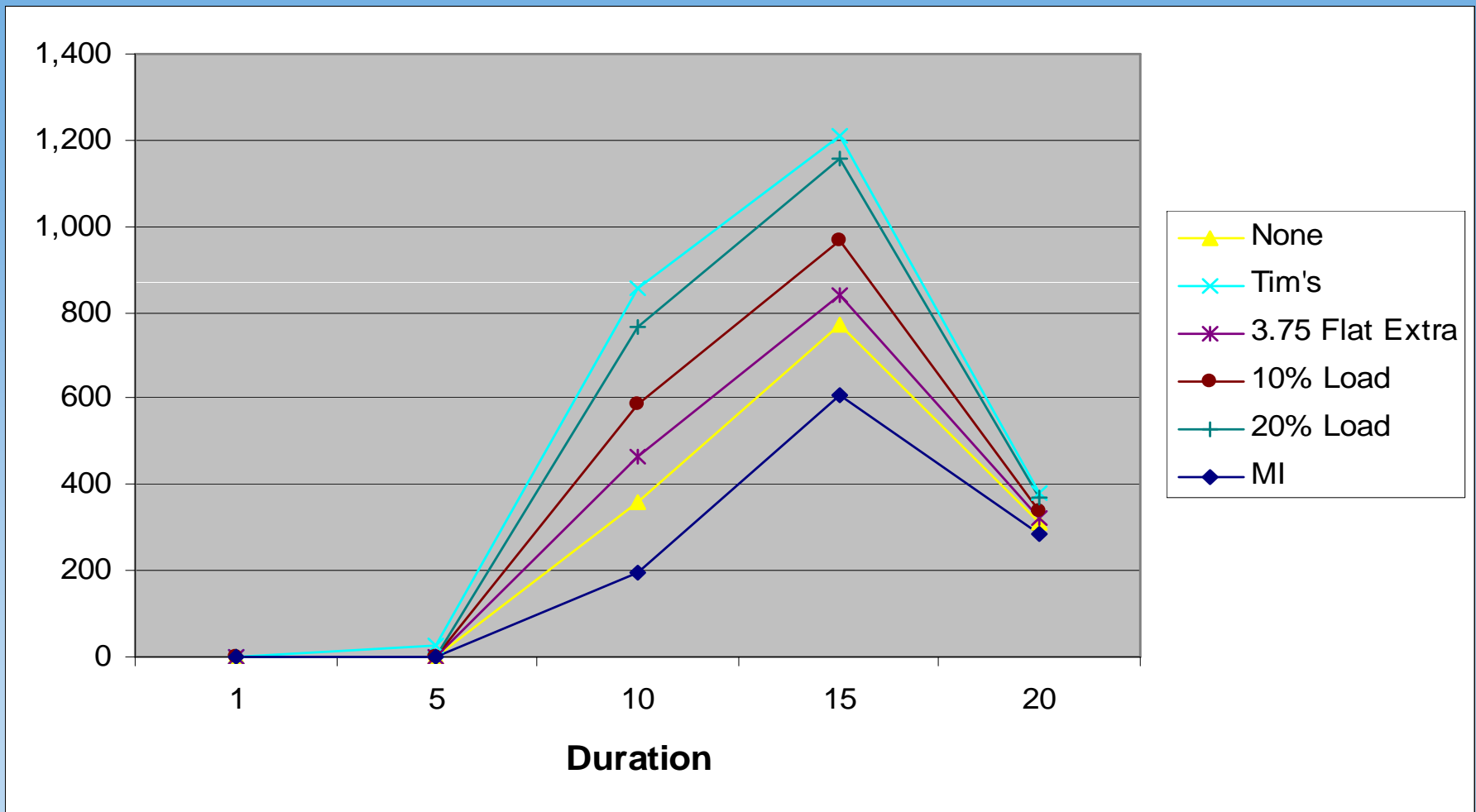
	Age 45	Age 75
Target Premium	\$11.00	\$58.00
Interim ⁽¹⁾ Non-Lapse Guarantee Premium	\$6.53	\$47.50
Lifetime Non-Lapse Guarantee Premium	\$10.00	\$50.00
Guideline Premium	\$19.53	\$110.51

(1) Interim Guarantee is for the earliest of 20 years and attained age 80.

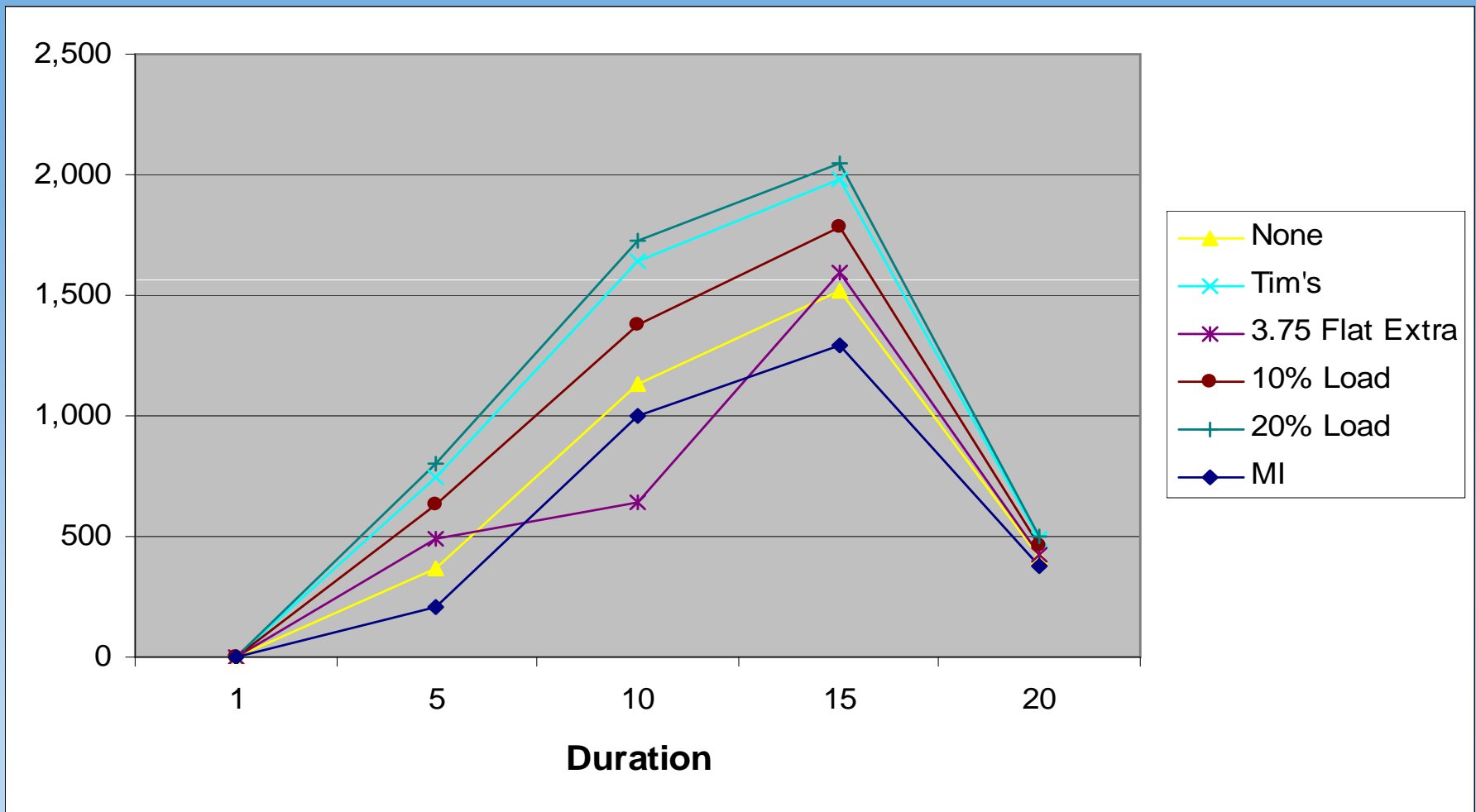
RR70, CTE(70) GPVAD Term Block, Male Age 45



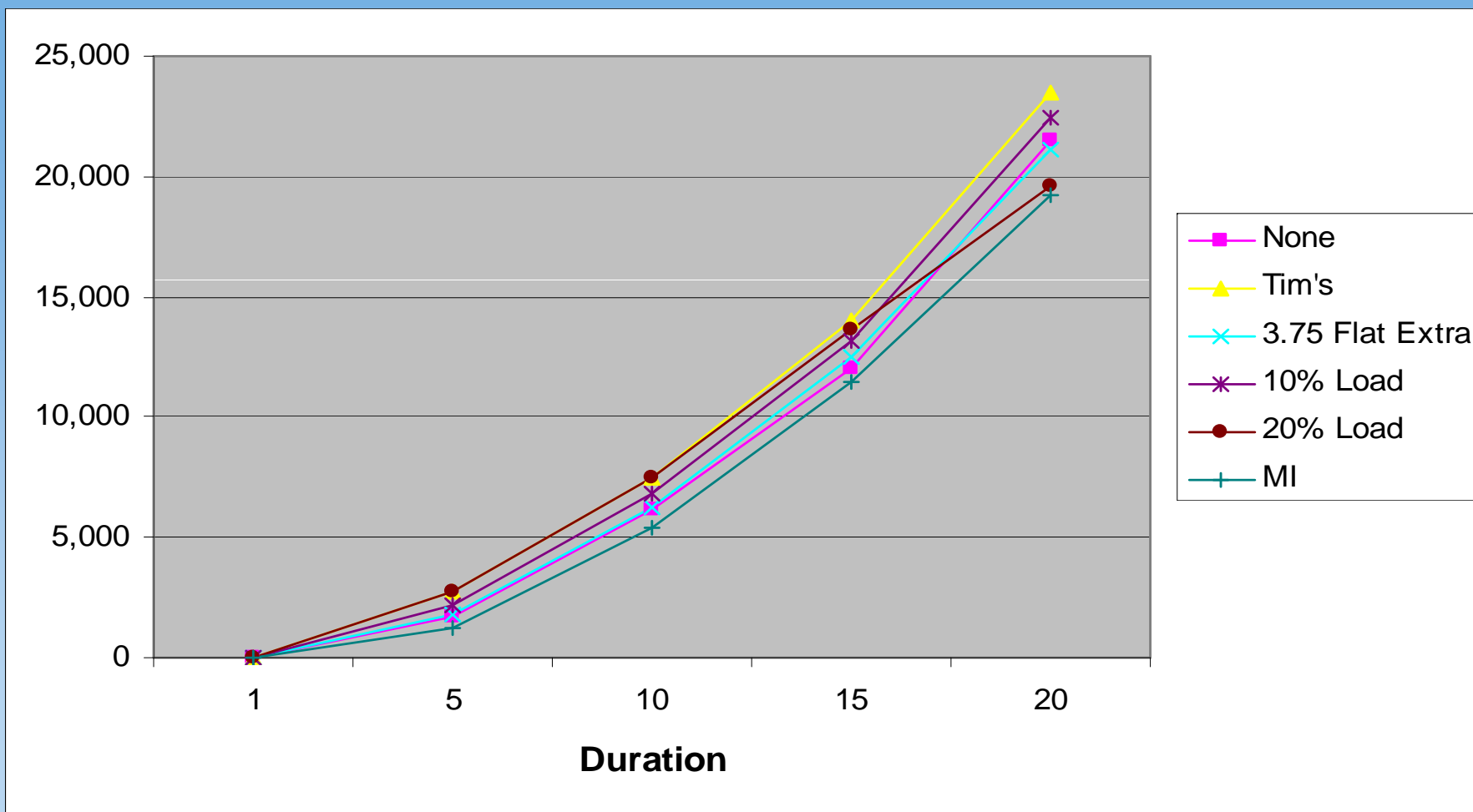
RR90, CTE(70) GPVAD Term Block, Male Age 45



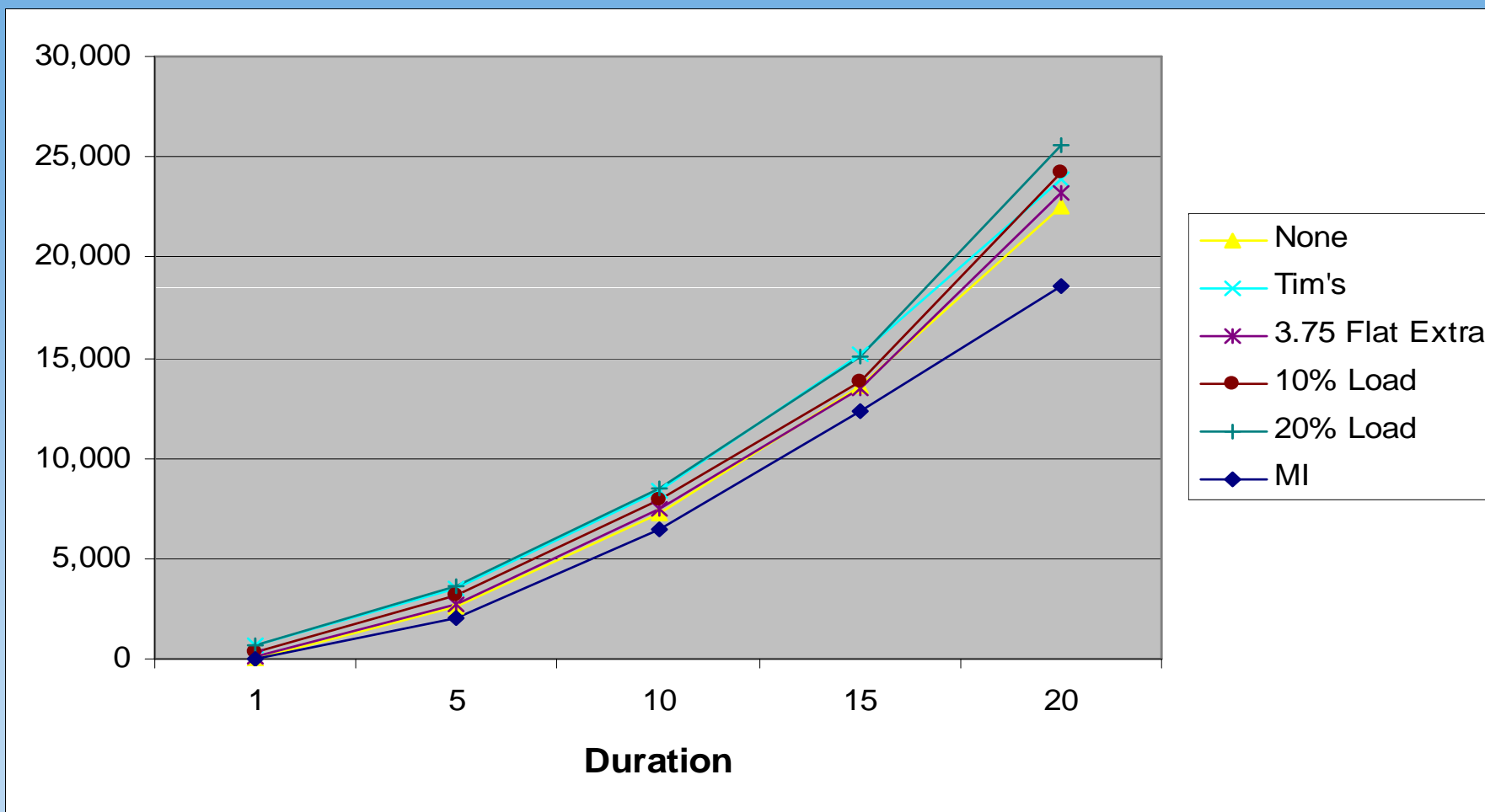
RR130, CTE(70) GPVAD Term Block, Male Age 45



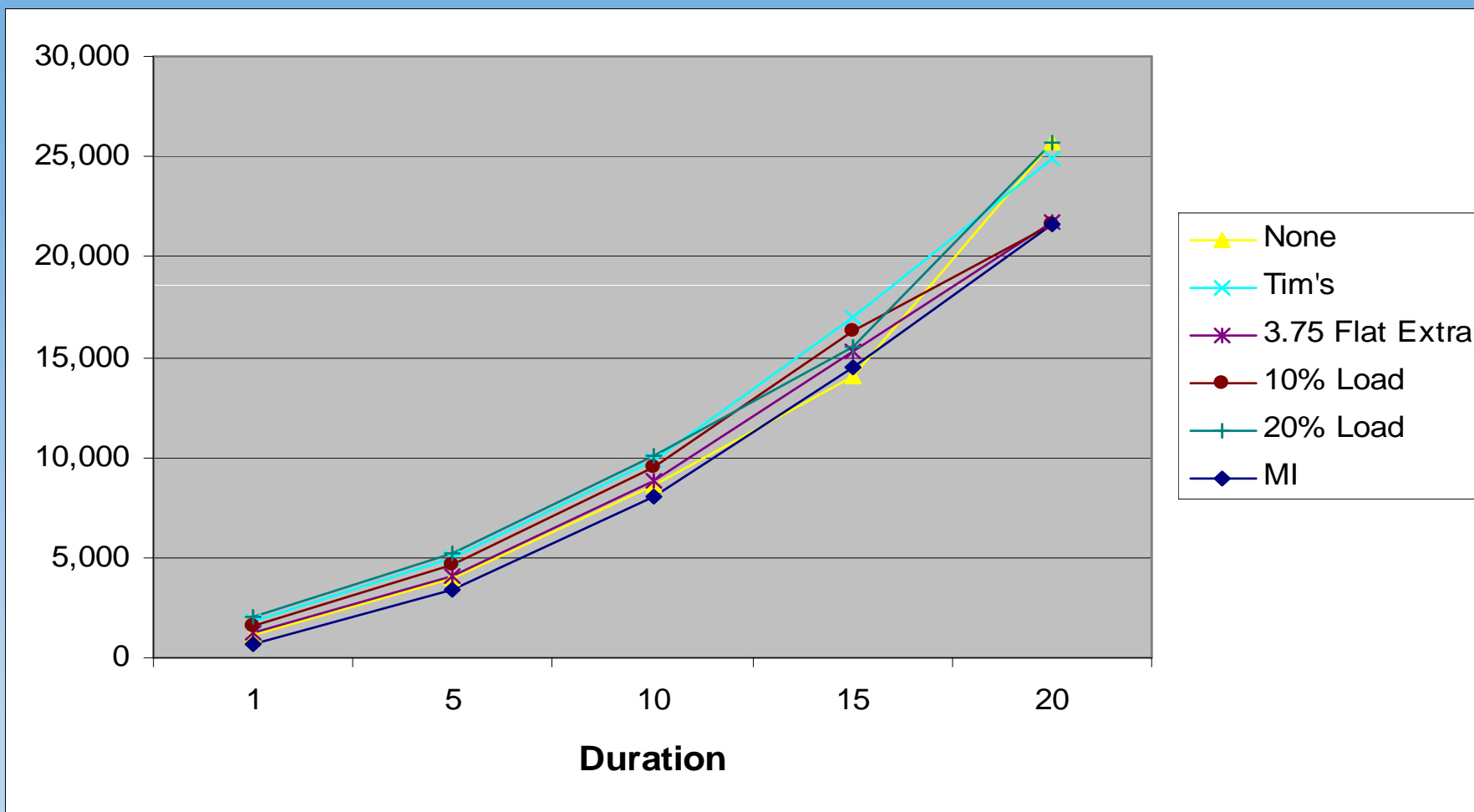
RR70, CTE(70) GPVAD ULSG Block, Male Age 45



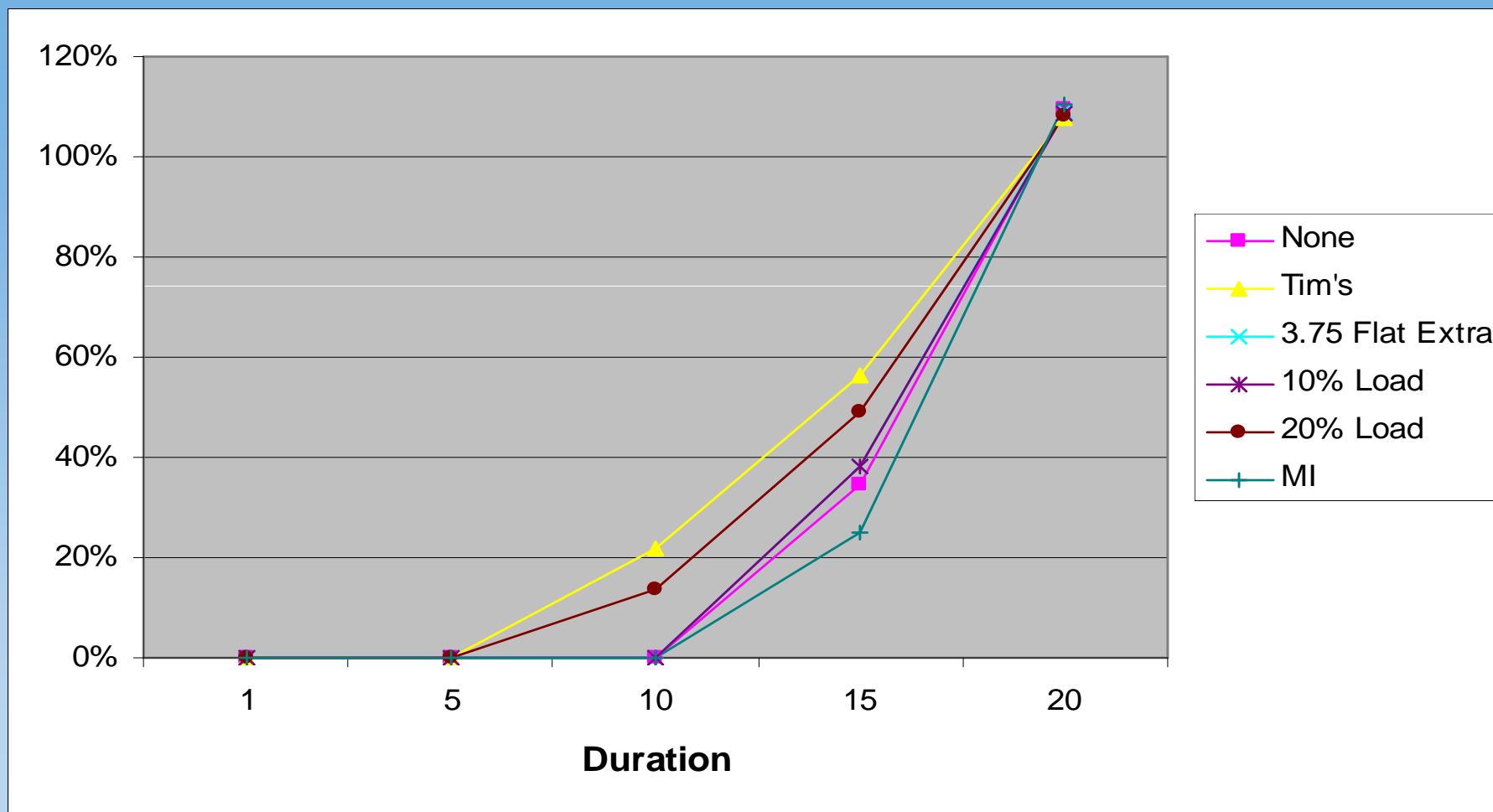
RR90, CTE(70) GPVAD ULSG Block, Male Age 45



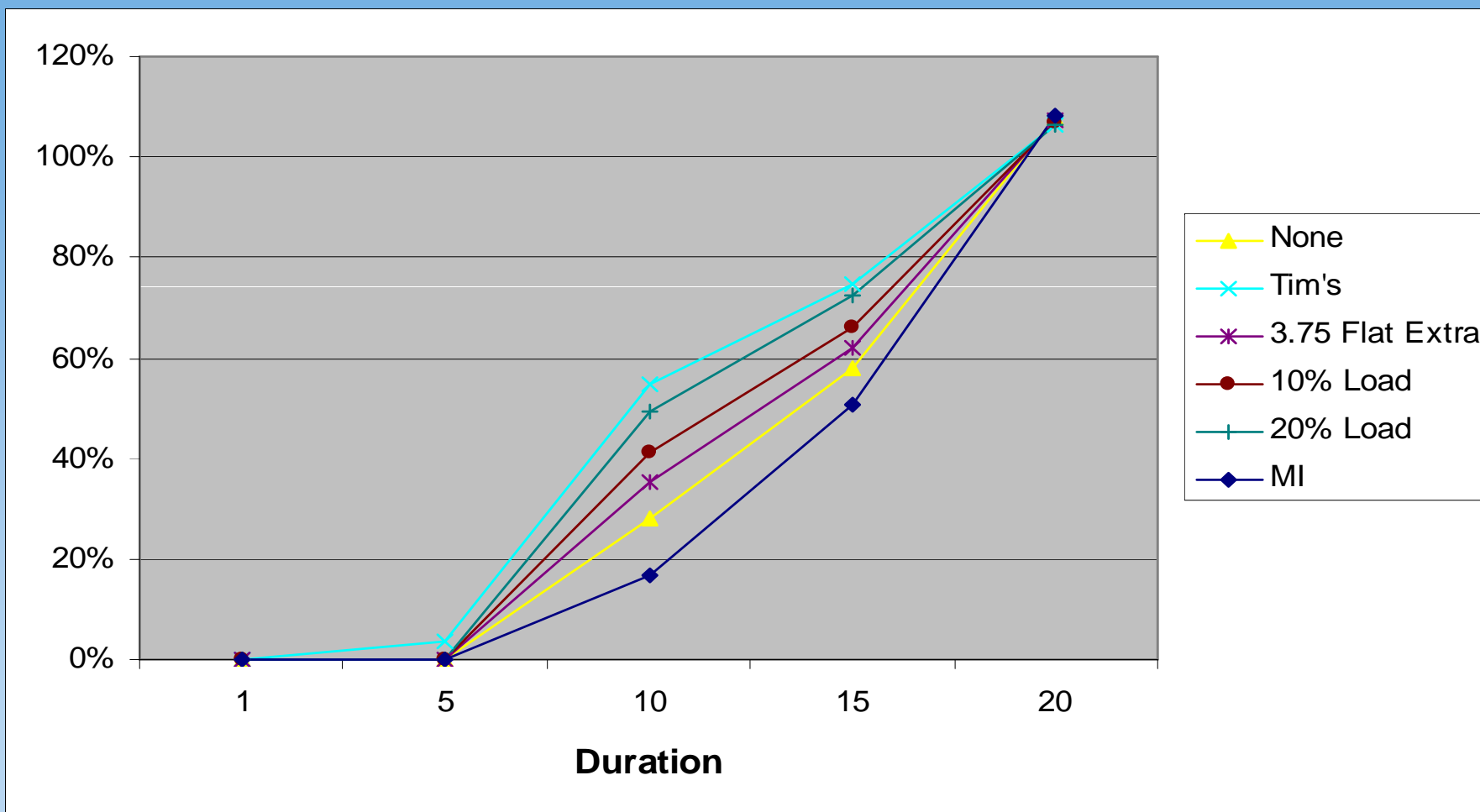
RR130, CTE(70) GPVAD ULSG Block, Male Age 45



