Predictive Modeling for Smaller Companies

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Discussion Topics

- Setting the Stage
  - Historical ratemaking considerations
  - Current landscape of the marketplace
- Is the glass half empty?
  - Unique challenges for smaller companies
  - Unique opportunities for smaller companies
- Considerations
  - Data
  - Analysis
  - Application
- Extended Applications

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Setting the Stage

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Once Upon a Time in Ratemaking-ville…

- The actuaries/rate-setter for smaller companies would set the rates
- Overall rate level
  - Review of individual company experience
  - Many ratemaking assumptions based on external data
- Class plan
  - Limited review of internal experience
  - Review of competitor relativities
  - Statistical bureau information

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Then, the World Began to Change…

- Increase in the use of tiering
- Increase in the use of new or proprietary factors
  - Insurance score
  - Prior limits
  - Historical non-chargeable losses
- Increase in the difficulty of getting competitor information
  - Filings on copy resistant paper
  - Classifying of certain information as underwriting
- Increase in sophistication of analysis
- Increase in the complexity of rating plans

Problem with Class Plan Analysis

- Limited review of internal experience
  - Results inferior to more advanced analytical techniques used by competitors
  - Traditional ratemaking techniques may dismiss data as not credible
- Review of competitor relativities
  - More difficult to find rate relativity information
  - “Unraveling” the information you find could be problematic
  - Difference may reflect different market focus
- Statistical bureau information
  - May represent a different insured population
  - May not include newer factors being used by insurers

Smaller Company Options

- Do nothing
- Judgmentally add complexity
- Use credit score vendor to super-impose credit on your rating and underwriting plan
- Copy competitors to the best of your ability
- **More detailed analysis of rating and underwriting plan**

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Is the Glass Half-Empty? Or Half-Full?

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Unique Challenges of Smaller Companies

- Data
  - Credibility
  - Availability
- Unique focus
  - Staying within themselves
- Smaller margin for error
- Expense considerations

Unique Opportunities for Smaller Companies

- Smaller sometimes means nimbler
  - More opportunity to try new ideas
  - “Flatter” management structure
- Potentially less regulatory scrutiny
- Less competitive scrutiny

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Considerations for Smaller Companies– Increasing Confidence in Your Results

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Data

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Data Topics

- How much?
- Data cleansing
- Mid-term changes
- Homogeneity
- External Data

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How Much Data Is Needed?

- Rule of thumb – 50,000 exposures
- All else being equal, the more exposures you have, the more reliable the results
- Model validation
- Options
  - Additional years of experience
  - All coverage vs. by coverage/peril analysis

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Data Cleansing

- Watch for:
  - Exposures that are negative or zero
  - Positive claim counts and claim amounts of zero
  - Positive claim amounts and claim counts of zero
  - Miscoded variables
- Use:
  - Database analysis
  - One-way analysis

Mid Term Changes

Claim on 5/1/2000

Policy Number	Age	Territory	Symbol	Effective Date	Expiration Date	Transaction Date	Exposure
1	45	10	16	1/1/2000	7/1/2000	1/1/2000	0.50
1	45	10	16	1/1/2000	7/1/2000	4/1/2000	-0.25
1	45	10	19	1/1/2000	7/1/2000	4/1/2000	0.50

Policy Number	Age	Territory	Symbol	Effective Date	Expiration Date	Transaction Date	Exposure
1	45	10	16	1/1/2000	7/1/2000	1/1/2000	0.25
1	45	10	19	1/1/2000	7/1/2000	4/1/2000	0.25

Policy Number	Age	Territory	Symbol	Effective Date	Expiration Date	Transaction Date	Exposure
1	45	10	16	1/1/2000	3/30/2000	1/1/2000	0.25
1	45	10	19	4/1/2000	7/1/2000	4/1/2000	0.25

