

Experience Rating Current Challenges

WC-2

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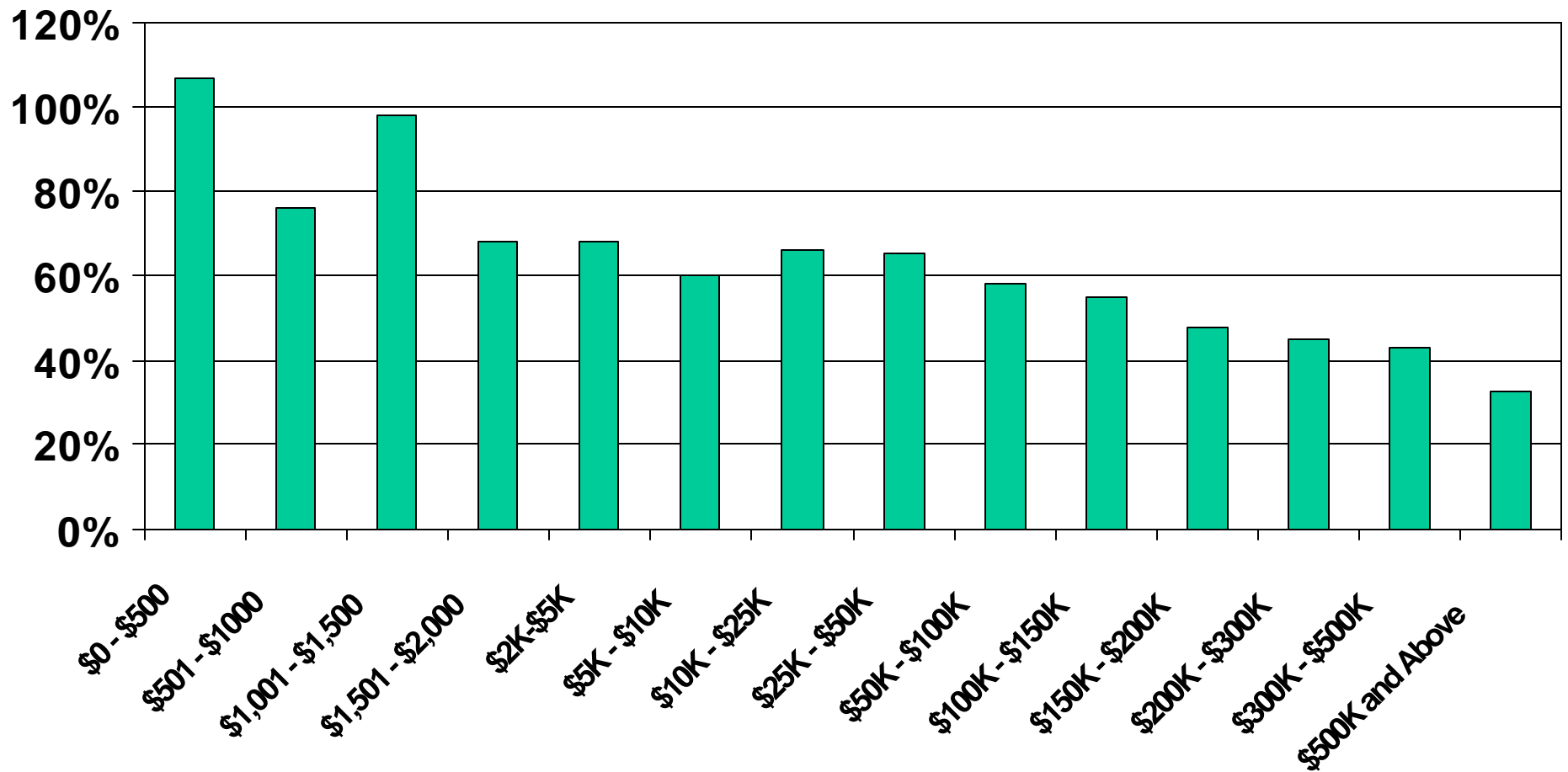
Current Challenges

- Loss Ratio Differences by Size of Risk
- Performance of ER Plan for Small Risks
- Potential Areas of Consideration

