



Implementation of a Predictive Model

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Concurrent Session PL-6
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Implementation of a Predictive Model

- As actuaries we tend to focus on the theory behind predictive models:
 - What are generalized linear models?
 - What do they do?
 - How do they do it?
 - How do we build a predictive model?
 - How do we translate the model output into a revised class plan or a tiering structure?

Implementation of a Predictive Model

- This session is designed to go to the next step.
- Once the decision is made to get involved in predictive modeling, what comes next?
- What are the implementation issues?

Implementation of a Predictive Model

- Here are just some of the implementation questions that should be answered before the modeling begins:
 - Who will do the modeling? Staff? Consultants?
 - What lines of business? Auto? Homeowners? Other?
 - What data will be used? Internal? External?
 - Will the result be a revised class plan or a tiering model? Other?
 - Will the results of the modeling apply to all business or new business only?
 - How long will it take?
 - How much will it cost?

Implementation of a Predictive Model

- Here are some additional questions that need to be answered before the modeling is complete:
 - What systems support is needed?
 - Who will be responsible for regulatory compliance?
 - What policyholders will be impacted by the implementation of the results of the modeling?
 - What will the impact be on those affected by the model?
 - What are the reactions of field personnel?
 - Is training required for marketing and underwriting personnel?

Implementation of a Predictive Model

- Horace Mann Insurance Companies recently went through this process.
- Here to share some thoughts about his experience implementing predictive modeling is Don Closter, AVP of Pricing Research at Horace Mann.
- Don Closter
 - Responsible for developing and implementing predictive modeling for Horace Mann.
 - Twenty-eight years in actuarial pricing field with Horace Mann, Nationwide and Hanover.
 - Associate of Casualty Actuarial Society and Member of the American Academy of Actuaries.
 - Graduate of Kent State University.

Implementing a Rating Structure Based on Predictive Modeling

From Zero to One
(and beyond)

Concurrent Session PL-6

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Don Closter, ACAS, MAAA

Horace Mann Insurance Companies



Horace Mann
Educated Financial Solutions

Outline

- 1) Why bother?
- 2) Commitment
- 3) Data
- 4) Software
- 5) Hardware
- 6) Algorithm Design
- 7) Model Output
- 8) Histograms
- 9) Peer Review
- 10) Filing
- 11) Systems Issues
- 12) Testing
- 13) Communication
- 14) Follow-up & Measurement
- 13) The Production Environment
- 14) The Future

Why Bother?

- Minimize adverse selection
- Accurate pricing for risks
- Knowledge of book of business
- Quantifies problem areas
- Identifies opportunities for growth
- Allows for creation of unique pricing

Commitment – The starting point

- Large, long term project
- Management must recognize the need and be willing to invest for the future
 - People: 5 people half days
 - Time: 2 years for first state
 - Tools: Predictive modeling software & the hardware to run it efficiently
 - and there is a learning curve.

Data is King

- The first painful step is getting clean data in an acceptable format at a policy level.
- Take 4-8 months to understand data & clean it up at a detailed level.
- You need to understand the data coding process including policy input, coding changes over time, claims coding and how to connect policy data with claim data.

Data is King

part 2

- You will most likely find:
 - Invalid codes
 - Codes with multiple meanings
 - Data not updated or maintained
 - Blank fields
 - Dummy data
- These items need to be identified and fixed going forward so the problems don't perpetuate.
- You also need to consider correcting historical data based on the value that data can provide weighed against the cost of correction.

Software

- A number of different software packages are available.
- Software analyzes policy level parameters on a multivariate basis so covariance and interactions can be accounted for.
- Important to have a source for help.

Hardware

- Lots of data (millions of records) are being analyzed at once so computing capacity can become an issue.
- Our initial analysis runs in some cases took 8 or more hours to run.
- We ended up purchasing a server dedicated to the research area and made some technical changes to reduce the run time for the largest analyses to an hour or two.
- This is also where service after the sale of our software product came in handy.

General Approach

- Countrywide analysis
- Maintain overall indication process on an individual state level
- Use predictive modeling to generate indicated relativities for distribution of the overall state need
- Some items (like PIP) may need to be analyzed separately at some level other than Countrywide

Algorithm Design

- What is your market focus?
- How much detail will you require?
 - Additional field data input
 - Model complexity (overall factors, by coverage,...)
- What kind of model (mult, additive, mixed)?
- At what point do interactions get included?
- Will systems be able to support the new design?

