

Predictive Modeling for the Rest of Us

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“That” Company

- You know, “That” Company...
 - The big brother your company never had
 - Always seems to be half a step faster
 - Always a little bit bigger
 - Always a little bit better
 - Always doing the stuff you want to do
 - Always getting more
 - ... (or acting like it)



Reactions to “That” Company Vary

- Fast follower
- Dislike
- Admire
- Emulate
- Live and let live



DEPRESSED



FRIGHTENED



ANXIOUS



SUSPICIOUS



FRUSTRATED



ANGRY



MISCHIEVOUS



OVERWHELMED



HOPEFUL

“That” Company – Predictive Modeling

- Plenty of credible data in recent years (1-3)
- Accurate, populated fields
- Model both rating plan and underwriting
- Model frequencies and severities
- Run train, test & validate processes
- Flexible company structure, rating engine and policy management system
- Agents and underwriters excited about embracing change



“That” Company – Predictive Modeling Data

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Dealing with Data Constraints

- Approach 1 – Make fewer cuts.
- Lawrence, H. Longley-Cook's - "We may liken our (data) to a large crumbly loaf cake, which we may cut in slices to obtain easily edible helpings. ... If we try to slice the cake more than one way at a time, we shall be left with a useless collection of crumbs"
- Examples
 - Building Age
 - Parking Lot
 - Youthful Operators (+ Driver Age)



Combining Data

- Approach 2 – Increase the size of your cake.
- Problem:
 - Small Books of Businessowners (BOP) and Commercial Package (CPP/CMP)
 - Neither ideal for modeling by itself
 - Similar factors expected to improve pricing accuracy
- Solution: Combine class rated CMP and BOP into single underwriting score model

Got the Data...Sort of

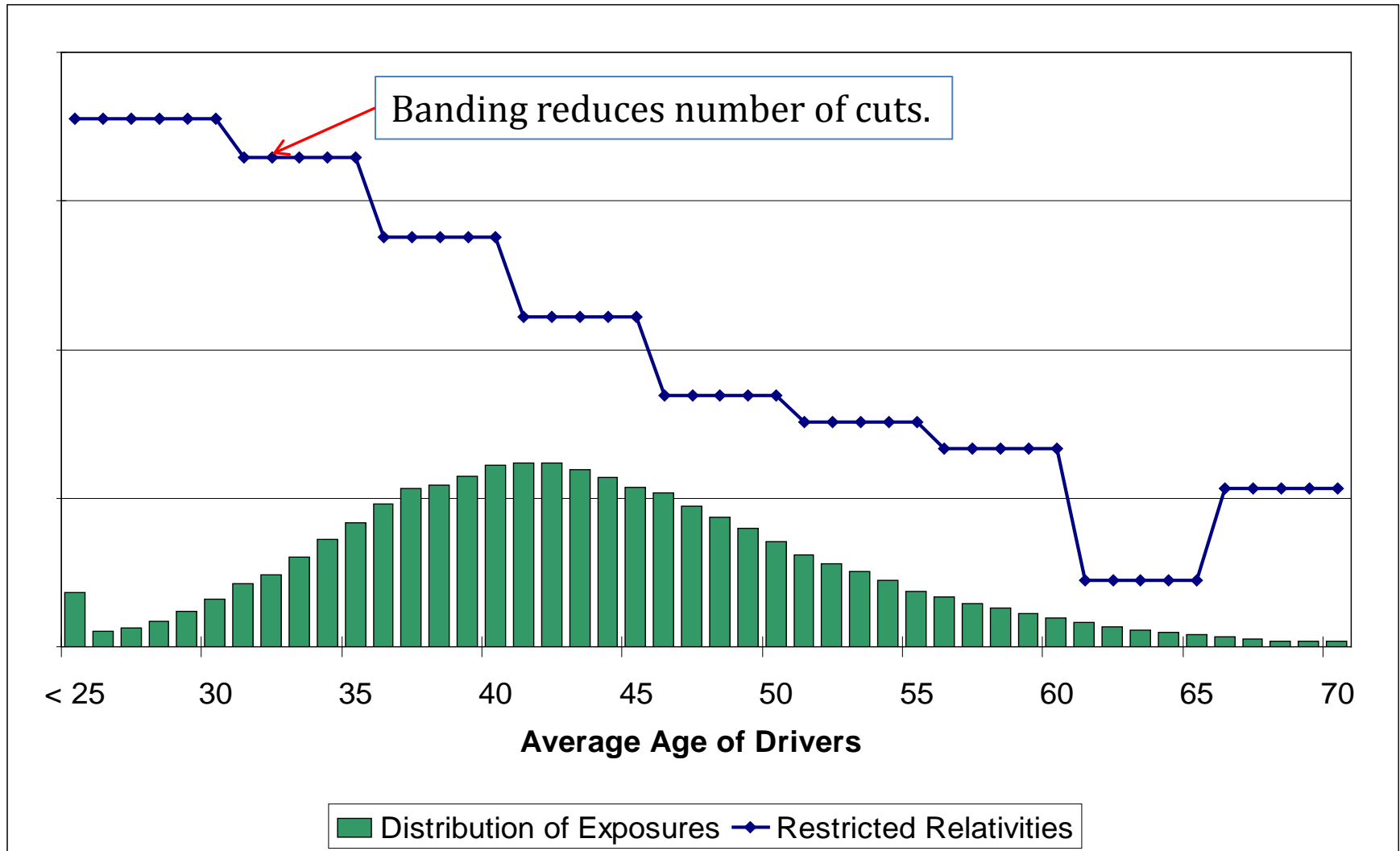
- Problem: Lots of data accurately captured by agents on ACORD BOP application and company supplemental application... in ink (pencil, crayon). Never gets into systems.
- Solution: Hire college kids? No.

