

California Personal Auto: Class Plan Changes and Case Study

Presented by

Nancy P. Watkins, FCAS, MAAA
Susan M. Miller, FCAS, MAAA
Milliman, Inc.

Scott Sobel, FCAS, MAAA
EagleEye Analytics, Inc.

March 10, 2009



What Can We Do Post-ARF ?

- Understand New Landscape
- Optimize Class Plan

Understand the New Landscape

UNSETTLED

Filings for 4 of the 5 top companies are still pending

More than half of all class plans filed since July 2008 are still pending

DISLOCATED

For the top 5 companies:

7 percent of policies will receive a > 10% increase.

13 percent will receive more than a 10% decrease

SUBSIDIZED

Regulatory constraints on the class plan lead to over-reliance on some variables (mileage), under-reliance on others (territory) and prohibition on certain variables (credit score)

Understand the New Landscape

Full compliance is creating
new areas of profitability,
unprofitability, and
competitiveness.

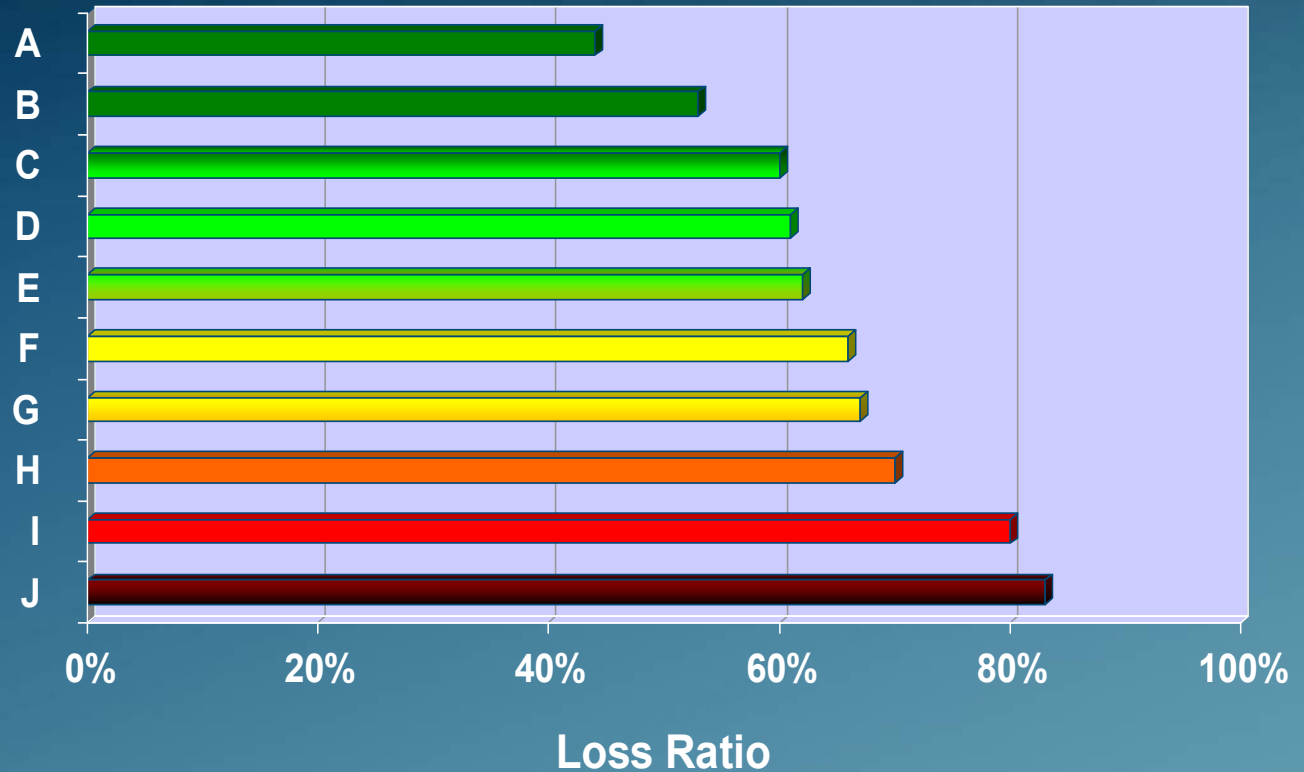
For each company, that will
leave a changed landscape –
segments of business with different
profitability and levels of competitiveness.

Our Approach

- ✓ Measure profitability of various segments.
- ✓ Measure real-time competitiveness of the policies in the segments.
- ✓ Measure market size of various segments.
- ✓ Identify areas of opportunity, based on the intersection of profitability, competitiveness and market size.

First, Measure Profitability

- Segmentation – statistical identification of segments by loss ratio.
- *Insight*: the web-based tool from EagleEye Analytics that we used to perform this segmentation.
- Each customer segment shares common risk attributes that describe persistent loss ratio behavior year-after-year.
- *Insight* also facilitates “drill-down” into individual segments or attributes.



Segmentation Analysis - Considerations

Data Input

Company Policy and Claims Detail
(Third Party Data)

Types of Analysis

Loss Ratio, (Frequency, Severity, Loss Cost)

Data Adjustments

Premiums unadjusted and/or adjusted to present rate level
Losses and premiums in total (or by coverage)
Losses un-trended and un-developed
Including loss adjustment expense