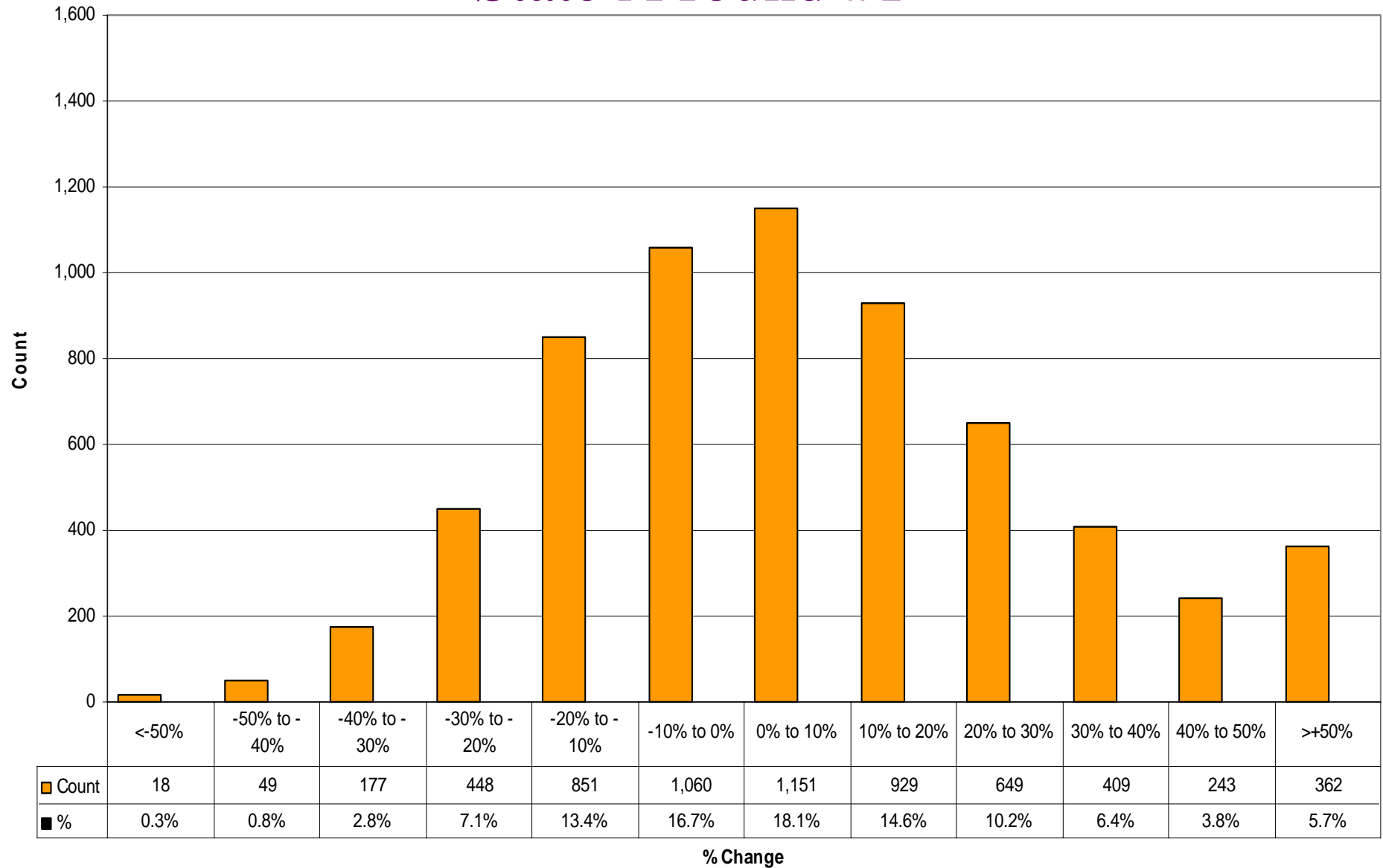
Model Output

part 1

- Interpretation
 - Frequency / severity / pure premium
 - Standard error and percent
 - Interactions
 - Identifying significant parameters and interactions
 - Lots of graphs
- Analysis & adjustments
 - Histograms
 - Policy lists
 - Competitive position
 - Smoothing / fitting / controlling extremes
 - Lots of iterations because the models are multivariate