Seek out retirees group that knows company systems and is familiar with applications. They're looking for supplemental income and a way to stay connected. You get accurate, inexpensive data input.

Simplifying Data

- Approach 3 – Simplify the data.
- Problem: Commercial auto modeling
 - No driver detail available
 - Hard to assign to vehicles
 - SIC data gets “crumby” fast
- Solutions: Averages & Groupings/Banding
 - Average driver age groups
 - First 2 or 3 positions of SIC

Impact of Average Driver Age



Indicated SIC Relativities

SIC 3	Description	Exposure	On-Balance Relativity
171X	Plumbing/HVAC	37,542	1.055
173X	Electrical Contractors	36,629	0.886
175X	Carpentry	32,404	0.969
179X	Misc. Contractors	23,829	0.982
27XX	Printing/Publishing	16,005	0.824
35XX (o/t 357)	Industrial Machinery	19,753	0.838
507X	Hardware Wholesaler	10,866	0.932
514X	Grocery Wholesaler	16,486	1.149
571X	Home Furnishings	11,795	0.918
581X	Restaurants	12,239	0.916
59XX	Misc. Retail	38,818	1.031
64XX	Insurance Agents	13,209	0.921
65XX	Real Estate	30,856	0.986
721X	Laundry/Dry Cleaning	13,341	1.373
734X	Building Services	19,012	1.145
737X	Computer Services	16,663	1.145
76XX	Misc. Repair Services	15,425	1.010
80XX	Health Services	18,607	1.068
87XX	Eng. & Mgt. Services	80,160	0.927

External Data Options

- Approach 4 – Use somebody else’s cake.
 - Insurers:
 - Commercial Auto: Progressive, Hartford
 - Medical Malpractice: The Doctors Company, Medical Protective, (also NCMIC, PICA in specialties)
 - Casualty Programs: CNA, Zurich, Hartford, et al.
 - Statistical Agents: NCCI, ISO
 - Data Collectors: RL Polk, Central Analysis Bureau, Lexis-Nexis, Experien, MSB, PointRight, NPDB, State Closed Claims
 - Modelers: AIR, RMS