Current Challenges

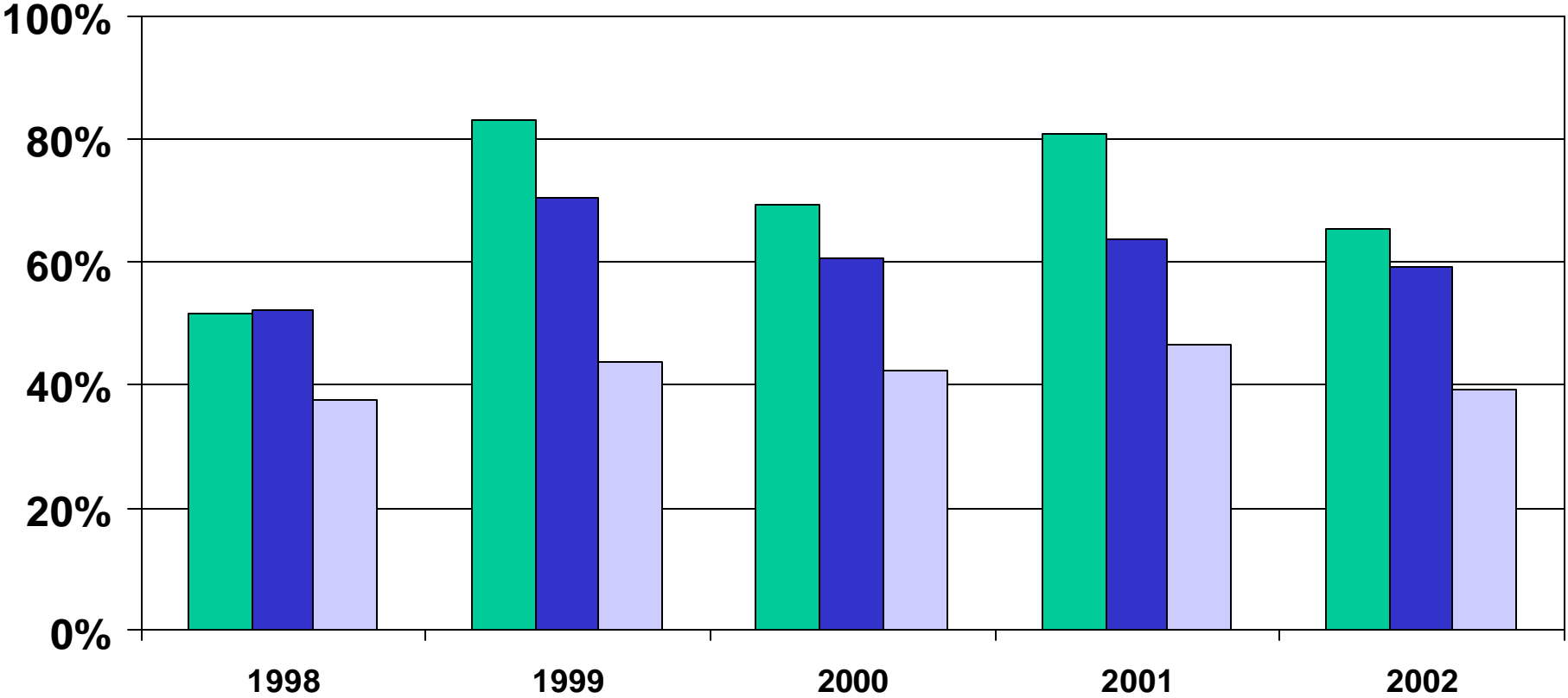
- **Loss Ratio Differences by Size of Risk**
 - Performance of ER Plan for Small Risks
 - Potential Areas of Consideration

Developed Manual Loss Ratios by Premium Size (State X, Five Recent Policy Years)



Developed Manual Loss Ratios (State X, Five Recent Policy Years)

Unrated Intra Inter



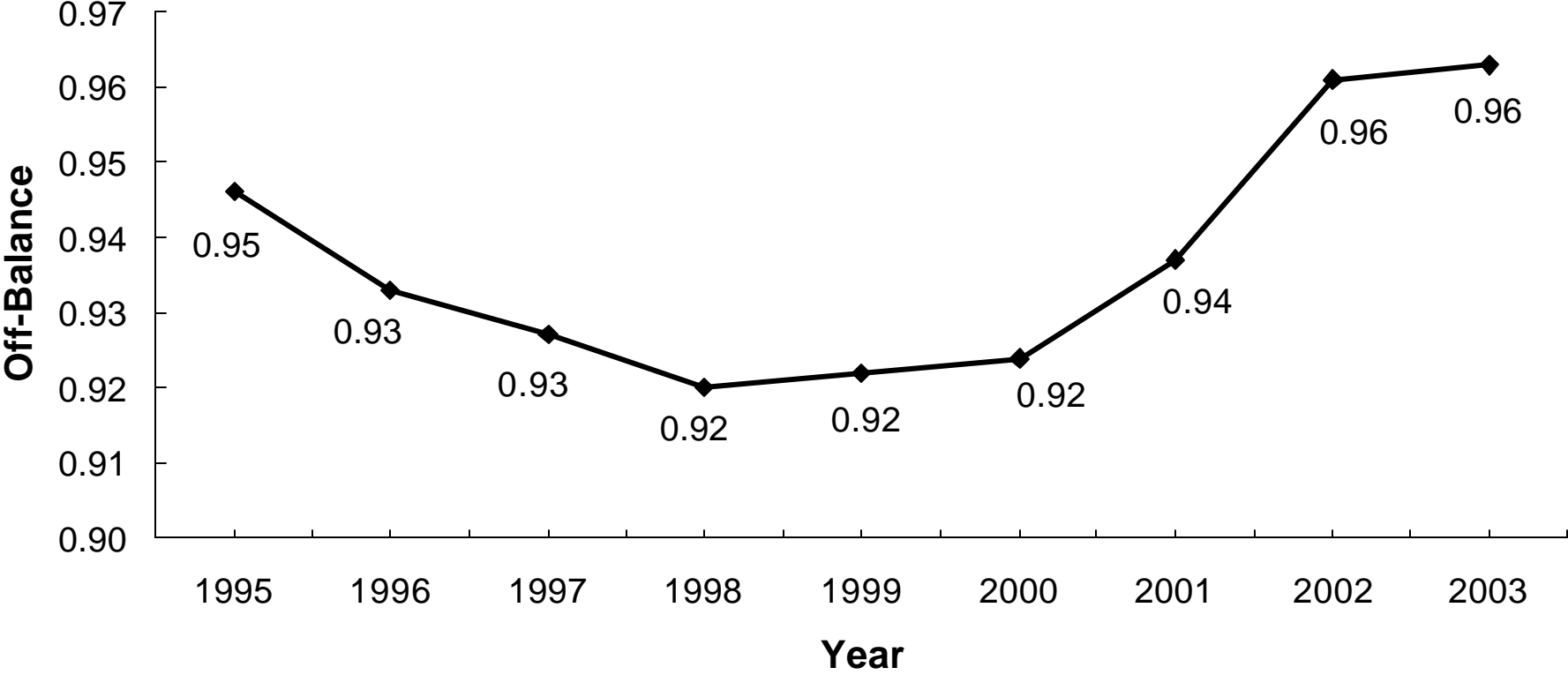
What Should the Experience Rating Plan Off-Balance Be?

