PREDICTIVE ANALYTICS AND THE CAS

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Agenda

- The CAS Institute

- Predictive Analytic Projects

- Questions and Discussion

CAS basic education strategy is focused in three areas

- The actuary of the future: identification of our members' future educational needs

- Transformation of content delivery and validation methods

- Review of preliminary educational requirements

CAS is adapting its basic education program to the changing environment

- Advent of Big Data and Big Data methods

- Emergence of new P&C risks and insurance coverages

Introducing
The CAS Institute

Also known as "iCAS"

What is The CAS Institute?

- Subsidiary of the Casualty Actuarial Society
- Provides credentialing and professional education to quantitative specialists in selected areas, such as:

Predictive Analytics / Data Science	Catastrophe Modeling	Capital Modeling / ORSA analysis
Quantitative Reinsurance Analysis	Other analytics and quantitative specialties	

Why was The CAS Institute Created?

To meet a market need for specialization

- Actuaries working in advanced analytics and data science
- Data scientists working in the insurance industry

To serve professionals in practice areas where quantitative and actuarial skills overlap

To allow the CAS to continue its focus on credentialing property and casualty actuaries

How are the CAS and The CAS Institute Different?

Casualty Actuarial Society	The CAS Institute
Independent professional society	Wholly-owned subsidiary of CAS
Premier credentialing and professional association for property and casualty (P&C) actuaries	Offers specialty credentials in selected quantitative practice areas that target both actuarial and non-actuarial professionals
For actuaries working primarily in the insurance sector	Will span multiple sectors, including insurance and risk management
Time required to earn Fellowship credentials: 5-7 years	Time required to earn specialty credentials: 1-2 years

How will the CAS Institute Credentialing Process Work?

Candidates will follow a relevant course of study, including self-study programs that meet specified learning objectives.

- Knowledge and competency assessments will include examinations, and possibly a project.
- May grant credit for previously completed academic courses, academic degrees, professional technical papers, or other evidence of practical specialized knowledge and experience.

How Will the CAS Institute Ensure the Quality of its Credentials?

Oversight by an expert panel of industry specialists and thought leaders in each practice area that:

- Establishes eligibility requirements
- Creates the curriculum
- Directs development of educational materials
- Sets competency levels
- Oversees high-quality examination
- Establishes experienced practitioner pathway

Data Science/Predictive Analytics Credential Requirements

1. **P&C Insurance Principles**
   - Extracts from CAS online courses 1 & 2; Extracts from CAS Exam 5: Ratemaking / Reserving
   - One online module – similar to CAS online courses 1 & 2, with multiple choice and short answer questions

2. **Data Concepts, Tools and Visualization**
   - Multiple choice, short answer exam

3. **Predictive Modeling – Methods and Techniques**
   - Computer-based exam – requires ability to use software

4. **Predictive Modeling Application Project**
   - Individual project; not an exam or online module
   - Assessed by Project Review Panel

Winning an unfair game

"People operate with beliefs and biases.

To the extent you can eliminate both and replace them with data,
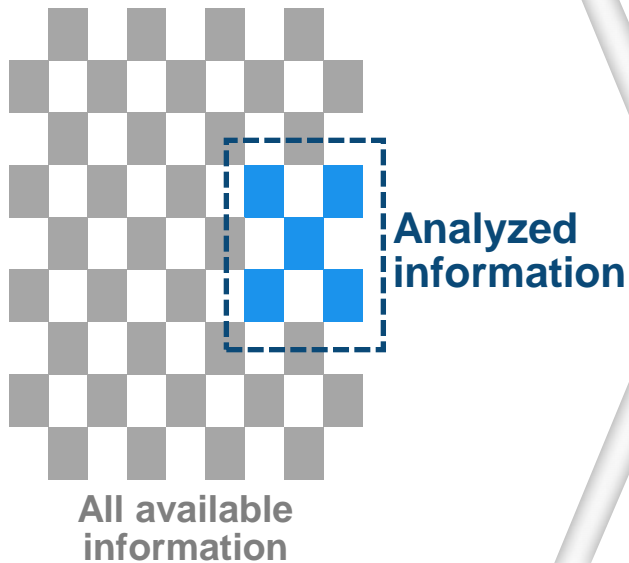
you gain a clear advantage."