Publicly Available Rate Filings - 1

DRVR-CLASS-FCT-TBL							
DRVR	MS	POINTS	WEIGHT	SAND	DRVR		
AGE			CLASS	GRAVEL	CLASS		
					FCT		
					LKUP		
14	...	18	M	0	H	Y	2.87
14	...	18	M	0	H	N	3.93
14	...	18	M	0	L	Y	2.51
14	...	18	M	0	L	N	2.51
14	...	18	M	0	M	Y	2.87
14	...	18	M	0	M	N	3.93
14	...	18	M	0	X	Y	2.87
14	...	18	M	0	X	N	3.93
14	...	18	M	1	H	Y	2.95
14	...	18	M	1	H	N	4.12
14	...	18	M	1	L	Y	3.55
14	...	18	M	1	L	N	3.38

Type of Operation Multiplier x Rate for Bodily Injury, Property Damage and Medical Payments Coverage

0.95 – Grain Haulers	0.95 – Dry Freight – Truckload
1.00 – Livestock Haulers	1.15 – Intermodal
1.10 – Bulk/Tank – Chemical/Food Grade	1.10 – Dry Freight – Less Than Truckload (LTL)
1.00 – Bulk – Dry Bulk	1.20 – Auto Transporters
1.10 – Tank – Fuel, Oil, Petroleum	1.40 – Dumping Operations
0.95 – Refrigerated (Reefer)	1.25 – Drive Away Operations
1.00 – Flatbeds	1.30 – Logging Operations
1.00 – Specialized Carriers	1.40 – Mobile Home Toters

Publicly Available Rate Filings -2

C. TIERED RATING

1. Tier is determined at policy inception, renewal or anniversary based on the following characteristics. Number of "power units", length of time insured with company, accident history, age of driver(s), Motor Vehicle Record of driver(s), management safety ranking, and driver retention.

Tiered Rating Multipliers

TIERED RATING MULTIPLIERS									
Tier	Multiplier	Tier	Multiplier	Tier	Multiplier	Tier	Multiplier	Tier	Multiplier
1	0.401	10	0.557	19	0.774	28	1.076	37	1.495
2	0.416	11	0.578	20	0.803	29	1.116	38	1.551
3	0.431	12	0.599	21	0.833	30	1.158	39	1.609
4	0.447	13	0.622	22	0.864	31	1.201	40	1.669
5	0.464	14	0.645	23	0.896	32	1.245	41	1.731
6	0.481	15	0.669	24	0.929	33	1.292	42	1.795
7	0.499	16	0.694	25	0.964	34	1.340	43	1.862
8	0.518	17	0.719	26	1.000	35	1.390	44	1.932
9	0.537	18	0.746	27	1.037	36	1.442	45	2.004

Publicly Available Scorecards

Location of Business	Attached to Habitational Structure	10
	Stand-alone Building	3
	Strip Shopping Center	0
	Enclosed Mall	-3
Hours of Operation Open to Public	21-24 Hours	10
	16-20 Hours	5
	12-15 Hours	0
	Less than 12 Hours	-5
Percentage of Sales from Catering Services	Over 10%	10
	1-10%	5
	None	0
Total Percent of Sales from Liquor Sales	More than 20%	5
	1-20%	2
	None	0
Drive Thru	Yes	0
	No	0
Credit Score	All Responses	0

“That” Company – Modeling Techniques

- Plenty of credible data in recent years (1-3)
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Constrained or Restricted Models

- Problem: Simply not enough data to model all of the rating and tiering/scoring variables available.
- (Not able to file independent rates even if I could model them.)
- Solution: Constrain the rating factors in the model to AAIS, ISO, or NCCI loss costs (or a competitor) and focus on scorecard/tiering factors.