Credibility

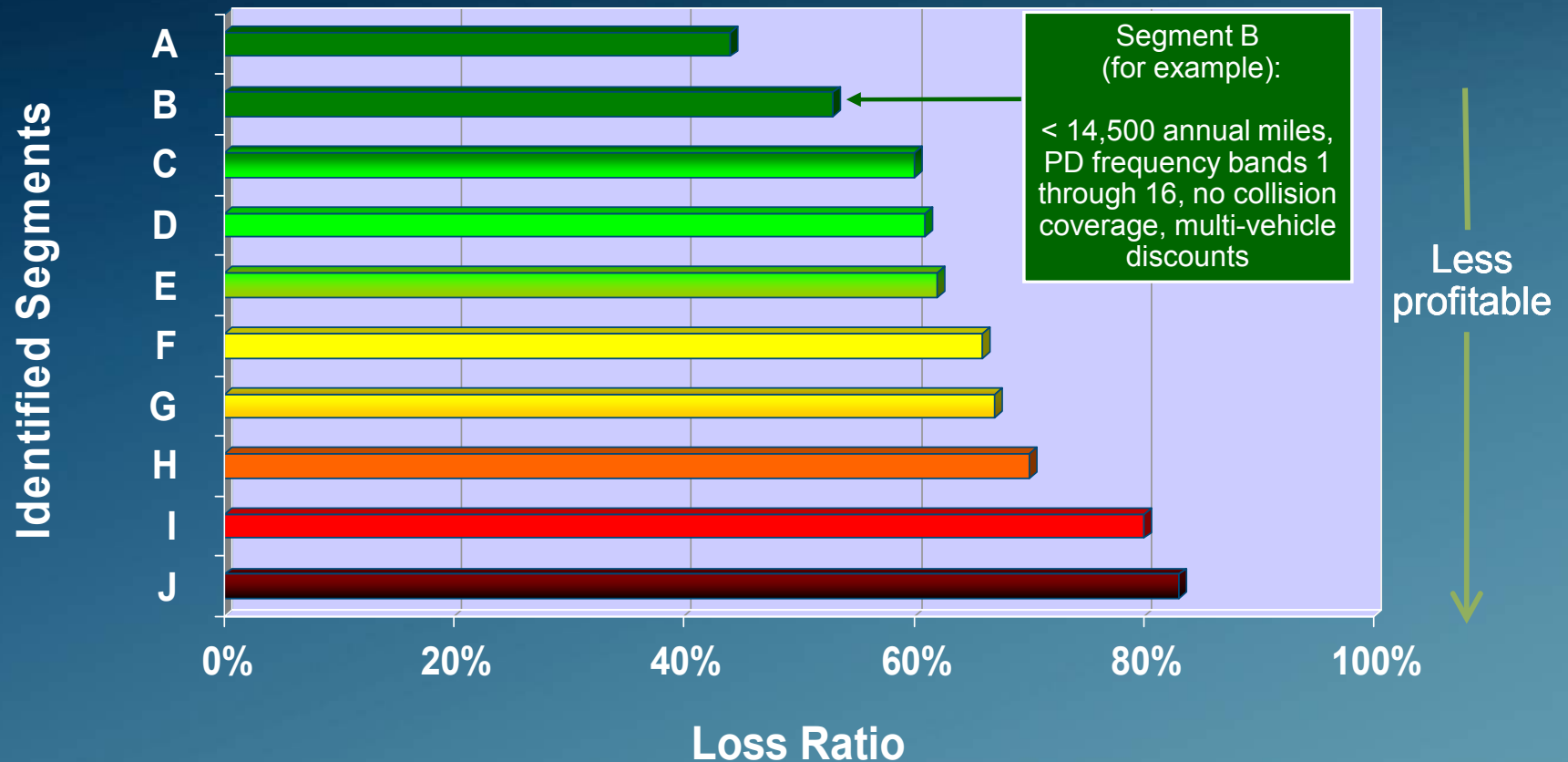
Number of years to use
Minimum number of claims or exposures per segment
Level of detail in definition of variables

Segmentation Results

Range of loss ratios: 44% to 83%

“Lift” = 1.9X

Correlation = 95%



Segmentation Definitions

Segment :	A	B	C	H	I	J
Loss Ratio	44%	53%	60%	70%	80%	83%
Premium Distribution of All Segments	12%	11%	8%	9%	8%	12%
Significant Attributes Below						
Rating Bands - Property Damage Severity Band	1 to 6 (inclusive)			1 to 9 (inclusive)	1 to 9 (inclusive)	10 or more
Mileage - Annual Miles	14,500 or more	0 to 14,499 (inclusive)	0 to 14,499 (inclusive)	12,500 to 14,499 (inclusive)	0 to 12,499 (inclusive)	0 to 14,499 (inclusive)
Rating Bands - Property Damage Frequency Band		1 to 16 (inclusive)	1 to 16 (inclusive)			
Coverage - Collision Indicator		No	No	Yes	Yes	Yes
Discounts - Multiple Vehicle		Yes	No			
Coverage - Comp Deductible				1, 100, 225, 250, 475, 950, NA	1, 100, 225, 250, 475, 950, NA	
Vehicle - Model Year				2000 +	2000 +	

Given Constraints, Some Results are Expected

Segment :	A	J
Loss Ratio	44%	83%
Premium Distribution of All Segments	12%	12%
Significant Attributes Below		
Rating Bands - Property Damage Severity Band	1 to 6 (inclusive)	10 or more
Mileage - Annual Miles	14,500 or more	0 to 14,499 (inclusive)
Rating Bands - Property Damage Frequency Band		
Coverage - Collision Indicator		Yes
Discounts - Multiple Vehicle		
Coverage - Comp Deductible		
Vehicle - Model Year		