- Manual loss ratios for the smallest premium sizes and for unrated risks are generally higher than the all-risk average
- If the off-balance is 1.00, then there is no standard premium price differential between experience rated and unrated risks
- Having an off-balance less than 1.00 can partially address the difference
- The indicated standard premium level is still correct even if there is a net off-balance

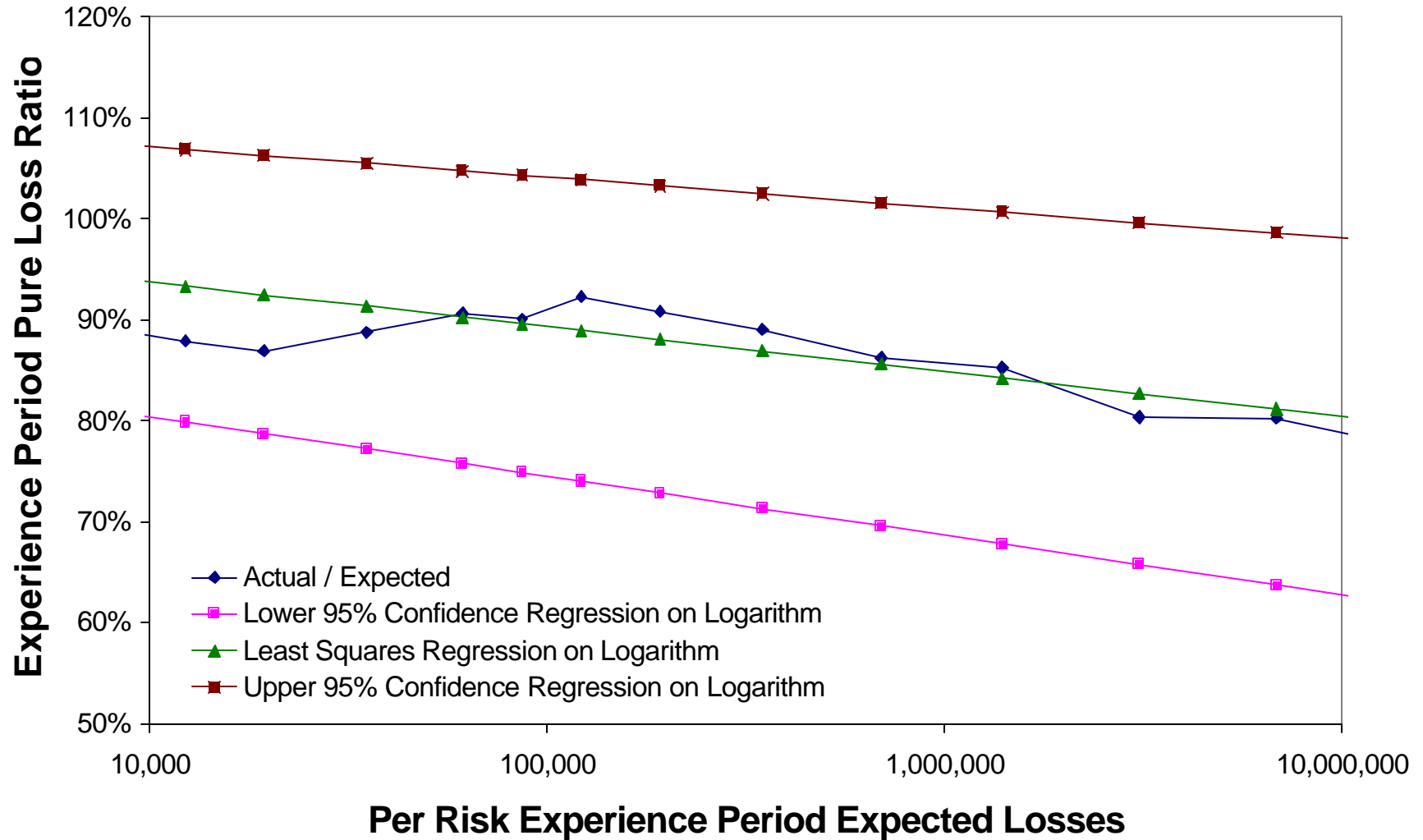
Simplified Hypothetical Illustration of Experience Rated vs. Unrated Impact on Off-Balance

	<u>Unrated Risks</u>	<u>Rated Risks</u>	<u>Average</u>
% of Manual Premium	10%	90%	100%
Manual Loss Ratio	70%	50%	52%
Actual Loss / Expected Loss	1.35	0.96	1.00
Mod Needed to Equalize Standard Premium Loss Ratios	1.00	0.71	0.74
Mod if Unrated Risks are Subsidized	1.00	0.96	0.964

Average Off-Balance - NCCI States



Experience Period Actual / Expected Losses By Size of Risk



Note: These loss ratios corresponds to an estimate of manual loss ratios. The data comes from experience used for the experience modification factor calculation averaged over policy years 1998-2002 for risks having mods in all 5 policy years)

Manual Loss Ratio Differences by Size of Risk

- Manual loss ratios generally decrease with the size of risk
- A loss constant was once used to help level manual loss ratios by size of risk
- Experience mods alone can only partially compensate for these differences, especially for small risks where credibility is very low