Constrained or Restricted Model

Construction Type	Factor
Frame Construction	1.000
Joisted Masonry	0.825
Non-Combustible	0.825
Masonry Non-Combustible	0.749
Modified Fire Resistive Or Fire Resistive	0.560

Public Protection (Fire) Classification	Factor
1 - 4	1.000
5 - 6	1.063
7 - 8	1.260
8B	1.490
9 - 10	1.490

Constrained or Restricted Models

- Issues
 - Assumes rating plan is correct
 - Will not fit data as well as unrestricted model
- Advantages
 - Focuses on incremental value added beyond current rates
 - Simpler, smaller modeling project
 - Increased speed to market

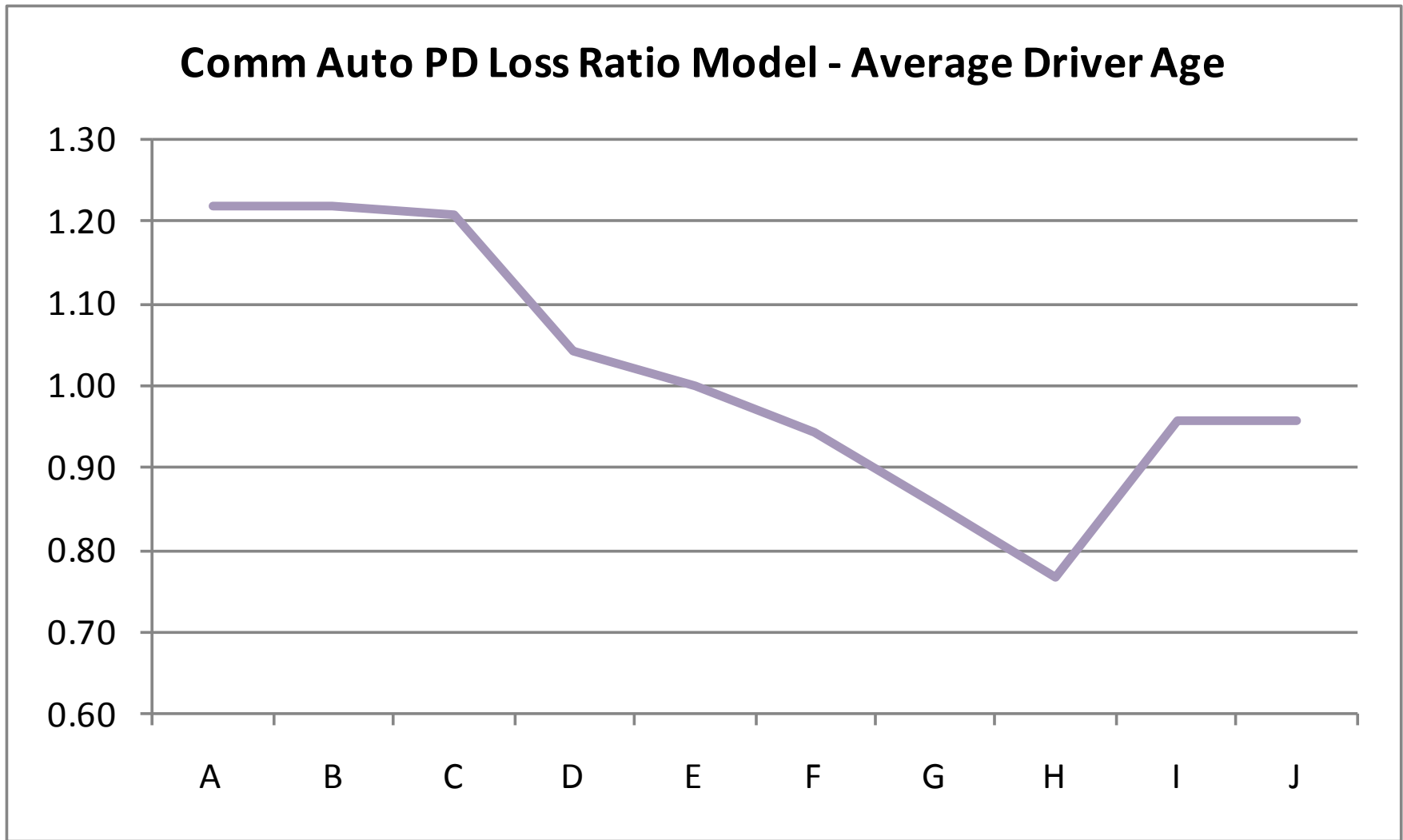
Loss Ratio Modeling

- Problem: From a purely statistical standpoint, it is preferable to model frequencies and severities separately and then combine into a pure premium model
 - On small data sets, severities are extremely volatile (capping large losses helps some, but often not enough)
 - Some lines and coverages have difficult to manage exposure data (general liability)

Loss Ratio Modeling

- Solution: Loss Ratio Modeling
 - Idea is to answer “how do these characteristics explain historical differences in loss ratios?”
 - Goal: achieve a consistent expected loss ratio on every risk
- Issues:
 - Use Tweedie Distribution
 - Adjusting for historical rate changes
 - On-level premiums
 - Use policy year as a variable
 - May still want to cap large losses

Loss Ratio Model Output



Train-Test-Validate

- Problem: From a purely statistical point of view, it is ideal to perform modeling in three phases on three independent subsets of data: Train, Test and Validate
- Train – Portion of the data used to develop the model
- Test - Portion of the data used to test the model and optimize it
- Validate - Portion of the data used to decide between competing models and ensure the model is appropriate and does not overfit the data
- Typically (40%-30%-30%)



Train-Test-Validate

- Solutions:
