A Regulatory Perspective on Predictive Modeling & Analytics Beyond GLMs

CAS RPM 2014
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Outline

- Role of a Regulator
- Predictive Models – GLM vs. "Beyond GLM"
- Regulatory Challenges
  - Reviewing Rates in General
  - Reviewing GLMs
  - Reviewing Models that go "Beyond GLMs"
- Rate Filings – What might Company expect from Regulators?
- How Insurers can help Regulators?

Disclaimer

- This presentation is not state specific. It reflects general impressions of state regulators across many jurisdictions.

- The views and impressions in this presentation are those of the presenter and by no means an official opinion of a specific Department of Insurance.

Role of a Regulator

Role of a Regulator – Statutes & Regulation

- Financial Division
  - Monitor company solvency and compliance with financial reporting requirements
- Rate Regulator
  - Ensure rates are not excessive, inadequate nor unfairly discriminatory
  - Ensure complete rates and rules manual on file
  - Ensure adequate supporting evidence submitted
- Market Conduct Examiner
  - Verify that company operations are compliant and meet standards

Role of a Regulator - Prohibited Rating Variables

- Rating variables generally interpreted as unfairly discriminatory
  - Race, Ethnicity, Religion, Income
- Rating variables occasionally not permitted for use
  - Credit Reports and/or specific items found in a Credit Report, Education, Occupation, Gender, Marital Status, Not At Fault Claims
- Regulators are mindful of proxies for prohibited rating variables

Predictive Models – GLM vs "Beyond GLM"

Predictive Models - GLMs

- Generalized Linear Models (GLMs)
  - The use of complex statistics and regression to determine linear interactions between many rating variables
  - Loss Cost; Frequency; Severity; Loss Ratio
  - Uses company data and possibly external data
  - Have become more common in the 21st century

Predictive Models – "Beyond GLMs"

- Non-Linear Models
  - "Newer" classification models relative to GLMs
  - Used independently of GLMs or combined with a GLM to capture signal not reflected by GLM
  - Use complex statistics and regression models to determine the non-linear interactions between rating variables
  - E.g. ensemble learning methods; random forests
  - Use company data and more often, external data
  - Result often classifies individual risks based on a "Score" that falls into a certain Tier

Regulator Challenges

Regulator Challenges – In General

- Reviewing filings with variations in pricing sophistication
- Wide variation in filing support for rates
- Wide variation in filing support for new products
- Company expectation of Department handling of confidential material
- Impact on consumers

Regulator Challenges – Reviewing GLMs

- Ongoing concerns over Generalized Linear Modeling by regulators may include:
  - Over fitting or poor fitting of data
  - Increased rate dispersion
  - Reliance on company presentation
  - Proper documentation by qualified individuals
  - Models generally prevent state-based modeling, analysis or validation
  - Models based on criteria other than risk
  - Proper maintenance and validation of model over time

Regulatory Challenges -Reviewing Predictive Models that go Beyond the GLM framework

- Ongoing GLM concerns may still apply
- Additional complexity in ratemaking
- In depth technical expertise by few
- "Test of Time" not yet lapsed
- Satisfy statutes that a complete rate manual be on file
  E.g. learning methods
- Company disclosure
- Implementation and maintenance concerns
- Overall ➜ "BLACK BOX"

Rate Filings - What might a Company expect from Regulators?

GLM Filings – Regulators may Receive, Require, Request:

- Technical Memorandum –
  - Description of data and rating variables
  - Disclose GLM assumptions and software used
  - Steps taken by modeler in constructing model
  - Discussion and visual demonstration of validation methods (e.g. test sample vs. hold out sample and lift curves)
  - Discuss credibility standard and considerations
  - Goodness of fit statistics & written interpretation
- Model indications and company selections.

"Beyond GLM" Filings – Regulators may Receive, Require, Request:

- GLM type filing standards maintained
- Discussion of data adjustments and credibility
- Inquiries on external data sources
- Discussion on how model can be successfully implemented
- Attestations by modeler
- More frequent filing submissions
- Market Conduct examination to monitor implementation and maintenance of model

How Insurers Can Help Regulators?

How Insurers can help Regulators?

- Submit a thorough Technical Memorandum
- Include statistics and visual representation showing fit of model to raw data
- Be familiar with state specific statutory requirements and prohibited rating variables before filing
- Be specific about the treatment of proprietary and confidential information
- Be prepared to answer questions and/or re-run the model under alternative scenarios

Questions?