CASTF Book Club

Predictive Modeling Variables and Potential Implications

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PRESENTER

Dave Heppen, FCAS, MAAA
Actuarial Partner

- Key areas of expertise include ERM, financial reporting, reinsurance, and the use of complex models in ratemaking and reserving.
- Chair of the American Academy of Actuaries' (AAA) ERM/ORSA committee, Chair of the AAA's Workers' Compensation Committee, member of the AAA's Committee on Property and Liability Financial Reporting, member of the AAA's Casualty Practice Council, and member of the AAA's Risk Management and Financial Reporting Council
- Frequent speaker at industry conferences; author of numerous publications on Property/Casualty risks.

PRESENTER

Jennifer Balester, FCAS, MAAA
Actuarial Consultant

- Key areas of expertise include reserving, financial reporting, process improvement and documentation, and implementation of complex models for underwriting, pricing, and other uses.

- Member of AAA Data Science and Analytics Committee and Casualty Actuarial Society Syllabus & Examination Committee

OBJECTIVES

- Provide overview of use of complex models for ratemaking
- Provide examples of rating variables we have encountered in reviews of complex models used for P&C ratemaking
- Discuss potential implications of the use of such variables
- Receive feedback from CASTF members on follow-up information that would be useful in thinking about the issues raised during the discussion

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Principles of Ratemaking

PRINCIPLE 1

A rate is an estimate of the expected value of future costs

PRINCIPLE 2

A rate provides for all costs associated with the transfer of risk.

PRINCIPLE 3

A rate provides for the costs associated with an individual risk transfer.

PRINCIPLE 4

A rate is reasonable and not excessive, inadequate, or unfairly discriminatory if it is an actuarially sound estimate of the expected value of all future costs associated with an individual risk transfer

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RATING VARIABLES

Rating Variables are characteristics of the insured that are correlated with either the propensity to make a claim or the severity of that claim.

1. **Statistically Significant**
   Differentiate between different groups based on the projected cost to insure
2. **Objective**
   Does not require any judgment
3. **Verifiable**
   Unable to be manipulated by the insured
4. **Easy to Administer**
   Cost to use the variable does not outweigh benefit recognized

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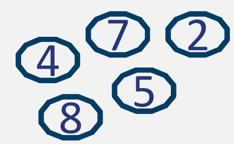
Changing World

Increased access to technology

Increased adoption of complex models

Better grouping and segmentation of risk



Increased complexity for regulators

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Regulation of Complex Models

- Regulators may reject or prohibit variables if they differentiate between policyholders based on prohibited characteristics whether that differentiation is intentional or unintentional.
- Examples of protected classes:
  - Federal: race, color, sex, sexual orientation, gender identity and expression, national origin, religion, age, military status, equal pay, pregnancy, disability, or genetic information
  - Most states: race, religion, national origin
  - Life insurance in NY State: race, color, creed, national origin, status as a victim of domestic violence, past lawful travel, sexual orientation

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Disparate Treatment vs. Disparate Impact

- Discrimination does not have to be overt to be disallowed
- Disparate treatment: intentionally treating someone differently because of a given characteristic
- Disparate impact: causing a disproportionate result on a certain group
- The NAIC's Special (EX) Committee on Race and Insurance scope includes these considerations

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Potential Pitfalls

- Variable that represents a prohibited characteristic
- Another variable takes the place of the variable that represents a prohibited characteristic
- Some insureds subsidize other insureds when the company is not allowed to differentiate between them despite different costs
- Adverse selection
- Company rejects risks that they cannot adequately price

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Sources of Variables

- Policy Characteristics - Deductible, Limit, Coverage Amount
- Characteristics of Insured (or Insured Property) – location, age of home, vehicle model, violations
- Financial Characteristics – payment history, credit score
- Claims History – number of claims, dollar value of claims, type of claims
- Demographic data – general characteristics often based on zip code

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Example 1 – Prior Claims History