Michael Lewis,

Moneyball: The Art of Winning an Unfair Game
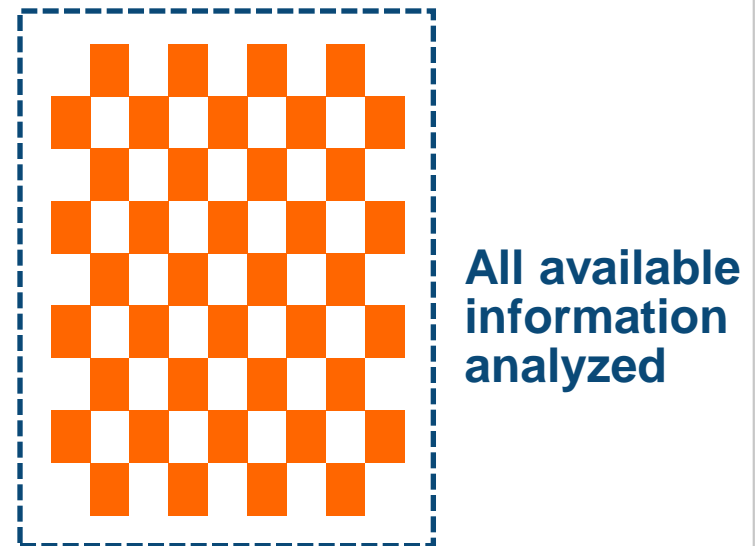
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Analytics can help identify "Useful" data

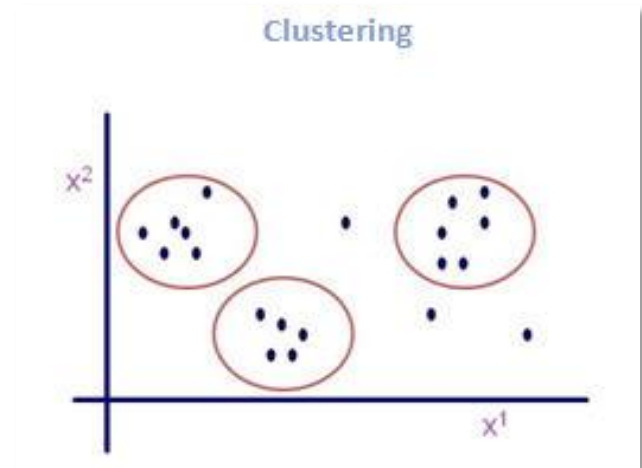- Leverage more of the data being captured
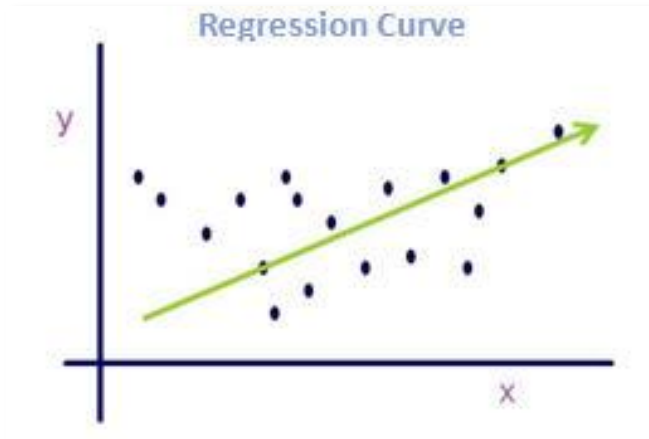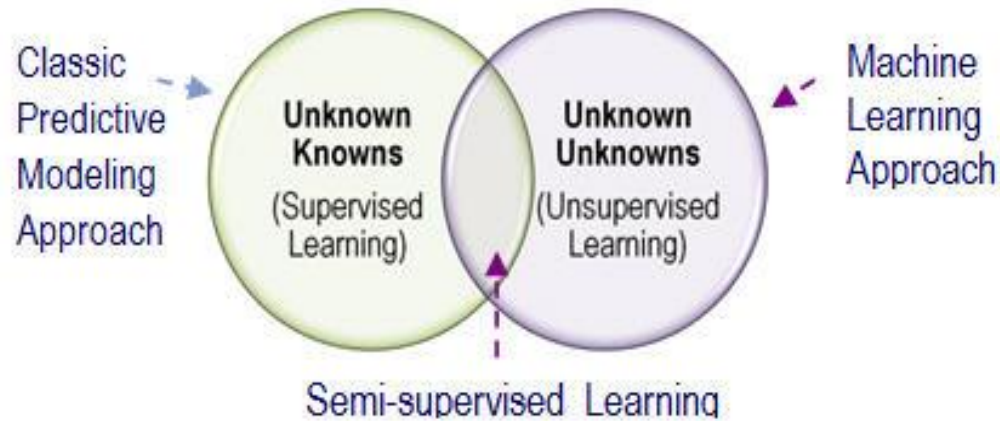
Traditional Approach