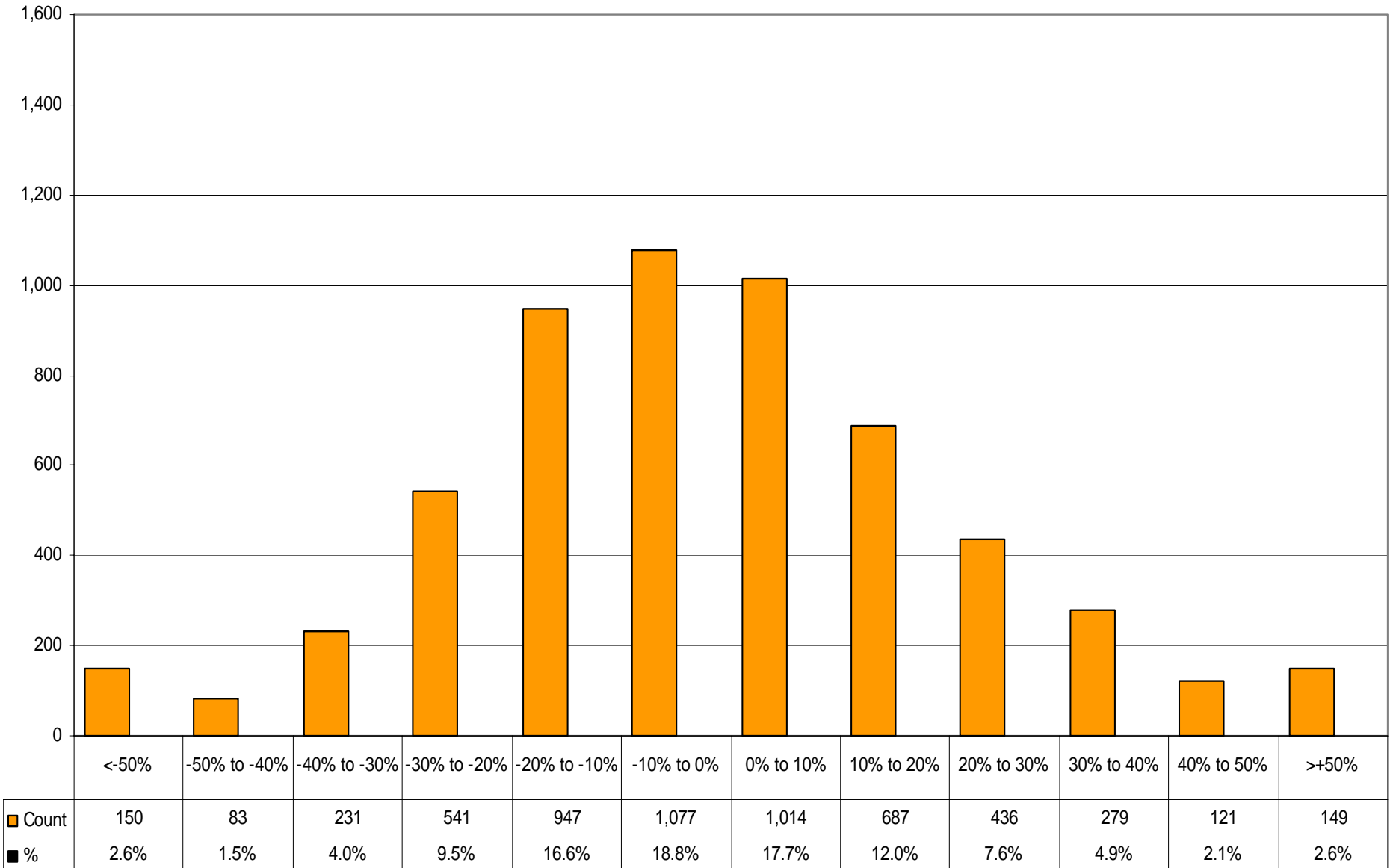
Sample Histogram

State A round #1



Sample Histogram

State A round #10b



Model Output

part 2

- Decisions
 - New business only
 - May need a clean charter to do this
 - Maintain multiple algorithms
 - Slower impact of new model advantages
 - Need some kind of transition plan
 - In-force impacts
 - Can generate significant premium swings on implementation
 - Need to temper impacts to generate desired effects
- Tailoring
 - State specific issues
 - Marketing, underwriting, regulatory & systems issues

Peer Review

- Peer review of first state
 - Unique new method so want to make sure we are doing the right thing and are comfortable with the results.
 - Gain insights into:
 - How to review the output
 - Approaches used by others
 - Additional parameters or ways of looking at things in the future

Filing

- Generally describe multivariate approach
- Preliminary conversation with DOI so they know what is coming
- Simplify descriptions of what is happening in general terms rather than swamping with lots of numbers and pages

Systems Issues

- Get systems involved early so you can tailor the algorithm, data acquisition, and data manipulation to accommodate system constraints.
- Opportunity to discuss system needs for the future.

Testing

- Too many combinations to test everything so focus on educated sampling
- We built several test sets:
 - Imaginary policies focusing on changes occurring in the interaction tables
 - In-force policy rating from histogram compared to mainframe rating

Communication

- Everyone needs to know this is a very big change – especially the agency force, marketing, and customer service.
- Agents need to:
 - Be comfortable with the screens and data required for quoting a risk.
 - Understand that there are complexities in this model that make traditional terms like ‘discount’ and ‘surcharge’ meaningless. There are only rating factors associated with the characteristics of the risk.
 - Understand that there will be significant changes to policies as they renew.

Follow-up & Measurement

- Be sure to get a key variable snapshot of your book of business prior to implementing a new rating structure
 - Provides a benchmark or starting point for measuring the impact of the new model
 - Comparisons should include:
 - Distribution shift measurements
 - Growth measures
 - Retention measures
 - Profitability measures

The Production Environment

- Once a state or two is in production, management will be screaming for lots of implementations in a short timeframe.
- Take some time to clean up the process so it can be turned over to the pricing actuaries. If you don't, the research area will end up doing production pricing and be a bottleneck in the implementation process.

The Future

- Set up regular review of CW rating factors
- Look for additional rating variables
 - Appending external data
 - Collecting additional information
 - Designing scoring mechanisms
- Develop approaches with underwriting and marketing to take advantage of non-pricing information