1. Statistically Significant
2. Objective
3. Verifiable
4. Easy to Administer

Implications

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Example 1 – Prior Claims History

- Rating Variable Construction
  - Data may come from internal claims history or from external sources such as Comprehensive Loss Underwriting Exchange (CLUE)

- Industry View of Variable Relationship to Loss Propensity
  - Generally highly correlated with future loss potential

- Usage
  - Commonly accepted variable

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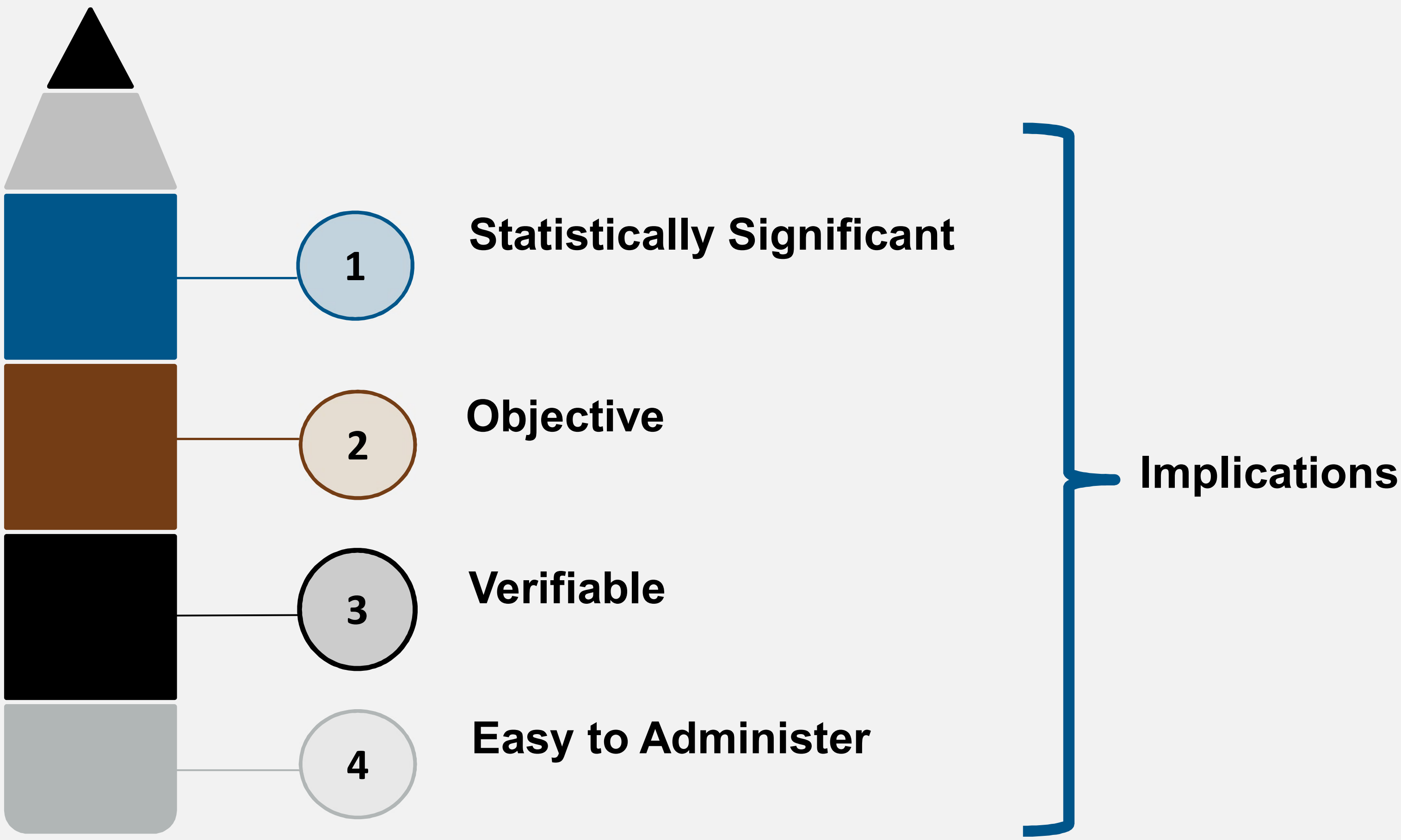
EXAMPLE 2 – CREDIT SCORE