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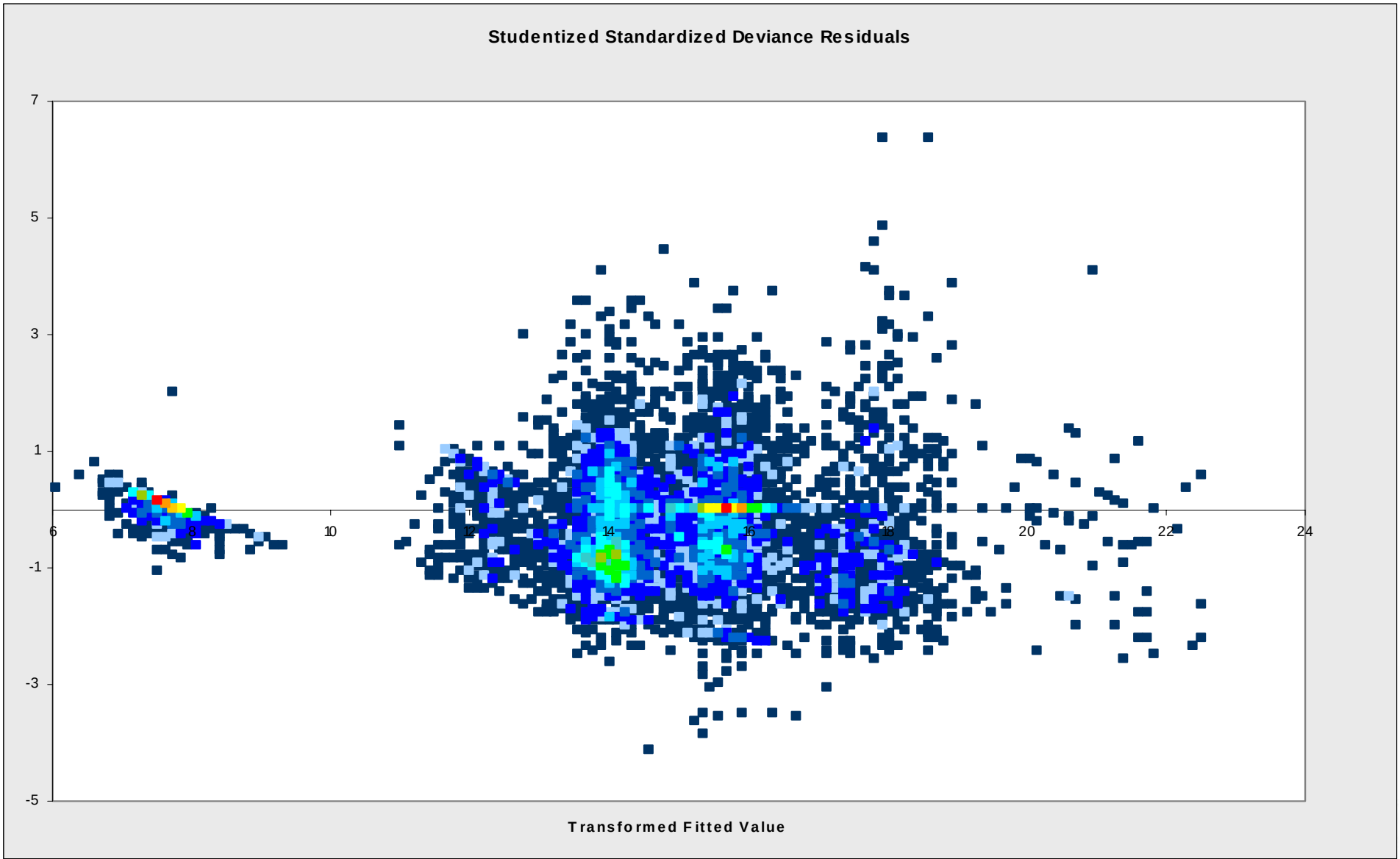
Mid-term Changes

- Problems
  - Reversals don't always match original entry
  - Matching claims
  - Exposure weights
- Solutions
  - Adjust dates by reviewing individual transactions
  - Fix characteristics at beginning of policy year or calendar year

Non-homogeneity



External Data

- Can assist in evaluating new factors
- Can also help validate existing factors
- Potential sources
  - Credit
  - Individual/household level demographics
  - Vehicle/home characteristics
  - Fire station data
  - Etc.