Current Challenges

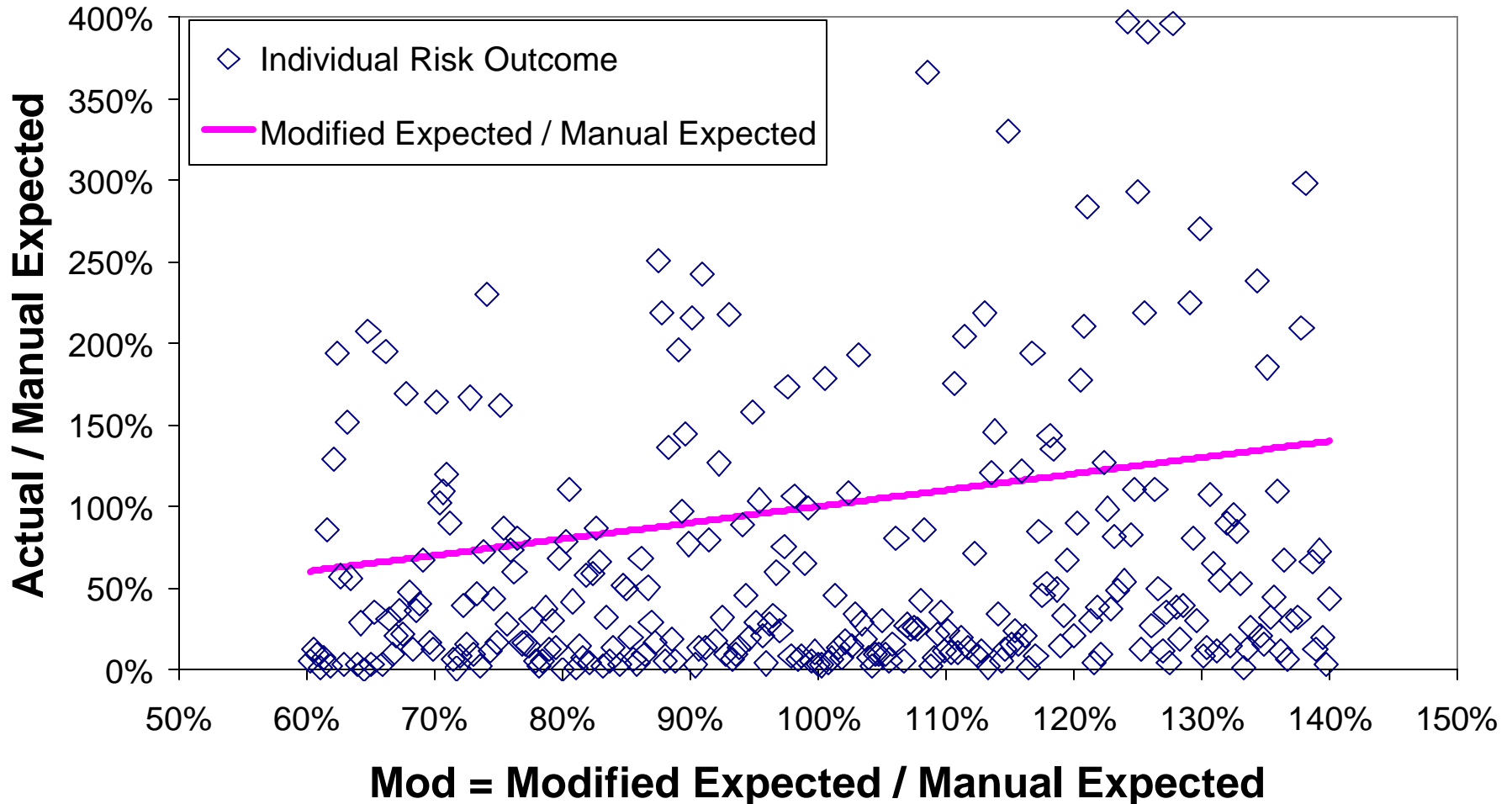
- Loss Ratio Differences by Size of Risk
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Individual Risk Process Variance

- The coefficient of variation of actual losses for a single risk (process CV) can easily be 300%+ for small and medium risks.
- The coefficient of variance across different risks of the true expected losses relative to manual basis expected losses (parameter CV) is less than 100%.
- Performance testing individual risk mods is effectively impossible for all but the largest risks, as actual losses are highly uncertain.

Simulation Example of Process Variance in Action

(uniform mods on [0.6,1.4], outcome CV =300%)