 - Model the entire data set, then use random sampling techniques to test & validate
 - Hold out an immature policy year to validate

“That” Company – Model Implementation

- Plenty of credible data in recent years (1-3)
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“Every New Beginning Comes From Some Other Beginning's End...”

- Problem: U/W knows it works, we just don't capture it.
- Solutions:
 - Commit to collecting them as a project objective – at the beginning of the project
 - Expect it as a project deliverable
 - Plan for implementing it, just like other deliverables
- Do Not:
 - Try to capture everything at once.
 - Overlook this step and still expect the data to be better in three years.

Filing Alternatives

- Goal: Preserve competitive advantage so “That Company” et al. don’t “me too”
- “That Company” Approach – Use multiple statutory companies and IRPM/schedule rating (or underwriting guidelines) to implement without filing
- Problems:
 - Not enough companies
 - Not a flexible enough systems
 - State may require filing of underwriting guidelines
- Solution: “Black box” filing

CA Scorecard Example - Hartford

Company Rates applicable to Sentinel Insurance Company, LTD only: ✓

Based on the following risk characteristics:

1. MVR Information
2. Average Driver Age
3. Youthful Composition
4. Length of Credit History
5. Total Number of Trades
6. Percentage of Balance Overdue of All Trades
7. Total Balance of Regular Trades
8. Number of Public Records / Collections
9. Amount of Judgment
10. Average Number of Days Balance Overdue in the Past 3 Months
11. Number of Inquiries in the Past 9 Months
12. Years in Business (when financial information is not available)
13. Industry Classification
14. Percentage of TTT Power Units
15. Prior 3-Year Loss Frequency by Size of Risks
16. Other risk-specific characteristics that are not contemplated above

use the applicable tier factor as a final step prior to rounding to determine the final rates.