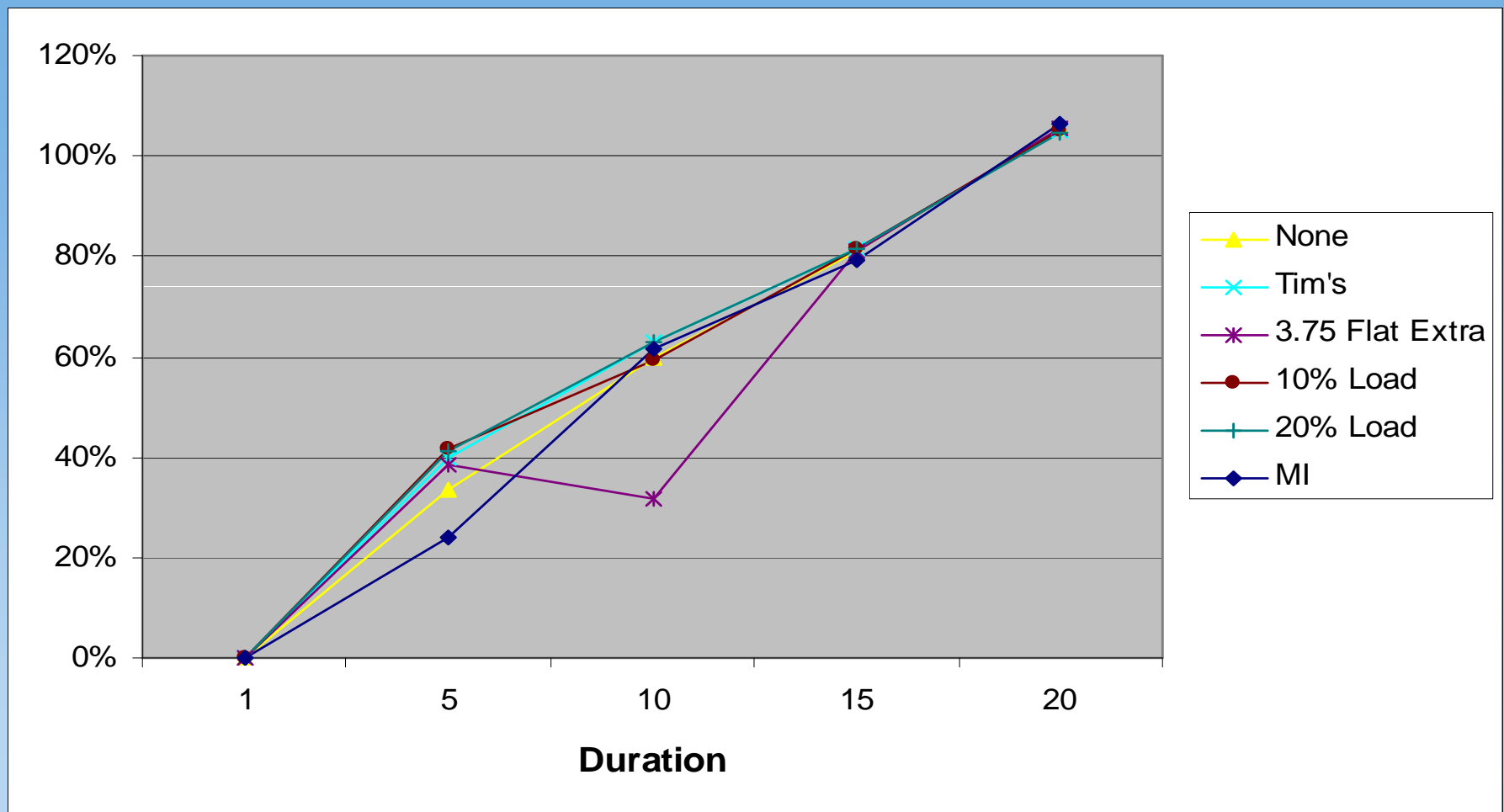
RR70, GPVAD/Formulaic Term Block, Male Age 45



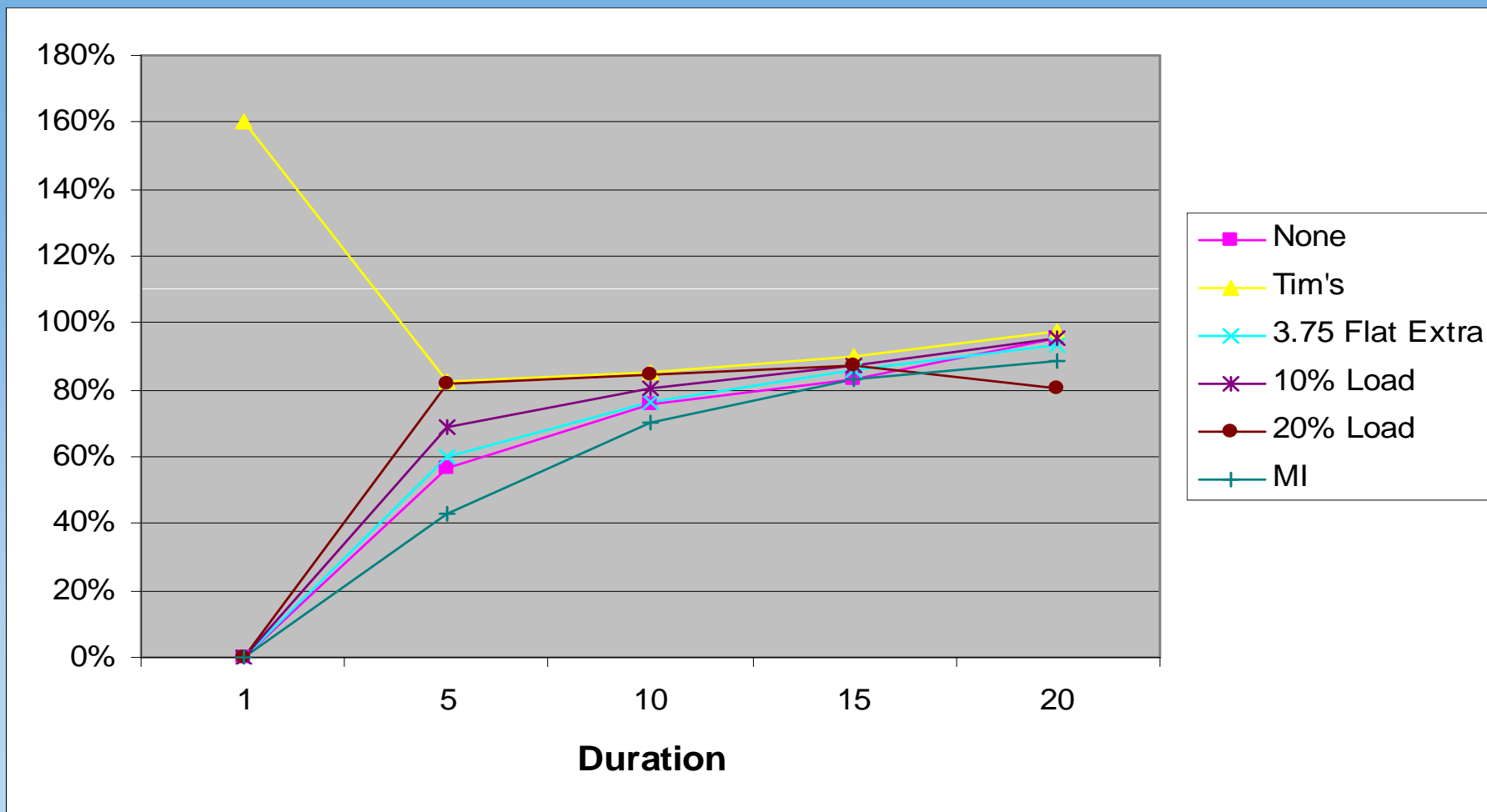
RR90, GPVAD/Formulaic Term Block, Male Age 45



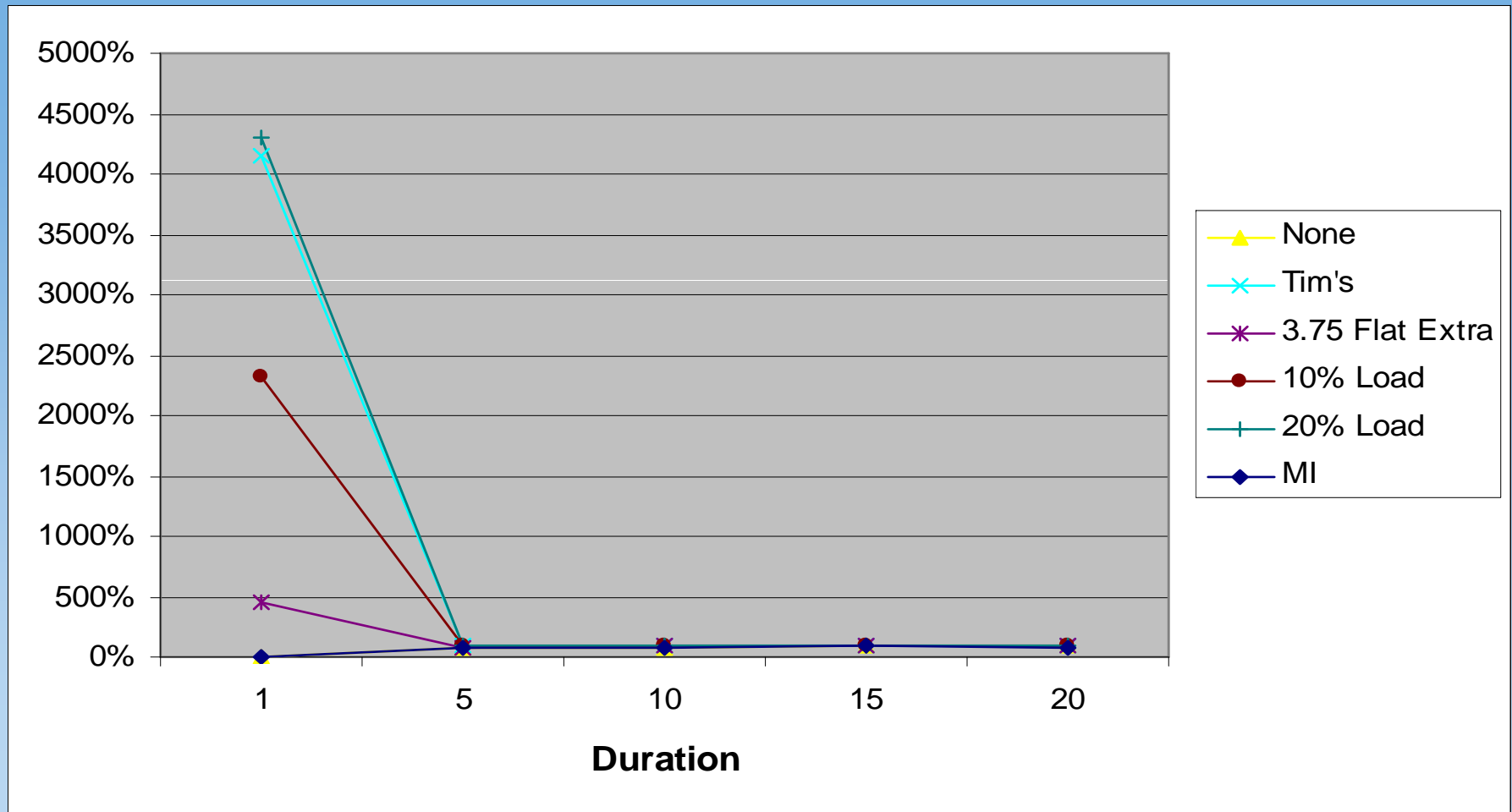
RR130, GPVAD/Formulaic Term Block, Male Age 45



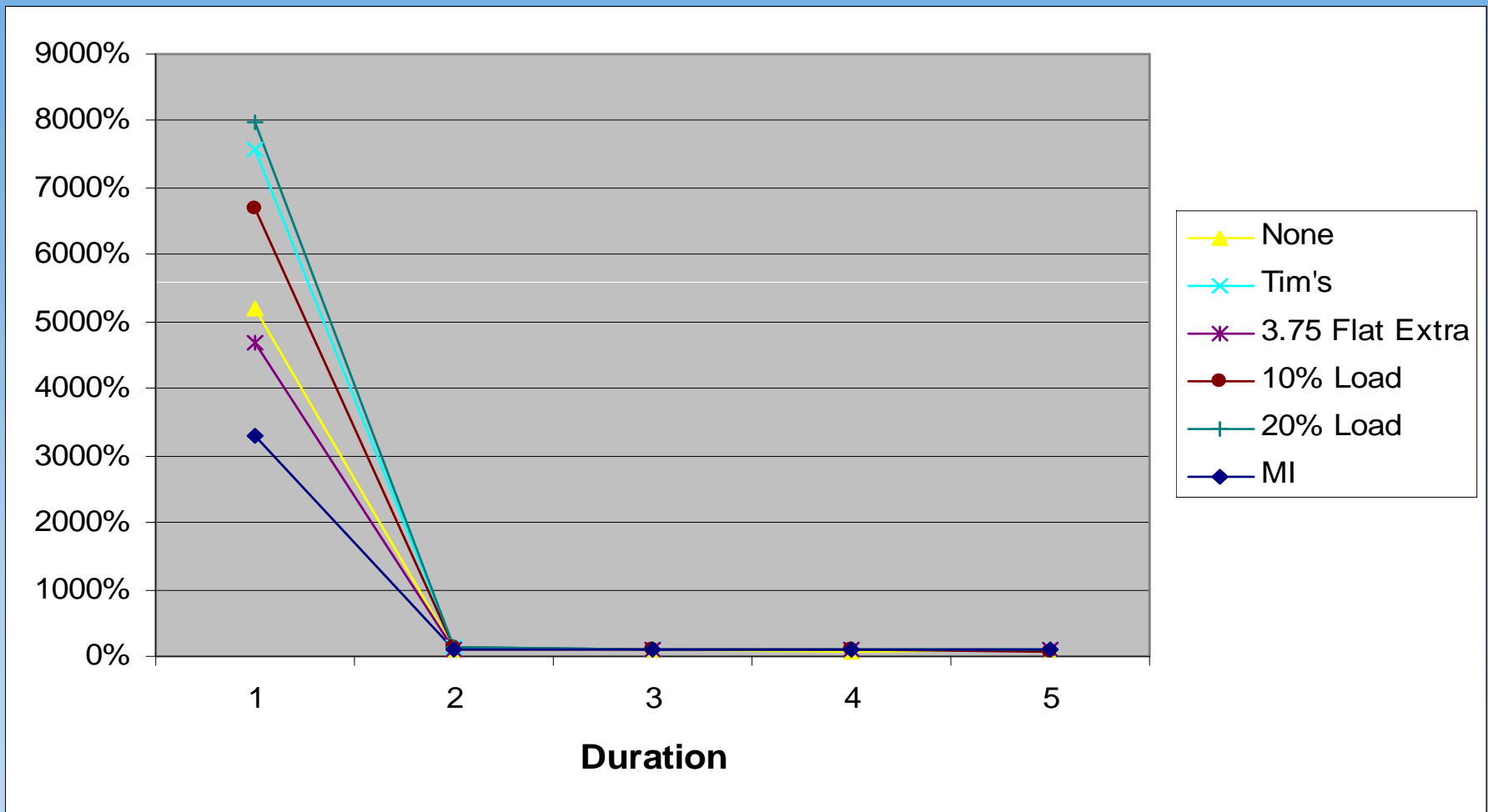
RR70, GPVAD/Formulaic ULSG Block, Male Age 45



RR90, GPVAD/Formulaic ULSG Block, Male Age 45



RR130, GPVAD/Formulaic ULSG Block, Male Age 45



Remaining Tasks

- Prepare written guidance on mortality margins to be added when calculating principle-based reserves
- Respond to other requests and inquiries from LHATF

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Appendix A

The following slides have been previously presented and discussed.

Comparison of Statutory Reserves using 2001 CSO to those using 2008 CSO

- Products Compared:
 - 20-Year Term – Issue ages 35, 45, 55
 - Whole Life – Issue age 35
 - UL with Secondary Guarantee – Issue ages 45 and 75
- Reserves using current Statutory Requirements including AXXX for UL
- Calculated using 4% interest and 2008 CSO
- Compared using 2001 CSO vs. the 2008 CSO Basic (RR100) Table for both the S&U and Ultimate Tables
- Also compared using Preferred vs. RR90 and Super Preferred vs. RR70 Tables

Comparison of Reserves per 1,000 2001 CSO Ultimate vs. 2008 CSO Ultimate Whole Life Male NS Issue Age 35

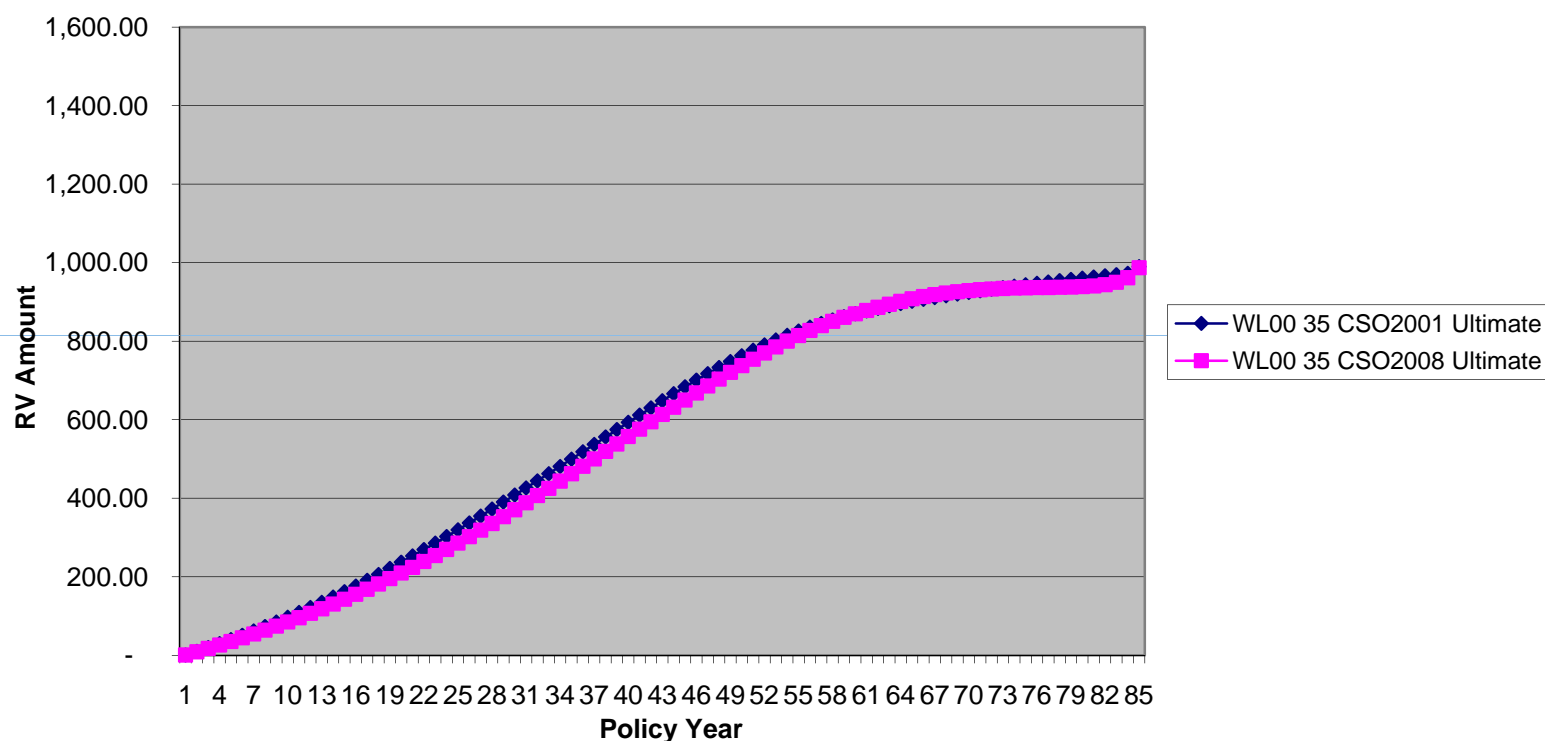


Table	Dur 1	Dur 5	Dur 10	Dur 20	Dur 30
2001 CSO	.53	39.98	96.83	236.95	408.08
2008 CSO	.64	35.20	84.84	209.45	370.68

Comparison of Reserves per 1,000 2001 CSO S&U vs. 2008 CSO S&U 20 Year Term Male NS Issue Age 35

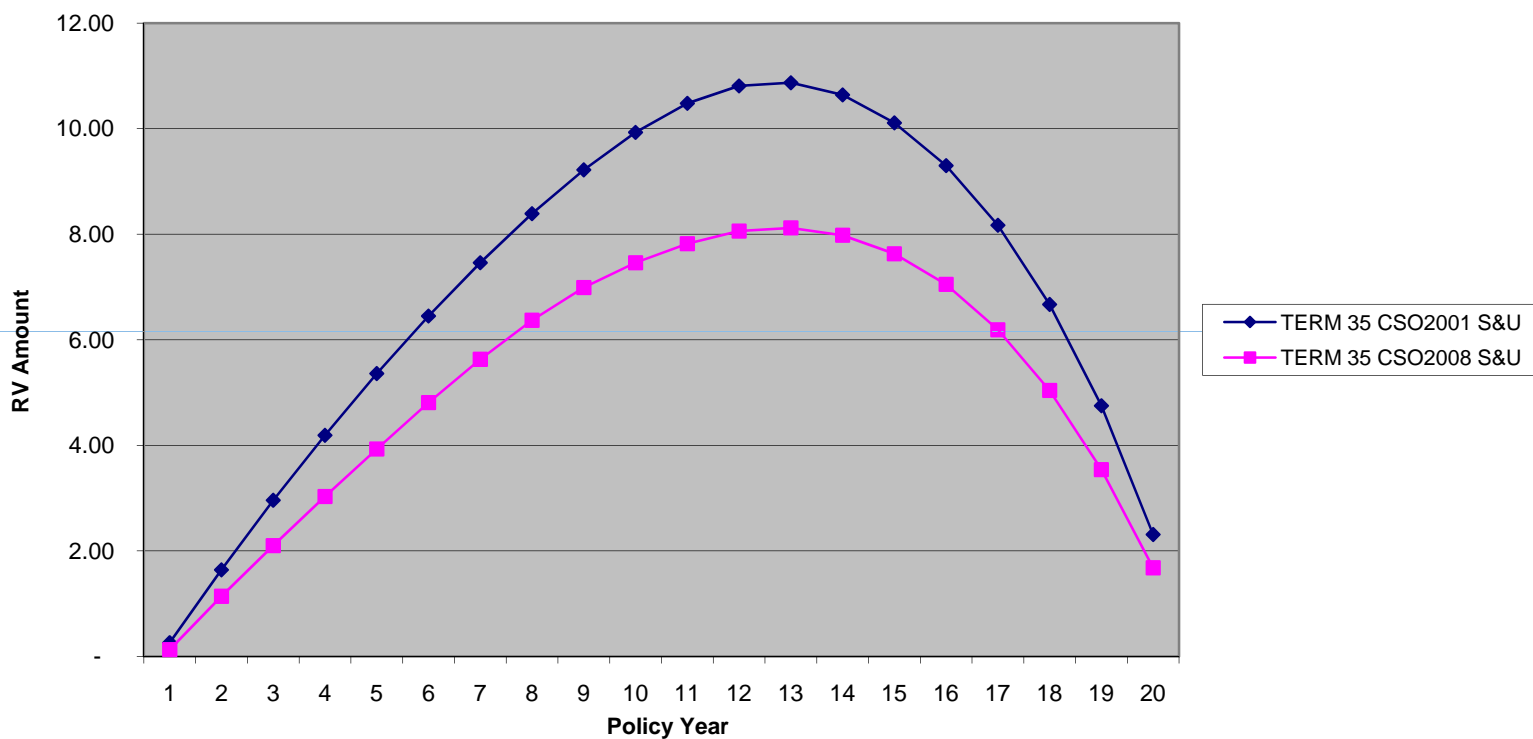


Table	Dur 1	Dur 5	Dur 10	Dur 20
2001 CSO	.26	5.36	9.93	2.31
2008 CSO	.13	3.93	7.46	1.68

