Helping a Company Achieve Its Commercial Lines Underwriting Goals Through Predictive Analytics

2010 Ratemaking and Product Management CAS Seminar
Chicago, IL

Presented by:
Gaetan Veilleux
March 16, 2010

VALEN
technologies

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.

Why Use Predictive Analytics?

Not Using Predictive Analytics for Pricing

Fundamental Questions

- What is the underwriter's fundamental mission?

- What are the fundamental decisions an underwriter makes to accomplish the mission?

- What explicit or implicit predictions do underwriters make when making a decision?

Pricing Risk

- Workers Compensation
  - Company placement   ← Rules
  - Rating plan for a company   ← Formula
  - Experience-based modifications   ← Formula
    - Experience-mod
    - Retrospective-rating
    - Merit rating
  - Schedule rating   ← Judgment
    - (or dividend plans)

- Key Question: Why would an underwriter schedule debit/credit a policy?

How Accurate?

Copyright 2003, John Klosser, jklossner.com
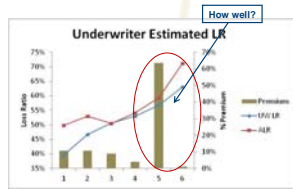
Prediction Accuracy: How Accurate is Accurate?

■ Suppose you asked each member of your underwriting staff to make an explicit, numerical prediction of the ultimate loss ratio each policy will experience in the prospective term. How accurate would the predictions be?
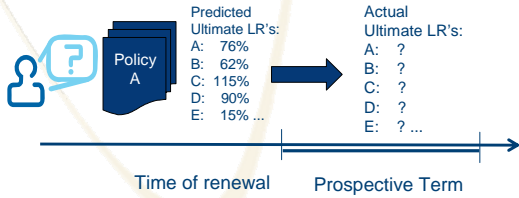
Policy A

Predicted Ultimate LR's:
A: 76%
B: 62%
C: 115%
D: 90%
E: 15% ...

Actual Ultimate LR's:
A: ?
B: ?
C: ?
D: ?
E: ? ...

Time of renewal   Prospective Term

Underwriter Versus Model Results

How well?

Underwriter Estimated LR

Underwriter Versus Model Results

Pricing Opportunity

What Happened?

- Were company goals at play?
- Is this the result of the volume/profit tradeoff?
- Was the competitive marketplace a consideration?
- Could something else be at play?
- Did the current work flow or systems constraints influence the outcome?

Company Confidential
© 2010 Valen Technologies, Inc.

Decisions Under Uncertainty

"Economic research often assumes that people are motivated primarily by material incentives and make decisions in a rational way."
www.nobelprize.org

"But how do we know when irrational exuberance has unduly escalated asset values, which then become subject to unexpected and prolonged contractions…?"
Alan Greenspan

Are decisions performed in a rational way?

Company Confidential
© 2010 Valen Technologies, Inc.

Kahneman Conclusion

"Kahneman has shown that people are incapable of fully analyzing complex decision situations when the future consequences are uncertain. Under such circumstances, they rely instead on heuristic shortcuts or rules of thumb."
www.nobelprize.org

Company Confidential
© 2010 Valen Technologies, Inc.

Cognitive Studies

Comparing statistical models to human judgment alone

- Hastie and Dawes compiled hundreds of studies ranging from medical diagnosis to highway safety, financial stock values to live-stock quality. (Cooksey, 1996)
- Some findings of note:
  - Statistical models generally outperform "experts" often by great degrees
  - Experts are often good at selecting variables that are predictive, but are generally poor at weighting the variables, particularly when there are more than a very few
  - Few judgments exhibit non-linearity (though the experts describe their own process as often non-linear)
  - When seemingly pertinent, but in truth, irrelevant additional information is provided to judges, they become more confident in the accuracy of their judgments, although the true accuracy does not increase and often decreases

Reference - Cognitive Errors

- 108 Types
  - Decision-making and behavioral biases
  - Biases in probability and belief
  - Social biases
  - Memory errors

- Examples
  - Clustering illusion
  - Selection bias
  - Confirmation bias
  - Deformation professionnelle
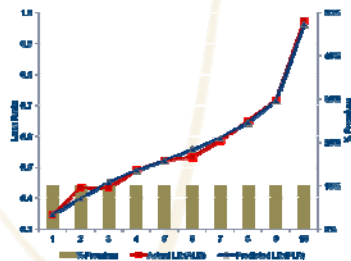 - Texas Sharpshooter Fallacy
  - Base rate fallacy

Source – Wikipedia

How Well Can a Statistical Model Do?

