Marrying Underwriter Intuition & Predictive Modeling - A Workers' Compensation Perspective

CANW Fall Meeting

Sep 25, 2009

Portland, OR

Presented by:
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Agenda

- A Short Story
- The Objective
- Getting There

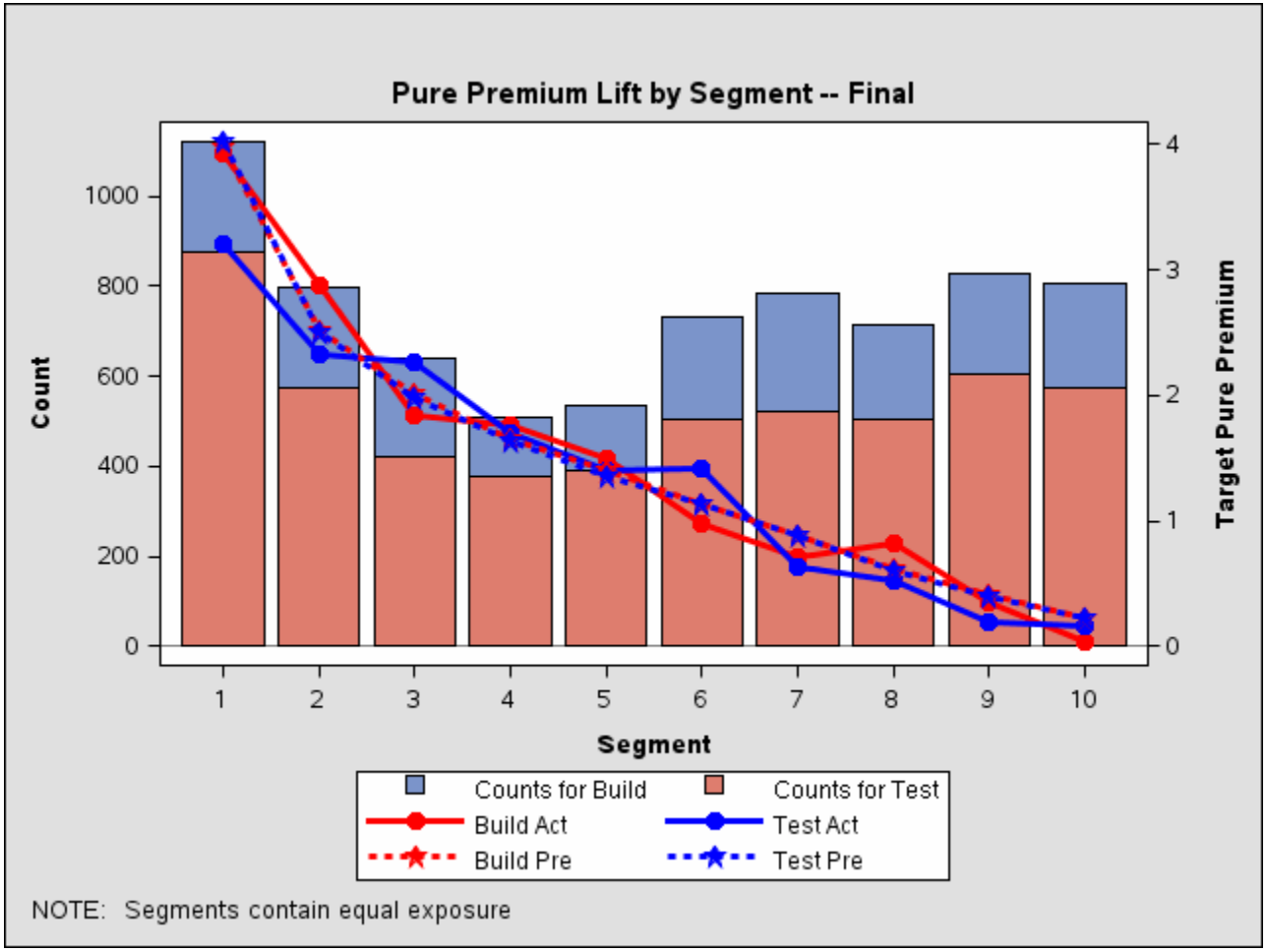
A Short Story

After Several Weeks of Analysis...

the Predictive Modeler and
the Underwriter

Meet...