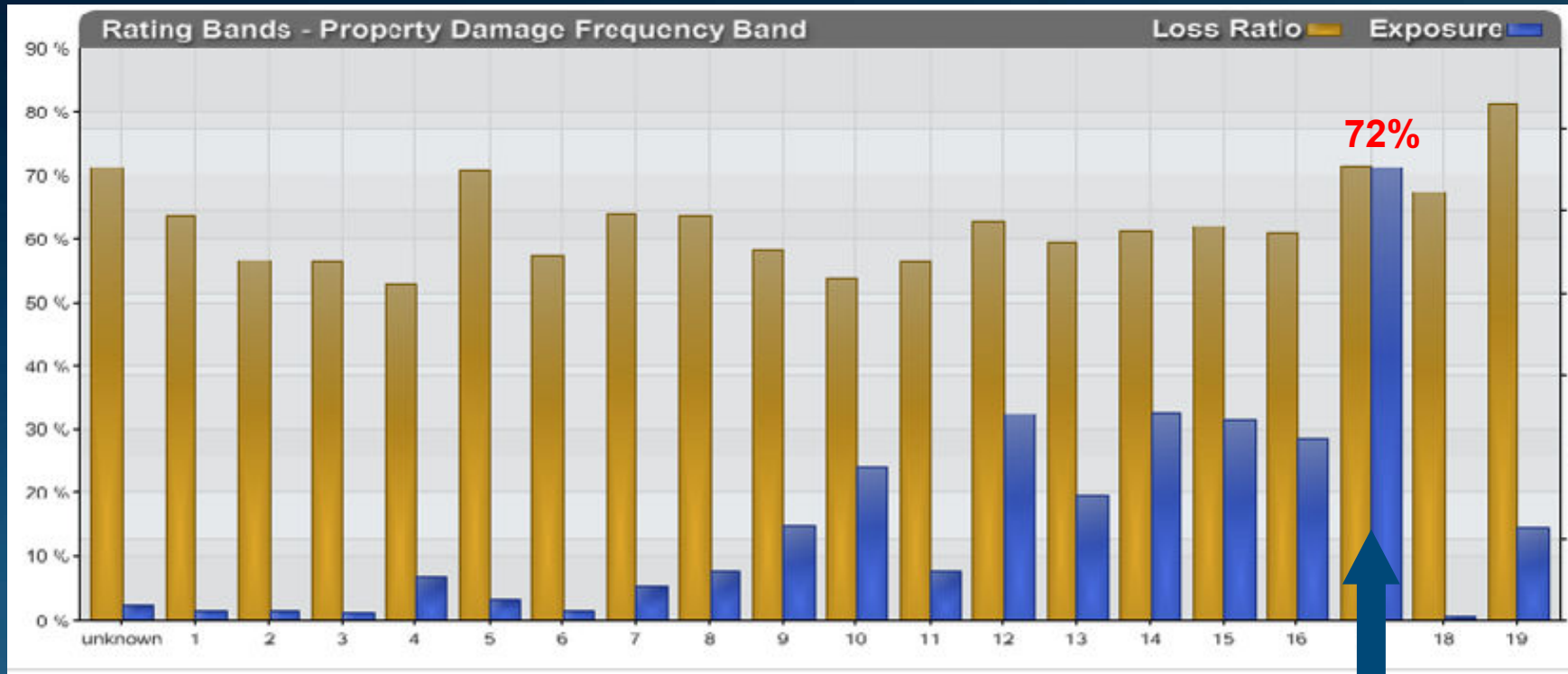
Low severity bands subsidize high

High mileage subsidizes low

Some ... Not as Expected

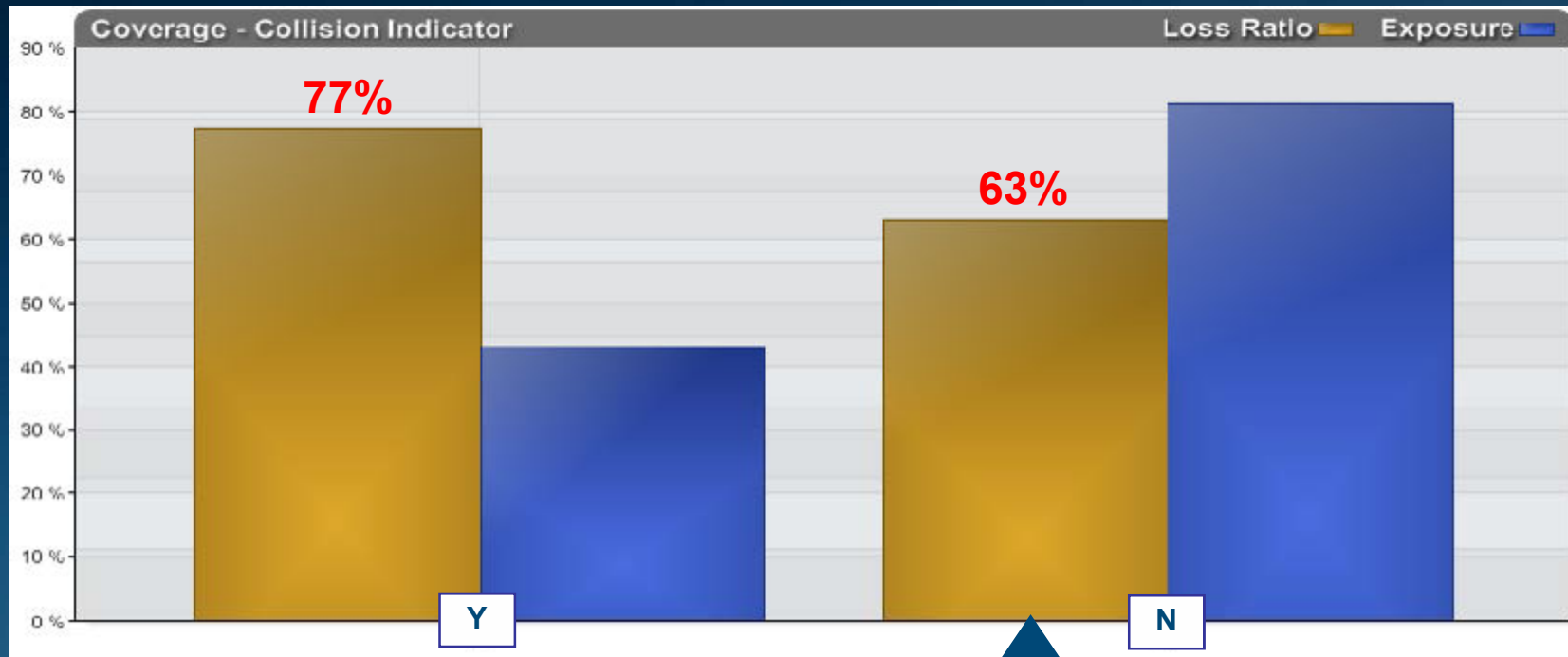
Segment :	A	B	C	H	I	J
Loss Ratio	44%	53%	60%	70%	80%	83%
Premium Distribution of All Segments	12%	11%	8%	9%	8%	12%
Significant Attributes Below						
Rating Bands - Property Damage Severity Band	1 to 6 (inclusive)			1 to 9 (inclusive)	1 to 9 (inclusive)	10 or more
Mileage - Annual Miles	14,500 or more	0 to 14,499 (inclusive)	0 to 14,499 (inclusive)	12,500 to 14,499 (inclusive)	0 to 12,499 (inclusive)	0 to 14,499 (inclusive)
Rating Bands - Property Damage Frequency Band		1 to 16 (inclusive)	1 to 16 (inclusive)			
Coverage - Collision Indicator		No	No	Yes	Yes	Yes
Discounts - Multiple Vehicle		Yes	No			
Coverage - Comp Deductible				1, 100, 225, 250, 475, 950, NA	1, 100, 225, 250, 475, 950, NA	
Vehicle - Model Year				2000 +	2000 +	

Drill-Down Example: Loss Ratios By Frequency Band Entire Company Portfolio



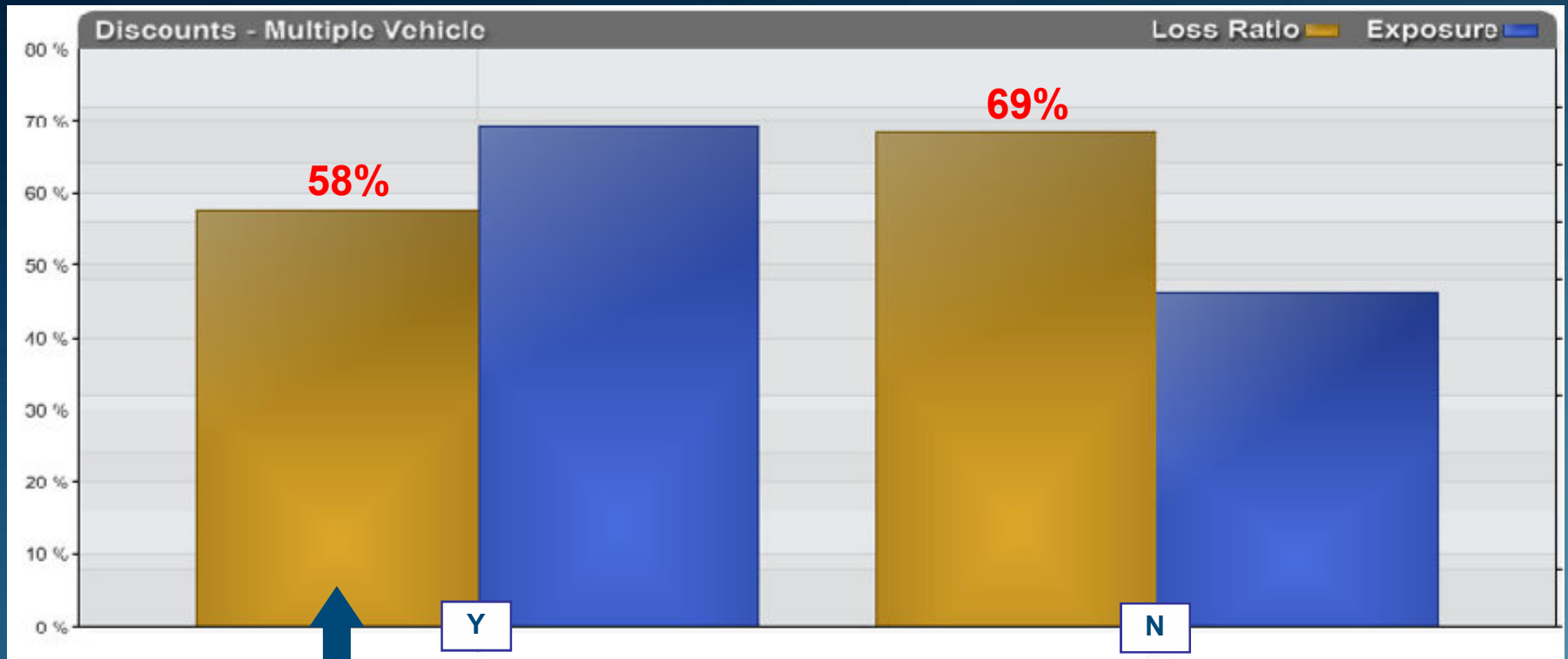
Freq. Band 17
 Loss ratio 8 points
 higher than average
 Largest band:
 25% of total