Analyzed information

All available information

Analyze small subsets of data

Big Data Approach

All available information analyzed

Analyze *all* data

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Supervised versus Unsupervised approaches

Text mining variables

- Text mining refers to the process of deriving relevant and usable text that can be parsed and codified into a word or numerical value.

- Text mining can identify co-morbid conditions and/situations that will have profound impact on the outcome of a claim.

Text sources: Adjuster notes, medical reports, independent medical exams, etc.

SAMPLE KEY WORDS/PHRASES
▪ Diabetes/insulin/injections
▪ Packs day/coughing
▪ Pain killers/anti-depression
▪ Children/school
▪ Pain unchanged
▪ Height/Weight
▪ Homemaker wife went to work
▪ c/o, CXR, FB, FX
▪ CBT – Cognitive Behavior Therapy

Case Study

Claim Segmentation

Decision support example - claims

Quickly identify "creeping catastrophic" claims.

- **Less than 20% of claims cause 80% of losses**

Create better claims outcomes with more timely and more detailed information.

- **Loss cost reductions that generally range from 3-6% per year**

"Operationalize" into claims/medical protocols/rules.

Integrate management of all available sources of data/information.

"Second pair of eyes" on existing claim/medical vendors.

Ancillary benefits.

- **Data driven culture**

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Segmentation analysis

Divide All Claims into 5 buckets of 20% each.
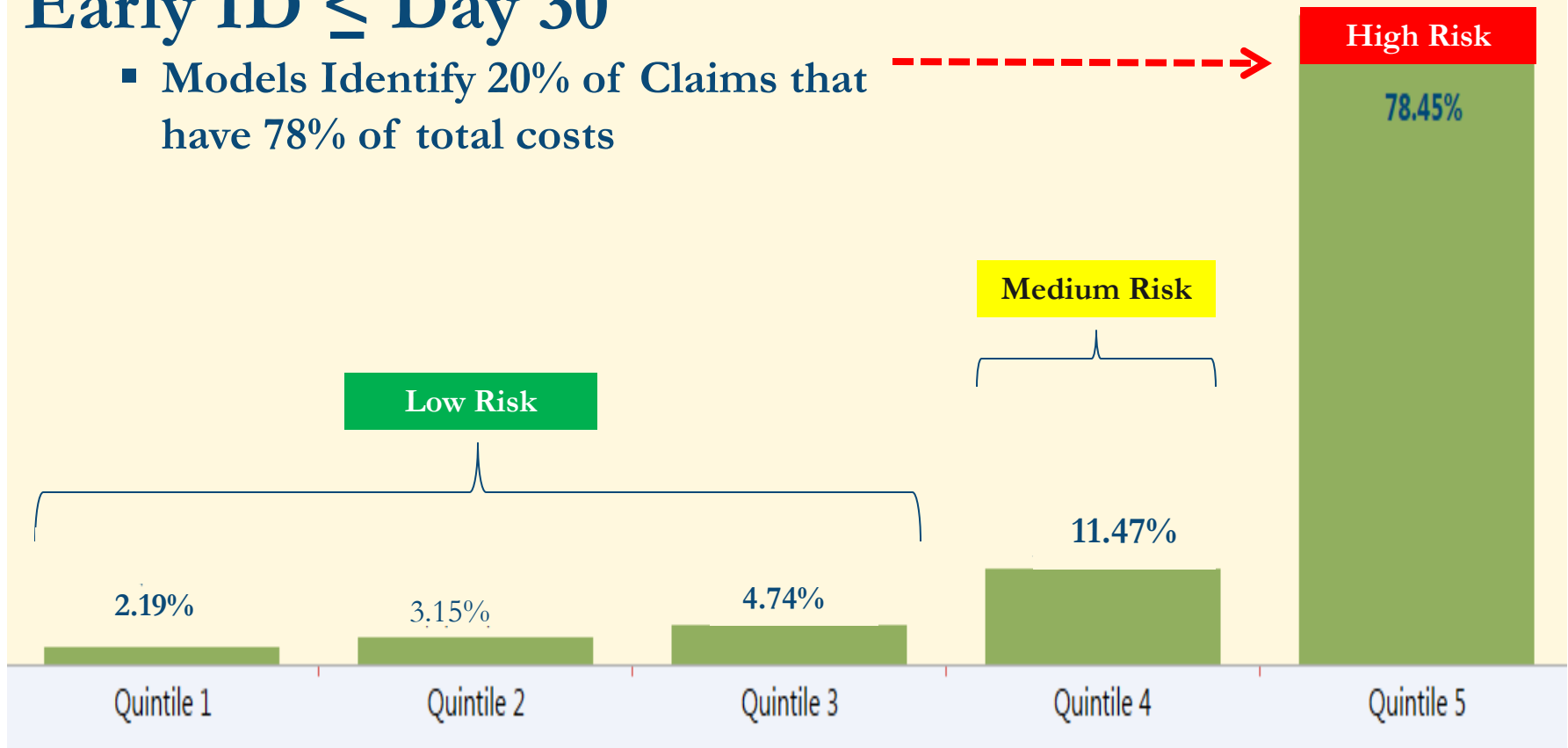
- **After Scoring distribute by Risk Score**

- **Highest Risk to the Right**

- **Lowest Risk to the Left**

- **Each Claim has a individual score**

- **Worst Claim far right vs. Best Claim far left**

- **Then add actual losses to test model accuracy**

20%	20%	20%	20%	20%
Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
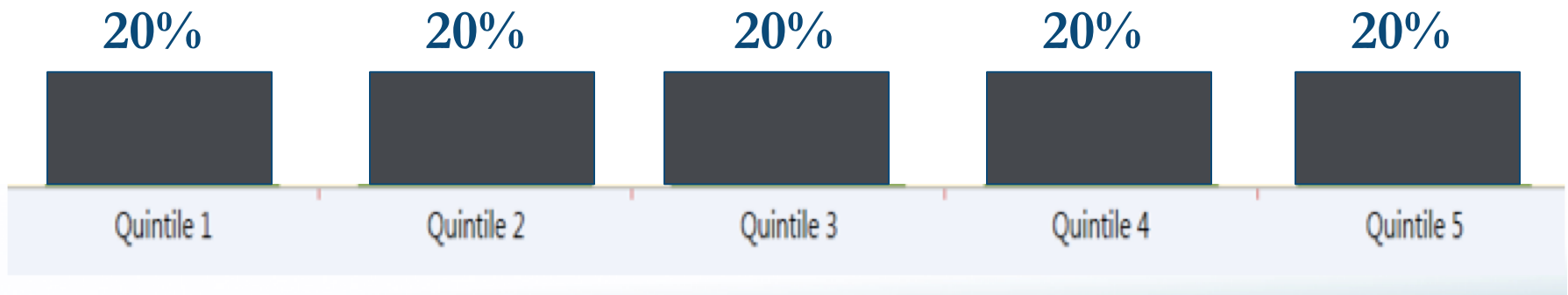
Predictive modeling in action