Initial Candidate Model



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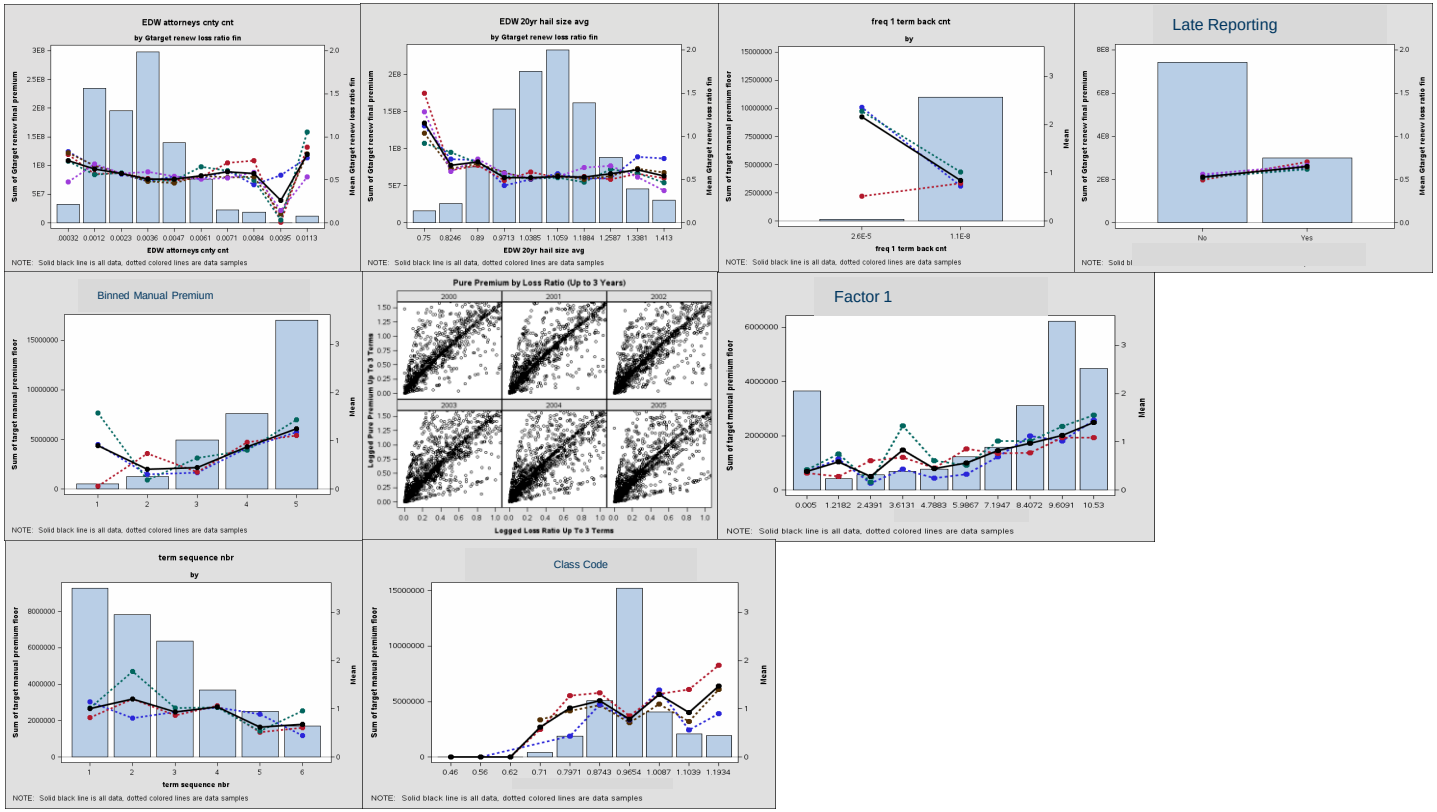
Model Risk Factors

- Attorney count by county
- Hail size by county
- Late reporting >30 days
- Claim Frequency –1 year back
- Combined factors – 3 term LR & PP
- Term sequence
- Binned Manual Premium
- Natural log (Class code/176 + 11,237)…(?!)

Review Model Factor Results



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Many Problems

- Incorrect or poorly defined target
- Premium issues
- Exposure issues
- Unexplainable risk factors
- Risk factors not available in production
- Inappropriate sample
  - Pool business
  - Hog confinement program
  - Large loss deductibles
- Underwriter's not involved
- ...

COMMUNICATION!

Several Months Later

The underwriting department, the actuarial department and the predictive modelers get on the same page

Can this process be improved?

The end...

Or

Is it?...