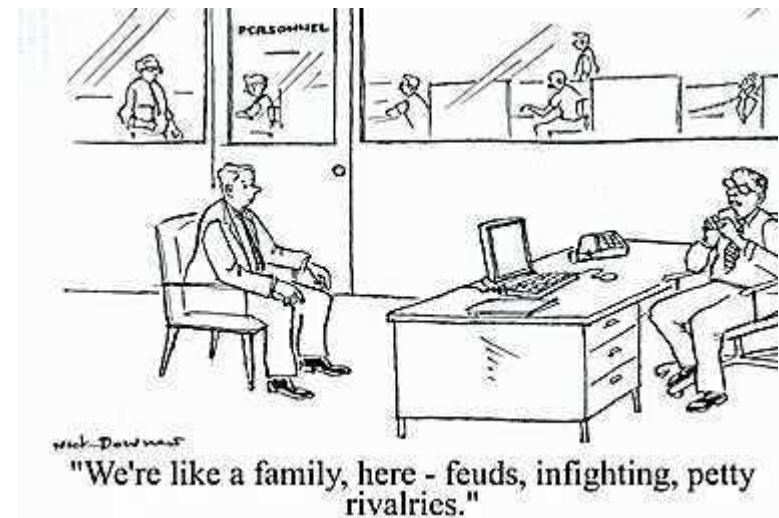
CA Scorecard Example - Hartford

Tier	Factor		Tier	Factor		Tier	Factor
1	0.40		18	0.81		35	1.66
2	0.42		19	0.85		36	1.73
3	0.43		20	0.89		37	1.81
4	0.45		21	0.92		38	1.88
5	0.47		22	0.96		39	1.96
6	0.49		23	1.00		40	2.05
7	0.51		24	1.05		41	2.13
8	0.54		25	1.09		42	2.23
9	0.56		26	1.14		43	2.32
10	0.58		27	1.19		44	2.42
11	0.61		28	1.24		45	2.52
12	0.63		29	1.29		46	2.63
13	0.66		30	1.35		47	2.74
14	0.69		31	1.40		48	2.86