Frequency Band 17: Loss Ratios by Collision Purchase Y / N



Two-thirds of rating band 17 did not purchase collision – and produced a much better LR

Frequency Band 17 with No Collision Coverage: Loss Ratios by Multi-Vehicle Y / N



60 percent of these exposures were on multi-vehicle policies – and LR is improved to 58%

Second, Measure Competitiveness

- Same segments, different metrics.
- We used the resources and tools of StoneRiver (formerly Fiserv Insurance Solutions) to calculate competitive metrics for our client company:

FSCRater:

the comparative rating software that was used to do batch rating of the entire portfolio of in-force business, by segment.

CAPRater:

could have also been used for premium comparisons based on a profile of sample risks by segment.

Market Basket Analysis (MBA):

an extensive database of California agency auto insurance quote statistics; we used this to measure market volume and client company “win rates” by segment.

Premium Comparisons by Segment:

Averages by Segment: Low, High and Company Premiums



Company
Position
in Range:

41%	42%	44%	40%	31%	51%	43%	41%	49%	42%
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Premium Comparisons by Segment: Other Measures (Averages in Segments)

	A	B	C	D	E	F	G	H	I	J
Rank (1 low, 7 high):	3.5	3.6	3.6	3.4	2.9	3.9	3.5	3.6	3.9	3.4
\$ from Minimum:	\$521	\$446	\$211	\$528	\$470	\$749	\$493	\$725	\$833	\$882
Company/ Median:	0.99	0.99	1.00	0.99	0.91	1.04	0.98	1.00	1.05	0.98

Data From Market Basket Analysis (MBA): Win Rates by Segment



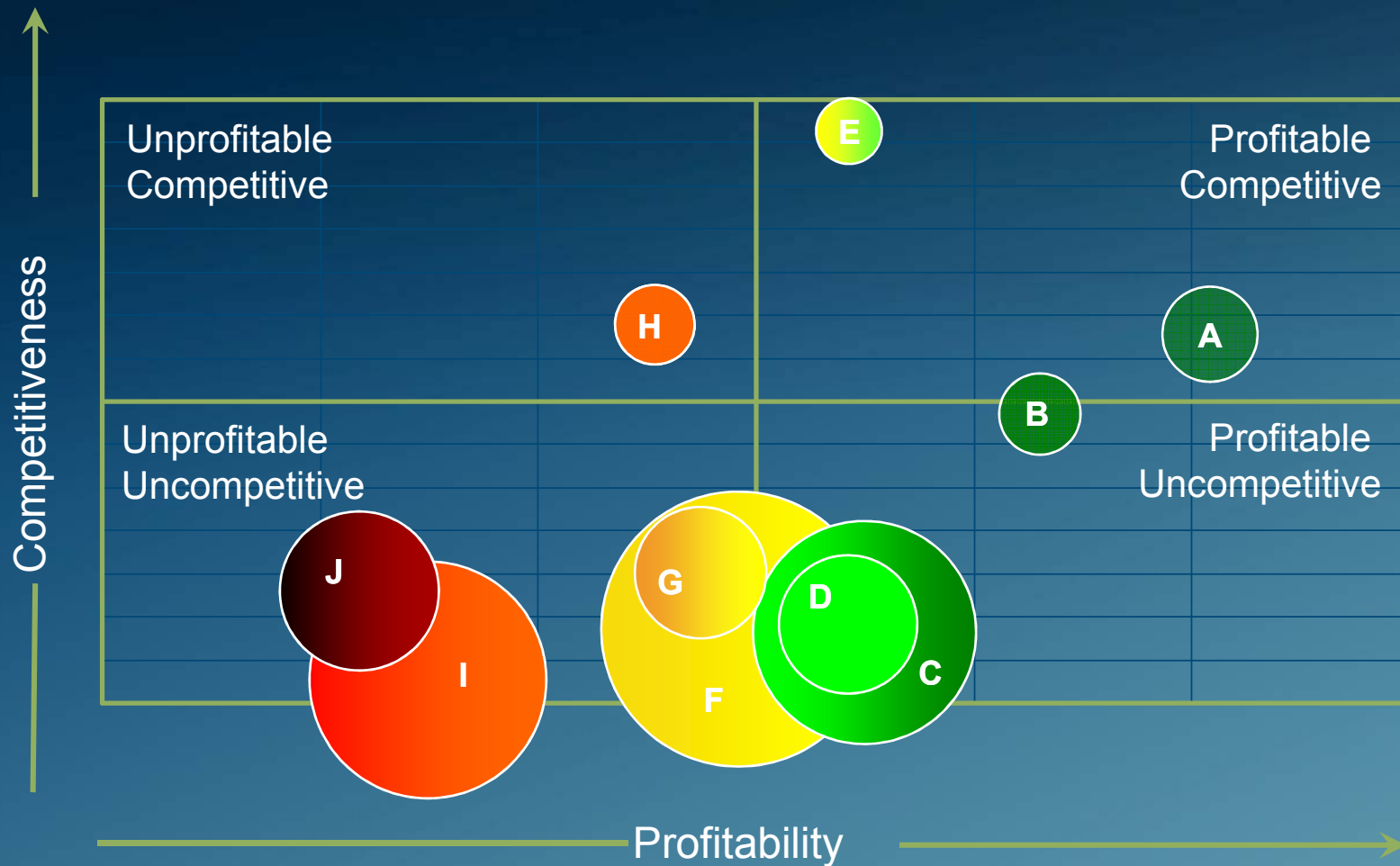
Premium Bound (\$M):