Comparison of Reserves per 1,000 2001 CSO S&U vs. 2008 CSO S&U 20 Year Term Male NS Issue Age 45

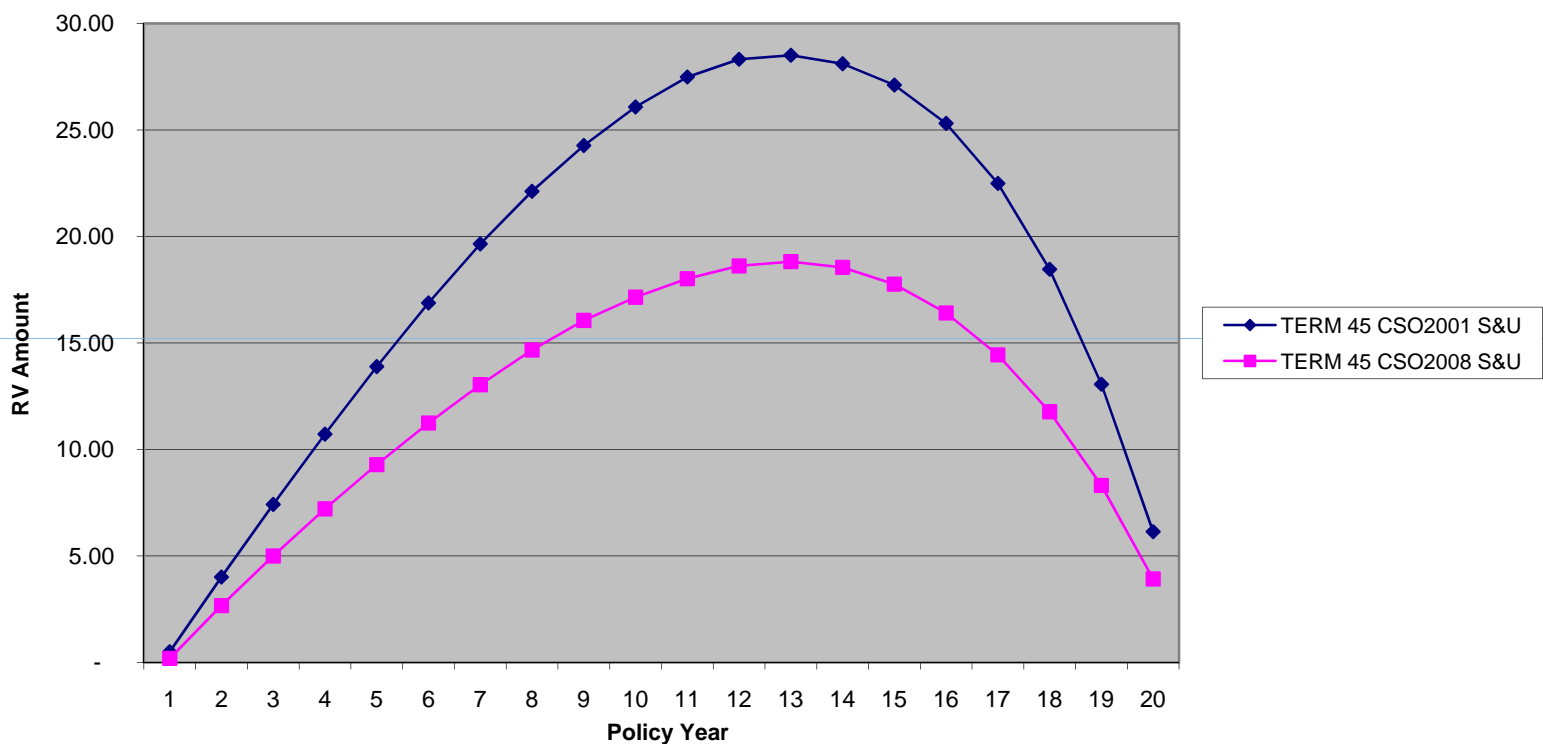


Table	Dur 1	Dur 5	Dur 10	Dur 20
2001 CSO	.50	13.89	26.08	6.14
2008 CSO	.19	9.29	17.15	3.92

Comparison of Reserves per 1,000 2001 CSO S&U vs. 2008 CSO S&U 20 Year Term Male NS Issue Age 55

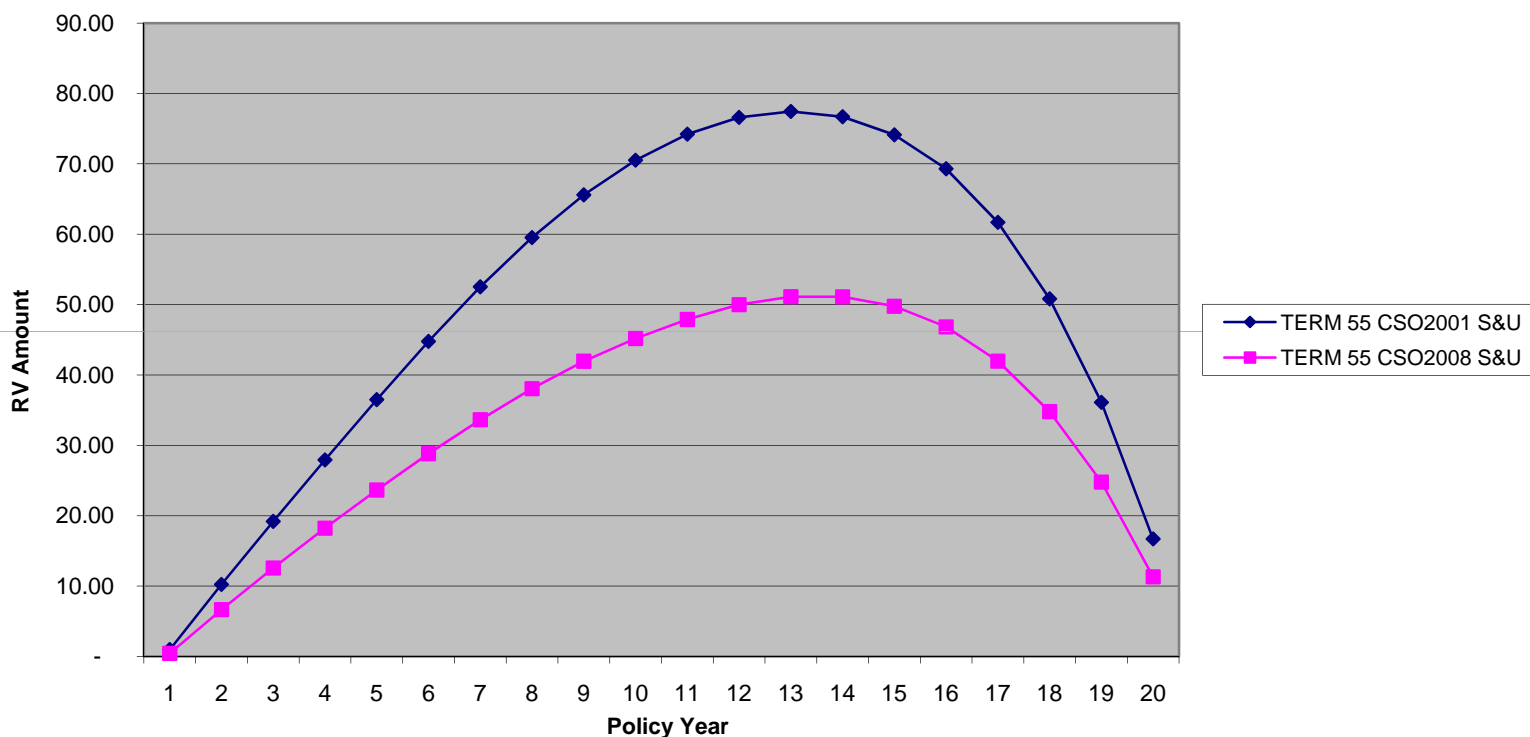


Table	Dur 1	Dur 5	Dur 10	Dur 20
2001 CSO	.97	36.49	70.52	16.70
2008 CSO	.44	23.65	45.18	11.31

Comparison of Reserves per 1,000 2001 CSO Ultimate vs. 2008 CSO Ultimate 20 Year Term Male NS Issue Age 35

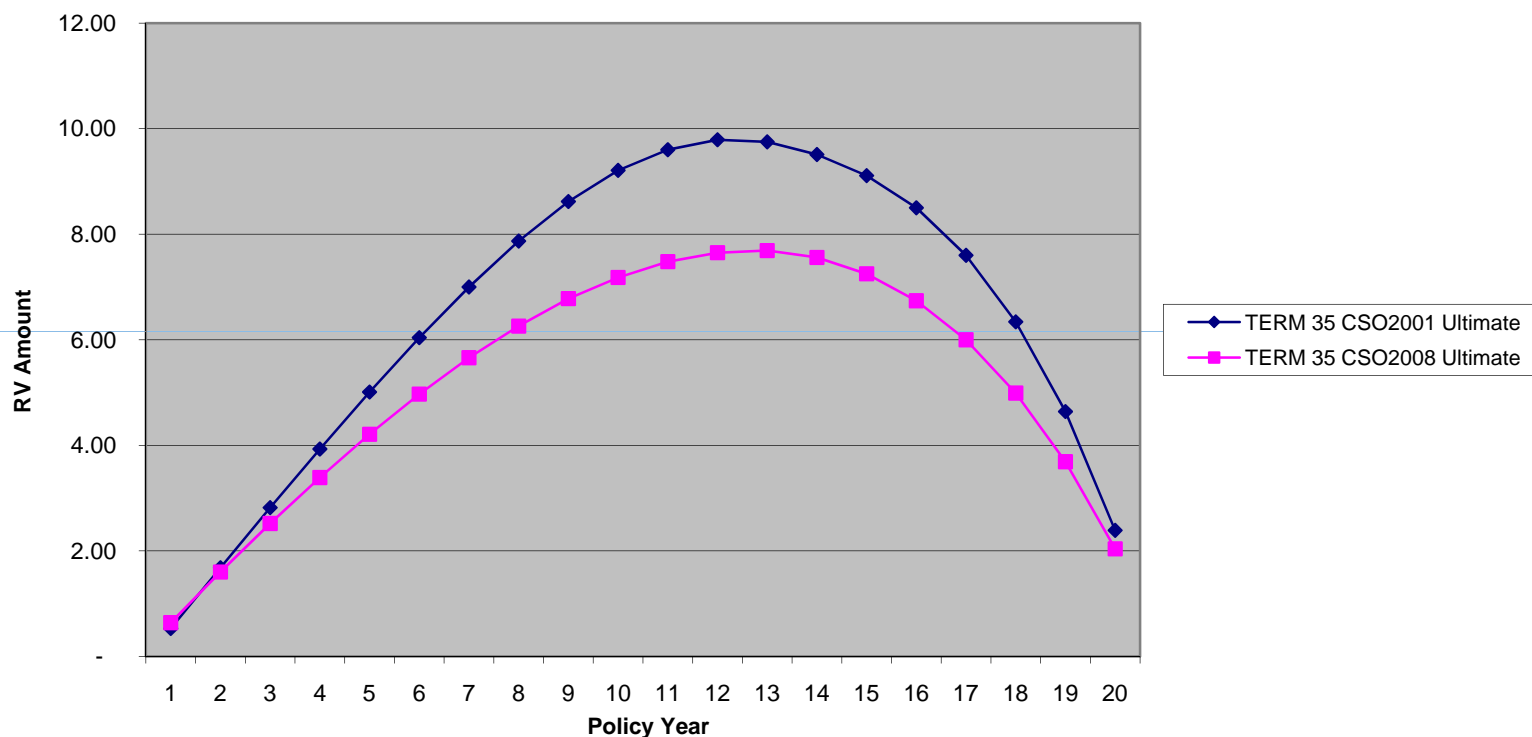


Table	Dur 1	Dur 5	Dur 10	Dur 20
2001 CSO	.53	5.01	9.21	2.39
2008 CSO	.64	4.21	7.18	2.04

Comparison of Reserves per 1,000 2001 CSO Ultimate vs. 2008 CSO Ultimate 20 Year Term Male NS Issue Age 45

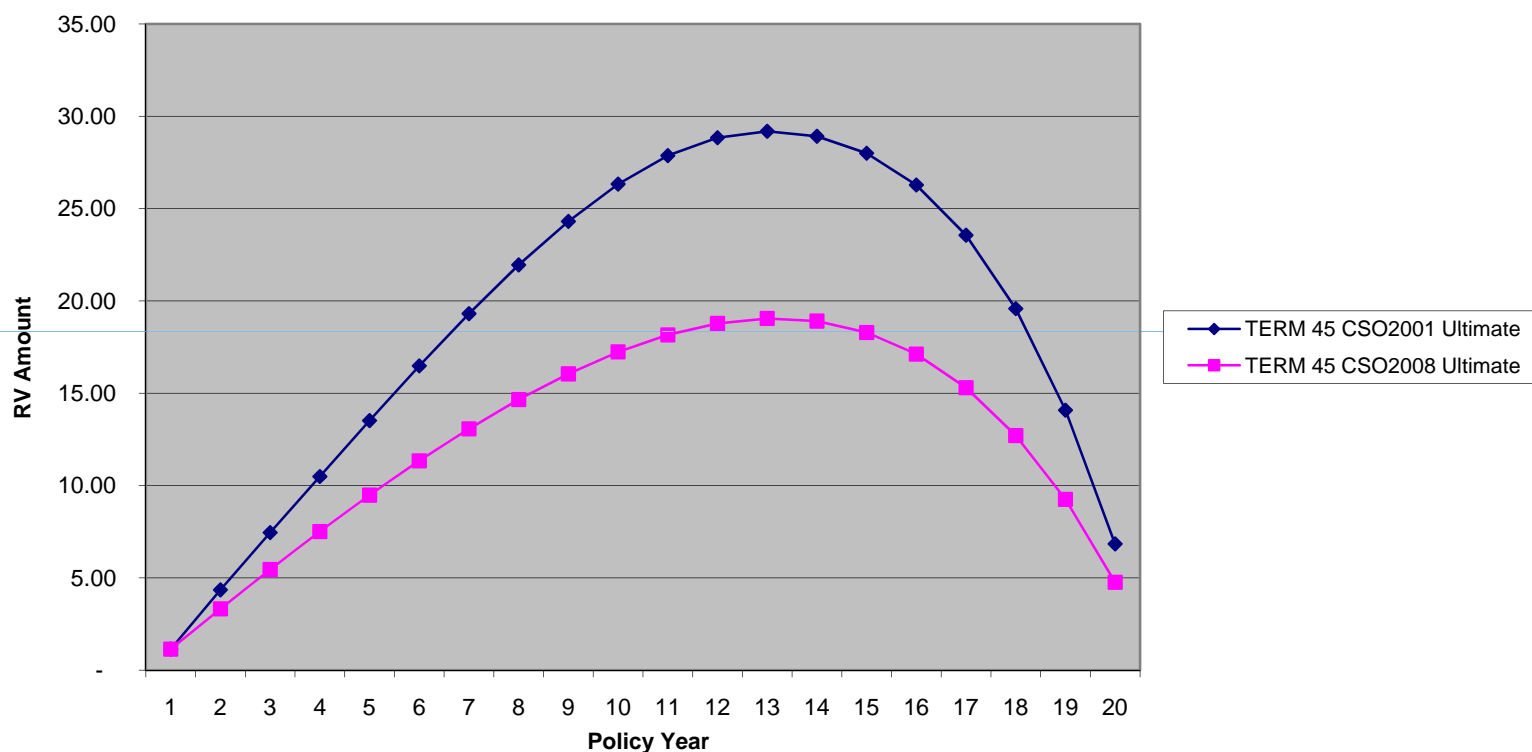


Table	Dur 1	Dur 5	Dur 10	Dur 20
2001 CSO	1.14	13.52	26.33	6.84
2008 CSO	1.14	9.48	17.24	4.76

Comparison of Reserves per 1,000 2001 CSO Ultimate vs. 2008 CSO Ultimate 20 Year Term Male NS Issue Age 55

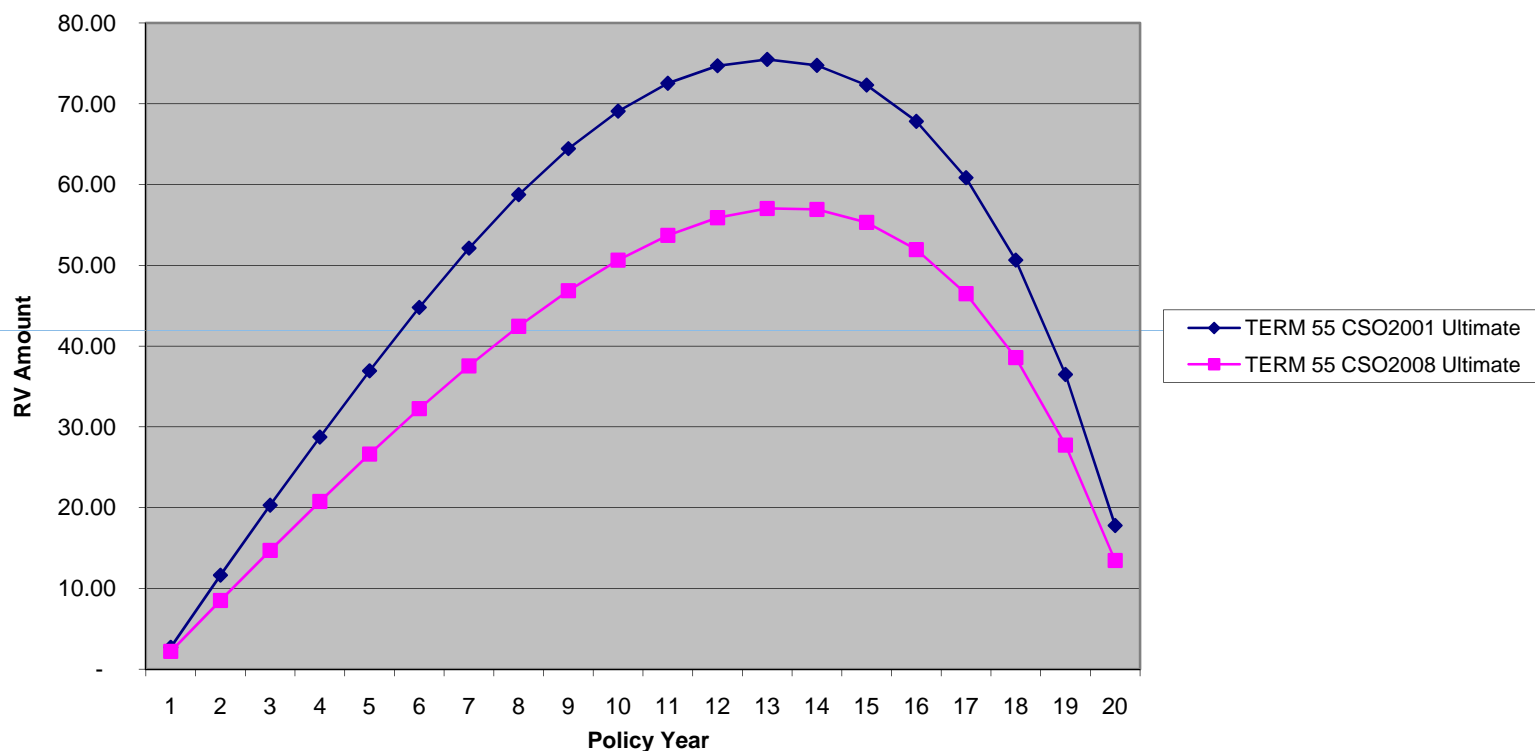


Table	Dur 1	Dur 5	Dur 10	Dur 20
2001 CSO	2.70	36.93	69.08	17.78
2008 CSO	2.20	26.63	50.64	13.45

Comparison of Reserves per 1,000 2001 CSO Preferred S&U vs. 2008 CSO RR90 S&U 20 Year Term Male NS Issue Age 35

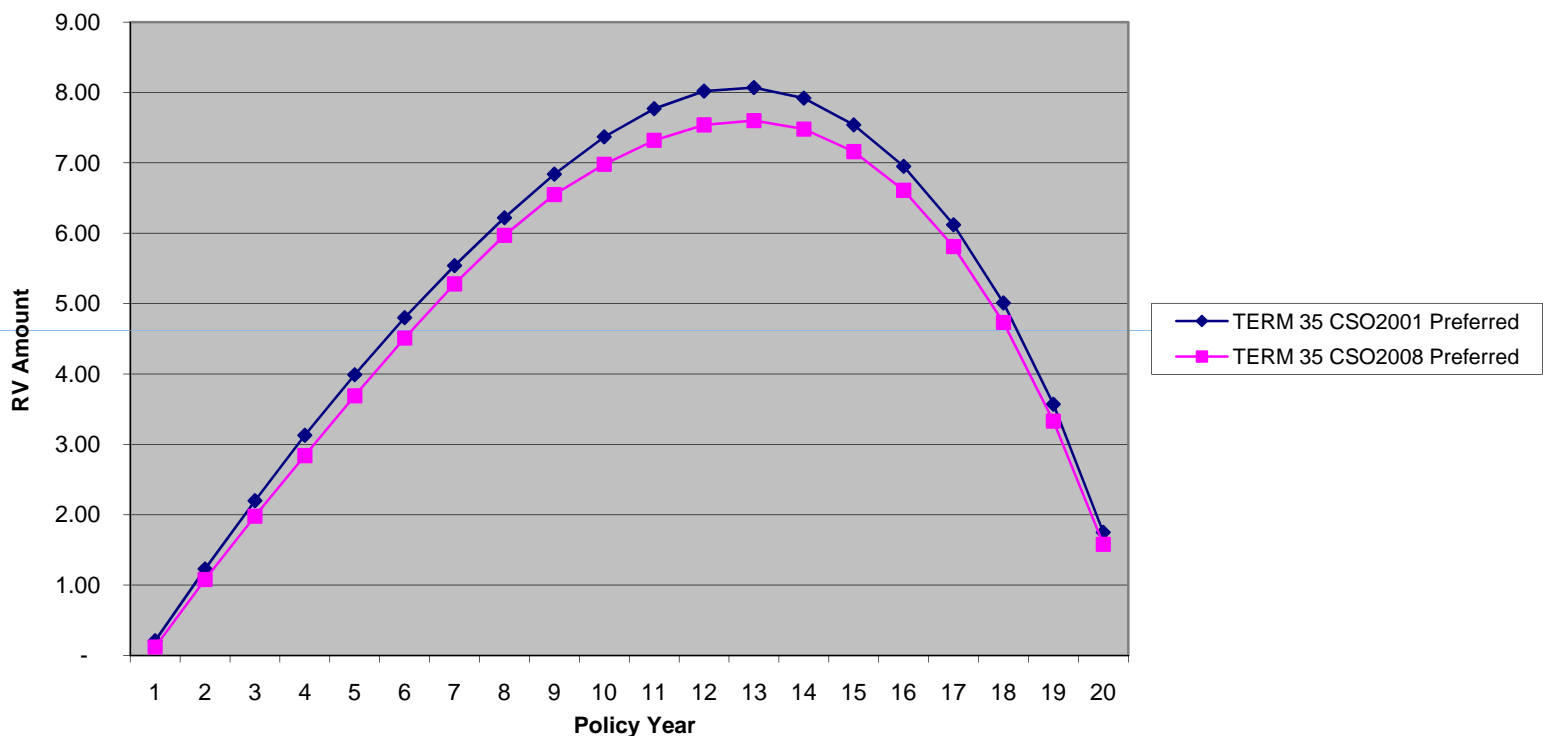


Table	Dur 1	Dur 5	Dur 10	Dur 20
2001 CSO	.21	3.99	7.37	1.75
2008 CSO	.12	3.69	6.98	1.58

Comparison of Reserves per 1,000 2001 CSO Preferred S&U vs. 2008 CSO RR90 S&U 20 Year Term Male NS Issue Age 45