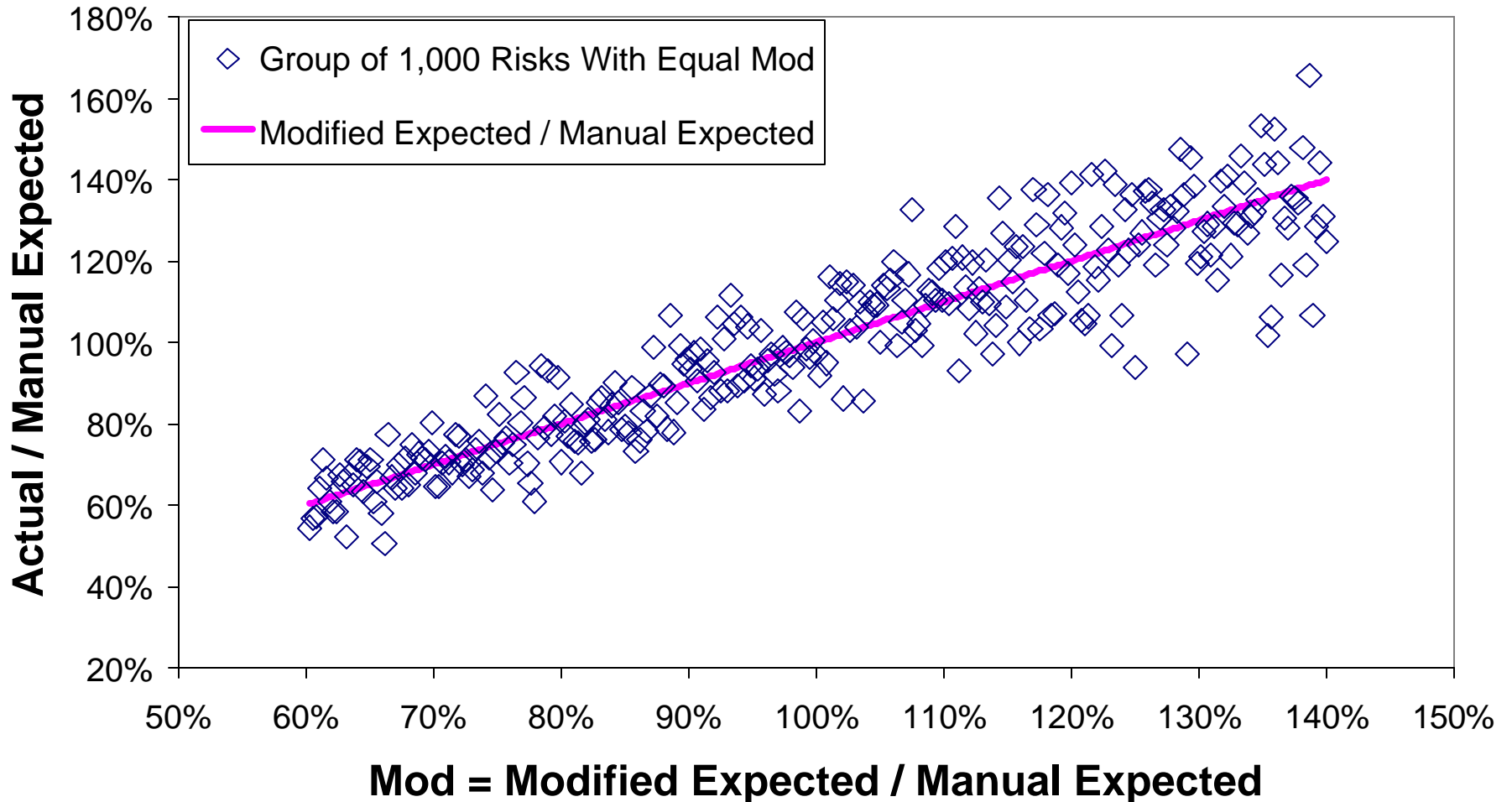


Grouping to Eliminate Process Variance

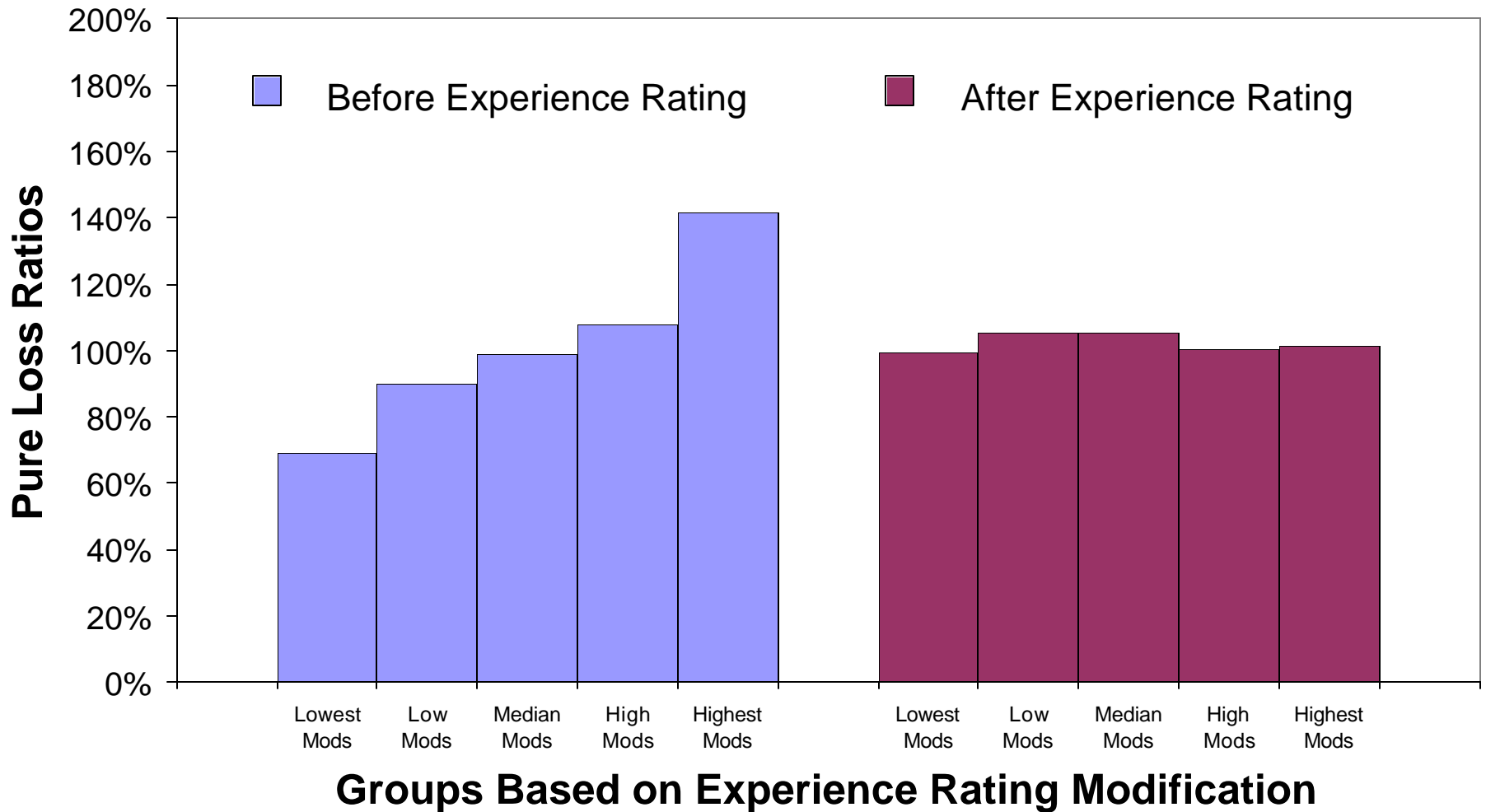
- The process CV drops when risk experience is grouped together.
- The parameter differences stay the same under grouping.
- Without some sort of grouping performance testing is virtually impossible.
- Quantile grouping, or grouping by mod ranges, has been used for over 70 years. W and B values have been determined to optimize the quintile test.