Company	\$4.9	\$2.7	\$2.6	\$1.2	\$3.8	\$3.9	\$2.2	\$3.5	\$1.3	\$3.0
Market	13.0	9.6	71.3	27.3	6.1	108.3	25.1	9.0	80.1	36.2
Win Rates	38%	28%	4%	4%	62%	4%	9%	39%	2%	8%

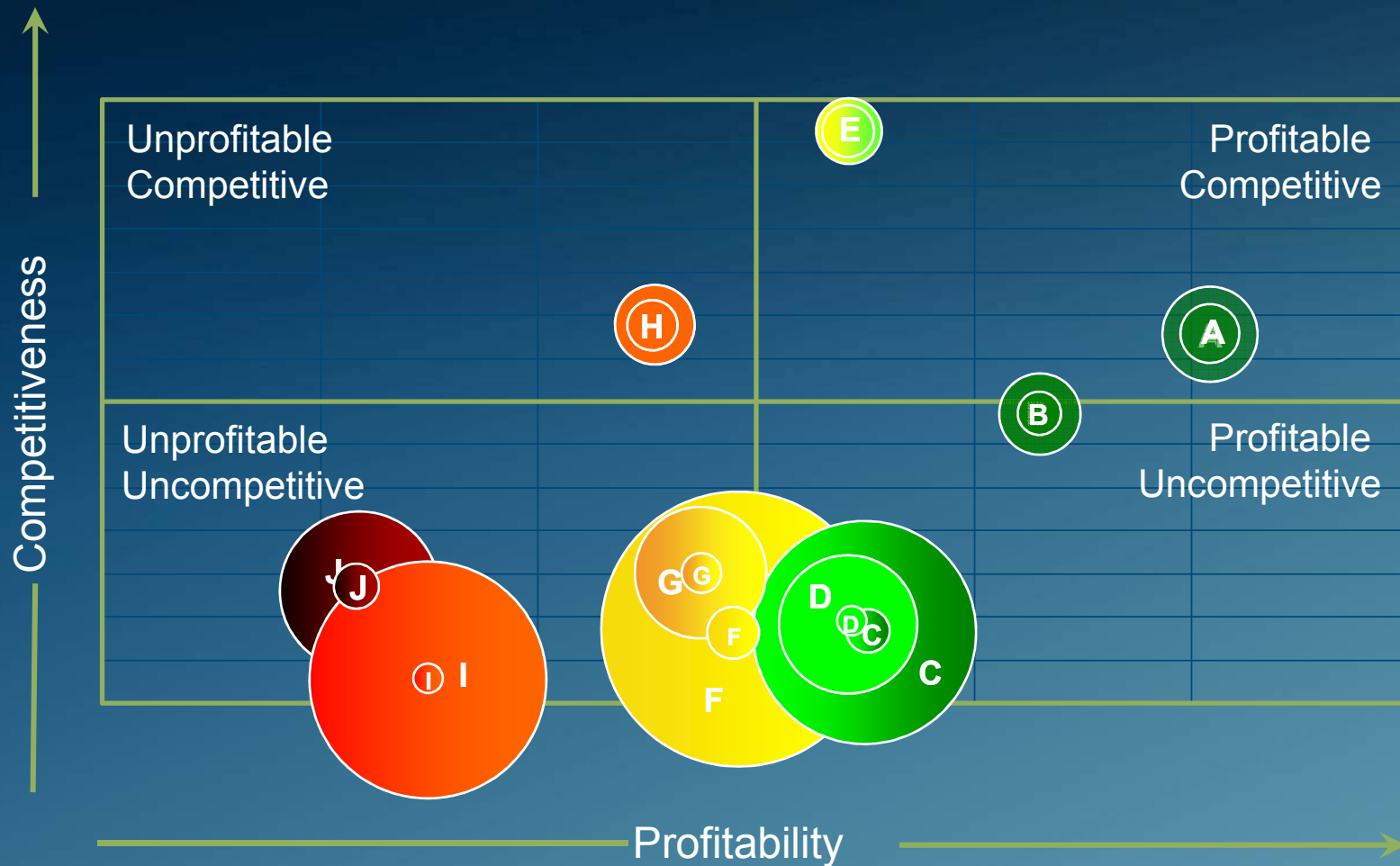
Profitability and Competitiveness



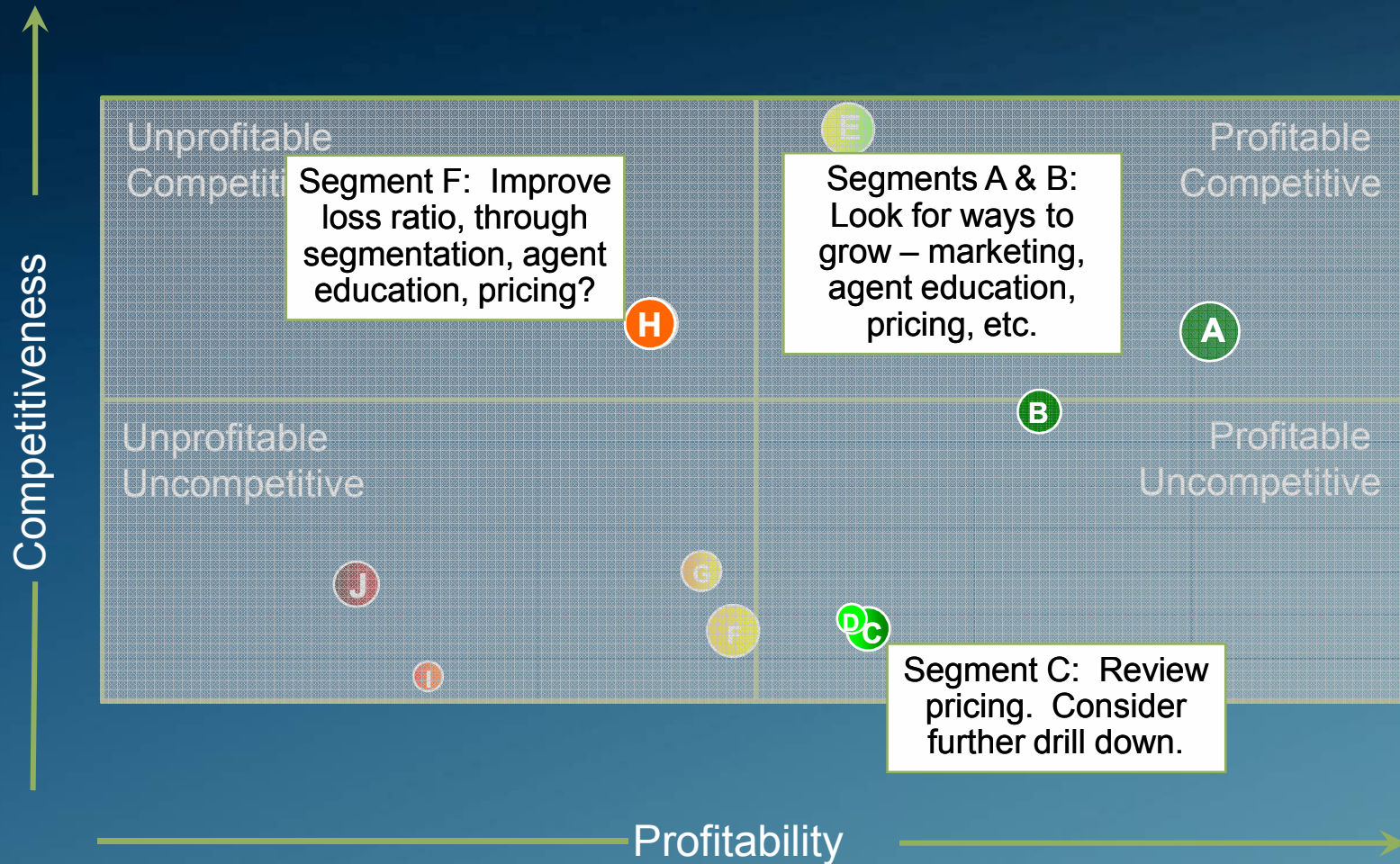
Third, Measure Market Size of Each Segment