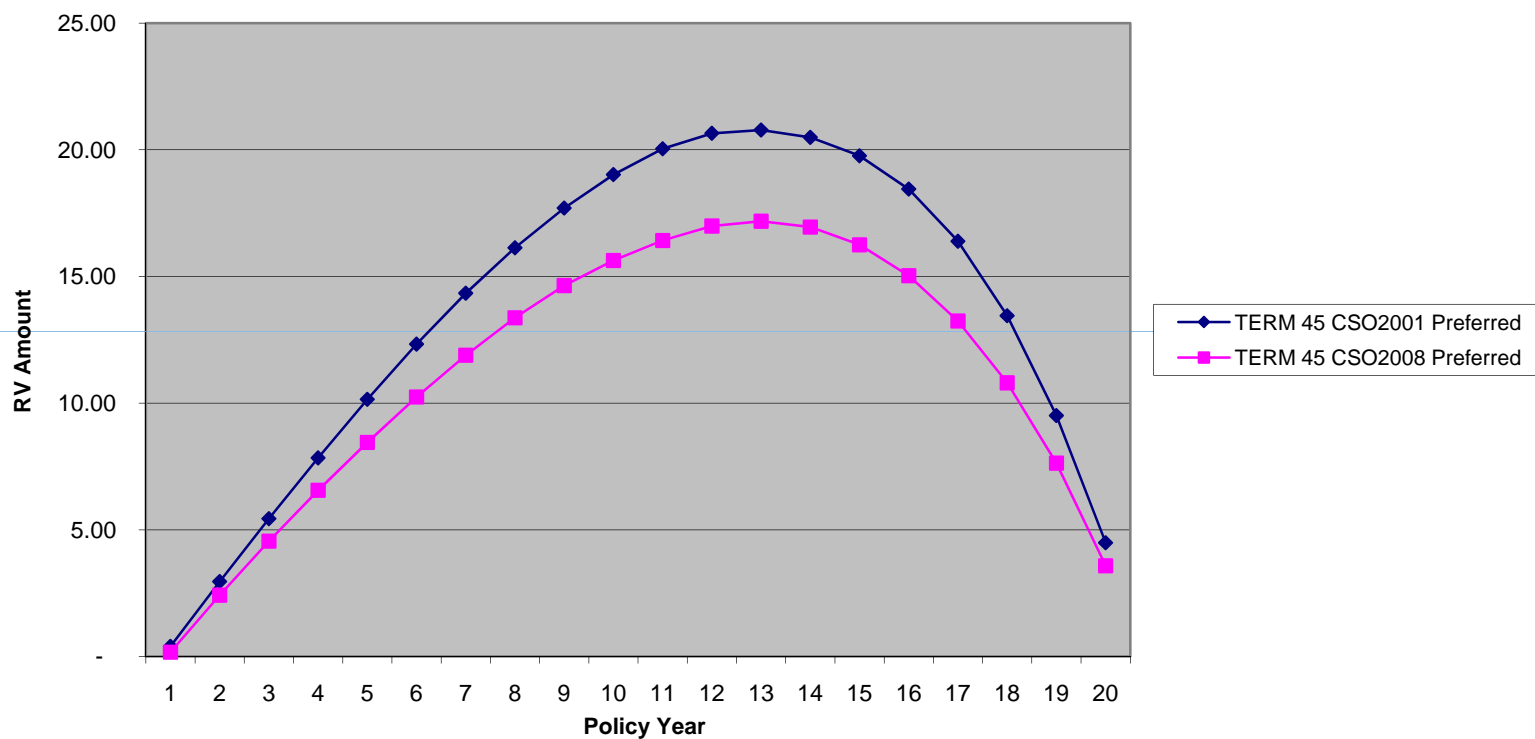


Table	Dur 1	Dur 5	Dur 10	Dur 20
2001 CSO	.40	10.15	19.02	4.49
2008 CSO	.17	8.45	15.63	3.58

Comparison of Reserves per 1,000 2001 CSO Preferred S&U vs. 2008 CSO RR90 S&U 20 Year Term Male NS Issue Age 55

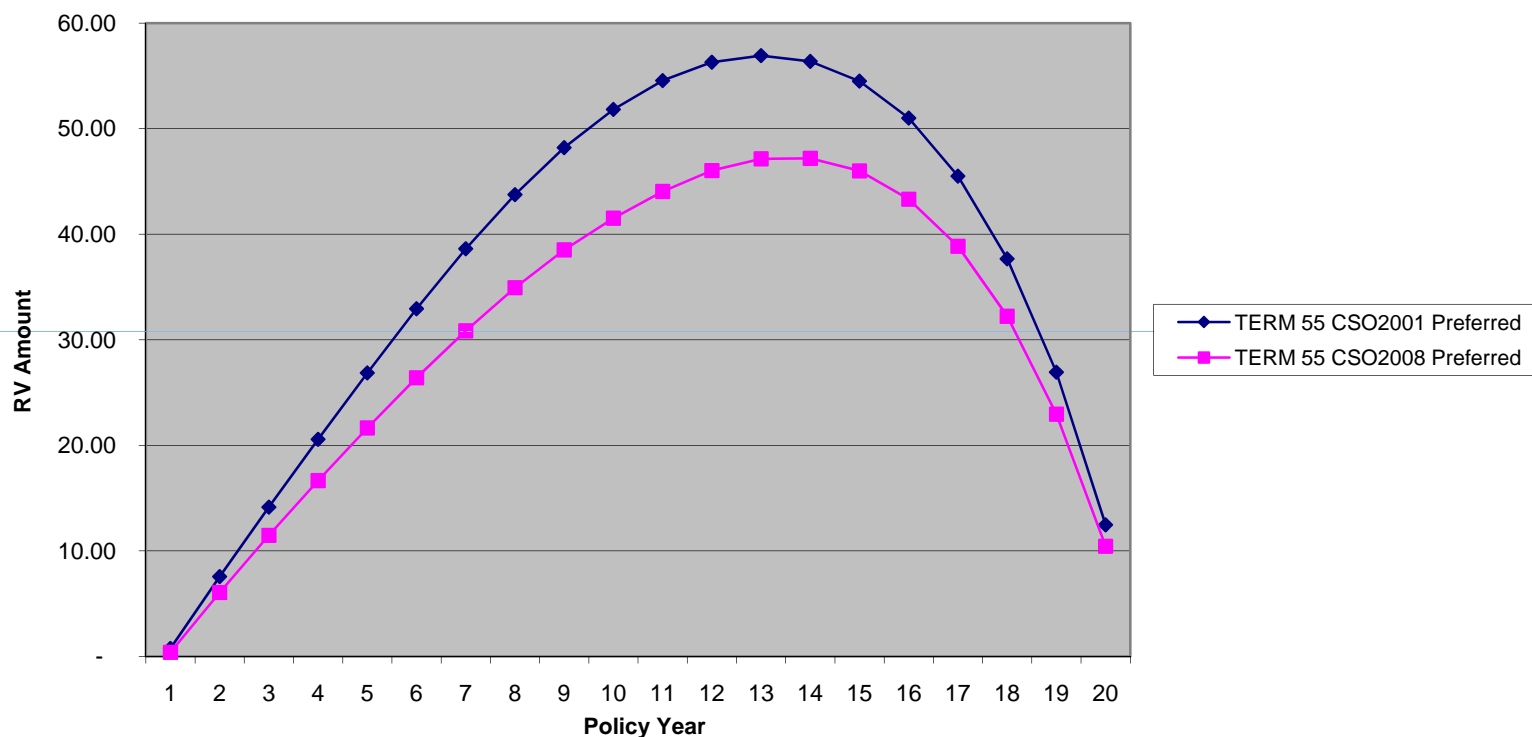


Table	Dur 1	Dur 5	Dur 10	Dur 20
2001 CSO	.76	26.86	51.82	12.47
2008 CSO	.39	21.65	41.52	10.44

Comparison of Reserves per 1,000 2001 CSO Super-Pref S&U vs. 2008 CSO RR70 S&U 20 Year Term Male NS Issue Age 35

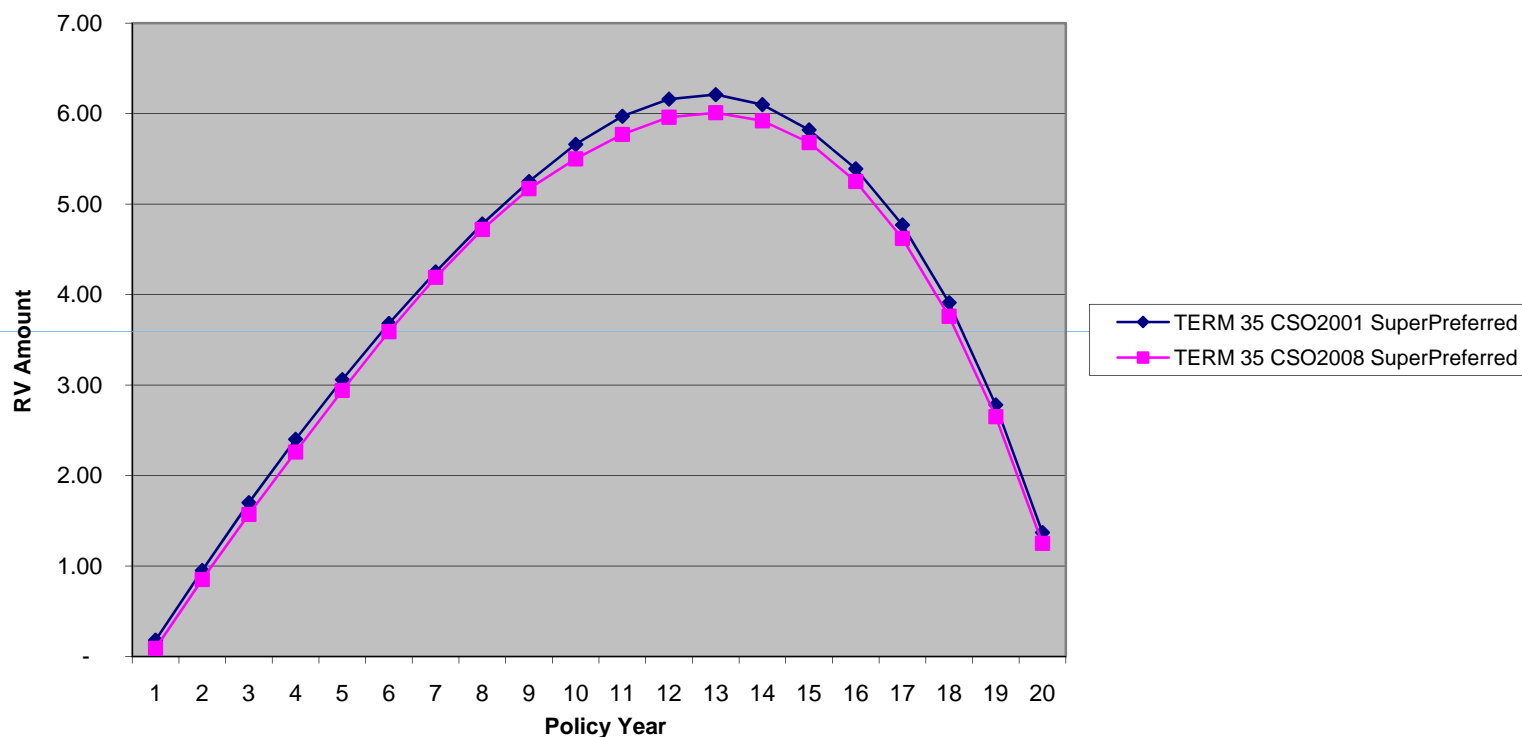


Table	Dur 1	Dur 5	Dur 10	Dur 20
2001 CSO	.18	3.06	5.66	1.37
2008 CSO	.09	2.94	5.50	1.25

Comparison of Reserves per 1,000 2001 CSO Super-Pref S&U vs. 2008 CSO RR70 S&U 20 Year Term Male NS Issue Age 45

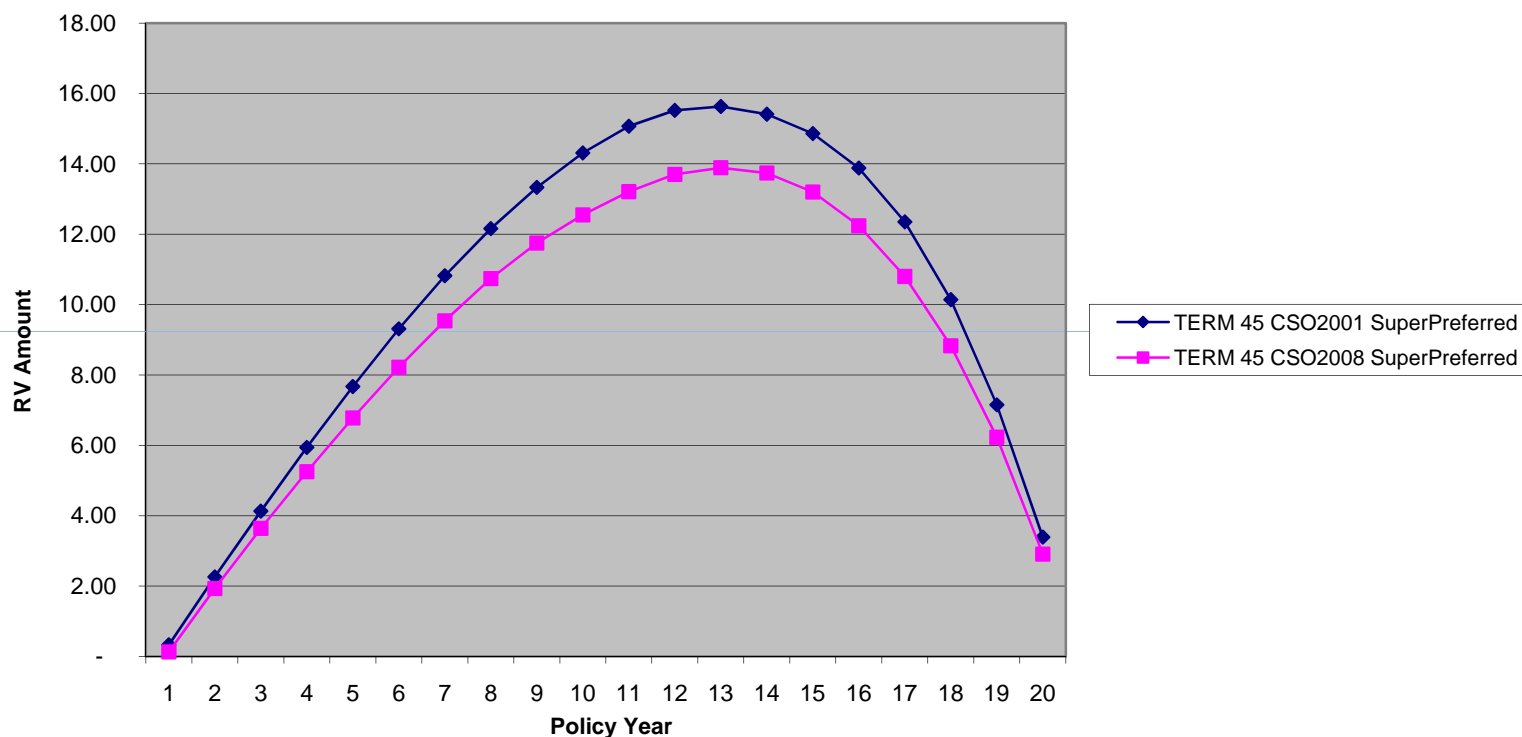


Table	Dur 1	Dur 5	Dur 10	Dur 20
2001 CSO	.33	7.67	14.31	3.39
2008 CSO	.13	6.68	12.55	2.91

Comparison of Reserves per 1,000 2001 CSO Super-Pref S&U vs. 2008 CSO RR70 S&U 20 Year Term Male NS Issue Age 55

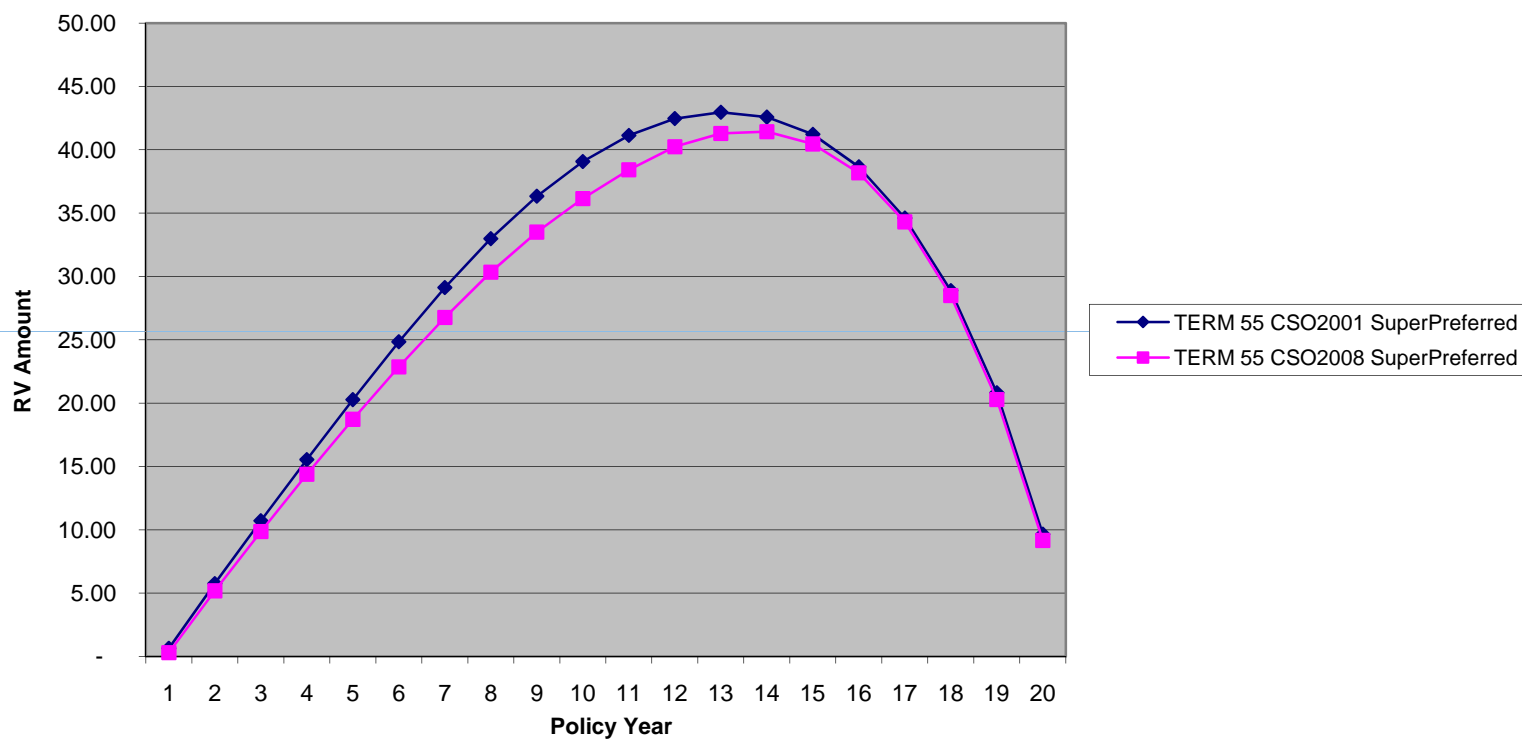


Table	Dur 1	Dur 5	Dur 10	Dur 20
2001 CSO	.64	20.27	39.07	9.65
2008 CSO	.30	18.72	36.15	9.16

Comparison of Reserves per 1,000

2001 CSO Residual S&U vs. 2008 CSO RR130 S&U

20 Year Term Male NS Issue Age 35

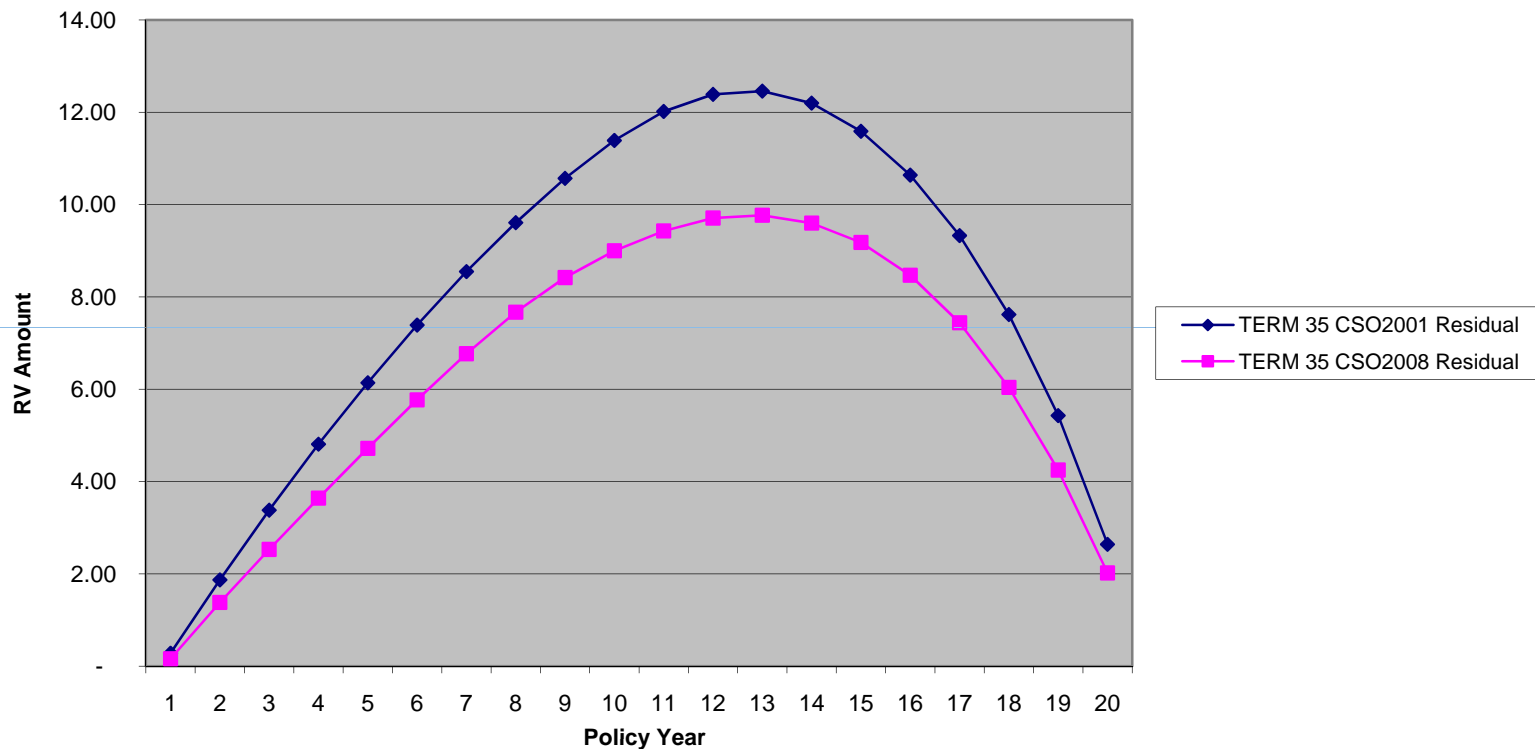


Table	Dur 1	Dur 5	Dur 10	Dur 20
2001 CSO	.28	6.14	11.39	2.64
2008 CSO	.16	4.72	9.00	2.02

Comparison of Reserves per 1,000 2001 CSO Residual S&U vs. 2008 CSO RR130 S&U 20 Year Term Male NS Issue Age 45

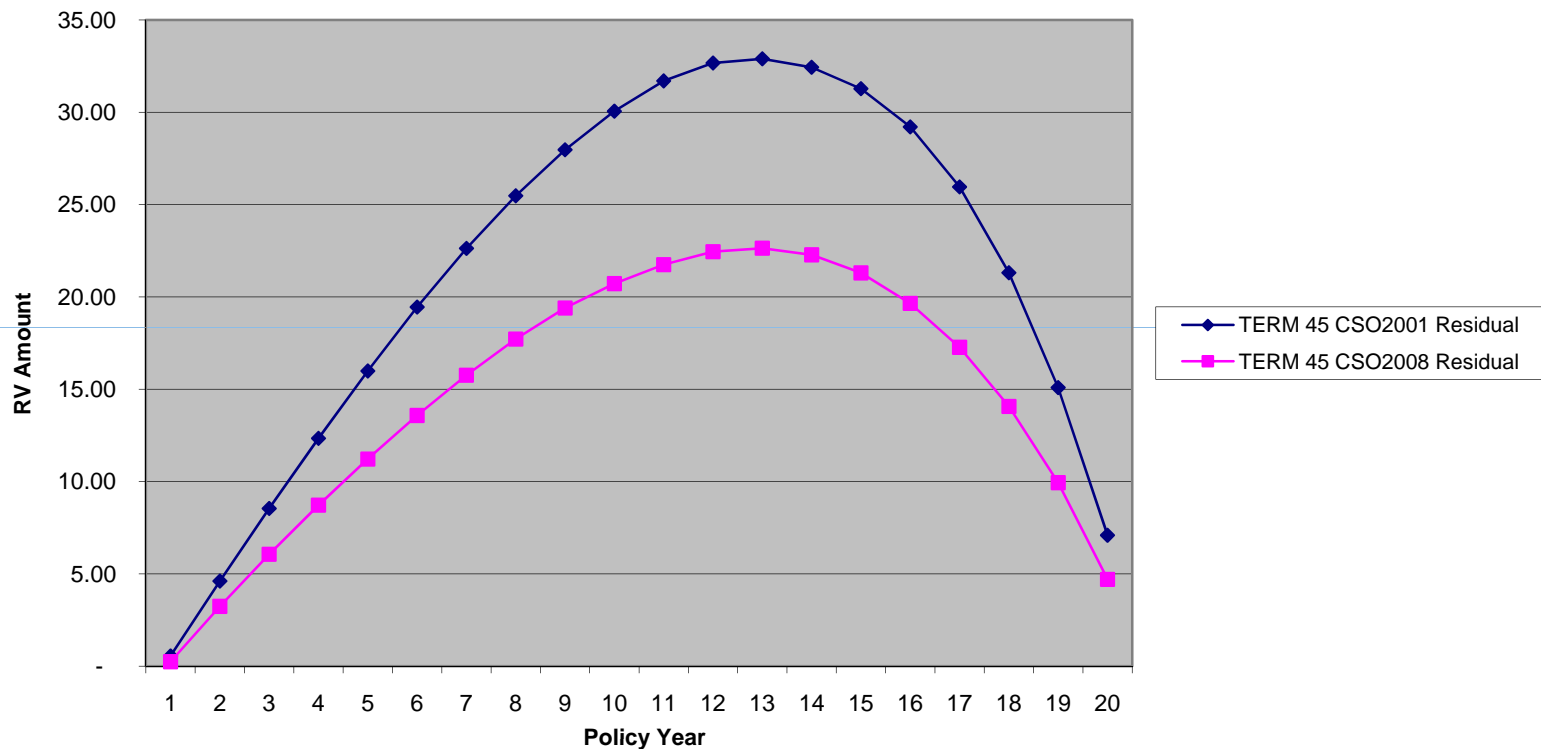


Table	Dur 1	Dur 5	Dur 10	Dur 20
2001 CSO	.55	15.99	30.06	7.09
2008 CSO	.24	11.22	20.72	4.70