Simulation Example of Grouping in Action

Previous Example for Groups of 1,000 Risks



PY 2001 Performance of Experience Rating Plan



Note: Includes nationwide data for experience rated risks with policy effective in 2001. Pure loss ratios are based on actual losses relative to expected losses, underlying prospective premium.

NCCI States
Quintile Testing Results
ALL RISK SIZES
Policy Effective Period 1/1/2001 - 12/31/2001

<u>Quintile Stratum Determined by Prior Mod</u> (1)	<u>Actual Subsequent Losses Divided by Manual Expected</u> (2)	<u>Squared Deviation from Mean of (2) x 10,000</u> (3)	<u>Actual Subsequent Losses Divided by Modified Expected</u> (4)	<u>Squared Deviation from Mean of (4) x 10,000</u> (5)	<u>Percentage of Expected Loss in Quintile</u> (6)	<u>Percentage of Risks Count in Quintile</u> (7)
Risk Count Uniformly Distributed Among Quintiles						
1	0.73	734	1.04	7	35.9%	20.0%
2	0.95	27	1.11	15	13.5%	20.0%
3	1.04	14	1.11	16	16.0%	20.0%
4	1.13	173	1.05	2	19.7%	20.0%
5	1.49	2,403	1.07	0	15.0%	20.0%
Mean or Total	1.00	3,351	1.07	39	100.0%	100.0%

Test Statistic: (5) / (3) = 0.012

NCCI States
Quintile Testing Results
ALL RISK SIZES
Policy Effective Period 7/1/98 - 6/30/99

<u>Quintile Stratum Determined by Prior Mod</u> (1)	<u>Actual Subsequent Losses Divided by Manual Expected</u> (2)	<u>Squared Deviation from Mean of (2) x 10,000</u> (3)	<u>Actual Subsequent Losses Divided by Modified Expected</u> (4)	<u>Squared Deviation from Mean of (4) x 10,000</u> (5)	<u>Percentage of Expected Loss in Quintile</u> (6)	<u>Percentage of Risks Count in Quintile</u> (7)
Risk Count Uniformly Distributed Among Quintiles						
1	0.72	765	1.05	23	33.7%	20.0%
2	0.89	112	1.07	6	14.9%	20.0%
3	1.00	0	1.12	5	11.8%	20.0%
4	1.13	168	1.12	6	21.9%	20.0%
5	1.45	2,076	1.13	8	17.7%	20.0%
Mean or Total	1.00	3,121	1.10	48	100.0%	100.0%

Test Statistic: (5) / (3) = 0.015

Quintiles by Risk Count

Test Results by Size of Risk

<u>Expected Loss Range</u>	<u>Quintile* Test Statistics for Policy Period 7/1/98 - 6/30/99</u>
\$ 0 - \$ 7,500	0.079
\$ 7,500 - \$ 15,000	0.060
\$ 15,000 - \$ 40,000	0.067
\$ 40,000 - \$ 100,000	0.027

* The risk count underlying each policy period and range is uniformly distributed among quintile stratum.

NCCI States
Quintile Testing Results
Expected Loss Range \$0 - \$7,500
Policy Effective Period 7/1/98 - 6/30/99

<u>Quintile Stratum Determined by Prior Mod</u> (1)	<u>Actual Subsequent Losses Divided by Manual Expected</u> (2)	<u>Squared Deviation from Mean of (2) x 10,000</u> (3)	<u>Actual Subsequent Losses Divided by Modified Expected</u> (4)	<u>Squared Deviation from Mean of (4) x 10,000</u> (5)	<u>Percentage of Expected Loss in Quintile</u> (6)	<u>Percentage of Risks Count in Quintile</u> (7)
Risk Count Uniformly Distributed Among Quintiles						
1	0.74	676	0.96	16	18.4%	20.0%
2	0.83	289	0.94	36	22.2%	20.0%
3	0.82	324	0.88	144	19.9%	20.0%
4	1.10	100	1.07	49	19.1%	20.0%
5	1.50	2,500	1.08	64	20.4%	20.0%
Mean or Total	1.00	3,889	1.00	309	100.0%	100.0%

Test Statistic: (5) / (3) = 0.079

Mod Variance Over Time

- Five policy years (1998-2002) of data are used
- For each risk an average mod is calculated from the five-year sample of mods
- A standard deviation across risks of the five-year average mods is calculated
- The standard deviation within risk of the five annual mods is calculated and the standard deviation of this standard deviation is also calculated
- The exhibit is then reproduced using the ratio of actual to expected losses instead of the mod

Volatility Over Time of Individual Risk Experience Modification Factor By Size of Risk

Policy Years 1998 through 2002

(Includes only risks with mods for all 5 policy years.)