And, Measure Company Share of Each Segment



Areas of Opportunity – Examples



What Can We Do Post-ARF ?

- Understand New Landscape
- **Optimize Class Plan**

Agenda: Optimize Class Plan

1. The Challenge

- Comply with the Prop 103 constraints and produce most accurate rate relativities

2. An Optimization Approach

- How to achieve increased accuracy

3. Results & Conclusions

- Optimization is possible, relativities more closely match experience

The Challenge

Mandatory

1. **Sequential analysis**
 - Only one pass
 - “Balanced relativities” approach
2. **Permitted rating variables**
 - Limited usage of compound variables
 - Max of 20 freq-based x 20 sev-based territories
3. **“Weights”**
 - Must be in descending order, use correction factor
 - Inversely related to credibility
4. **Credibility**
 - 3,000 claims std—need 2.75x more claims
5. **Good driver discount**
 - Must be offered at 20% or more

Optional

- **Optional variables**
 - Goal is to add value to rating plan, not restrict
- **Order of variables**
 - 3 mandatories
 - [optionals/compounds]
 - Territory bands
- **Compound variables**
 - Yrs Lic x (% use, academic standing, gender, marital status, driver training)
 - Yrs Lic x any other optionals, provided that individual weights comply
 - Optionals x optionals
- **Good driver discount**
 - Can be analyzed at beginning or end of sequential analysis

The Challenge

Unrestrictive/Silent

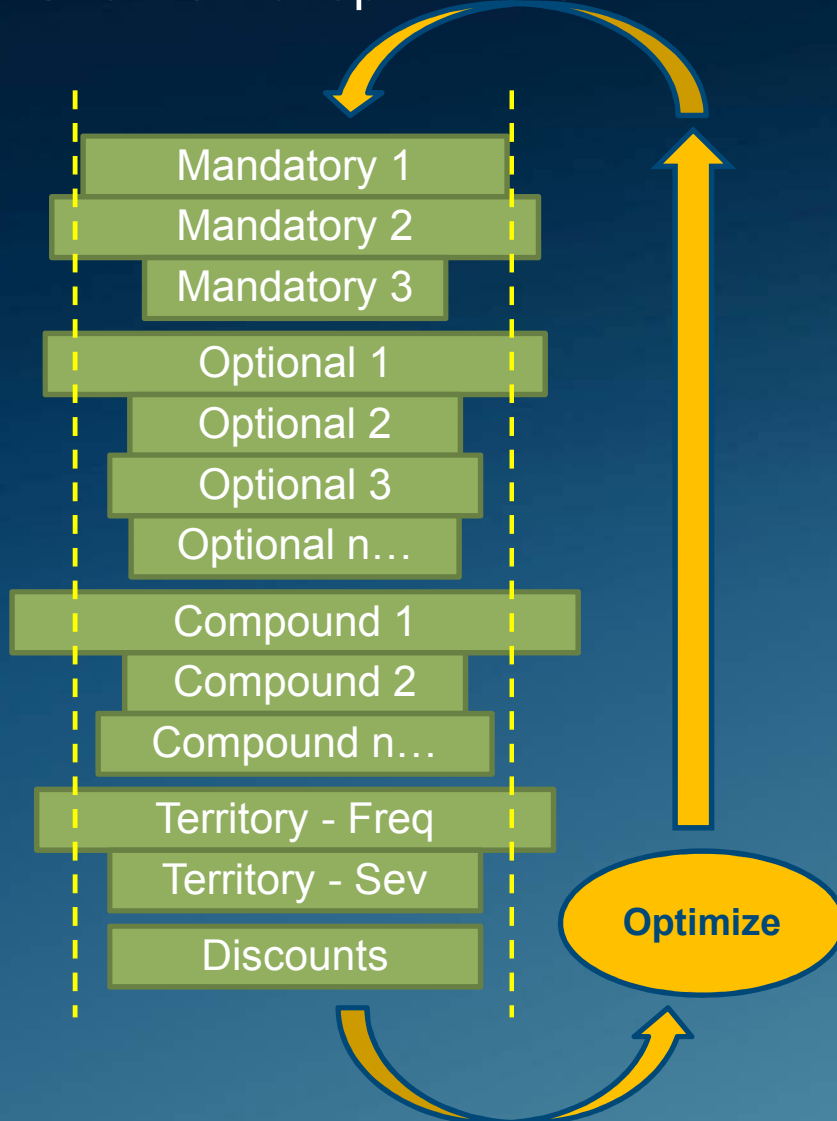
- **Complement of credibility**
- **Good driver discount methodology**
 - Actuarially justified, must comply with California Code of Regulations §1861.02
- **Vehicle symboling / make, model (/year), value, cost of repair**
 - Must submit methodology, values & relativities
- **Developing, trending losses, address large losses, # years of experience**
- **Relativity selections**—can override indicated
 - Smoothing
 - Competition/Marketing
 - Temper rate dislocations

Opportunity for Optimization

- July 15, 2008 regulatory constraints—over-reliance on some variables (points, mileage, yrs licensed, GDD); under-reliance on others ([age]/sex/m-s, terr)
- Create new challenges for profitability and competitiveness
- Goal—comply with regulations but also produce most accurate relativities reflecting your loss experience
- First, set objective function—minimize: simple deviance, squared deviance, Chi-squared deviance, Tweedie deviance, etc:
 - Use all optional variables available ideally
 - Take advantage of compounds—use machine learning to recognize patterns
 - Optimize relativities via correction factor