15	0.72		32	1.46		49	2.98
16	0.75		33	1.53		50	3.11
17	0.78		34	1.59			

UNINSURED/UNDERINSURED MOTORISTS Factor is 1.00.

Avoiding Turf Wars

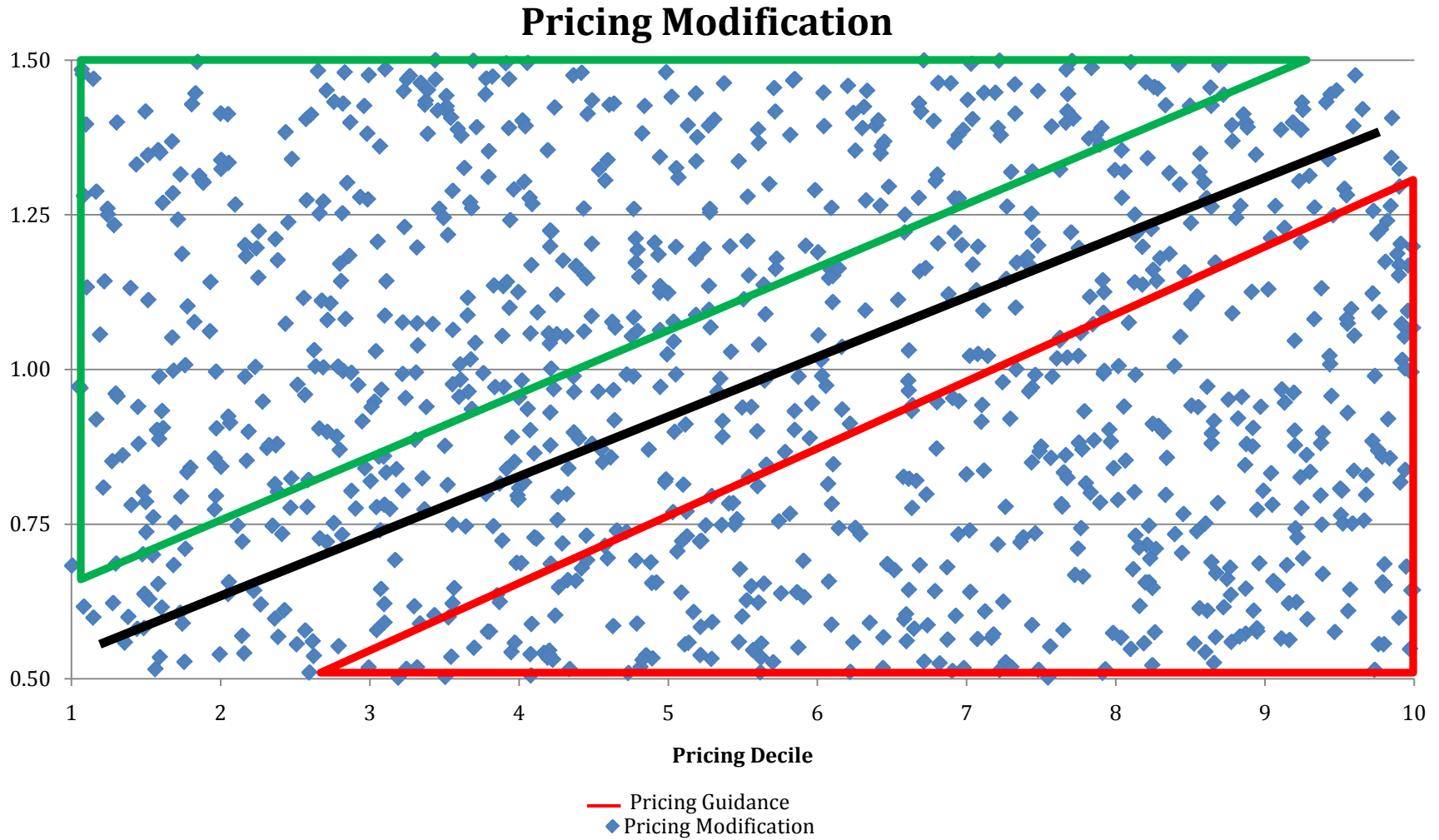
- Problem: If not implemented correctly, predictive modeling often leads to turf wars.
 - The models aren't stable year to year.
 - We're not sticking to the pricing guidance.
 - It doesn't work in a soft market.
 - The models aren't right.
 - Too many exceptions.