Comparison of Reserves per 1,000 2001 CSO Residual S&U vs. 2008 CSO RR130 S&U 20 Year Term Male NS Issue Age 55

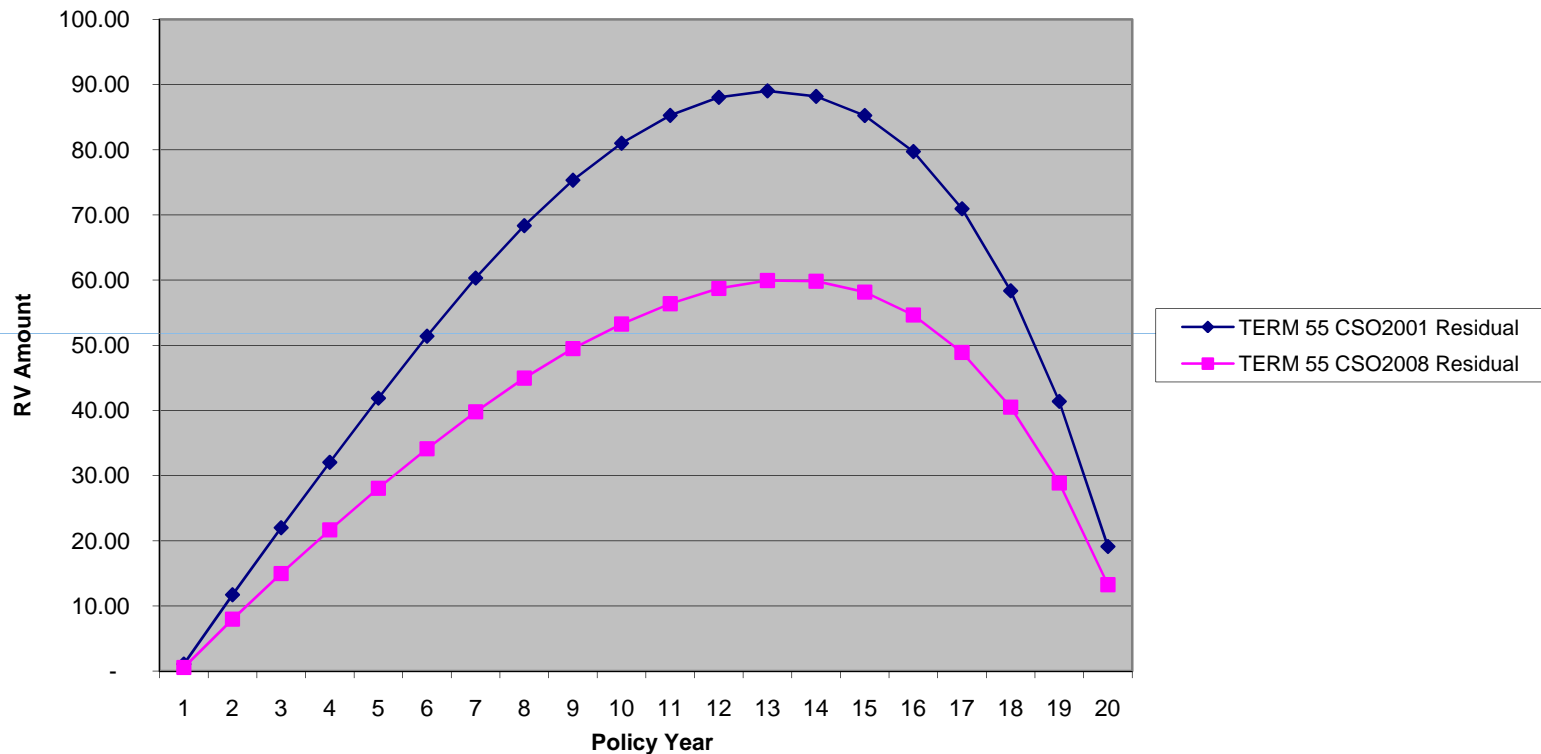


Table	Dur 1	Dur 5	Dur 10	Dur 20
2001 CSO	1.08	41.88	81.00	19.12
2008 CSO	.57	28.06	53.26	13.27

Comparison of Reserves per 1,000 2001 CSO S&U vs. 2008 CSO S&U UL Male NS Issue Age 45

AXXX Reserve Comparison

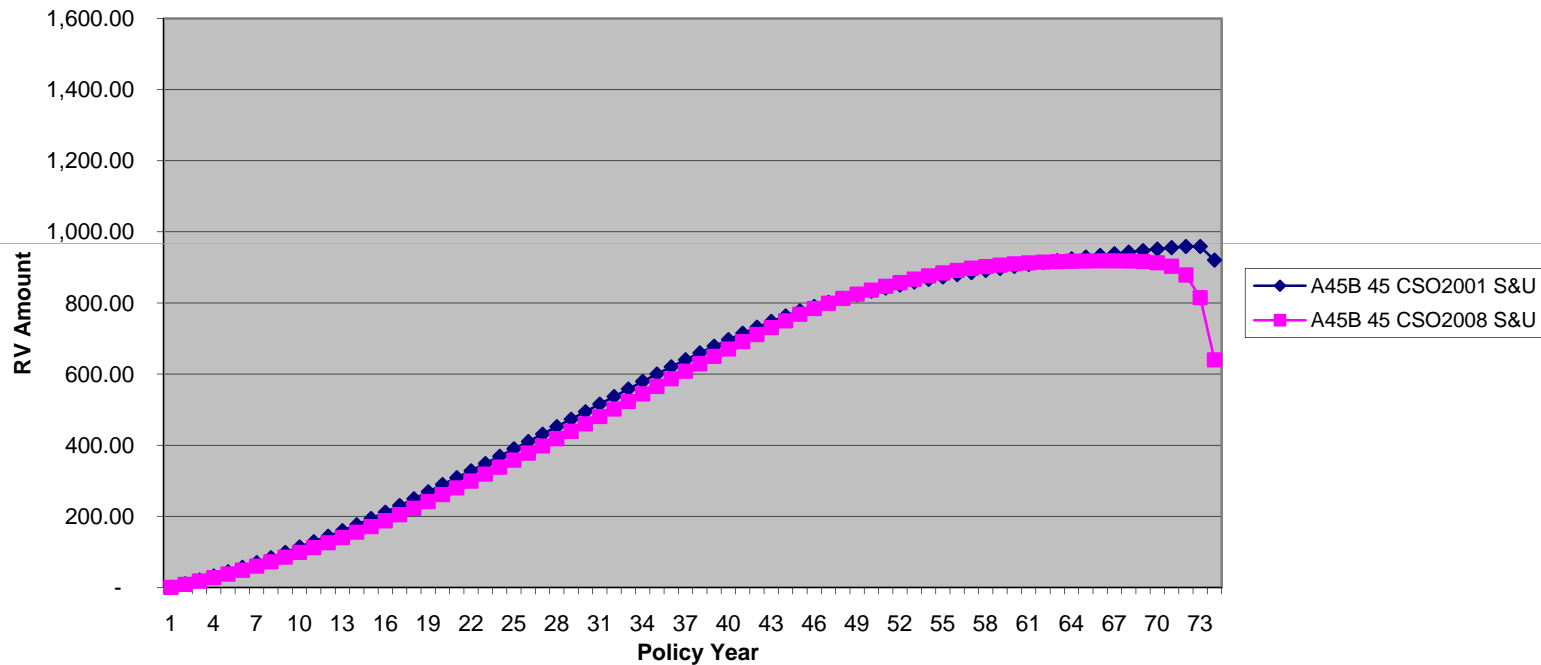


Table	Dur 1	Dur 5	Dur 10	Dur 20	Dur 30
2001 CSO	0	43.78	113.67	289.19	494.04
2008 CSO	0	37.56	98.52	261.05	459.75

Comparison of Reserves per 1,000 2001 CSO S&U vs. 2008 CSO S&U UL Male NS Issue Age 45

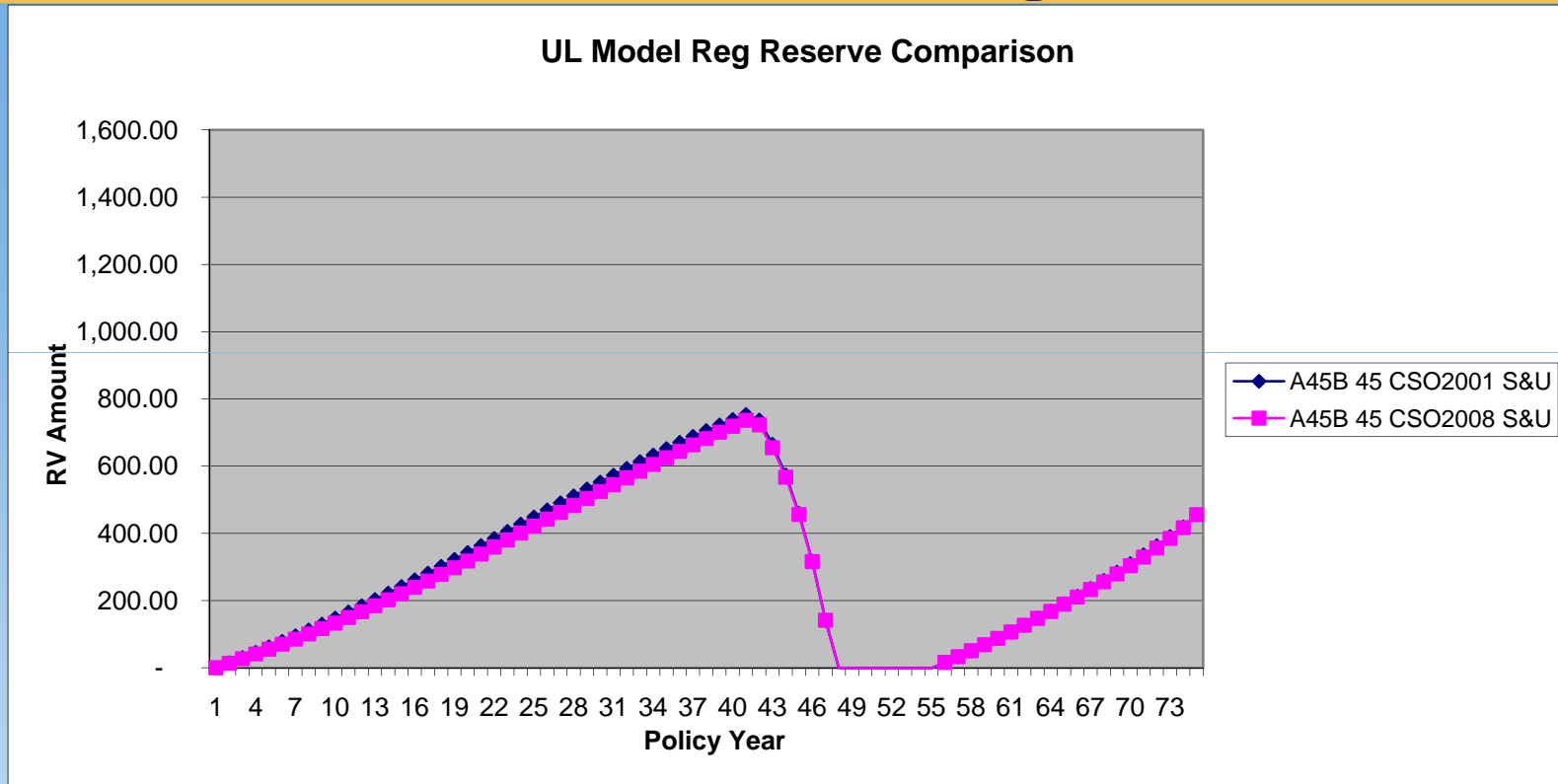


Table	Dur 1	Dur 5	Dur 10	Dur 20	Dur 30
2001 CSO	0	61.98	147.67	363.37	552.32
2008 CSO	0	55.33	132.86	338.26	524.05

Comparison of Reserves per 1,000 2001 CSO S&U vs. 2008 CSO S&U UL Male NS Issue Age 75

AXXX Reserve Comparison

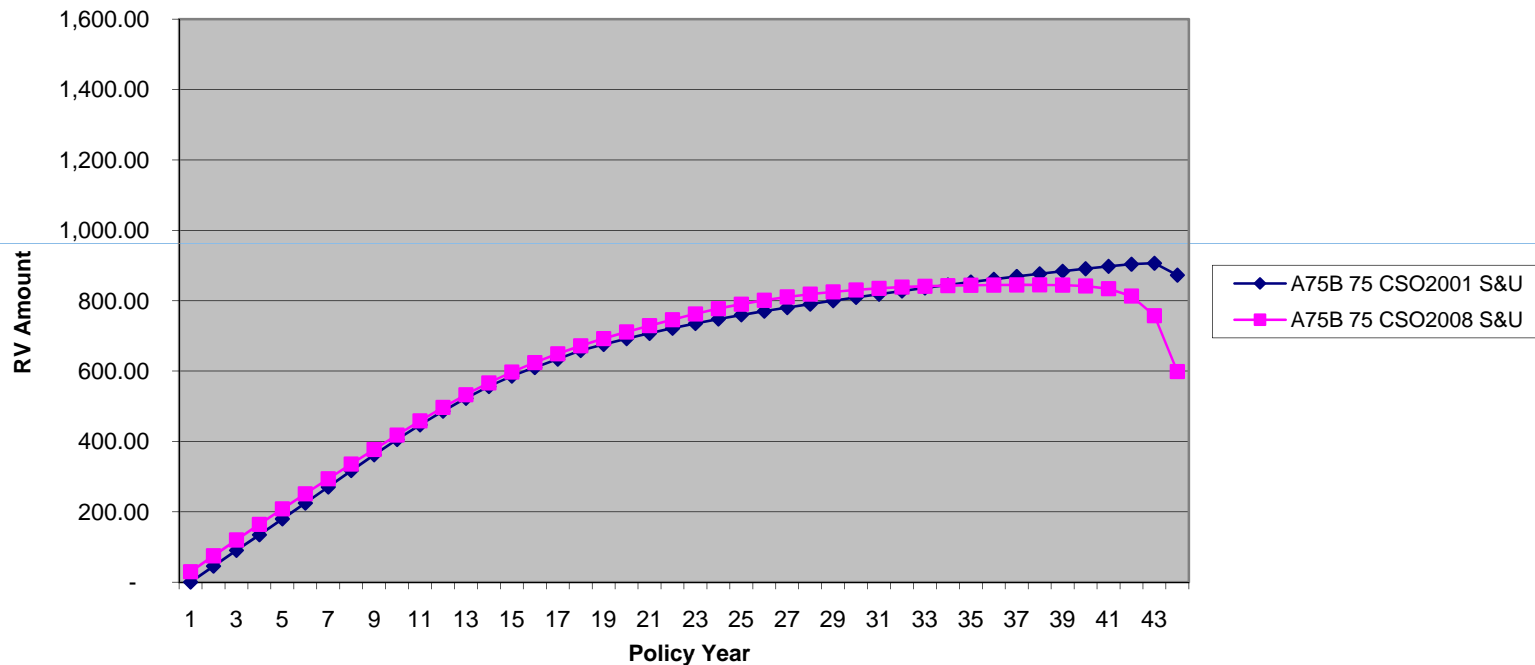


Table	Dur 1	Dur 5	Dur 10	Dur 20	Dur 30
2001 CSO	0	179.74	405.40	692.13	809.33
2008 CSO	29.67	208.28	418.11	711.09	830.51

Comparison of Reserves per 1,000 2001 CSO S&U vs. 2008 CSO S&U UL Male NS Issue Age 75

UL Model Reg Reserve Comparison

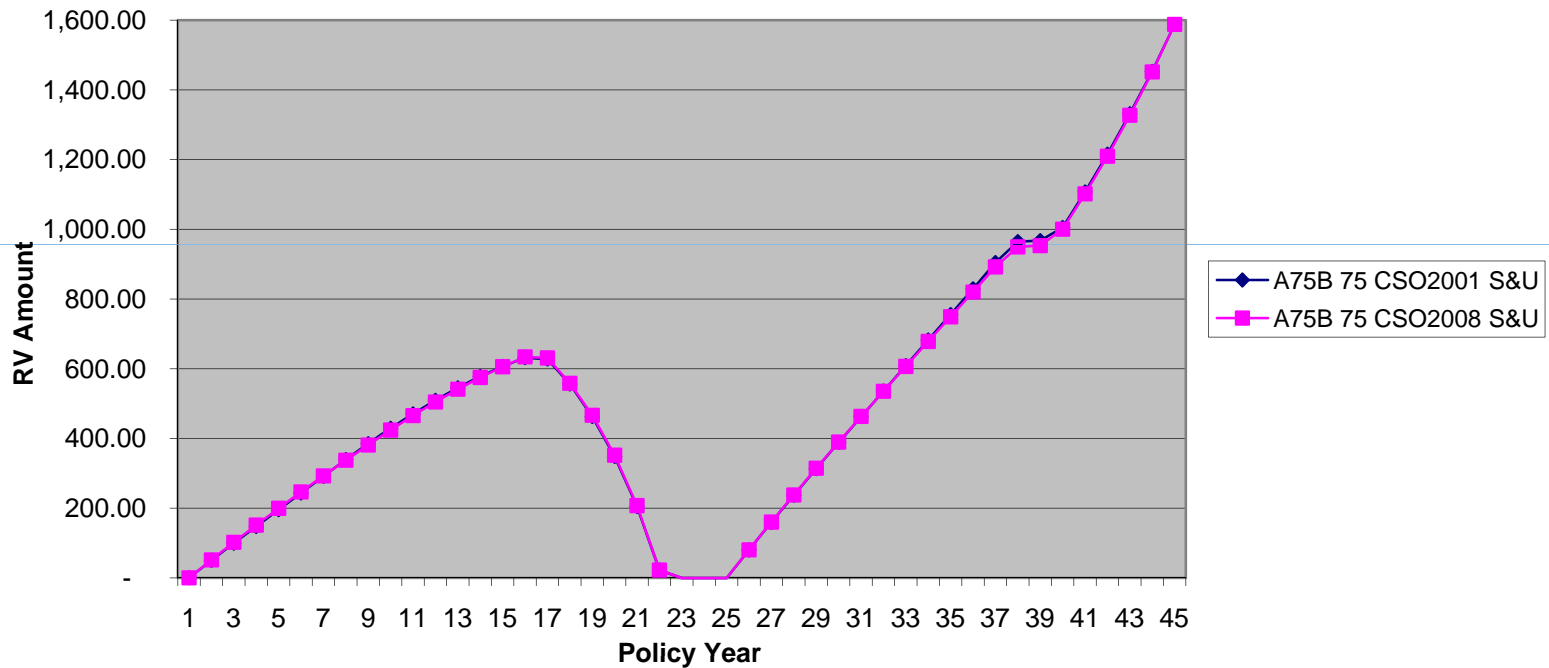


Table	Dur 1	Dur 5	Dur 10	Dur 20	Dur 30
2001 CSO	0	195.64	428.97	348.33	388.79
2008 CSO	0	199.50	423.99	351.94	389.59

Comparison of Reserves per 1,000 2001 CSO Ultimate vs. 2008 CSO Ultimate UL Male NS Issue Age 45

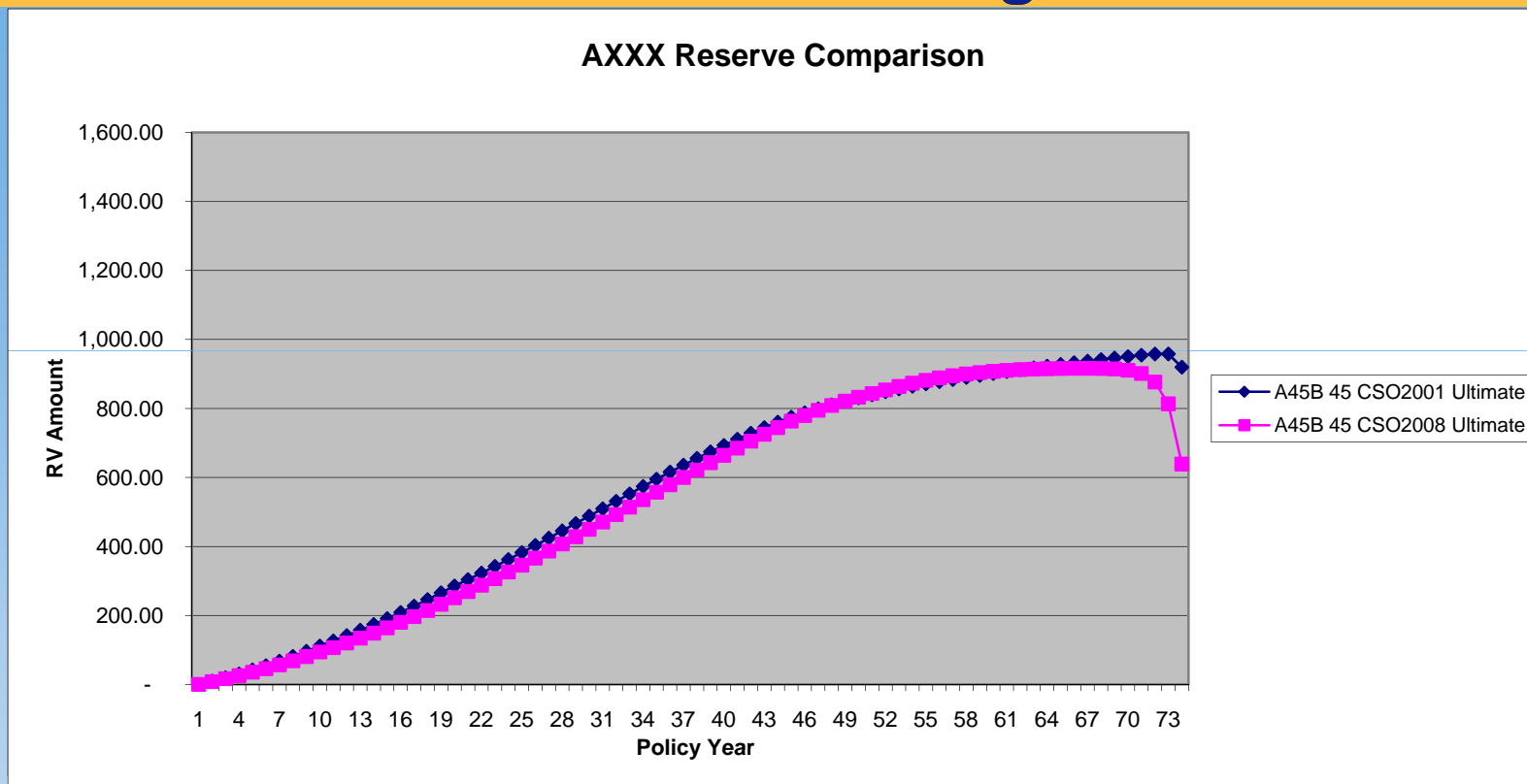


Table	Dur 1	Dur 5	Dur 10	Dur 20	Dur 30
2001 CSO	0	42.12	111.55	285.38	487.87
2008 CSO	0	35.40	93.90	251.25	449.44

Comparison of Reserves per 1,000 2001 CSO Ultimate vs. 2008 CSO Ultimate UL Male NS Issue Age 45