Approach

Overview of optimization



Easy as 1-2-3:

1. Correct weights for mandatory variables if necessary
2. Add optional variables in descending order by weight, taking into account prior factor relativities
3. Optimize
 - Search to minimize objective function by pumping/tempering correction factors
 - Identify predictive compound variables
 - Iterate to solve for
 1. Best combination of correction factors
 2. Key compound variables

Example

- CA PPA writer
- Collision experience
- Two policy years
- Greater than 100k exposures, greater than 10k claims
- Loss ratio = 66%

➤ **Objective function:**
Minimize total simple deviance

- Used 14 variables
 1. Points
 2. Annual Miles
 3. Years of Driving Experience
 4. Vehicle Type
 5. Multi-Car Discount
 6. New/Renewal Indicator
 7. Driver Marital Status
 8. Vehicle Driving Wheels
 9. Driver Gender
 10. Vehicle High Performance Code
 11. Vehicle High Performance Indicator
 12. Territory - Freq-Based (company)
 13. Territory - Sev-Based (company)
 14. Good Driver Discount

Minimizing Total Simple Deviance

- Monitor 1,000s of iterations

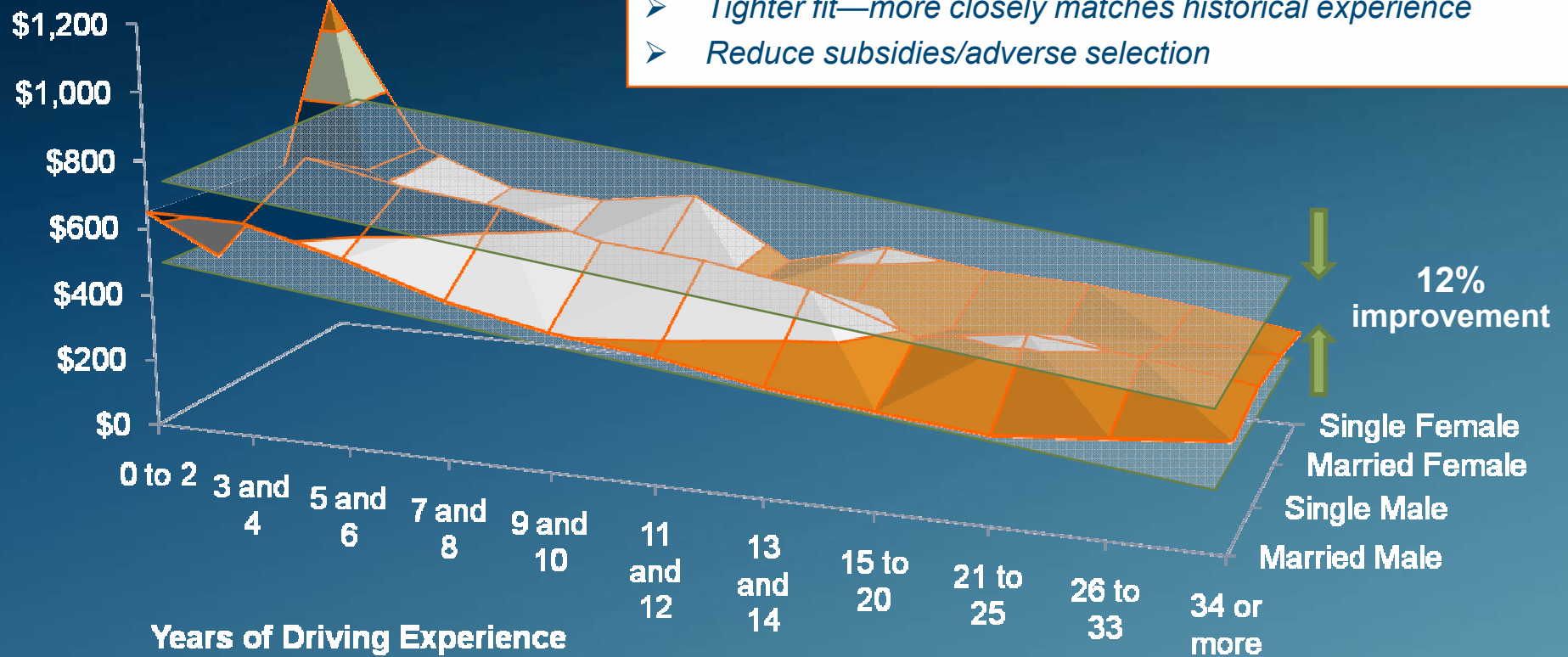


Kickoff analysis on Friday → Go home early → Come back Monday → Done

Results

Improvement in total simple deviance

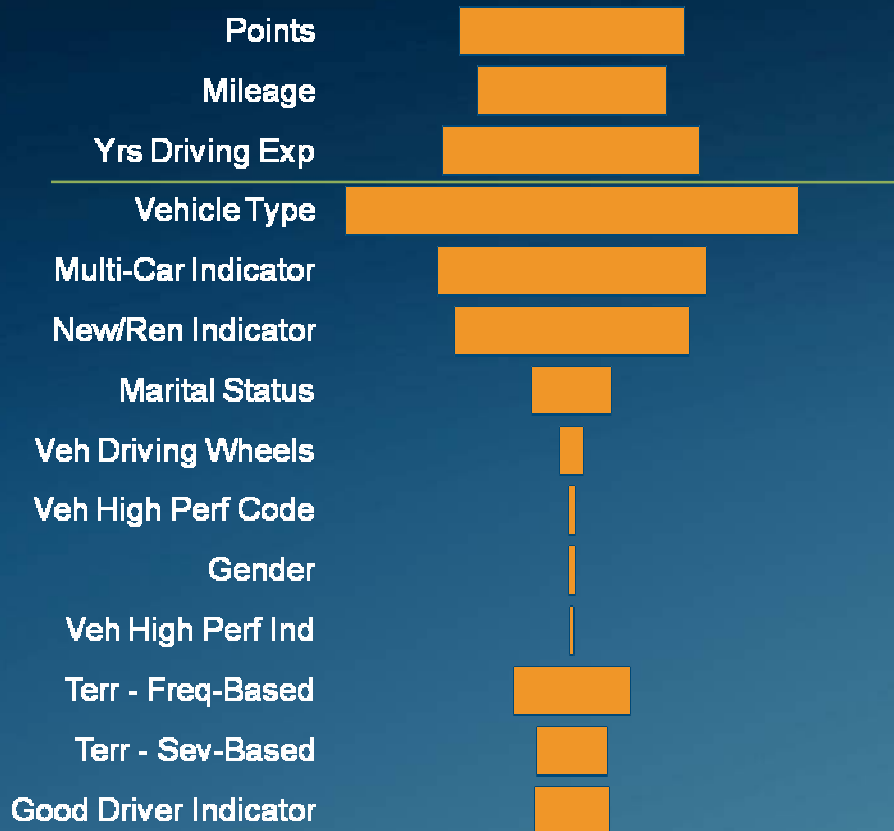
Actual Pure Premiums
Surface Plot



Results

Correct the weights

Sequentially Analyzed,
No Correction Factors

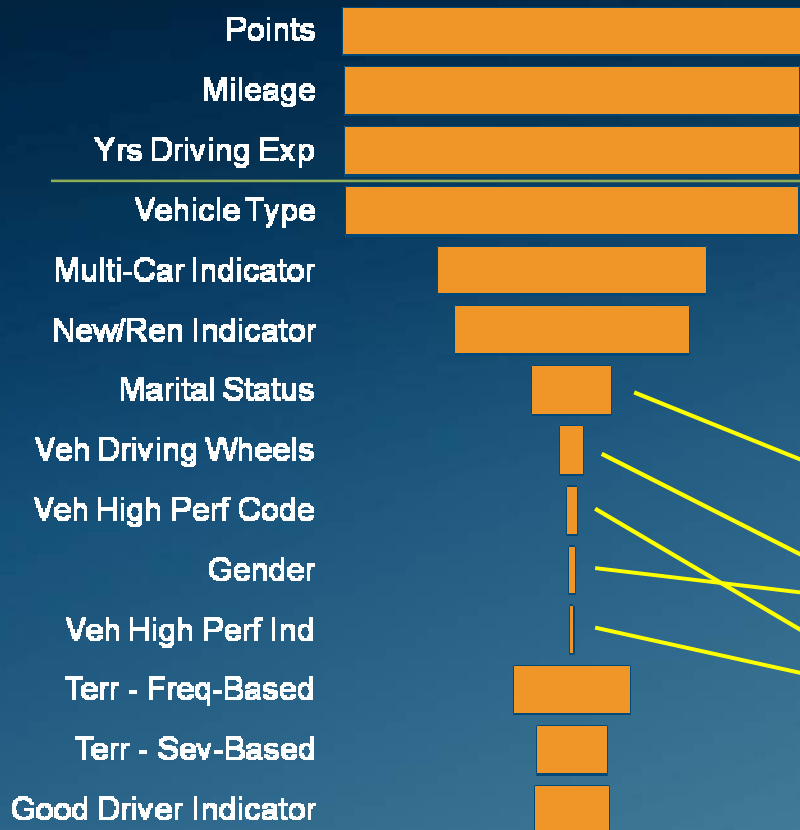


1. Need to expand mandatories or shrink optionals
2. Need to correct Mandatory #3

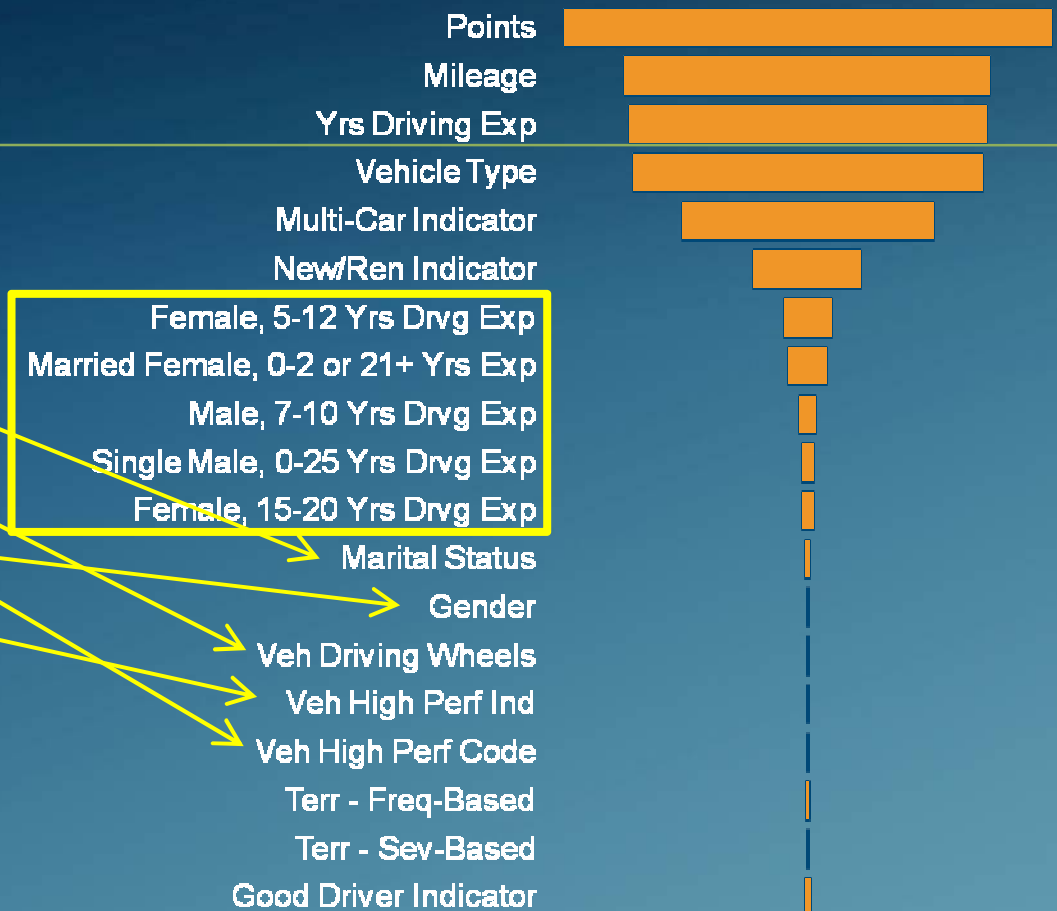
