NAIC National Association of Insurance Commissioners

NIPR NATIONAL INSURANCE PRODUCER REGISTRY


# Predictive Modeling Overview

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# PREDICTIVE MODELING: 7 KEY QUESTIONS




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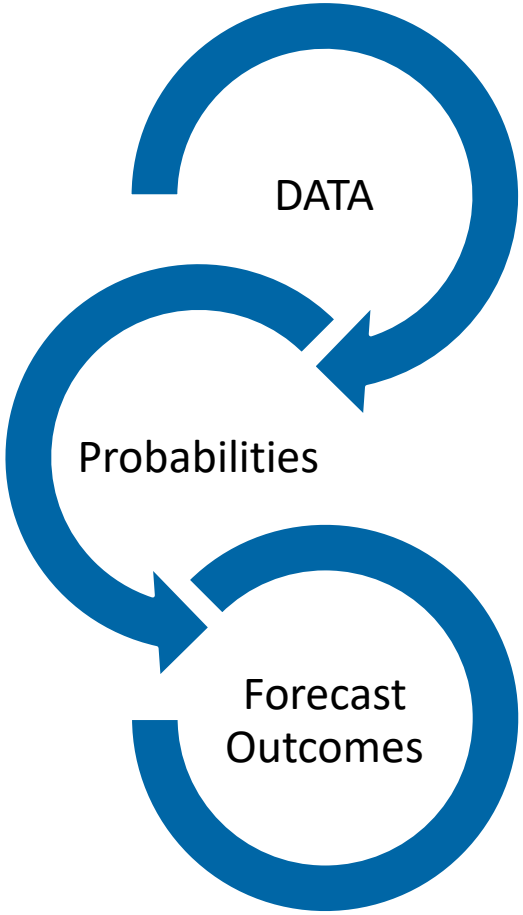
# 7 Key Questions

- *What* is predictive modeling?
- *Where* does predictive modeling occur?
- *Who* does predictive modeling?
- *Why* is predictive modeling done?
- *When* does predictive modeling happen?
- *How* is predictive modeling done?
- *How much* predictive modeling is enough?



# What Is Predictive Modeling?



# Where Does Predictive Modeling Occur?






**In short, EVERYWHERE!**

# Where Does Predictive Modeling Occur in Insurance?

- Ratemaking
- Underwriting
- Claims
- Reserving
- Human Resources
- Marketing
- Investments
- Etc.

# Who Does Predictive Modeling?

- Data Scientists
- Statisticians
- Actuaries
- Quants

People well versed in data, probabilities, and interpreting forecasted outcomes

# Who Does Predictive Modeling in Insurance Companies?

- Data Scientists
- Statisticians
- Actuaries
  - Actuarial Standards of Practice and the Professional Code of Conduct apply when actuaries are involved
- Quants

# Why Is Predictive Modeling Done?

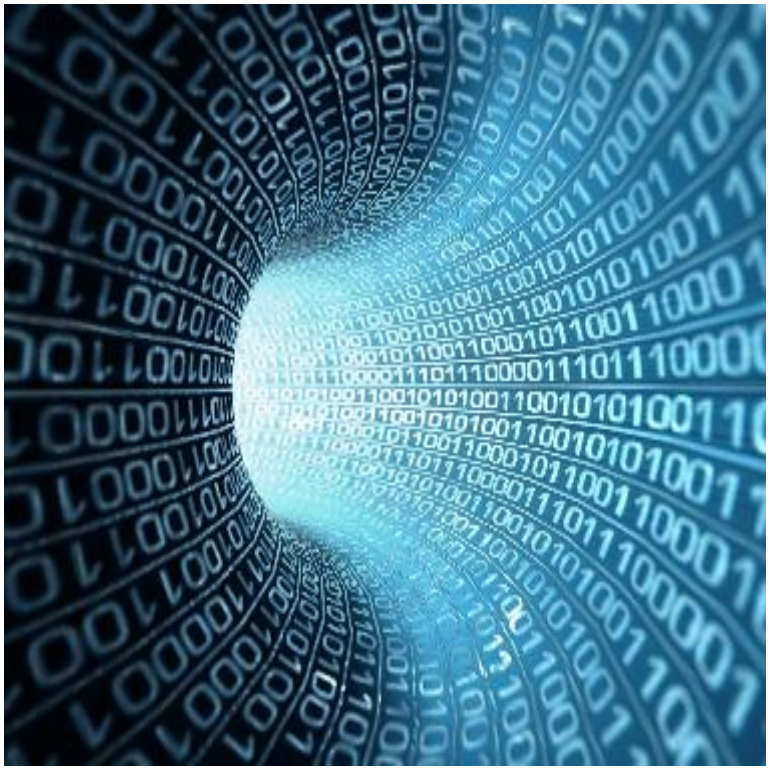
- Data driven decision making
- The ability to explain the world and human behavior
- To develop insights, both logical and unexpected
- To improve the world
- Personalization
- Instantaneous results

# Why Is Predictive Modeling Done by Insurance Companies?

- Protection against adverse selection
- More accurately match price to risk
- Gain a competitive advantage
- Improved reserve adequacy
- Prevent costly insurance fraud
- Innovation (telematics/UBI)
- Ability to write more customers
  - Less in residual markets

# When Is Predictive Modeling Done?

- When stronger computing power can enable something to be done that could not be done before
- When business problems necessitate modeling
- When newer data is available
- When newer data sources are available
- When open source code makes it easier