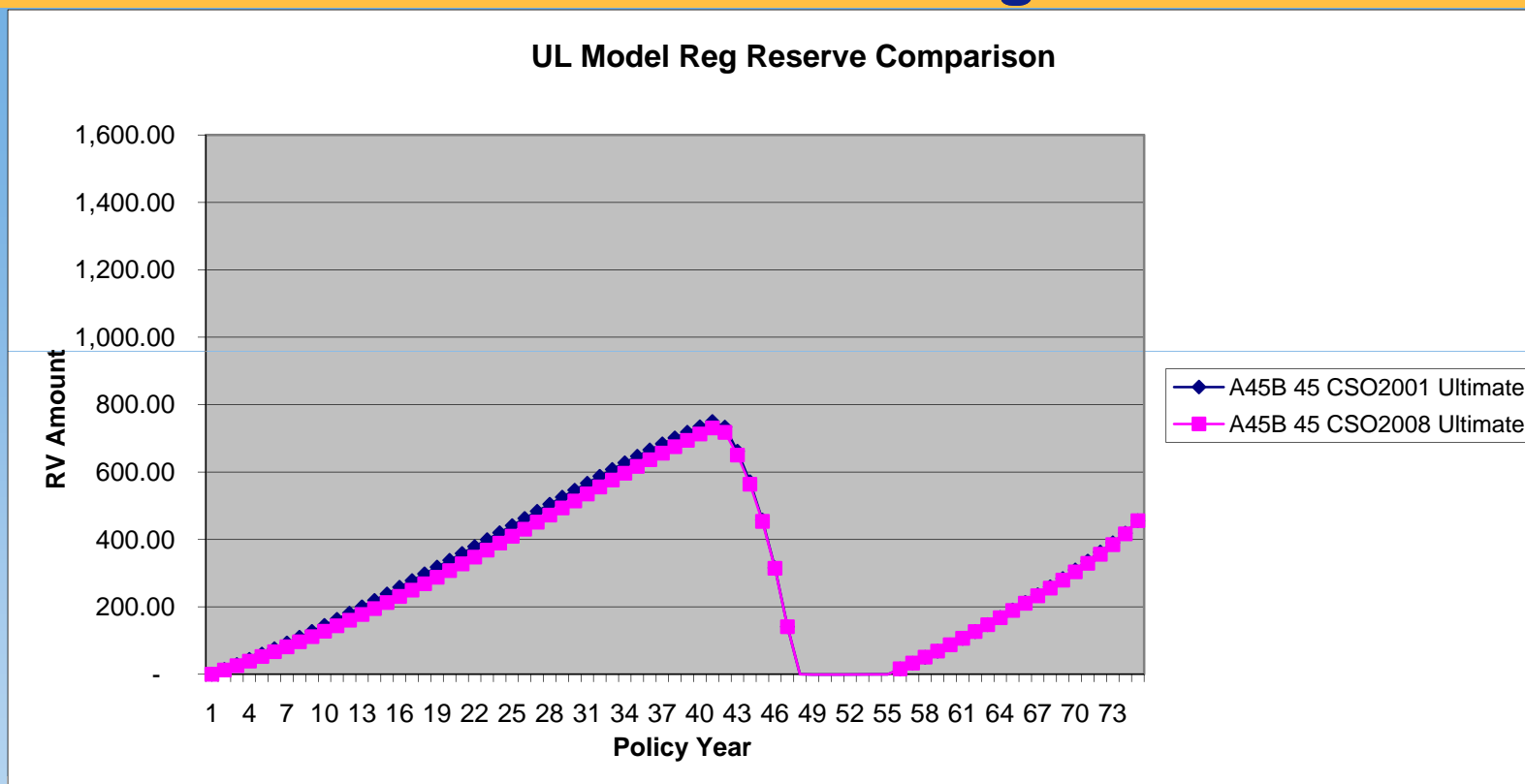


Table	Dur 1	Dur 5	Dur 10	Dur 20	Dur 30
2001 CSO	0	60.08	145.19	338.30	546.35
2008 CSO	0	52.61	127.47	307.53	514.22

Comparison of Reserves per 1,000 2001 CSO Ultimate vs. 2008 CSO Ultimate UL Male NS Issue Age 75

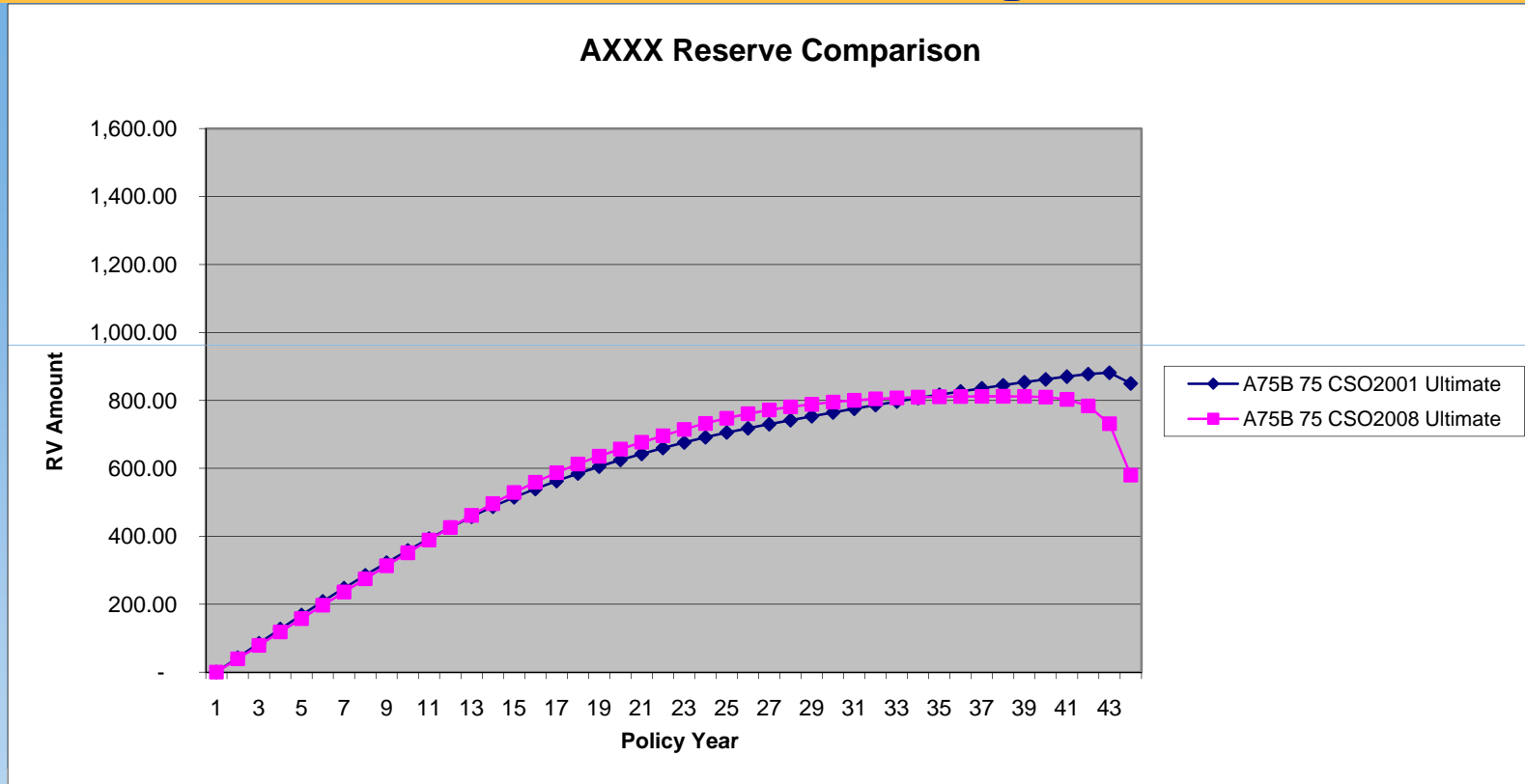


Table	Dur 1	Dur 5	Dur 10	Dur 20	Dur 30
2001 CSO	0	168.06	358.32	624.71	764.51
2008 CSO	0	157.77	351.46	656.59	794.92

Comparison of Reserves per 1,000 2001 CSO Ultimate vs. 2008 CSO Ultimate UL Male NS Issue Age 75

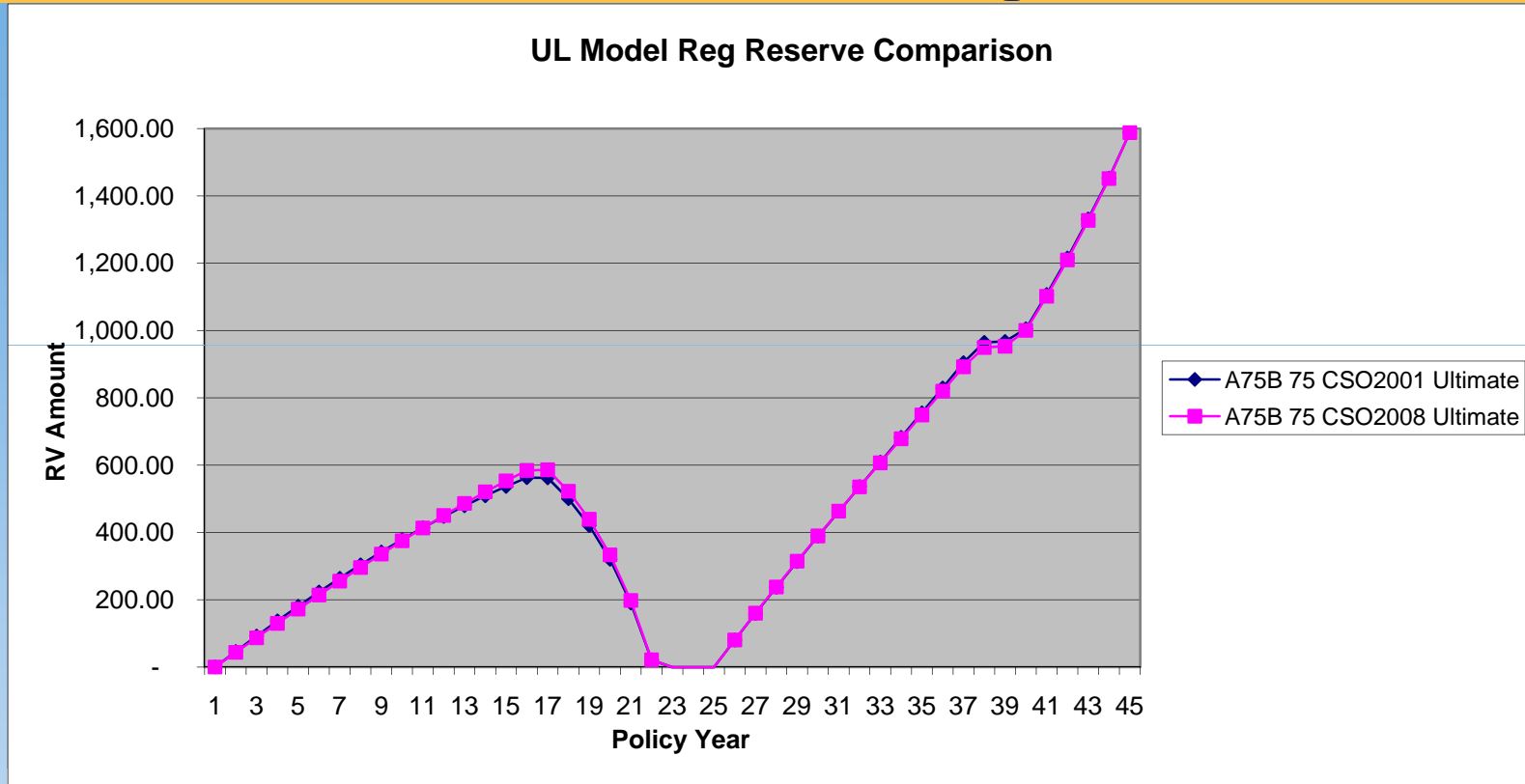


Table	Dur 1	Dur 5	Dur 10	Dur 20	Dur 30
2001 CSO	0	180.63	378.66	319.90	388.79
2008 CSO	0	172.05	375.07	333.47	389.59

Comparison of Reserves per 1,000 2001 CSO Preferred vs. 2008 CSO RR90 UL Male NS Issue Age 45

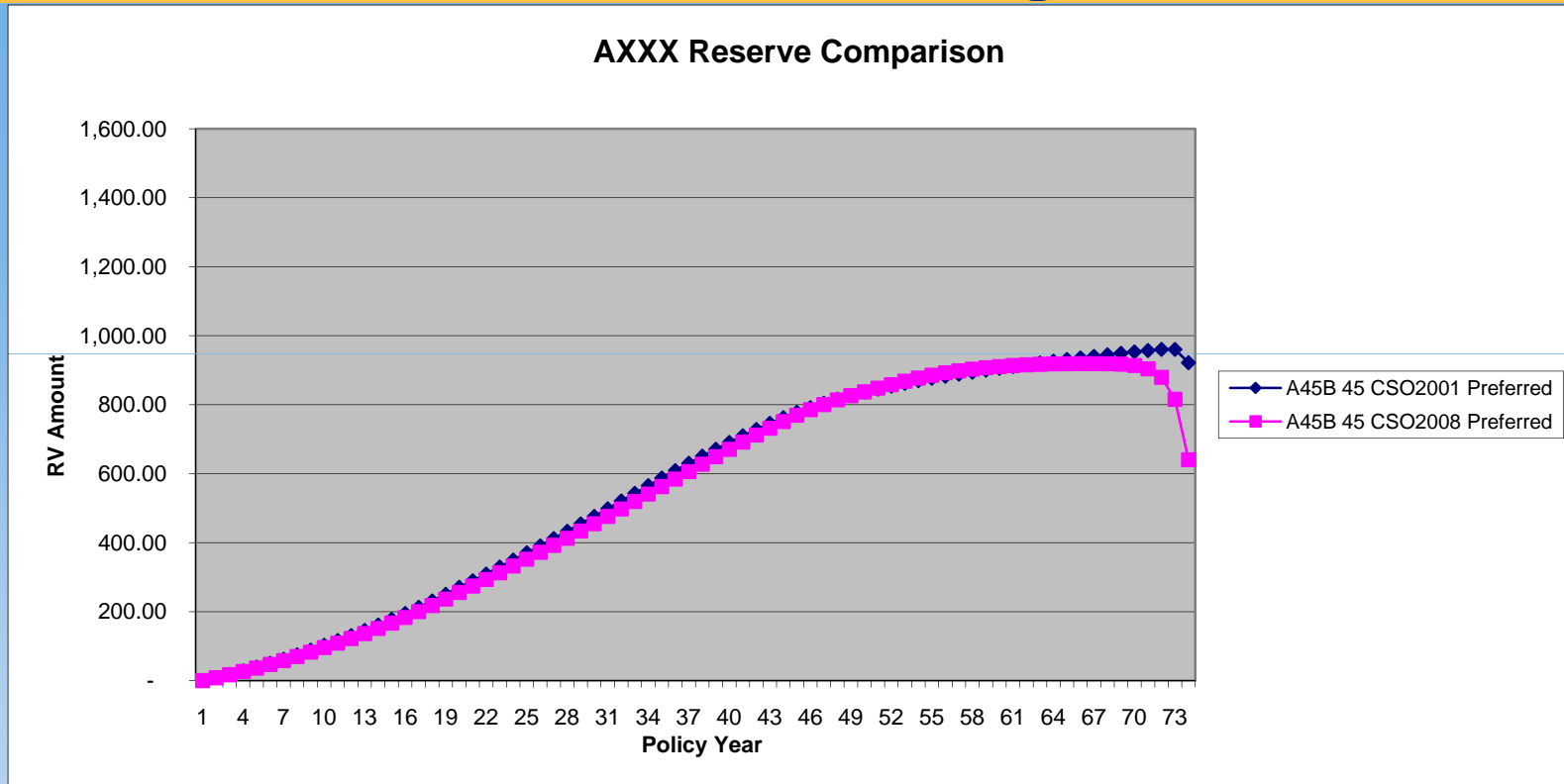


Table	Dur 1	Dur 5	Dur 10	Dur 20	Dur 30
2001 CSO	0	39.06	102.74	270.58	476.17
2008 CSO	0	36.37	95.72	255.70	454.76

Comparison of Reserves per 1,000 2001 CSO Preferred vs. 2008 CSO RR90 UL Male NS Issue Age 45

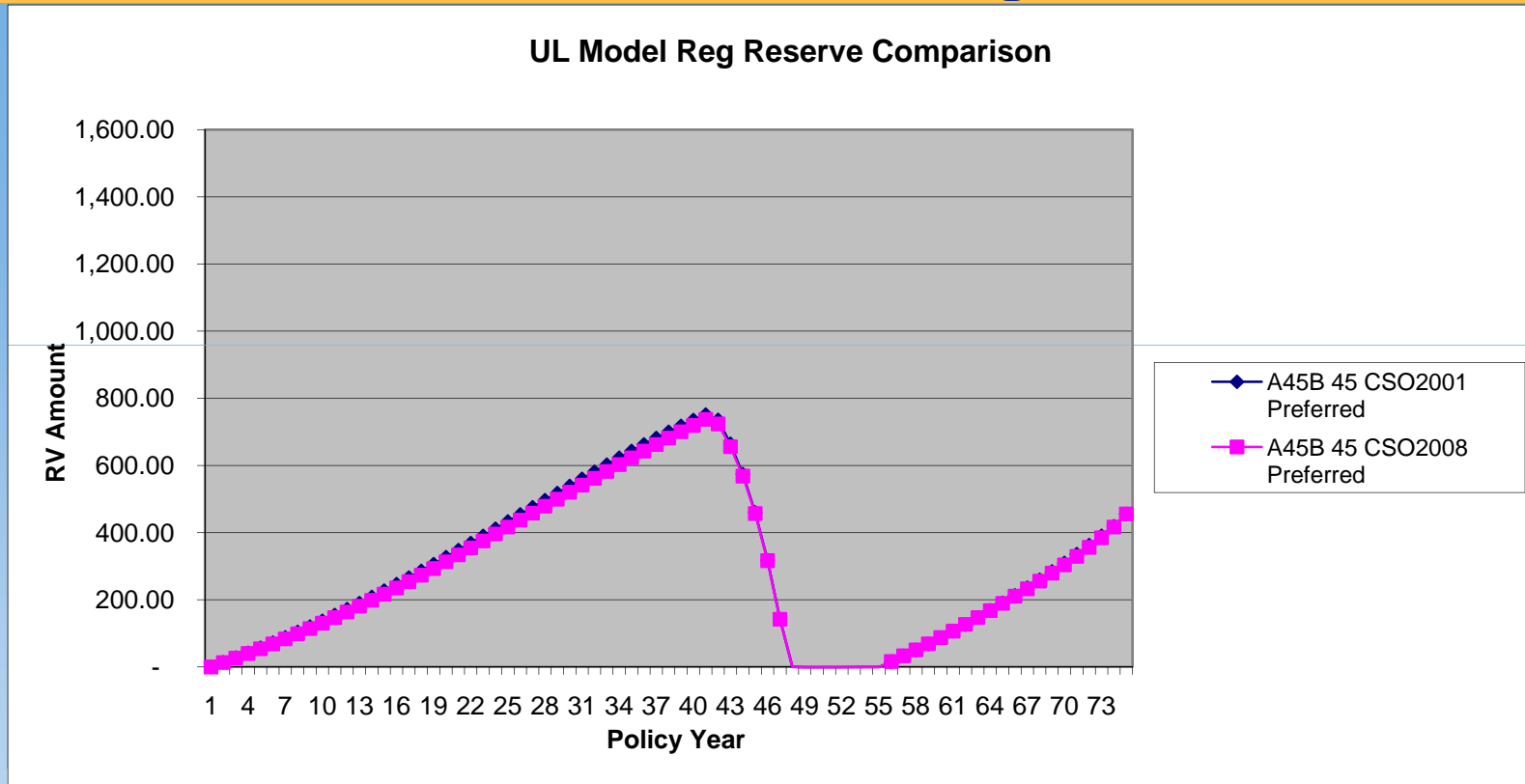


Table	Dur 1	Dur 5	Dur 10	Dur 20	Dur 30
2001 CSO	0	57.09	137.32	326.86	538.77
2008 CSO	0	54.08	130.20	313.17	520.38

Comparison of Reserves per 1,000 2001 CSO Preferred vs. 2008 CSO RR90 UL Male NS Issue Age 75

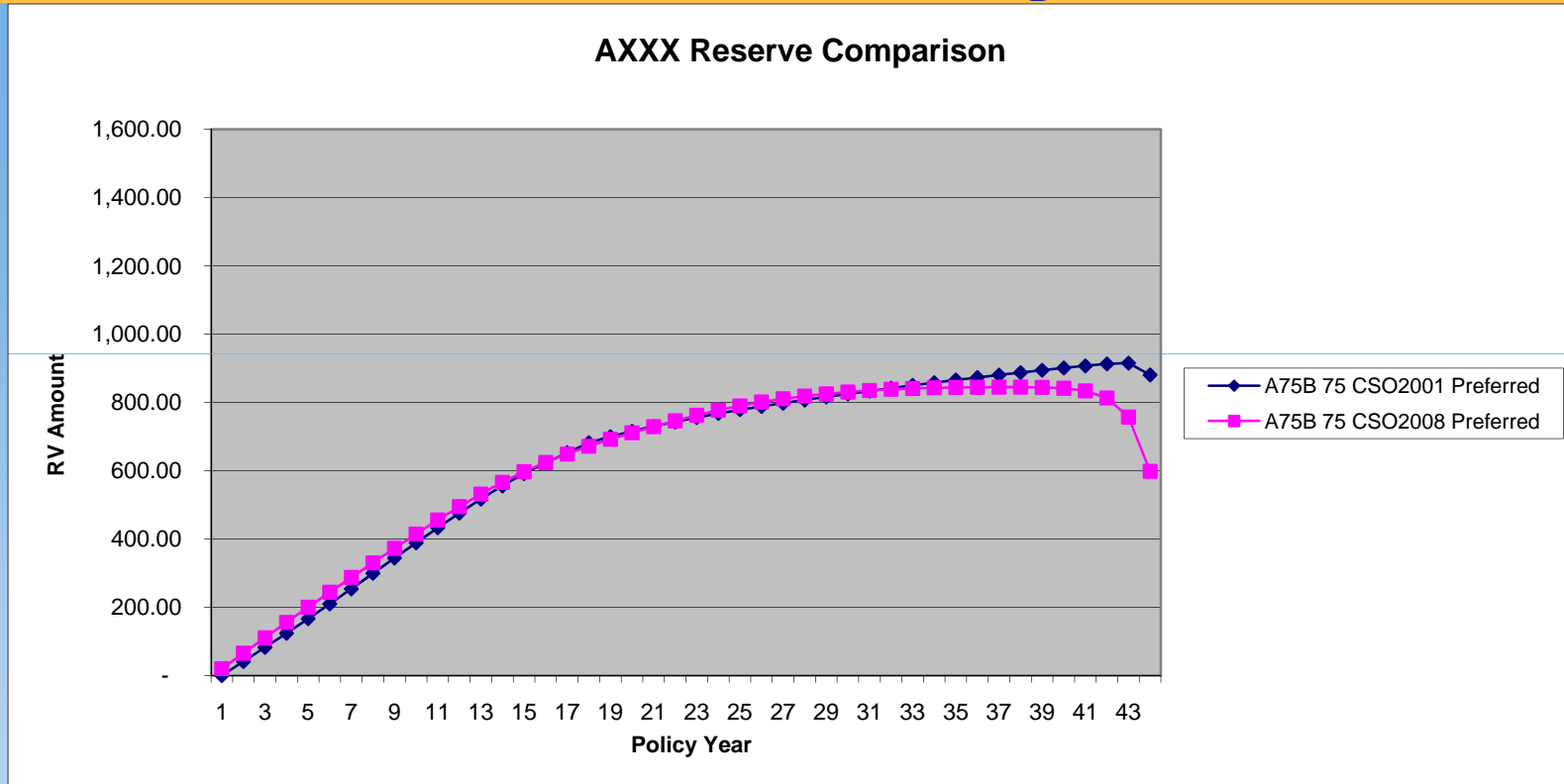


Table	Dur 1	Dur 5	Dur 10	Dur 20	Dur 30
2001 CSO	0	166.85	389.09	715.68	824.96
2008 CSO	20.16	200.34	414.50	711.09	830.51

Comparison of Reserves per 1,000 2001 CSO Preferred vs. 2008 CSO RR90 UL Male NS Issue Age 75