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The Objective

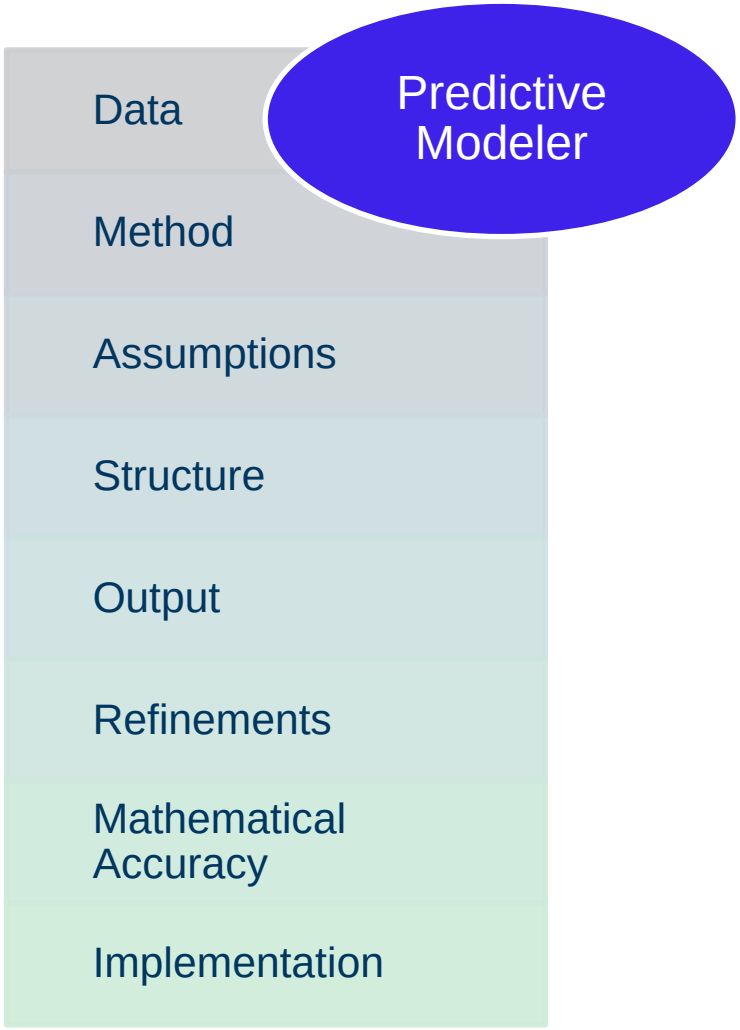
Design, build, implement, monitor and refresh a predictive model that solves a specific business need