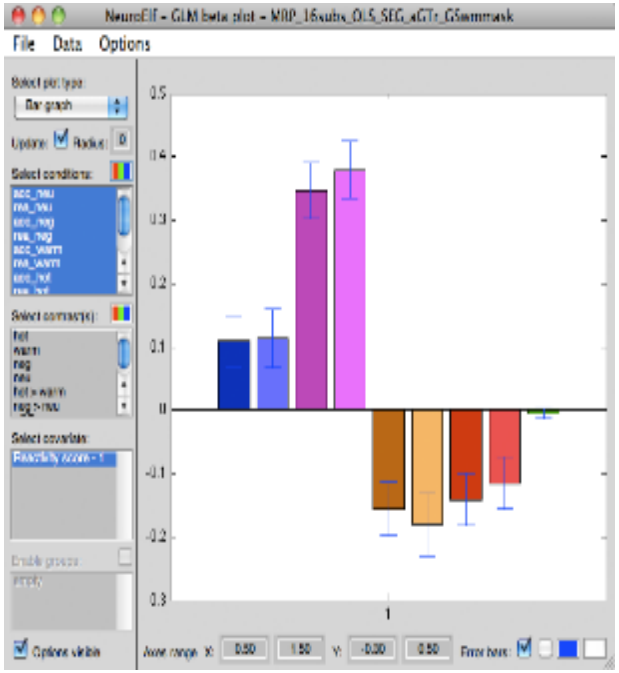


# When Is Predictive Modeling Done for Insurance Companies?

- When stronger computing power can enable something to be done that could not be done before
- When business problems necessitate modeling
- When newer data is available (refreshing a model)
- When newer data sources are available (creating a new model)
- When new interactions are learned
- When new statistical models become available (GLM to GBM)


Predictive modeling has always been done and will continue to always be done. The techniques, data, and technology allow for continuous evolution.

# How Is Predictive Modeling Done?




- Generalized linear models
- Decision trees
- Gradient boosting models
- Neural networks
- Experimentation
- Etc.

# How Is Predictive Modeling Done in Insurance Companies?

- Historically, univariate loss ratios, Bailey's Minimum Bias procedure, or sequential analysis for ratemaking
- Currently, generalized linear models (GLM) dominate the ratemaking arena
- Experimenting with gradient boosting models (GBM) now in ratemaking space
- In accordance with Actuarial Standards of Practice
- No companies do the same thing (no one-size-fits-all)
- Other techniques used for underwriting, claims, etc.

# How Much Predictive Modeling Is Enough?

- Ability to store and access more data simultaneously given technology advances
- Competitive pressures
- Consumer adoption
- Privacy
- Appropriate data sources and validation techniques

# How Much Predictive Modeling Is Enough in the Insurance Industry?

- Balance between insurance company innovation, regulation, and consumer interest
- Insurance companies need to revisit models to avoid adverse selection
- Shift from larger homogenous group pricing to more granular pricing

# PREDICTIVE ANALYTICS: A PRACTICAL PERSPECTIVE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# A Practical Perspective: Predictive Modeling

- Why?
- How?

# A Practical Perspective: Why?

- Profitable Growth
- Avoid Adverse Selection

# A Practical Perspective: Key Observation / Can Not Be Overemphasized

- Adverse Selection, …
  - **anti-selection**, or **negative selection** is a term used **in** economics, insurance, risk management, **and** statistics. **It refers to a market process in which undesired results occur when buyers and sellers have** asymmetric information**.**

# A Practical Perspective:
# How: Yesterday

Key Characteristics:

- Myopic *(?)*
  - Limited data,
  - Uni-variate analyses,
  - Linear relationships,
  - Limited analytic horsepower.

# A Practical Perspective: How: Today

Key Characteristics:

- Scientific
  - *Big Data and lots of it!*
  - Multi-dimensional analyses,
  - Great variety of potential relationships tested,
  - Interactions,
  - Unlimited analytic horsepower.

# A Practical Perspective: Personal Auto

- Key factors:
  - How many miles are driven,
  - Where are they driven,
  - When are they driven,
  - How are they driven,
  - What is driven,
  - And the insured's proclivity to use the insurance product.

# A Practical Perspective: Homeowners

- Key factors:
  - Type of home,
  - Age of home,
  - How maintained,
  - Weather exposure,
  - And the insured's proclivity to use the insurance product.

# A Practical Perspective: Commercial Auto

- Key factors:
  - Type of Business
  - Business tenure
  - Location
  - How many miles are driven,
  - Where are they driven,
  - When are they driven,
  - How are they driven,
  - What is driven,
  - And the insured's proclivity to use the insurance product.

# A Practical Perspective: Commercial Multiperil

- Key factors:
  - Type of Business
  - Business Tenure,
  - Geographic location,
  - Weather exposure,
  - And the insured's proclivity to use the insurance product.

# A Practical Perspective: Workers Compensation

- Key factors:
  - Type of Business
  - Business Tenure,
  - Location,
  - And the insured's proclivity to use the insurance product.
    - ***Most recent experience!***

# A Practical Perspective: Interactions!

- Between data elements, and…
- Between coverages

# A Practical Perspective: How: Tomorrow


Key Characteristics:

- It is now!
  - *More Big Data and lots of it!*
  - Activity trackers,
  - Phone apps,
  - ……

# Questions

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# For More Information

For more information, contact

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