Achieving Buy In

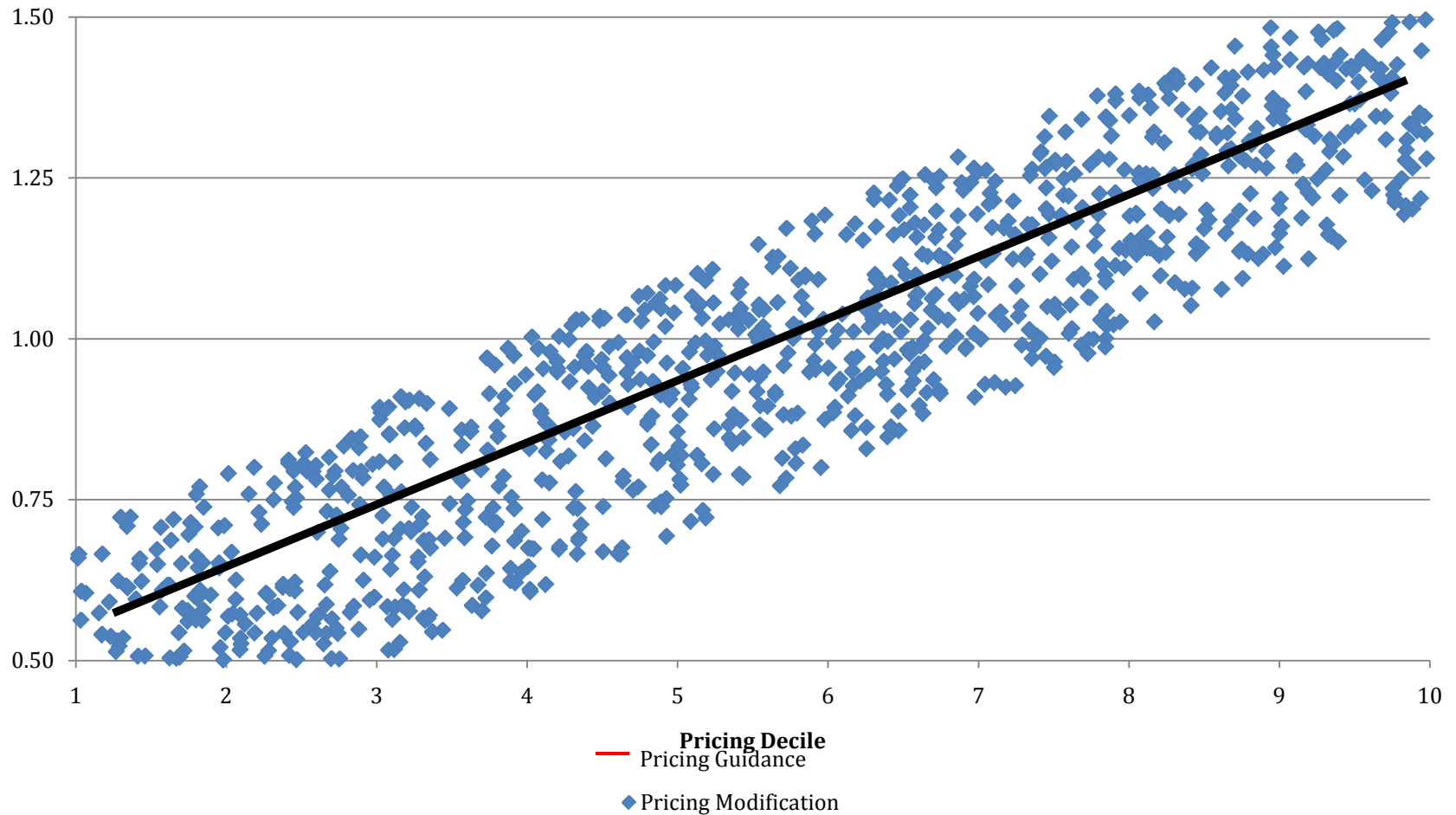
- Solutions:
 - Highly visible commitment at the C-level
 - Active involvement of all departments in modeling and product development processes
 - Testing prior to implementation
 - Reason codes/Feedback
 - **Monitoring/Keeping Score**

Actual vs. Suggested Pricing



A Better Implementation

Pricing Modification



Conclusion

- Many regional & niche commercial lines insurers are taking advantage of predictive analytics for pricing, underwriting, marketing and even claims.
- These companies are using a wide variety of creative approaches to get tremendous value from their own available data and a myriad of additional resources.
- They are also take steps at implementation to increase “buy in” to model results and to ensure that the next models will be even better

Thank You for Your Attention



About the Author



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Mr. Walling is a Principal and Consultant in Pinnacle's Bloomington, Ill. office. He is a Fellow of the Casualty Actuarial Society (CAS) and a member of the American Academy of Actuaries. Mr. Walling is a frequent industry

Underwriting Power Tools for Small Business Insurance

By Robert J. Walling, III, FCAS, MAAA

Commercial lines insurers are moving faster than ever to develop sophisticated underwriting tools for their small business insurance programs.

One of the most popular innovations is an underwriting scorecard that quantifies the impact of a variety of factors into the rating process. By providing greater pricing accuracy, scorecards offer advantages including more accurate risk pricing, better

tier almost five-and-a-half times the lowest tier, which was impossible before. This new approach also allows more accurate assessment of the loss potential of each risk.



About the Author



Commercial Auto Predictive Modeling: The Time Is Now

By Robert J. Walling, III, FCAS, MAAA

The time has come for commercial auto insurance to benefit from the same predictive modeling techniques and strategies that have been a boon to personal lines insurance products.

between 25% and 40% of personal auto rates when it compared commercial auto rates for private passenger-type vehicles to personal auto rates for similar drivers and vehicles. The

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