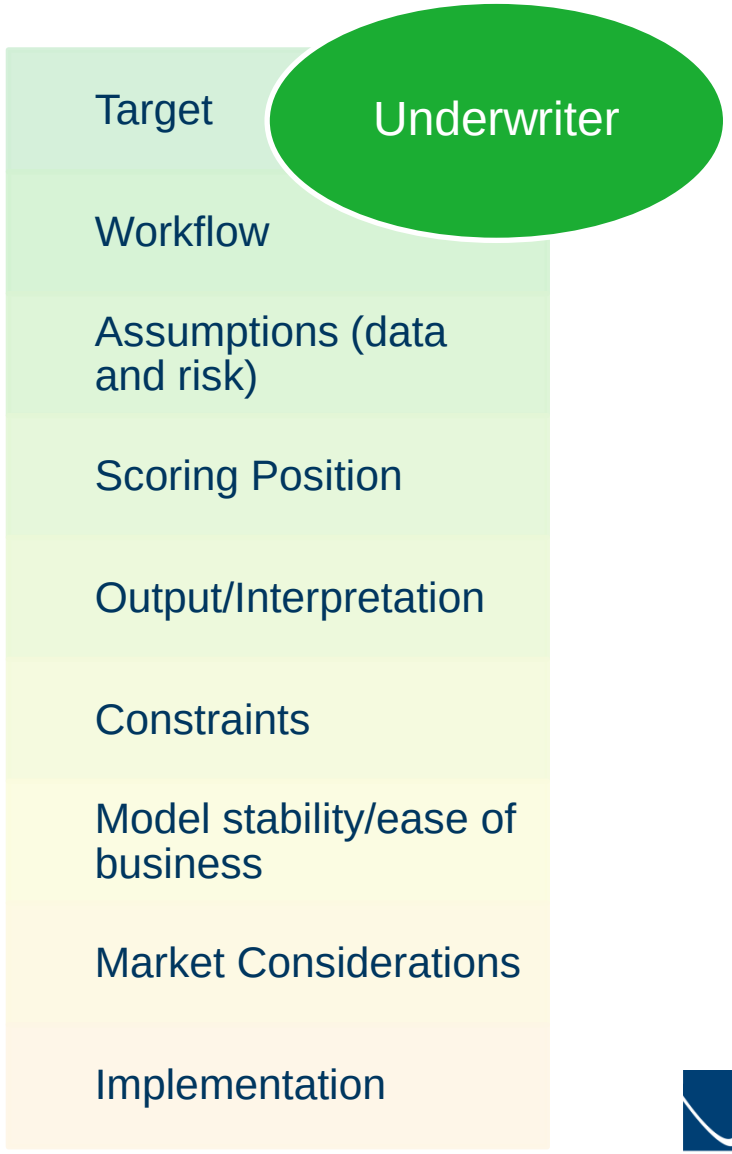
GETTING THERE

The Stage

- Intuition versus Empiricism
- Art versus Math
- Underwriting versus Predictive Modeling/Actuarial
- Collaboration

Perspectives





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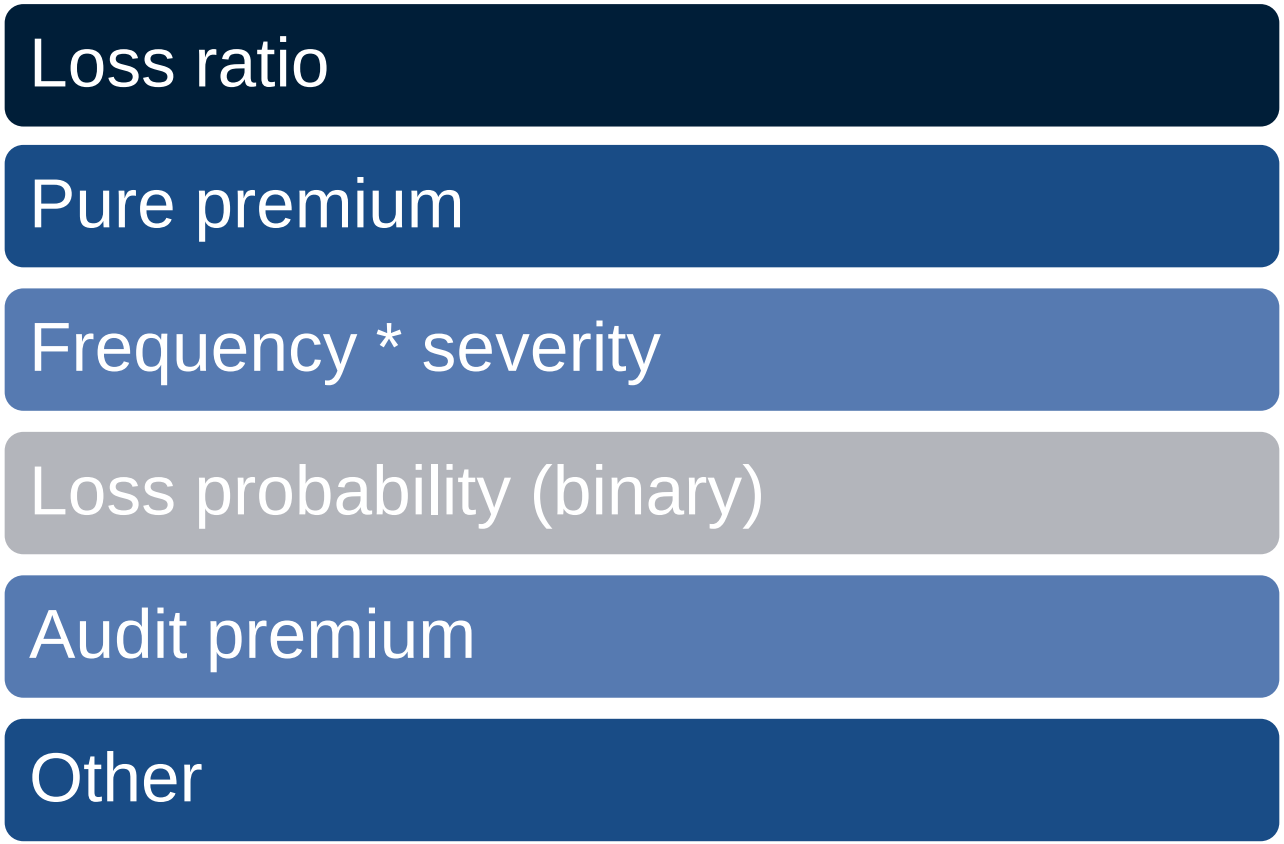
Language