Results

Minimally corrected vs. optimized weights, identify compound variables

Sequentially Analyzed,
Minimal Correction Factors



Sequentially Analyzed, Optimized
Correction Factors, Compound Variables



Conclusions

- **Prop 103 restricts...**
 1. Methodology
 2. Allowable variables, and
 3. Major controlling parameters

- **But there still exists an opportunity to optimize rate relativities by**
 - Identifying compound variables
 - Optimizing correction factors

- **Found a 12% improvement in fit in Collision coverage alone:**
 - Reduces subsidies
 - Increases competitive advantage
 - Reduces adverse selection

Questions?

sue.miller@milliman.com

nancy.watkins@milliman.com

ssobel@eeanalytics.com

Antitrust Notice



- The Casualty Actuarial Society is committed to adhering strictly to the letter and spirit of the antitrust laws. Seminars conducted under the auspices of the CAS are designed solely to provide a forum for the expression of various points of view on topics described in the programs or agendas for such meetings.
- Under no circumstances shall CAS seminars be used as a means for competing companies or firms to reach any understanding—expressed or implied—that restricts competition or in any way impairs the ability of members to exercise independent business judgment regarding matters affecting competition.
- It is the responsibility of all seminar participants to be aware of antitrust regulations, to prevent any written or verbal discussions that appear to violate these laws, and to adhere in every respect to the CAS antitrust compliance policy.