Real World Challenges Using Predictive Models to Make Underwriting Decisions

SOCIETY INSURANCE Uncommon Insurance

VALEN ANALYTICS

CAS RPM Presentation

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Agenda

- Setting the stage
- Developing and implementing a *predictive?* model.
- The change management challenge
- Measuring results
- Building a data driven culture

Types of Models and Impact

Type	Pricing	Underwriting	Agent
Prescriptive	Take it or Leave it	None	No control or flexibility
Exception Based	Same as Prescriptive for *Most*	*Can or must* intercede for certain cases	Able to plead a case for unusual accounts
Guidance	Ranges of *desired* pricing	Still review the majority of the business	Flexibility based on conditions of the account


Traditional Underwriting Cultural Milieu
Explicit recalcitrance
Pessimism
We've always done it this way
Complacency
Fear
Tribal knowledge
Passive defiance
Immobilization
Market Hegemony
Unfalsifiability of religious belief
System 1 thinking: Subjective/Associative
Arguments from Authority
Exceptions prove the rule
Tyranny of the moment
Narratives and stories
Cognitive dissonance/Self preservation
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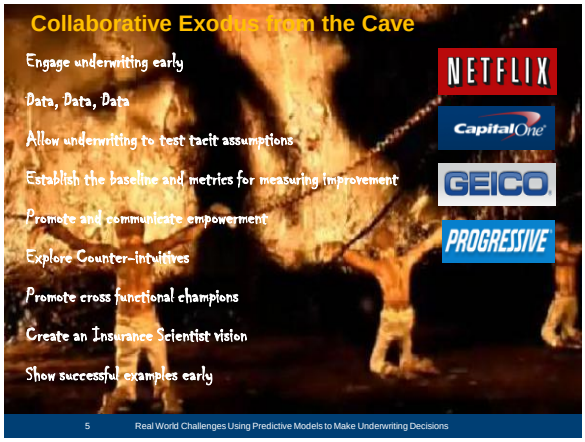
Real World Challenges Using Predictive Models to Make Underwriting Decisions


Collaborative Exodus from the Cave
Engage underwriting early
Data, Data, Data
Allow underwriting to test tacit assumptions
Establish the baseline and metrics for measuring improvement
Promote and communicate empowerment
Explore Counter-intuitives
Promote cross functional champions
Create an Insurance Scientist vision
Show successful examples early
NETFLIX
CapitalOne
GEICO
PROGRESSIVE
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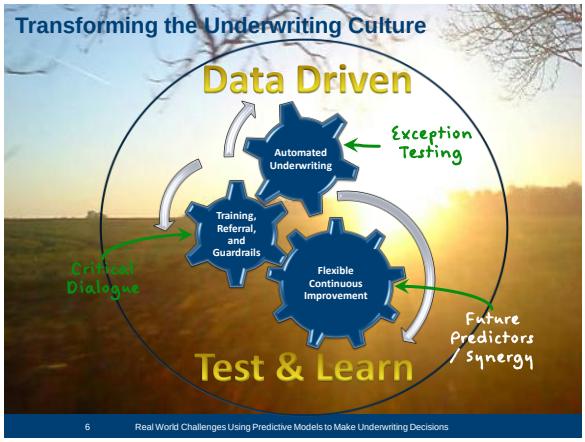
Transforming the Underwriting Culture
Data Driven
Automated Underwriting
Exception Testing
Training, Referral, and Guardrails
Critical Dialogue
Flexible Continuous Improvement
Future Predictors / Synergy
Test & Learn
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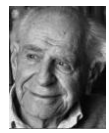
Real World Challenges Using Predictive Models to Make Underwriting Decisions

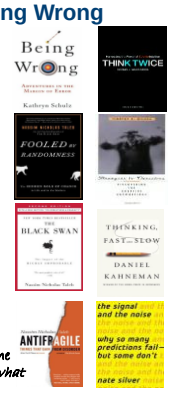
Background - Practical

- The best model in the world is only as good as the implementation.
- WC Model for small accounts
  - Signed off by U/W VP but told underwriters to price the way they wanted
  - Thought the model was a black box with no input
- Solutions:
  - Force them to use it
  - Start over with acceptance process