- Results shown are the actual LR outcomes on a separate, blind sample of scored polices

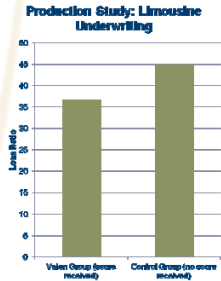## Case Study: Commercial Auto Insurance Pricing

- Valen developed a predictive model for a limousine book of business.
- The business goal for model usage was to lower loss ratio and increase profitability through more accurate risk-based pricing.
- The carrier chose to maintain status quo with one portion of their business as a benchmark for actual modeling results comparisons. Policies did NOT receive or use model predictions for this portion.
- **The loss ratio difference between the benchmark group and the scored group was 8%.**

Production Study: Limousine Underwriting

(bar chart: Loss Ratio on vertical axis from 0 to 50; "Valen Group Score received" bar ≈ 37; "Control Group (no score received)" bar ≈ 45)

Challenges and Keys to Success

Challenges

Change management and investment:
- Moving forward means change
- Financial commitment and investment
- Cross-functional alignment
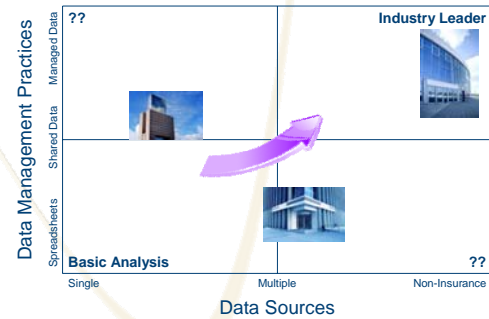
Challenges

Project:

- Identifying the business goal and formulating a modeling solution that addresses it
- Developing a Project Plan
- Data
- Modeling
- Translating the model properly into business usage
- Work-flow integration and software/production system implementation
- Monitoring

Company Confidential
© 2010 Valen Technologies, Inc.

The Value of Data

Data Management Practices (vertical axis): Spreadsheets, Shared Data, Managed Data

- ?? (top left)
- Industry Leader (top right)
- Basic Analysis (bottom left)
- ?? (bottom right)

Data Sources (horizontal axis): Single, Multiple, Non-Insurance

Company Confidential
© 2010 Valen Technologies, Inc.


Commercial Lines Modeling Challenges

- Complexity
  - Risk heterogeneity
  - State to state differences
  - Size of risk
  - Claim types
  - Mix of Business
  - Number of classes
  - Diverse industry groups
  - Long tail lines of business
  - Inflation sensitive exposure base
  - Data volume

Company Confidential
© 2010 Valen Technologies, Inc.

Success - Dramatic Improvement

Loss Ratio Segmentation -- Overall
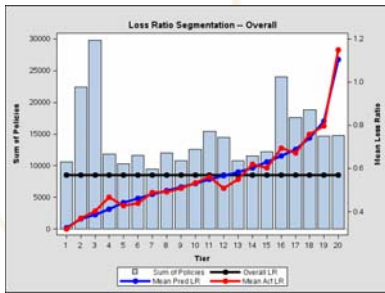
Business Impact

- Benefits types:
  - Combined ratio decreases
  - Increased profit
  - Lower average price
  - Premium growth
  - Lower ops cost (straight-through processing, claims management expense)

Benefit Drivers:
- Pricing accuracy
  - Price risk of worse policies
  - Profit opportunities on good risks
- Portfolio mix shifts to better risks
  - Higher retention rates on renewal business
  - Higher closing rates on good new business
- Expansion opportunities
- Higher submission rates from agents
- Higher underwriting efficiencies:
  - Straight-thru processing
  - Underwriters focused on problem policies

Keys to Success

- Believing
- Declaring
- Investing:
  - Data
  - Modeling
  - Implementation
  - Expertise
- Managing change

Questions?

Thank You!

**Helping a Company Achieve
Its Commercial Lines
Underwriting Goals Through
Predictive Analytics**

2010 Ratemaking and
Product Management
CAS Seminar
Chicago, IL

Presented by:
Gaetan Veilleux
March 16, 2010

VALEN
technologies