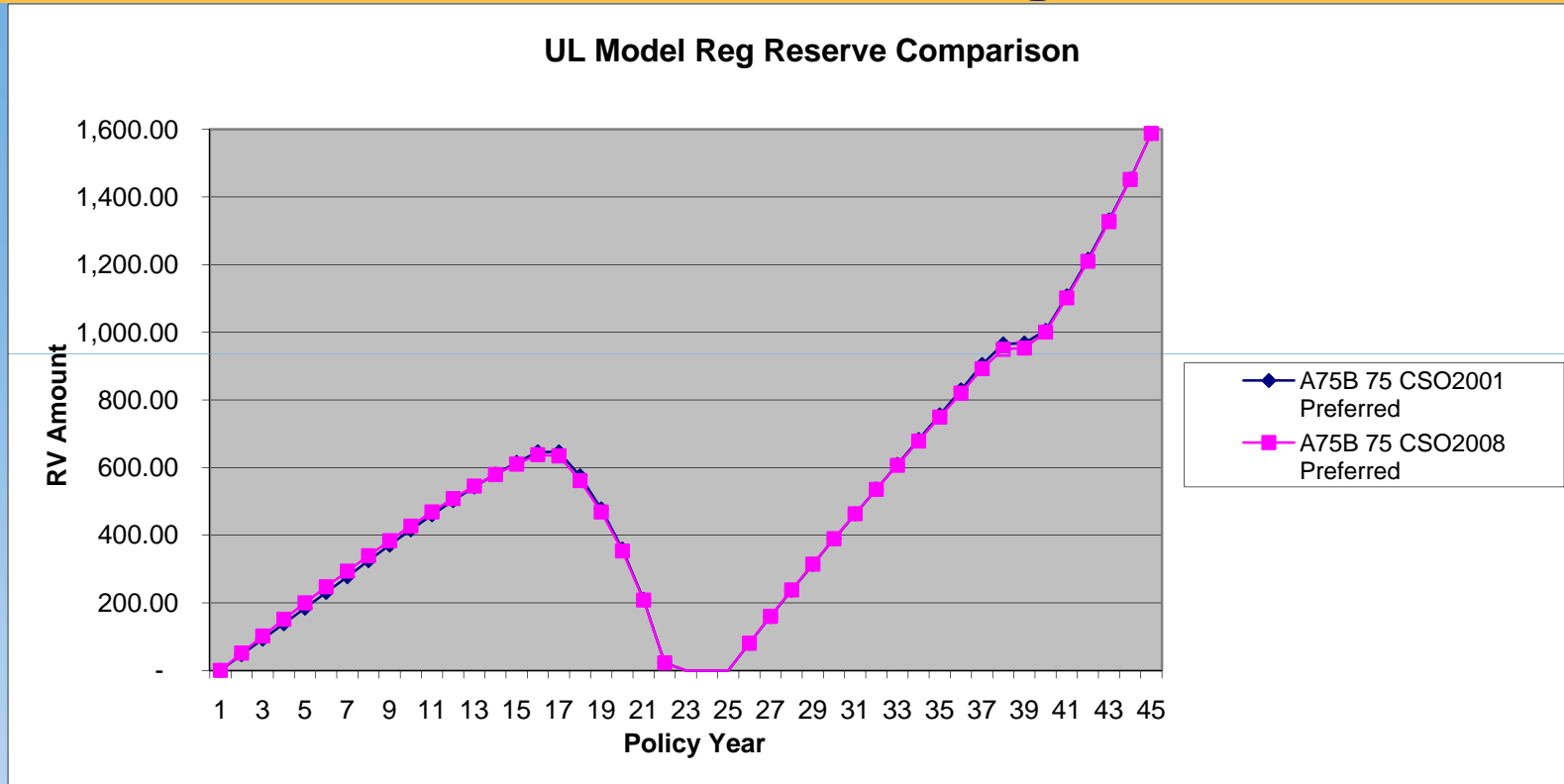


Table	Dur 1	Dur 5	Dur 10	Dur 20	Dur 30
2001 CSO	0	184.26	415.94	358.54	388.79
2008 CSO	0	199.77	426.63	353.31	389.59

Comparison of Reserves per 1,000 2001 CSO Super-Pref vs. 2008 CSO RR70 UL Male NS Issue Age 45

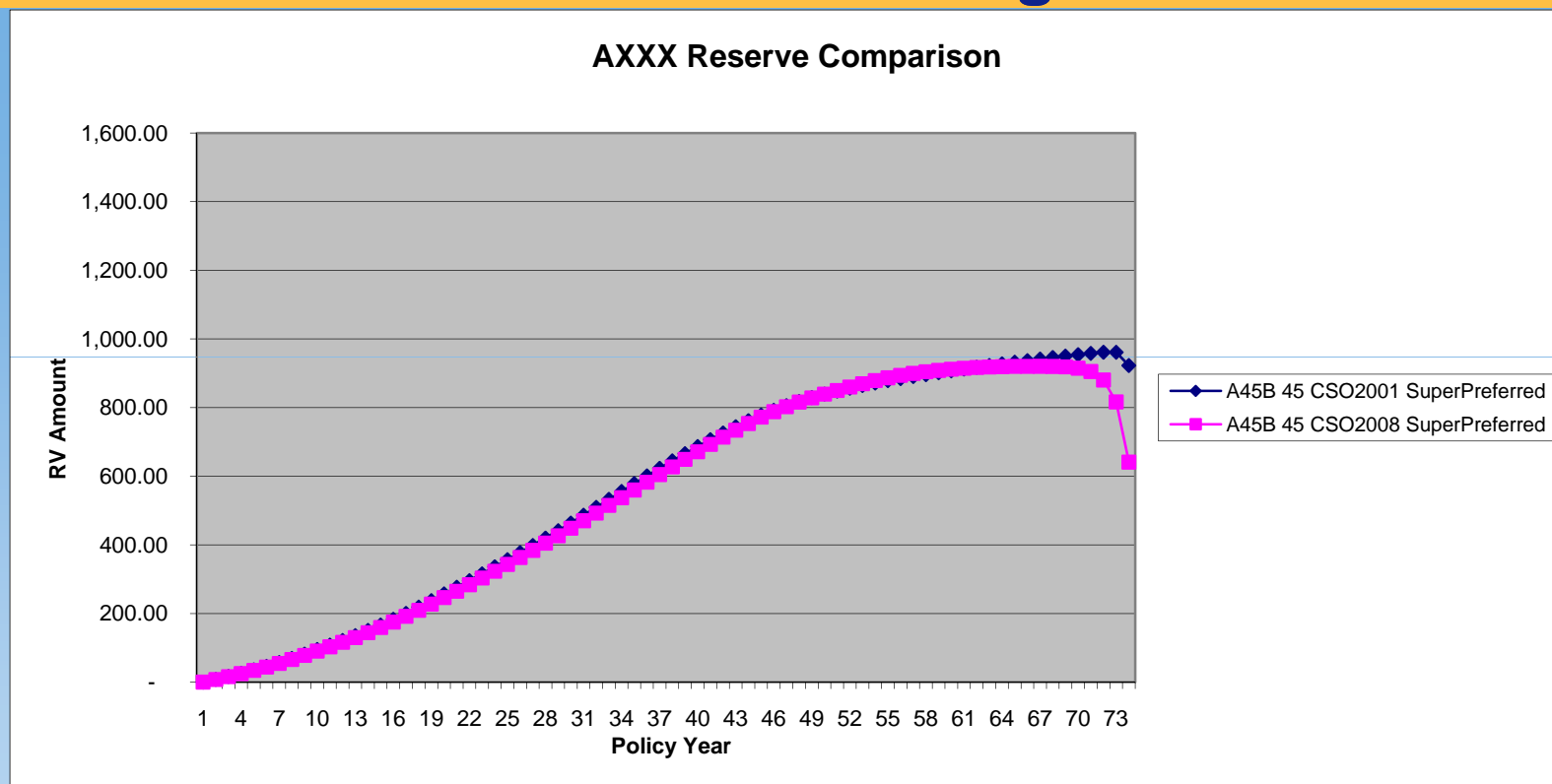


Table	Dur 1	Dur 5	Dur 10	Dur 20	Dur 30
2001 CSO	0	35.82	95.14	257.50	463.69
2008 CSO	0	34.12	90.52	246.53	448.30

Comparison of Reserves per 1,000 2001 CSO Super-Pref vs. 2008 CSO RR70 UL Male NS Issue Age 45

UL Model Reg Reserve Comparison

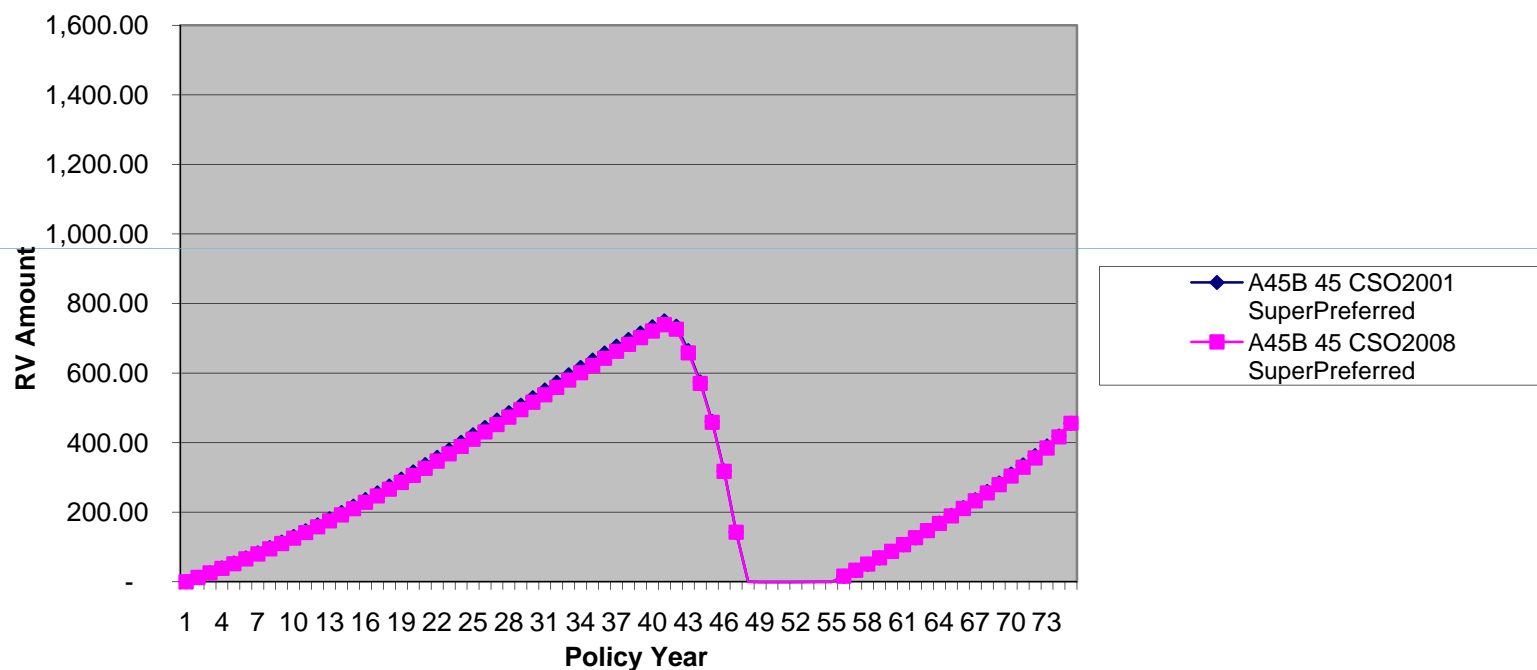


Table	Dur 1	Dur 5	Dur 10	Dur 20	Dur 30
2001 CSO	0	53.73	130.14	315.89	529.44
2008 CSO	0	51.80	125.39	305.71	516.19

Comparison of Reserves per 1,000 2001 CSO Super-Pref vs. 2008 CSO RR70 UL Male NS Issue Age 75

AXXX Reserve Comparison

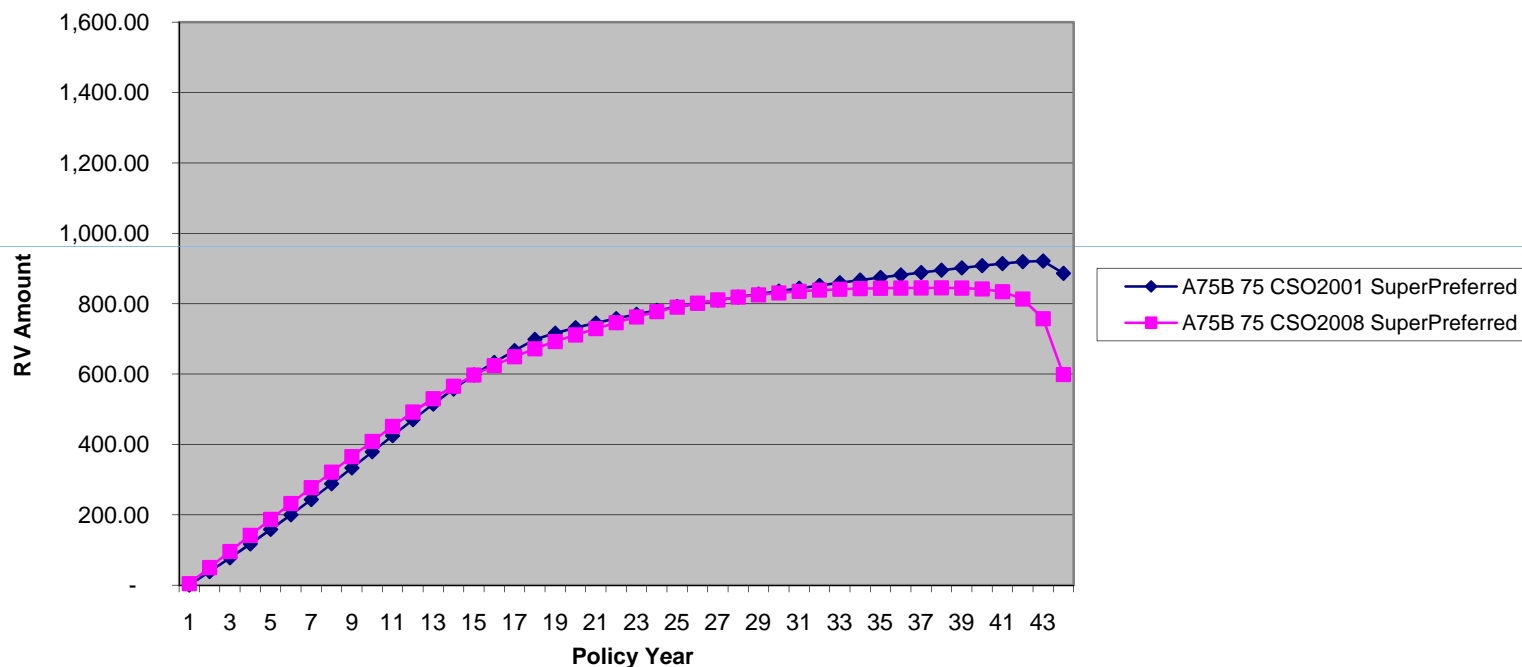


Table	Dur 1	Dur 5	Dur 10	Dur 20	Dur 30
2001 CSO	0	158.15	378.91	731.59	835.52
2008 CSO	4.33	187.14	408.55	711.09	830.51

Comparison of Reserves per 1,000 2001 CSO Super-Pref vs. 2008 CSO RR70 UL Male NS Issue Age 75

UL Model Reg Reserve Comparison

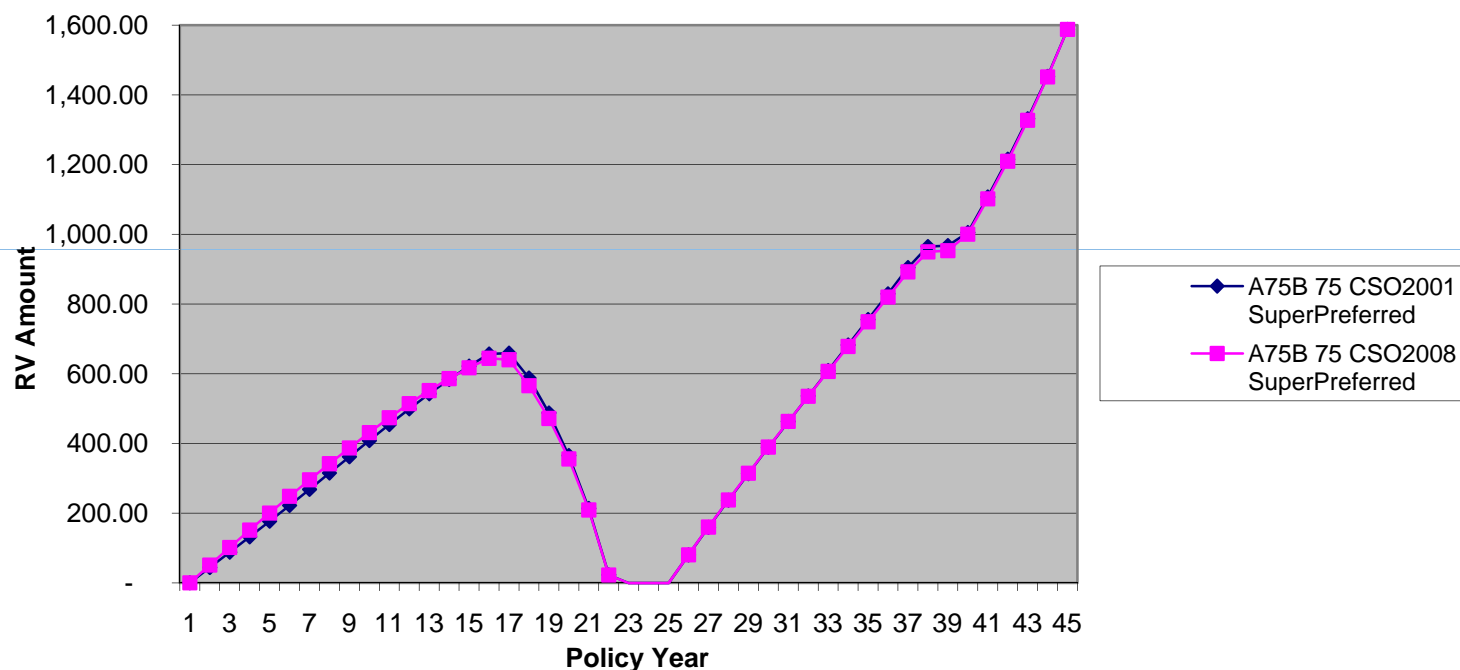


Table	Dur 1	Dur 5	Dur 10	Dur 20	Dur 30
2001 CSO	0	176.72	408.19	365.39	388.79
2008 CSO	0	200.26	430.98	355.54	389.59

Comparison of Reserves per 1,000 2001 CSO Residual vs. 2008 CSO RR130 UL Male NS Issue Age 45

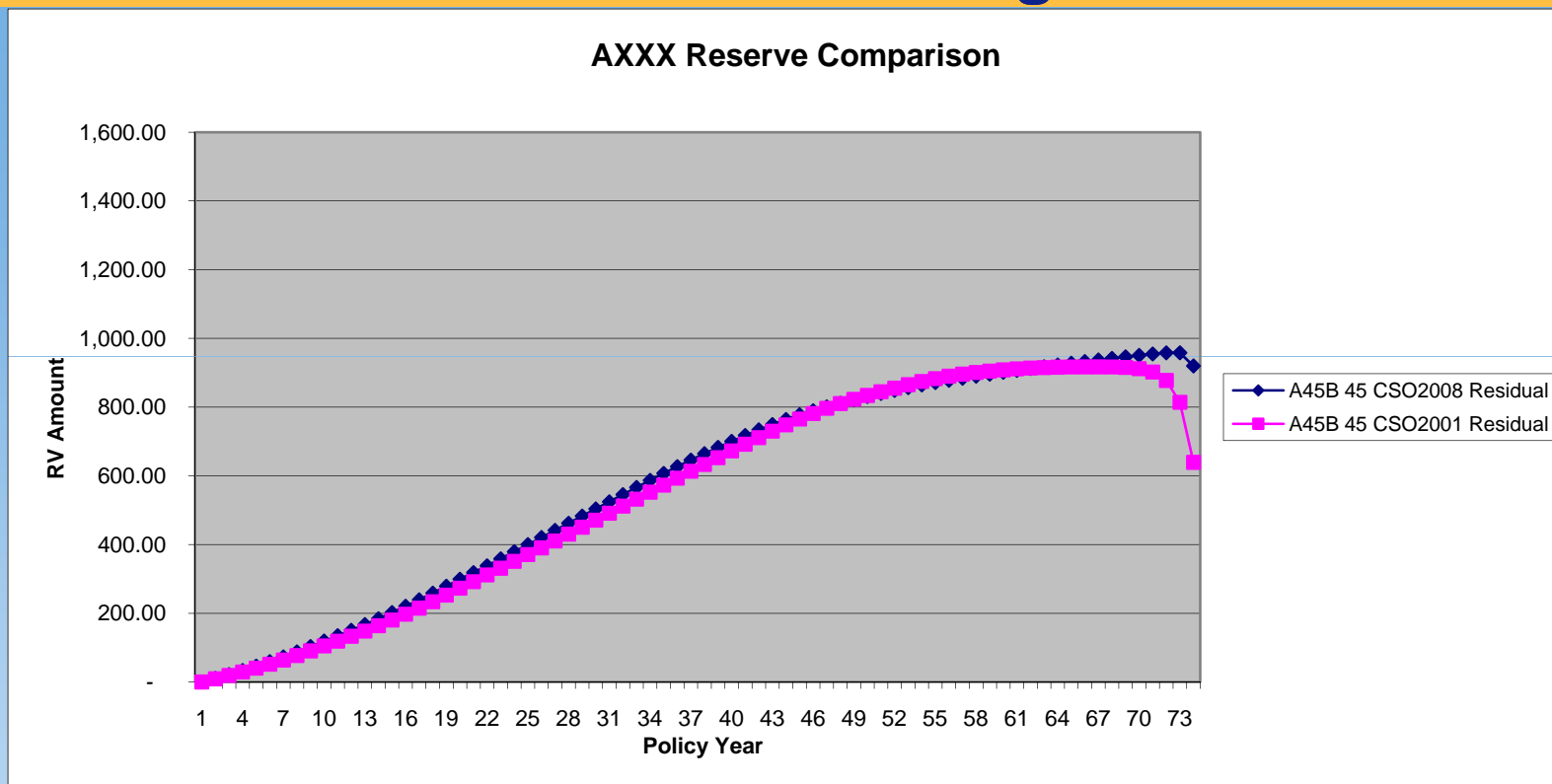


Table	Dur 1	Dur 5	Dur 10	Dur 20	Dur 30
2001 CSO	0	46.36	119.61	299.31	503.83
2008 CSO	0	40.26	104.84	272.91	470.83

Comparison of Reserves per 1,000 2001 CSO Residual vs. 2008 CSO RR130 UL Male NS Issue Age 45

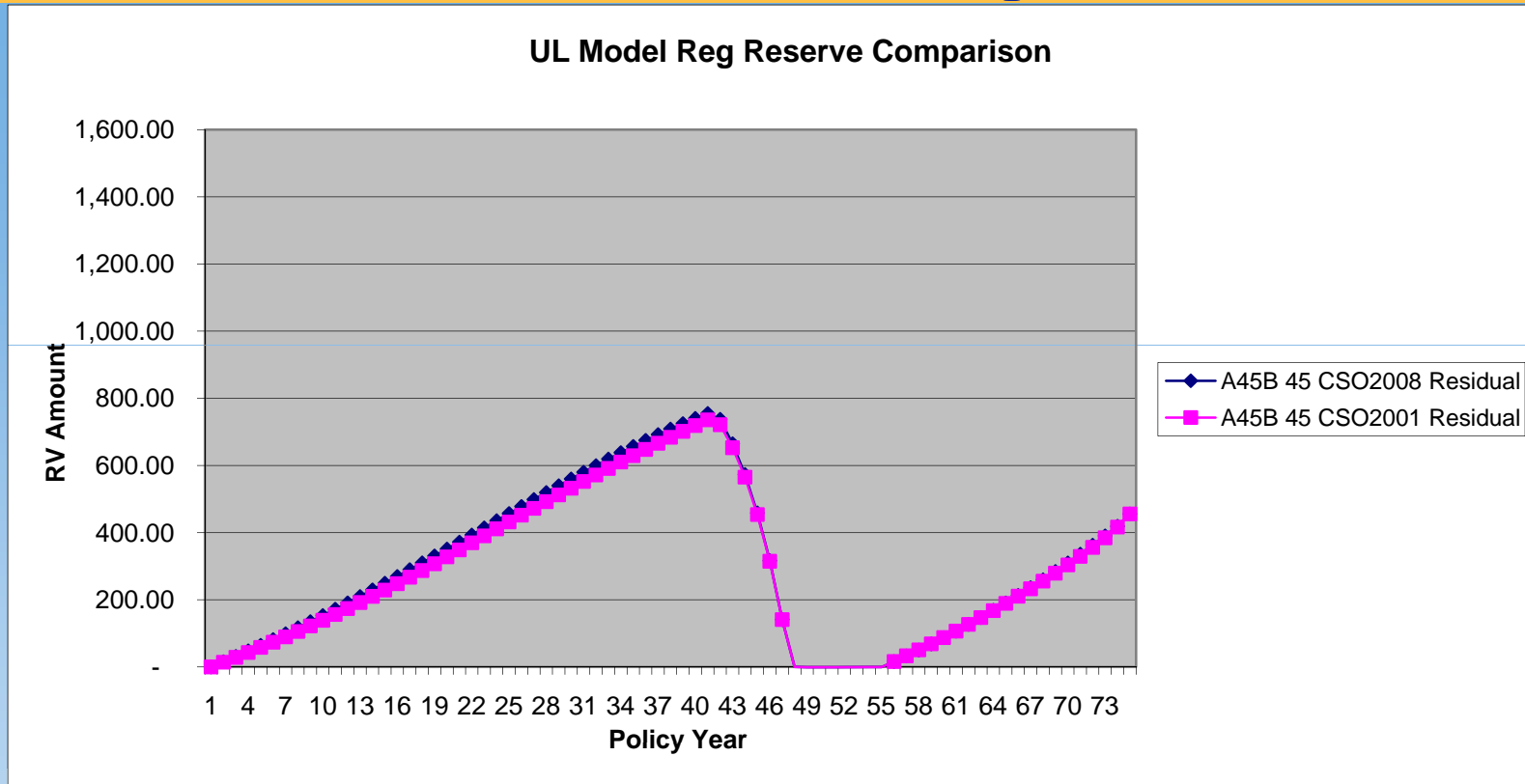


Table	Dur 1	Dur 5	Dur 10	Dur 20	Dur 30
2001 CSO	0	64.66	153.33	351.19	559.85
2008 CSO	0	58.14	138.89	327.81	532.34

Comparison of Reserves per 1,000 2001 CSO Residual vs. 2008 CSO RR130 UL Male NS Issue Age 75