Predictive Modeler	Underwriter
• Predicted Value • Variance • Deviance • Homogeneity • Heteroscedasticity • Linear model • Non-linear model • Neural Network • Decision Tree • Hierarchical model • GLM • Eigenvalue • Heckman process • …	• Exposure/Payroll • On-leveling • Indemnity vs. Medical • Minimum Premiums • E-Mod • Standard vs. Manual • LDF • Trending • LCM • Schedule Rating • Merit Rating • …

Modeling Method

- Complexity – compared to personal lines
  - Risk heterogeneity
  - Size of risk
  - Number of classes
  - Diverse industry groups
  - Pricing
  - Long tail line of business
- Data issues

Target



- What is the intent of the model?
- What other business rules are applied in the underwriting process
- How can the model build synergy with current best practices without being “constrained to fail”

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Workflow

- Where will the scoring engine live?
- At what point during the logical process will the model be used?
  - When will the output values be rendered to make a risk judgment?
- What data is available at time of scoring?
- What are the underwriters going to do before and after they render the outputs?
  - What judgments have they already made?
  - What judgments will they make post scoring?
- How does the workflow constrain the data or the scoring parameters?

Data

- How much (e.g. exposure, claim counts)
- States, years, class codes, policy size
- Explanatory variables
  - Huge opportunity to build rapport/gain knowledge
  - Derivations create collaborative synergy
- Data adjustments/transformations
- Exogenous data
- Data partitioning

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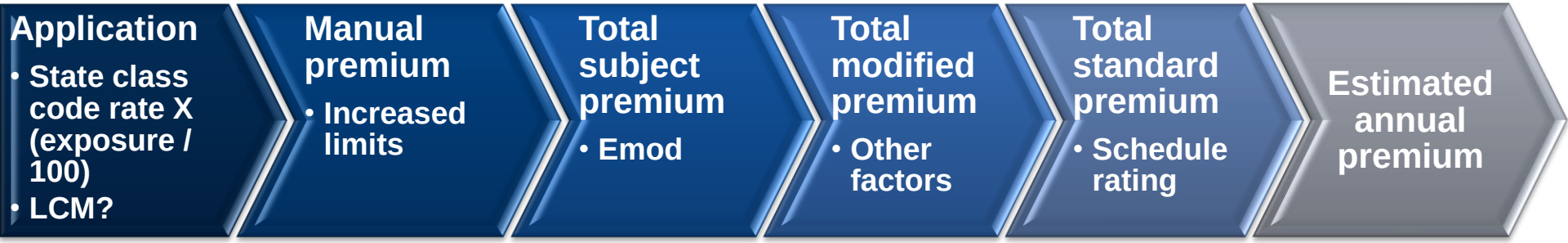
Data/Variable structure

Identify/define/structure specific variables.

- Continuous
- Categorical/Class
  - Work with underwriters to define categorical bins of continuous variables
- Variable Interactions
  - Underwriters may develop interactions intuitively/creatively
- Transformations

Scoring Position



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Production Outputs and Interpretation

- Loss ratio
- Pure premium
- Expected Loss
- Avg. bin loss ratio
- Score?
- Risk grade
- Company
- Tier
- Underwriting Referral
- Risk Factor Values
  - Transformed risk factor values

How will underwriters interpret results. What pitfalls can be avoided upfront?

Refinements

- Based on discussions with underwriting and business partners
- Likely changes arising from:
  - Regulatory
  - Acceptability
  - Explainability
  - Business knowledge
  - Business rules/philosophy
  - Availability

Constraints

- Rating plan limitations
  - Minimum premiums
  - Pool business
  - Per capita rated policies
  - Schedule rating caps
  - Discontinued classes/risk types
  - Business rules
    - Are they available in the data?

Model Stability vs. Ease of Doing Business

- 3 year historical loss and pure premium variables
- Frequency variables
  - On exposure? Premium? Employee count?
- Severity variables
- Exposure
  - Exposure vs. payroll
- Historical premium
  - Historical vs. prospective
  - Production implications
- Employee count
  - Integrity of data

How much information is too much? This question must be asked at the outset.

Statistical Accuracy

- Point estimates
- Standard errors
- Policy level prediction
- Credibility of policy level results
- Bin Framework
- Model accuracy/validation

A Short Story Revisited

Collaboration is critical...

the Predictive Modeler and
the Underwriter

Learn from each other...

Questions???

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