Practical Predictive Analytics Seminar: Welcome!

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SOA Antitrust Compliance Guidelines

Active participation in the Society of Actuaries is an important aspect of membership. While the positive contributions of professional societies and associations are well-recognized and encouraged, association activities are vulnerable to close antitrust scrutiny. By their very nature, associations bring together industry competitors and other market participants.

The United States antitrust laws aim to protect consumers by preserving the free economy and prohibiting anti-competitive business practices; they promote competition. There are both state and federal antitrust laws, although state antitrust laws closely follow federal law. The Sherman Act, is the primary U.S. antitrust law pertaining to association activities. The Sherman Act prohibits every contract, combination or conspiracy that places an unreasonable restraint on trade. There are, however, some activities that are illegal under all circumstances, such as price fixing, market allocation and collusive bidding.

There is no safe harbor under the antitrust law for professional association activities. Therefore, association meeting participants should refrain from discussing any activity that could potentially be construed as having an anti-competitive effect. Discussions relating to product or service pricing, market allocations, membership restrictions, product standardization or other conditions on trade could arguably be perceived as a restraint on trade and may expose the SOA and its members to antitrust enforcement procedures.

While participating in all SOA in person meetings, webinars, teleconferences or side discussions, you should avoid discussing competitively sensitive information with competitors and follow these guidelines:

• **Do not** discuss prices for services or products or anything else that might affect prices
• **Do not** discuss what you or other entities plan to do in a particular geographic or product markets or with particular customers.
• **Do not** speak on behalf of the SOA or any of its committees unless specifically authorized to do so.
• **Do** leave a meeting where any anticompetitive pricing or market allocation discussion occurs.
• **Do** alert SOA staff and/or legal counsel to any concerning discussions
• **Do** consult with legal counsel before raising any matter or making a statement that may involve competitively sensitive information.

Adherence to these guidelines involves not only avoidance of antitrust violations, but avoidance of behavior which might be so construed. These guidelines only provide an overview of prohibited activities. SOA legal counsel reviews meeting agenda and materials as deemed appropriate and any discussion that departs from the formal agenda should be scrutinized carefully. Antitrust compliance is everyone’s responsibility; however, please seek legal counsel if you have any questions or concerns.
Presentation Disclaimer

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Predictive Analytics: SOA Initiatives
Marketing Communications Campaign for Predictive Analytics

• Objectives:
  • *Increase PA opportunities* for actuaries among healthcare and life insurance hiring decision makers
  • *Grow supply of actuaries* trained in PA and interested in PA roles

• Strategies:
  • Promote the quality and value of the SOA’s suite of predictive analytics preliminary education and professional development opportunities
  • Showcase the predictive analytics journey at various stages in actuarial careers
  • Demonstrate the impact of actuaries in predictive analytics can have on employers’ organizations and society
  • Execute a targeted digital and social paid advertising campaigns
  • Nurture relationships with employers by sharing compelling content and through direct communication
New ASA Exams for Prequalification Education

• Statistics for Risk Modeling
  • 3.5 hours, computer-based, multiple choice
  • Five analytics methods: Generalized linear models, time series, decision trees, clustering, principal components analysis

• Predictive Analytics
  • Nine e-Learning modules created, including material on data visualization and communication
  • 5.25 hour proctored project in which candidates solve a business problem using R software and submit a report in Word
Enhanced PD Opportunities

• PA Certificate Program
  • Pilot program completed in Spring-Fall 2017
  • Approved by Board to continue in October 2017
  • 2 cohorts completed in 2018
  • 5 cohorts planned for 2019
  • 83 certificates earned to-date

• PA Symposium

• Seminar and Bootcamp Options
  • Health specific
  • Advanced Business Analytics
  • Primer programs in various international locations

... and ...
Welcome to Tampa!
Predictive Analytics:
Some preliminaries
A big topic: underfit vs overfit: How do we balance?

- Polynomial regression
- Spline regression
- Ridge regression
- Tree models
- ...

The following slides examine trade-offs with this model.
Let’s fit all the points: good job! … right? … right? … right?

This cubic spline model fits all the points.

Good job? Why, why not?

Why not: you don’t really think that the new points coming in would be around the red line.
Simple example: Polynomial Regression

- Higher-degree polynomial terms to capture fit
- Sometimes appear in actuarial work up to second order
- How high is too high?
- Extrapolation – watch out
Simple example: Ridge regression

- More examples of range of options: over- and underfit
- Adding all polynomial terms, penalizing coefficients
  - How much penalty is appropriate?
  - Spectrum of choices!
  - Once again – how to choose?
Simple example:
Tree

Trade-off in fit – but also in explanation.

Which would you rather explain?

Tree branch could be more than a constant.
Simple example: Many others possible

- Other types of models
  - Lasso
  - Random forests
  - Combinations
- Doesn’t matter for today – the point is:
  - The trade-off is there.
  - How do you deal with it?
Framework for addressing trade-off: Bias-Variance Trade-Off

Concept: the trade-off with increasing model complexity past a point

Simplest model is a constant: so more complexity should help.

Past a point, more complexity:
- means a better fit to experience
- means worse fit to next year
Bias-Variance Trade-off (cont’d)

In practice:
1. Split data into training and testing sets (3:1, 4:1 or so).
2. Choose complexity to minimize error vs the testing set.

In data-rich scenarios, training, validation, testing sets. Out of scope today.

From Elements of Statistical Learning (Hastie et al.):
- **Bias**: mean of the model (a random variable) and underlying reality
- **Variance**: … of the model around the mean of the model

Your model was randomly generated or calibrated in a sense (random split). That might be a talking point.
But remember: it was always random. You’re just acknowledging that and dealing with it.
Simple example of framework:
Ridge regression on 30-degree polynomial:
Best fit and worse fits; B-V T-O
Simple example of framework:
Tree model

Flattens out: with only 100 points, can only get so deep
Thanks for coming!

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