Early ID ≤ Day 30

- **Models Identify 20% of Claims that have 78% of total costs**

High Risk
78.45%

Medium Risk

Low Risk

11.47%

2.19%

3.15%

4.74%

Quintile 1   Quintile 2   Quintile 3   Quintile 4   Quintile 5

Claims Examples

- **Claims Scoring / Segmentation Analysis**
  - **Identification of which claimants would obtain more value (lower claim cost) with more clinical management**
  - **Early identification of low cost claims (less claim involvement)**
  - **Early identification of high cost claims (more claim involvement)**

- **Expense Analytics**
  - **Best performing outside legal council**
  - **Effective defense strategies**

Case Study

Using Telematics for Auto Portfolio

Using Telematics for Auto Portfolio

- **Data:**
  - 500,000 European auto policies
  - Years 2009-2013
  - 10% of policies had telematics installed

- **Telematics Data available**
  - Typical road type driven (highway, rural, town, other)
  - Number of trips per year
  - Total Mileage per year
  - Mileage per trip
  - Percentage of Mileage on Highways
  - Percentage of Mileage in towns
  - Percentage of Mileage in rural areas
  - Percentage of day trips

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Using Telematics for Auto Portfolio

- **Initial Observations:**
  - Policies with Telematics received a fixed premium discount
  - The premium discount was not adjusted depending on the measured telematics data
  - Polices with Telematics data had higher loss costs
    - Even without the discount, the loss ratios of the telematics business would have been higher compared to the non-telematics policies
  - Drivers were generally younger

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Using Telematics for Auto Portfolio

- **Variable Importance in Loss Ratio Model**
  - **Engine Power**
  - **Primary Road Type (telematics data)**
  - **Power/Weight of Vehicle**
  - **Mileage (telematics data)**
  - **Number of Trips (telematics data)**
  - **Percent of Mileage on Highways (telematics data)**
  - **Claims Free History**
  - **Age of Driver**
  - **Age of Vehicle**

The telematics data items (especially mileage as an exposure measure were very predictive for the loss ratio (and also the loss costs)

Using Telematics for Auto Portfolio

- **Overall Observations when analyzing just Telematics portfolio:**
  - All telematics policies did not warrant a premium discount
  - Clear segments that did have lower loss ratios
  - Moderate mileage primarily on highways indicated most discount
  - High mileage – but few trips indicated highest surcharge

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Other Examples

Underwriting Examples

- **Identify Market Segments**
  - **Segments with lowest loss ratios**
  - **Segments with highest retention ratios**
  - **Lapse Behavior**
  - **Segments with greatest likelihood of quote conversion (new business success)**
- **Scoring Models**
  - **Relate prescription drug histories**
- **Refine Pricing Models**
  - **Identify key predictive variables to reduce the number of information required from policy holders**

Improve Business Efficiency

- **Improve Expenses related to call center**
  - **Identify frequency of calls**
    - **Weather forecast, macro-economic data, local specific data (sport events, conventions)**
  - **Goal is to staff call center appropriately**
- **Relate Traffic / Travel with revenue opportunities**

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Thank you

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