Cognitive Error the Advantage of Being Wrong

- System 1 & System 2: heuristic thinking is non-probabalistic
  - Predictive Analytics:
    - Engages effortful thinking
    - Forces the re-evaluation of tacit assumptions
    - Hypotheses are meant to be DIS-proven
- Cognitive Error and tacit assumptions
  - Epistemic humility
  - More on this in a moment
- Empirical skepticism
  - Intellectual honesty
  - Test and Learn
  - De-correlation of error





"The more we learn about the world, and the deeper our learning, the more conscious, clear, and well-defined will be our knowledge of what we do not know, our knowledge of our ignorance" –Karl Popper

Types of Cognitive Error

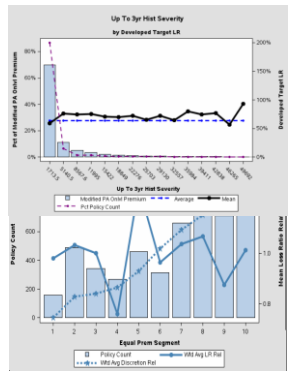
Decision making and behavioral Biases	Biases in Probability and belief	Social Bias	Memory Error
Bandwagon effect	Ambiguity effect	Actor-observer bias	Beneffectance
Bias blind spot	Anchoring	Dunning-Kruger effect	Consistency bias
Choice-supportive bias	Anthropic bias	Egocentric bias	Cryptomnesia
Confirmation bias	Attentional bias	Forer effect (aka Barnum effect)	Egocentric bias
Congruence bias	Availability heuristic	False consensus effect	Confabulation or false memory
Contrast effect	Clustering illusion	Fundamental attribution error	Hindsight bias
Déformation professianale	Conjunction fallacy	Halo effect	Selective Memory
Endowment effect	Gambler's fallacy	Herd instinct	Suggestibility
Exposure-suspicion bias	Hindsight bias	Illusion of asymmetric insight	
Extreme aversion	Hostile media effect	Illusion of transparency	
Focusing effect	Illusory correlation	Ingroup bias	
Framing	Ludic fallacy	Just-world phenomenon	
Hyperbolic discounting	Neglect of prior base rates effect	Lake Wobegon effect	
Illusion of control	Observer-expectancy	Notational bias	
Impact bias	Optimism bias	Outgroup homogeneity bias	
Information bias	Overconfidence effect	Projection bias	
Irrational escalation	Positive outcome bias	Self-serving bias	
Loss aversion	Primacy effect	Modesty bias	
Neglect of probability	Recency effect	Self-fulfilling prophesy	
Mere exposure effect	Reminiscence bump	System justification	
Obsequiousness bias	Rosy retrospection	Trait ascription bias	
Omission bias	Subadditivity effect	Ultimate attribution error	
Outcome bias	Telescoping effect		
Planning fallacy	Texas sharpshooter		
Post-purchase rationalization			
Pseudocertainty effect			
Reactance			
Selective perception			
Status quo bias			
Unacceptability bias			
Unit bias			
Von Restorff effect			
Zero-risk bias			

A Few Examples

Cognitive Error (s)	What I hear/see from Underwriters
Bandwagon effect/Herd instinct	We write restaurants; we don't write contractors. We only write policies with LR <30% case incurred
Choice-supportive bias/Overconfidence Effect	I had a low loss ratio last year and increased my premium volume; my choices will only improve
Confirmation bias	High hazard account and they had a big loss; I knew it was a bad risk!
Focusing effect	High historical loss ratio means bad account (this is pervasive)
Framing/Halo/Mere Exposure Effect	Same info, different agent…different answer. Narratives can carry more associative weight than empirical facts
Hyperbolic discounting	Large accounts systematically get better pricing, even with obviously worse expected values
Loss aversion/Von Restorff effect	Miscalculations of severity vs. frequency considerations; along with focusing effect in overestimating expected values of large historical losses
Outcome bias	Managers/Executives: BE CAREFUL! Also called Hindsight bias: "I knew it all along. You wrote this?! You're fired!"
Attentional bias	Evaluating restaurant frequency relative to a state average frequency
Gambler's fallacy	Their Due!

Results of Cognitive Error

- Biases create largely unknown opportunity costs
- Traditional risk selection criteria generally reduces populations of extremely bad results
  - Distribution of risks when scored through an industry standard model is left skewed
- Pricing to risk is highly correlated to policy size and e-mod
- Pricing has low or inverse correlation to risk quality
  - Heard at the water cooler:
  - "We keep making great rate estimates and the underwriters keep screwing them up!"
  - "We're given these absurd rate level goals and we have to work in the real world!"