AXXX Reserve Comparison

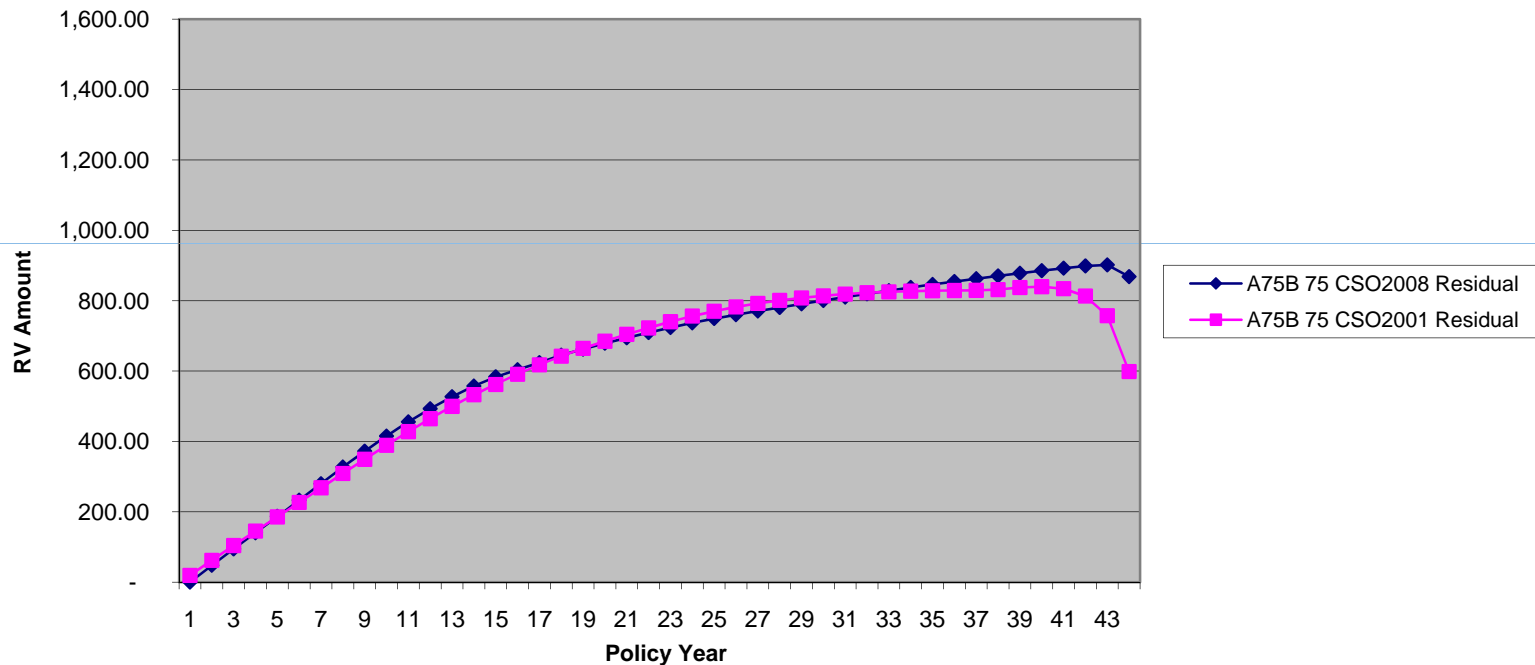


Table	Dur 1	Dur 5	Dur 10	Dur 20	Dur 30
2001 CSO	0	186.96	415.10	678.88	800.54
2008 CSO	19.34	185.37	388.88	684.83	813.77

Comparison of Reserves per 1,000 2001 CSO Residual vs. 2008 CSO RR130 UL Male NS Issue Age 75

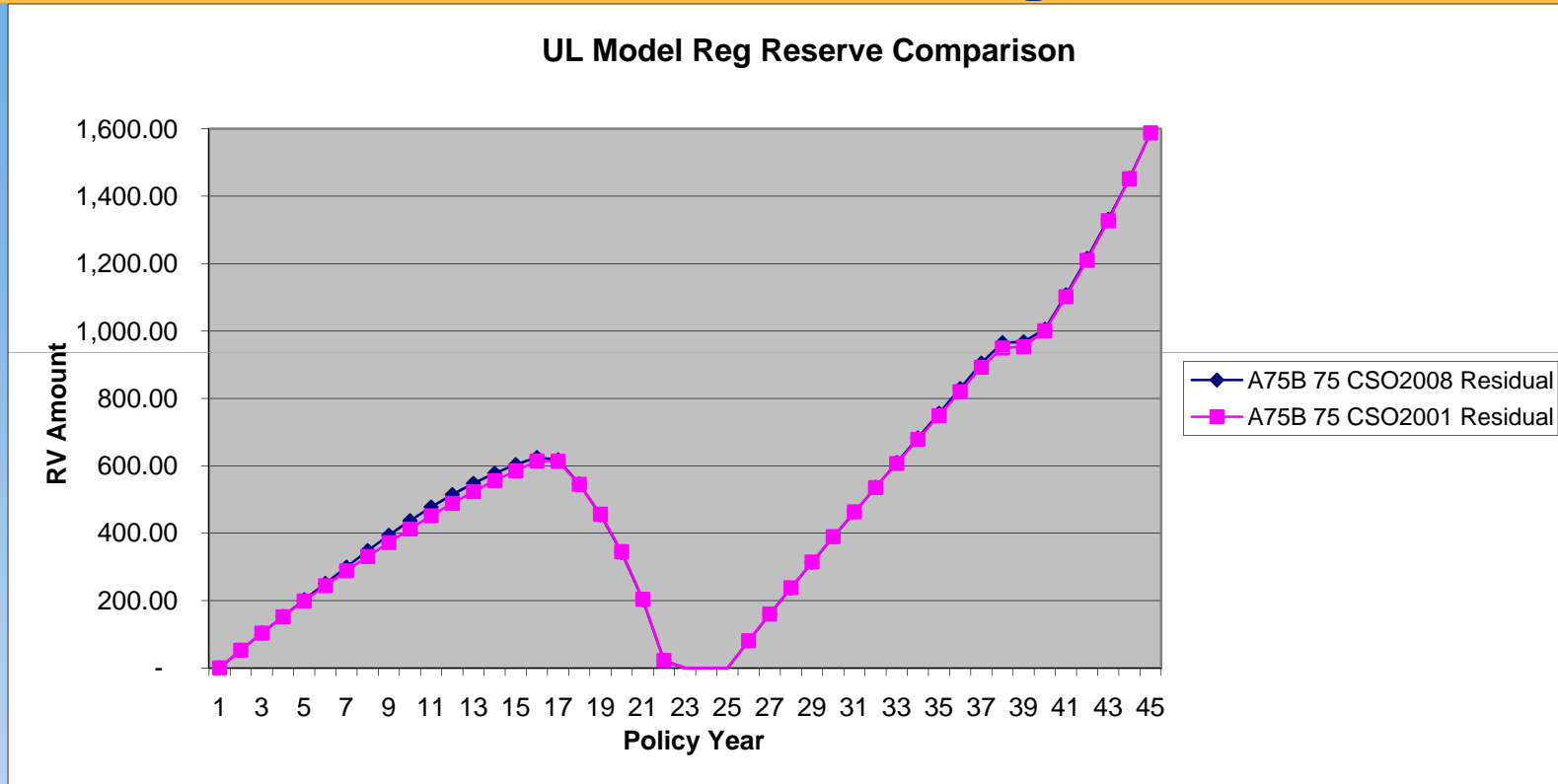


Table	Dur 1	Dur 5	Dur 10	Dur 20	Dur 30
2001 CSO	0	202.12	436.99	342.55	388.79
2008 CSO	0	198.78	412.32	345.07	389.59

Appendix B

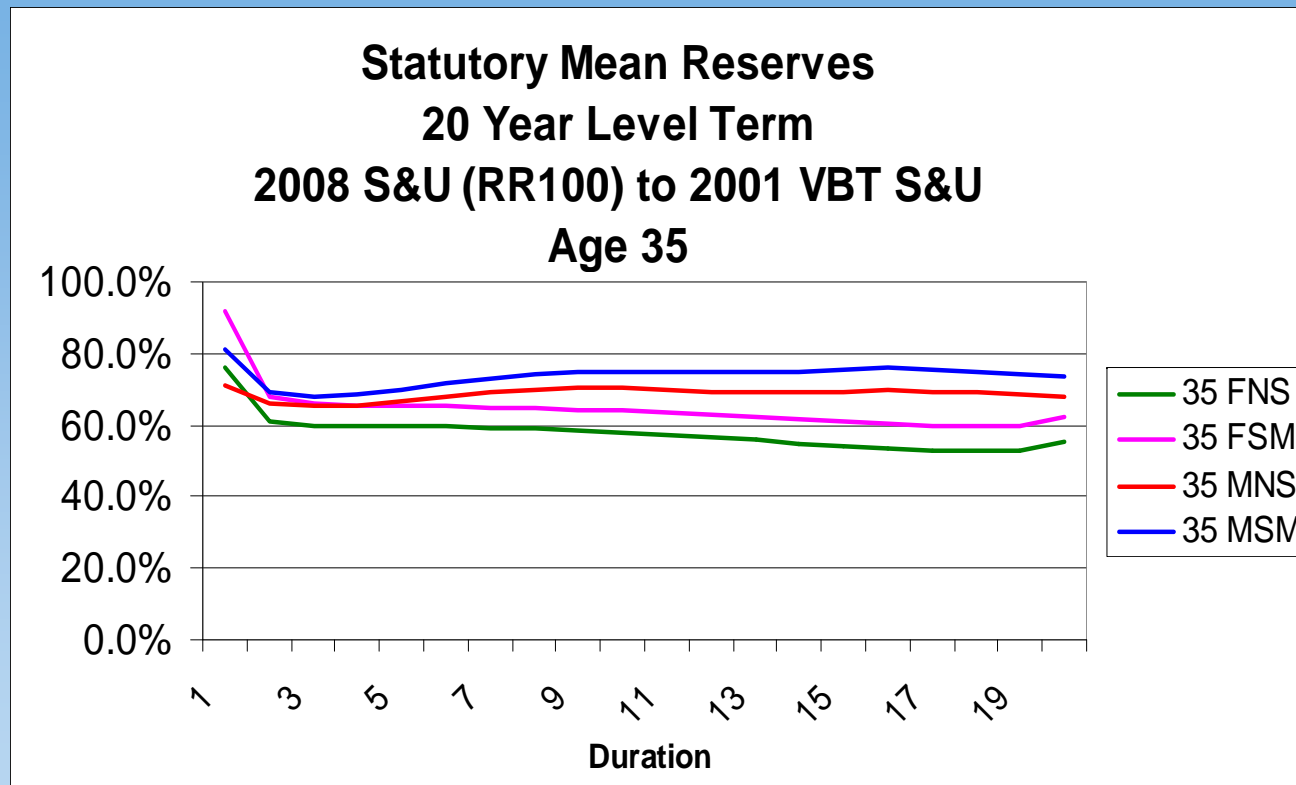
The following slides have been previously presented and discussed.

Comparison of Term Reserves

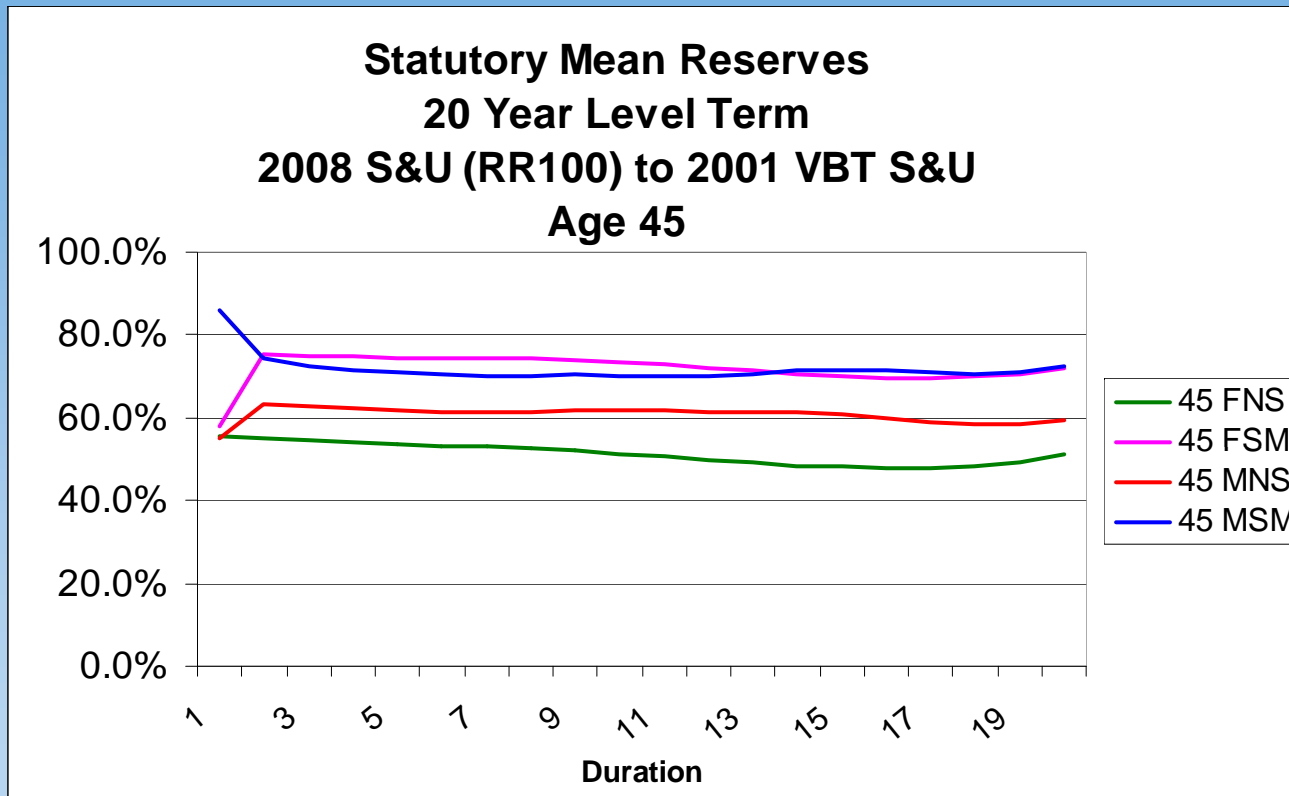
- The following slides show the testing results for CRVM reserves on a 20-year term product.
- Ratios are shown of reserves using the 2008 Basic Table to reserves using the 2001 Basic table.



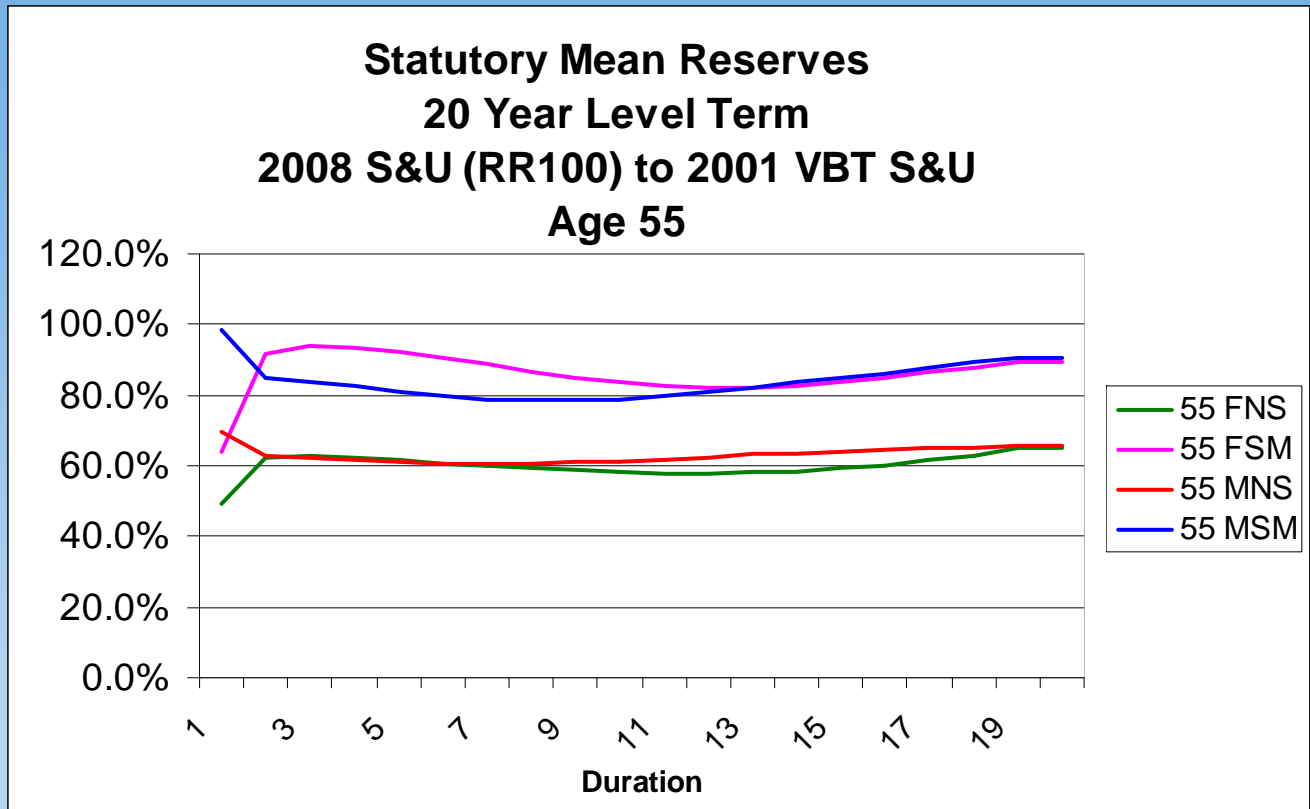
Testing Without Margins



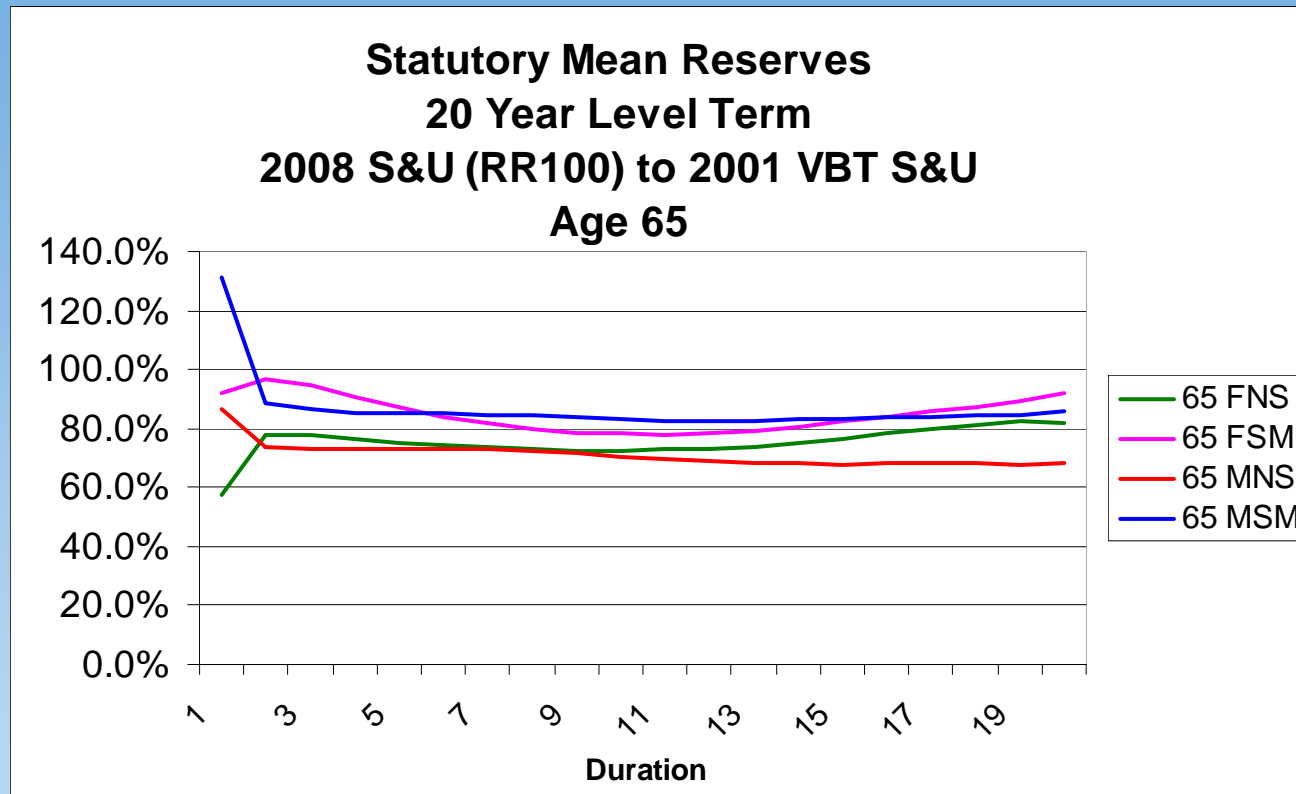
Testing Without Margins (cont'd):



Testing Without Margins (cont'd):



Testing Without Margins (cont'd):



Margins

- 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
- Results of comparison of Test Valuation Table to contributing companies' experience
- Proposed loading formula

Section E.2.7 of VM-20

- 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
- 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

Margins are in terms of extra deaths per thousand

- 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

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 Analysis of 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 propose an explicit margin for confidence

Valuation Table Team's Analysis of Margins – Variation by Company

- At the request of the VTT a Test Valuation Table using the 2001 CSO loading formula applied to the 2008 VBT was compared to the experience of the companies that contributed to the study.
- Tentative adjustments were made to the VBT to accomplish this including the termination of the table at age 120 assuming a mortality rate of 100% and the creation of a “uni-smoke” table assuming 80% non-smokers and 20% smokers. In addition, the mortality improvements that were included in the 2008 VBT were backed out for this analysis.
- The results of the test run are shown in the following table

Valuation Table Team's Analysis of Margins – Variation by Company

Analysis of Companies Covered by Test Version of 2008 Valuation Table

Durations	1-10	11-25	26+	All
Total number of Contributors to VBT	35	32	23	35
Number of Contributors with at least 50 deaths	30	27	14	33
Number of Contributors Covered by Test Table	28	25	14	29
Percentage Covered	93%	93%	100%	88%
85% of Companies with at least 50 deaths	25.5	23	12	28
A/E for that 85% of Covered Companies	80.5%	89.3%	101.1%	85.1%

Two values averaged if .5 in Rank Value used.
Expected based on 2008 Test Valuation Table created using
2001 CSO Loading Formula.

Valuation Table Team's Analysis of Margins – Variation by Company

- The experience of companies with a small number of death claims was thought to fluctuate too much to be included in this analysis by number of companies.
- For the groups that exclude companies with either fewer than 100 or fewer than 50 death claims for the exposure period the targeted coverage of 85% of the companies in the reduced groups could be accomplished by about:
 - 80% of the test table for durations from issue of 1-10
 - 90% of the test table for durations from issue of 11-25
 - 100% of the test table for durations from issue of 26+
- It was noted that the Test Valuation Table placed a heavier load at the early durations following issue.
- The VTT felt that the mortality experience of a company would be more predictable immediately after underwriting and would be less predictable in later durations following issue.
- One component of the Test Valuation Table loading formula was therefore modified to consider duration since issue.

Valuation Table Team's Analysis of Margins – Variation by Company

- If companies without credible experience use the proposed valuation table “as is,” then the margin requirements would be a little heavier than the 2001 CSO table, i.e., they will cover 85% of the contributing companies versus the 80% coverage of the 2001 valuation table.
- Due to the select and ultimate nature of the 2008 VBT and the variation in the number of contributing companies by duration, the percentage of companies covered by the Test Valuation Table varied by duration from issue.
- The 2001 CSO and 1980 CSO loading formulae did not explicitly consider duration since issue because they were developed for ultimate valuation mortality.
- Formulae using the concept of a quantity divided by the curtate expectation of life were developed considering duration since issue and varying by duration groupings of 1-10, 11-25, and 26+.

Valuation Table Team's Analysis of Margins – Variation by Company

- Alternative loading formulae might look something like the following:
 - Durations 1-10 = $(.0021 - .00003*(x+t) + .0000006*t*(x+t)^2) / e_x$
 - Durations 11-25 = $(.0035 - .00004*(x+t) + .00000035*t*(x+t)^2) / e_x$
 - Durations 26+ = $(.0078 - .00016*(x+t) + .000009*(x+t)^2) / e_x$
- 2001 CSO formula is $(0.0056 - 0.00016(x+t) + 0.000008(x+t)^2)/e_x$
- The average percentage loads for the Male NS Primary Table would then be:
 - Durations 1-10 = 15.4%
 - Durations 11-25 = 17.3%
 - Durations 26+ = 20.0%
- The average 2001 CSO load was 15%.
- The loads were kept somewhat higher in moving from Durations 1-10 to Durations 11-25 in order to ensure continuity in mortality rate increases from year to year. The same issue was addressed in moving from Durations 11-25 to Durations 26+. In addition, the fact that a higher load appears desirable at these higher durations in order to cover those companies with less than credible contributed experience. Note that the final tables will also be graduated in order to ensure reasonable mortality rate patterns from year to year.

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 valuation mortality table with loading that varies by the size of the block of business
- RBC factors for mortality are larger for smaller volumes
- Companies with credible mortality experience would need to perform an analysis of random fluctuations

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

- The Valuation Team suggests that “one-time” events 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 anti-selection)
 - PBR methodology will allow the for the table/margins to be updated based on experience