Avg Expected Losses			Risk Count	(1) Avg of 5-Yr Avg Mods	(2) Std Dev Across Risks of 5-Yr Avg Mods	(3) Avg Std Dev Within Risk of Mod Over 5 Yrs	(4) Std Dev of the Col (3) Std Devs	(5) Avg Spread Between Min and Max Mod Within Risk
2,000,000	---	5,000,000	1,075	0.859	0.277	0.135	0.134	0.295
1,000,000	---	1,999,999	1,670	0.904	0.263	0.137	0.136	0.304
500,000	---	999,999	3,396	0.920	0.237	0.134	0.126	0.300
250,000	---	499,999	6,663	0.946	0.226	0.130	0.130	0.294
150,000	---	249,999	8,930	0.959	0.216	0.127	0.117	0.290
100,000	---	149,999	10,875	0.967	0.199	0.130	0.123	0.293
75,000	---	99,999	10,454	0.962	0.196	0.126	0.119	0.287
50,000	---	74,999	19,656	0.966	0.199	0.130	0.129	0.294
25,000	---	49,999	50,827	0.965	0.191	0.132	0.134	0.298
15,000	---	24,999	55,412	0.965	0.186	0.132	0.143	0.294
10,000	---	14,999	55,694	0.967	0.173	0.126	0.142	0.277
7,500	---	9,999	41,905	0.967	0.156	0.113	0.132	0.248
5,000	---	7,499	44,144	0.969	0.141	0.102	0.122	0.221
2,500	---	4,999	23,687	0.961	0.120	0.086	0.105	0.186
Total			334,388	0.964	0.175	0.121	0.132	0.269

Notes:

1. Averages and Standard Deviations across risks are risk weighted.
2. The standard deviation formula is applied without adjustment for the correlation of the sample.

Volatility Over Time of Individual Risk Experience Period Pure Loss Ratio By Size of Risk

Policy Years 1998 through 2002

(Includes only risks with mods for all 5 policy years.)

Avg Expected Losses		Risk Count	(1)	(2)	(3)	(4)	(5)
			Avg of 5-Yr Avg LR	Std Dev Across Risks of 5-Yr Avg LR	Avg Std Dev Within Risk of LR Over 5 Yrs	Std Dev of the Col (3) Std Devs	Avg Spread Between Min and Max LR Within Risk
2,000,000	--- 5,000,000	1,075	0.804	0.392	0.199	0.206	0.431
1,000,000	--- 1,999,999	1,670	0.853	0.405	0.224	0.213	0.502
500,000	--- 999,999	3,396	0.862	0.446	0.276	0.268	0.614
250,000	--- 499,999	6,663	0.890	0.524	0.348	0.363	0.782
150,000	--- 249,999	8,930	0.909	0.603	0.430	0.423	0.962
100,000	--- 149,999	10,875	0.923	0.695	0.528	1.018	1.153
75,000	--- 99,999	10,454	0.901	0.727	0.558	0.614	1.234
50,000	--- 74,999	19,656	0.906	0.868	0.643	0.791	1.385
25,000	--- 49,999	50,827	0.888	0.994	0.750	1.036	1.590
15,000	--- 24,999	55,412	0.869	1.223	0.852	1.426	1.763
10,000	--- 14,999	55,694	0.879	1.479	0.946	1.797	1.924
7,500	--- 9,999	41,905	0.889	1.772	0.995	2.192	2.021
5,000	--- 7,499	44,144	0.952	2.062	1.104	2.660	2.211
2,500	--- 4,999	23,687	0.980	2.405	1.188	3.347	2.347
Total		334,388	0.901	1.396	0.863	1.872	1.775

Notes:

1. Averages and Standard Deviations across risks are risk weighted.
2. The standard deviation formula is applied without adjustment for the correlation of the sample.
3. Loss Ratios are defined as the sum of the primary and excess actual losses used for the experience modification factor calculation divided by the corresponding expected losses.

Variance Over Time of Small Risk Mods

- Using simple measurements of variance, mods for small risks seem to vary over time about as much as large risks
- Using the same measurements, actual experience for small risks varies significantly more over time
- Lower credibility in the Experience Rating Plan acts to create a level of stability in mods for small risks comparable to the stability of large risk mods

Current Challenges

- Loss Ratio Differences by Size of Risk
- Performance of ER Plan for Small Risks
- **Potential Areas of Consideration**