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Example 2 – Credit Score

- Rating Variable Construction
  - Data from external sources such as Experian
- Industry View of Variable Relationship to Loss Propensity
  - Generally correlated with future loss potential
- Usage
  - Used in most states, but often subject to strict guidelines

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Example 3 – Motor Vehicle Violations

1. Statistically Significant
2. Objective
3. Verifiable
4. Easy to Administer

Implications

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Example 3 – Motor Vehicle Violations

- Rating Variable Construction
  - External data from Motor Vehicle Report (MVR)
- Industry View of Variable Relationship to Loss Propensity
  - Generally highly correlated with future loss potential
- Usage
  - Commonly accepted variable

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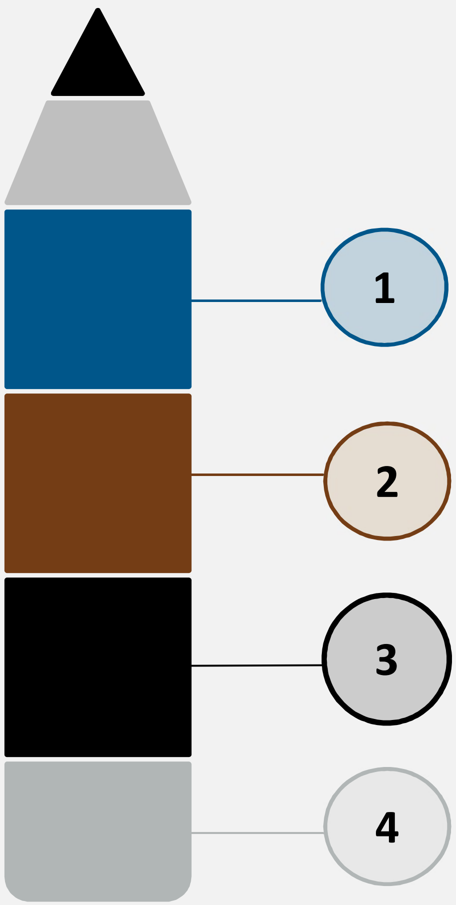
EXAMPLE 4 – DRIVER AGE



1. Statistically Significant
2. Objective
3. Verifiable
4. Easy to Administer

Implications

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EXAMPLE 4 – DRIVER AGE

- Rating Variable Construction
  - Internal policy data

- Industry View of Variable Relationship to Loss Propensity
  - Generally highly correlated with future loss potential

- Usage
  - Protected class, but has become acceptable for certain uses in insurance

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Example 5 – Amount of Insurance

1. Statistically Significant
2. Objective
3. Verifiable
4. Easy to Administer

Implications

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Example 5 – Amount of Insurance

- Rating Variable Construction
  - Internal policy data
- Industry View of Variable Relationship to Loss Propensity
  - Direct relationship to severity of losses
- Usage
  - Commonly accepted variable

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Example 6 – Population Density

1. Statistically Significant
2. Objective
3. Verifiable
4. Easy to Administer

Implications

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EXAMPLE 6

- Rating Variable Construction
  - External demographic data, such as Census
- Industry View of Variable Relationship to Loss Propensity
  - Not an obvious direct causal link to loss, but often correlated with loss
- Usage
  - Demographic variables are commonly accepted

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Reviewing a Model

- Understand the target variable
- Understand the predictive variables
- Assess the model output and validation
- Understand how the model is used and whether any judgment can be layered on top of the model results
- Understand triggers for model recalibration or update

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QUESTIONS AND CONTACT INFORMATION

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We welcome any feedback you have on this presentation or the topic in general.

Sources:
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