Process Issues

- Underwriters are in charge of individual risk selection:
  - Models rely on consistency of selection criteria that is not in the model. Credit
- Who is in charge of individual price selection:
  - Actuaries are good at using group data, but what about the exceptions. 10 year old vs new roof on 50 year old building.
  - How do you react to market conditions
  - How are these decisions made, communicated and incented

Reacting to Changing Conditions

- Management wants growth?
  - Lower price
  - Softer underwriting
  - More marketing (of what)
- Who decides the impact of these on the model?
  - Underwriting, Marketing, Sales, Actuarial, Products, Management
  - How flexible is the model and IT on changes

Vision of Business

- Clear Communication of Goals for Business
- Interdependency of rate level with:
  - Model individual pricing and dividends
  - Marketing and Underwriting guidelines
- Feedback/Monitoring/Updating
  - Model
  - Underwriting/Marketing/Sales on what is working or not working

How to Be Right and Lose a Bunch of Money

- Model indicates the need for pricing changes of 30% up and down. What can go wrong?
  - *Only take the decreases*
  - *Only take the increases*
  - *Phase in only one of the two*
  - *Model is wrong?*
  - *Underwriting changes/processes not considered. Credit score*

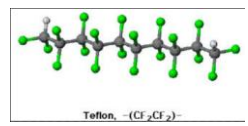
Dangers from Lack of Credibility

- What to do when you don't have enough data.
  - Use competitors information
  - Use industry data
  - Use non-insurance data
- Challenges
  - Underwriting - credit
  - Claims – Strong vs weak, they are all better than average?
  - Policy – Broader or more limited coverage

Here be Dragons!

- Model uses capped losses, but Underwriter cancels everything with a *large* loss.
- Model uses frequency assumption that is different than underwriting
- Model assumes that overall rate level is fine, but underwriter wants to adjust for a bad or good year
- Underwriters were pricing to what market would bear and model moves dramatically away.
- Black box disallows effective feedback loops
- Target or target interpretation allows for double counting
- Disparity between variable definitions: (Modeling vs. Production)

Your Teflon/Asbestos vest



- Communicate, Communicate, Communicate
- Make the model transparent or at worst slightly hazy
- There will be a transition period and premium volume may shrink
- Monitor and Report and this means showing the good and bad
- Create durable, systematic feedback loops
- Adjust – Make sure the system is flexible
- Be adaptive—Drive toward a test everything culture and promote the value of failure as learning from mistakes

Model Development and Data Concerns

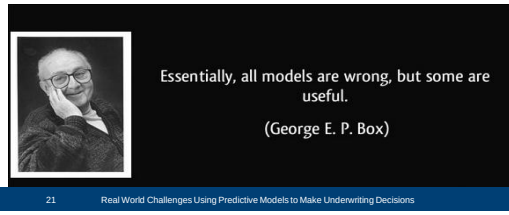
- Understand not only the data, but also the process that created it, i.e. underwriting and appetite shifts over time.
- Clearly understand the processes in other departments that affect the data. Why market to a niche you are pricing out of the market.
- Be wary of extreme data and its impact on everyone. Just because we cap and stabilize doesn't mean others do.
- Sample Size: How much is enough?
- Sample Partitioning and stratification
- Blind Validation / Extrapolation Datasets

How to be the White Knight

- Underwriters must believe they are being moved from processors to adding value to the process.
  - Not looking at everything
  - Being involved in interpreting results, building the model and underwriting guidelines (no model can think of or have data on everything)
  - Becoming "Portfolio Risk Managers"
- Build in feedback loops to improve and explain the model results.
  - Discuss the model good, bad and limitations
  - Actively solicit new ideas
  - Be on the lookout for other information no matter how tenuous the connection may seem.
  - Don't be afraid to experiment and fail

Final Thoughts

- The balance between the art and the science can be accretive and promote continuous learning if you've begun with the end in mind
- Building a predictive analytic framework is more about building a data driven, test and learn culture



Things to Remember

- Models can be right and still fail
- Failure is a good outcome
- Communicate, communicate, communicate
- All data is not the same even if it says it is
- The model is a journey not a result

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