Potential Areas of Consideration

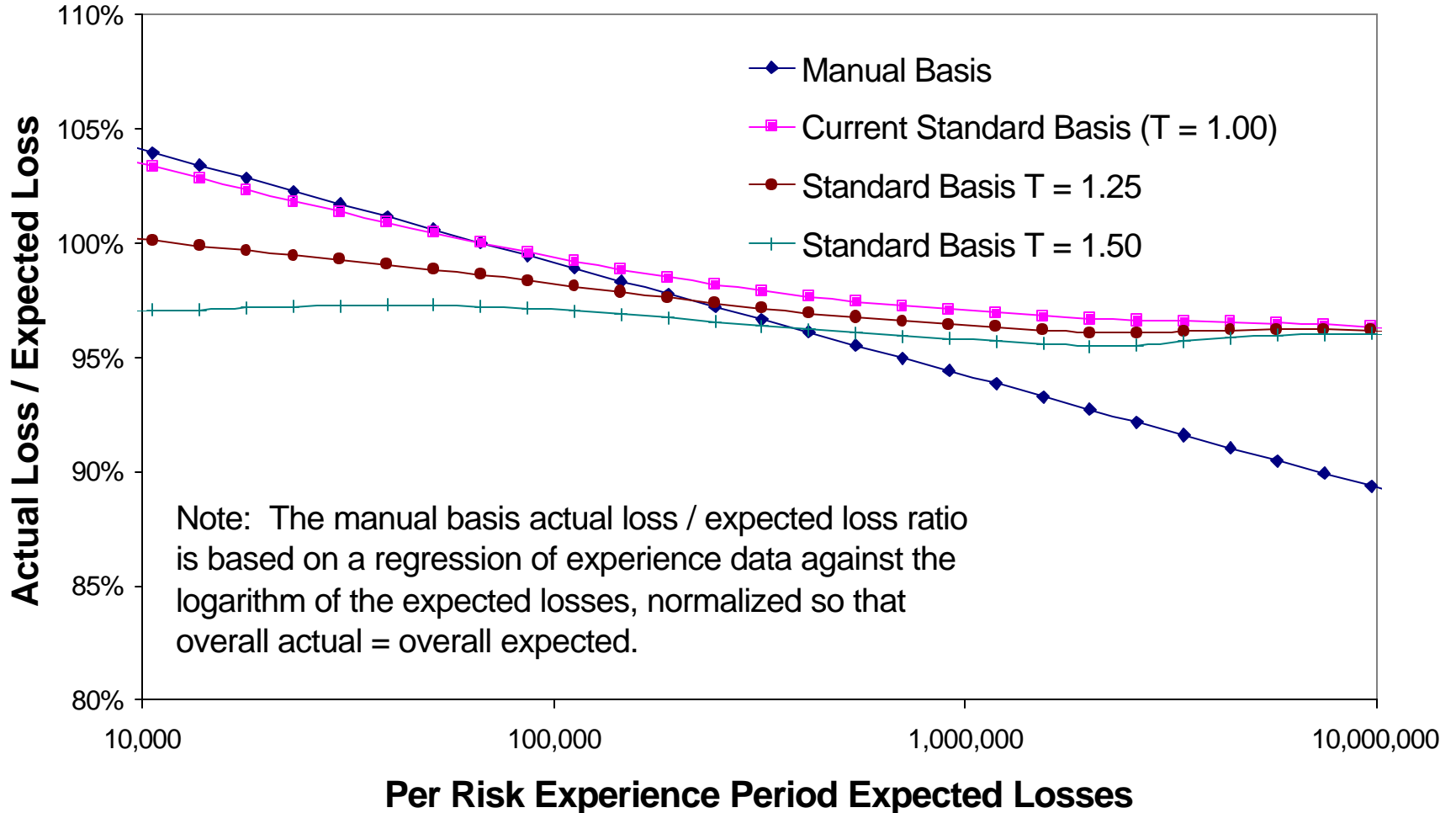
- Complement of Credibility
- Premium Eligibility Threshold
- Credit/Debit Programs

Complement of Credibility

- A complement of credibility different from 1.00 could hypothetically be used
- An alternative complement of credibility for primary losses in the mod formula could be used to more nearly equalize pure loss ratios by size of risk
- The effect of the alternative complement of credibility could diminish as risk size increases

Modeled Impact on Pure Loss Ratios By Size of Risk of Alternative Complement of Credibility in Mod Formula

Expected Primary Loss $\rightarrow T \times$ (Expected Primary Loss)



Premium Eligibility Threshold

- Quintile testing shows that the ER Plan performs better for the small risks that are significantly above the minimum threshold than for the small risks near the threshold
- Since there are many small risks, small changes in thresholds can lead to big changes in the number of risks that would be experience rated
- The impact of raising the current threshold can be estimated, but it would be difficult to address lowering the threshold since there would be data logistic issues

Eligibility Threshold

Actual Losses / Normalized Modified Expected Losses

Quintile	<--% of Current Threshold Proxy-->				
	0 -100%	100 -150%	150 -200%	200 -300%	300 -500%
1	0.91	0.91	0.95	0.90	1.02
2	0.94	0.95	0.86	0.87	1.00
3	0.98	0.93	1.01	0.99	0.98
4	0.93	1.20	1.08	1.08	1.06
5	1.25	1.02	1.08	1.08	0.94
Quintile Test Statistic	0.277	0.181	0.085	0.078	0.034
Risks Retained	42%	14%	8%	10%	9%
Expected Loss Retained	6%	3%	3%	4%	6%

Lost-Time-Free Credit/Debit For Small Risks

- About 20% of small risks (Expected Losses < 5,000) experience a lost-time claim within the experience period used for calculating the experience mod
- If a lost-time free credit of $x\%$ was applicable to small risks then a corresponding debit on the order of $4x\%$ would be needed to achieve balance
- Whether a risk had a lost-time claim in the experience period appears to be a very good predictor of future manual basis experience

Debit Needed to Balance a 10% Lost Time Free Credit for Small Risks

Eligibility Threshold as
Maximum Expected Loss
in Experience Period

Debit for Balance

3,000

58%

5,000

40%

10,000

26%

15,000

20%

20,000

17%

Comparison of Experience Rated Lost Time Claim Free Risks By Size of Risk

(Estimates Derived From Countrywide Policy Year 2001 Experience Rated Risks)

Experience Period Expected Losses	% of All Manual Premium	% of All Risks	Lost Time Claims in Experience Period	% of Manual Premium within Range	Weighted Average Experience Modification Factor	Subsequent Actual Loss / Manual Basis Expected Loss(1)
up to - 3,999	0.4%	6.6%	0	83%	0.92	1.37
			1+	17%	1.18	2.24
4,000 - 7,999	2.0%	23.8%	0	74%	0.88	1.09
			1+	26%	1.21	1.76
8,000 - 15,999	3.8%	26.9%	0	60%	0.84	1.03
			1+	40%	1.15	1.58
16,000 - 31,999	4.8%	18.1%	0	40%	0.80	0.91
			1+	60%	1.07	1.44
32,000 - 63,999	5.8%	11.2%	0	21%	0.76	0.86
			1+	79%	1.02	1.35
64,000 - or more	83.1%	13.5%	0	2%	0.71	0.73
			1+	98%	0.91	0.95

Note: (1) Assumes total countrywide manual basis expected loss equals actual loss at ultimate.

Currently Under Review

- Premium eligibility thresholds
- Small risks are under review from both a manual ratemaking and ER basis
- Off-Balance is reviewed annually ... by state and all states combined
- Performance testing is conducted every 2-3 years on an overall basis