Analysis

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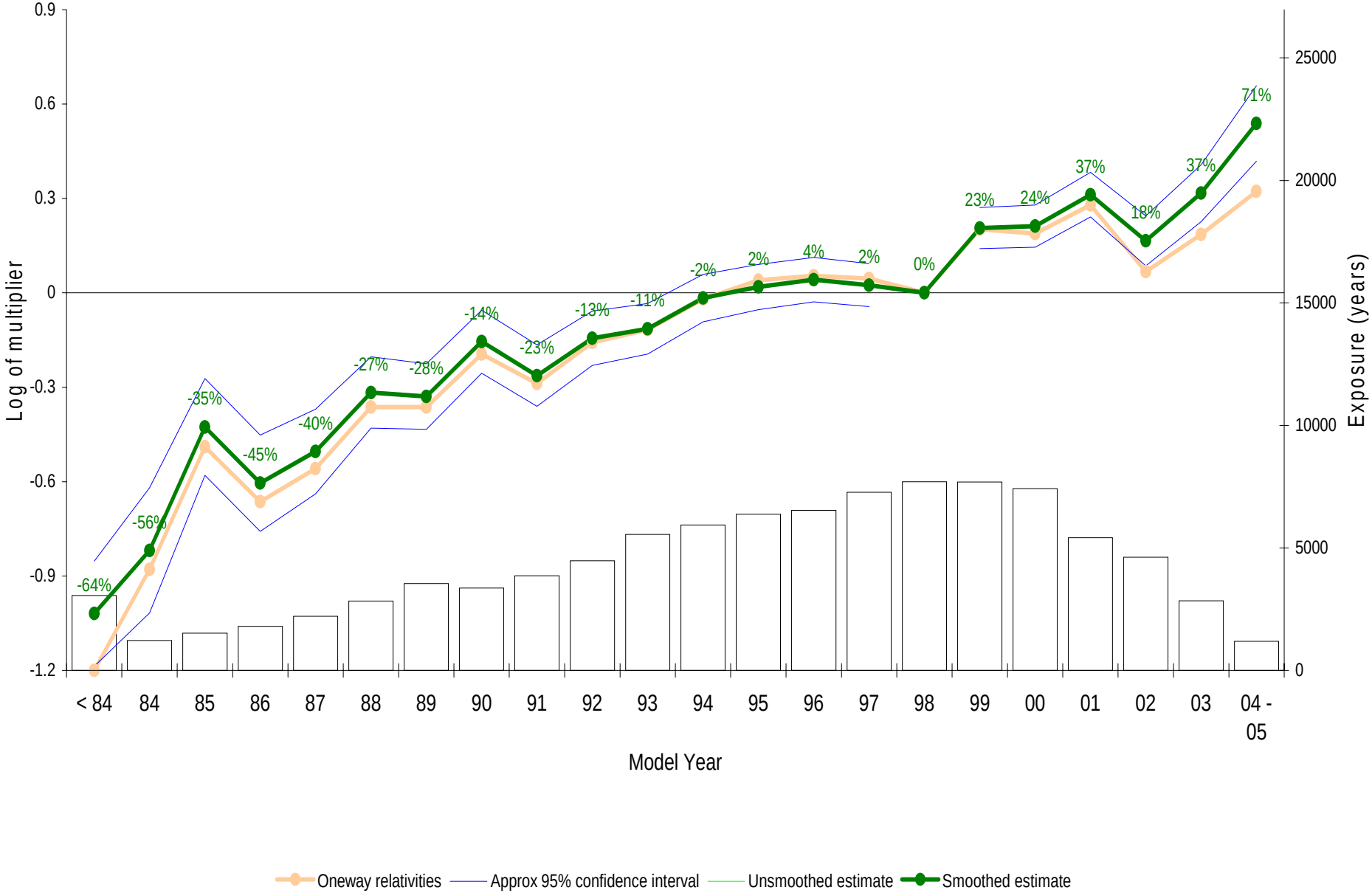
Evaluation of Individual Factors

- Variability of parameter estimates
- Tests of overall model significance
  - Single inclusion
  - Single exclusion
- Stability of parameters from year to year
- Validation holdback
- Re-sampling

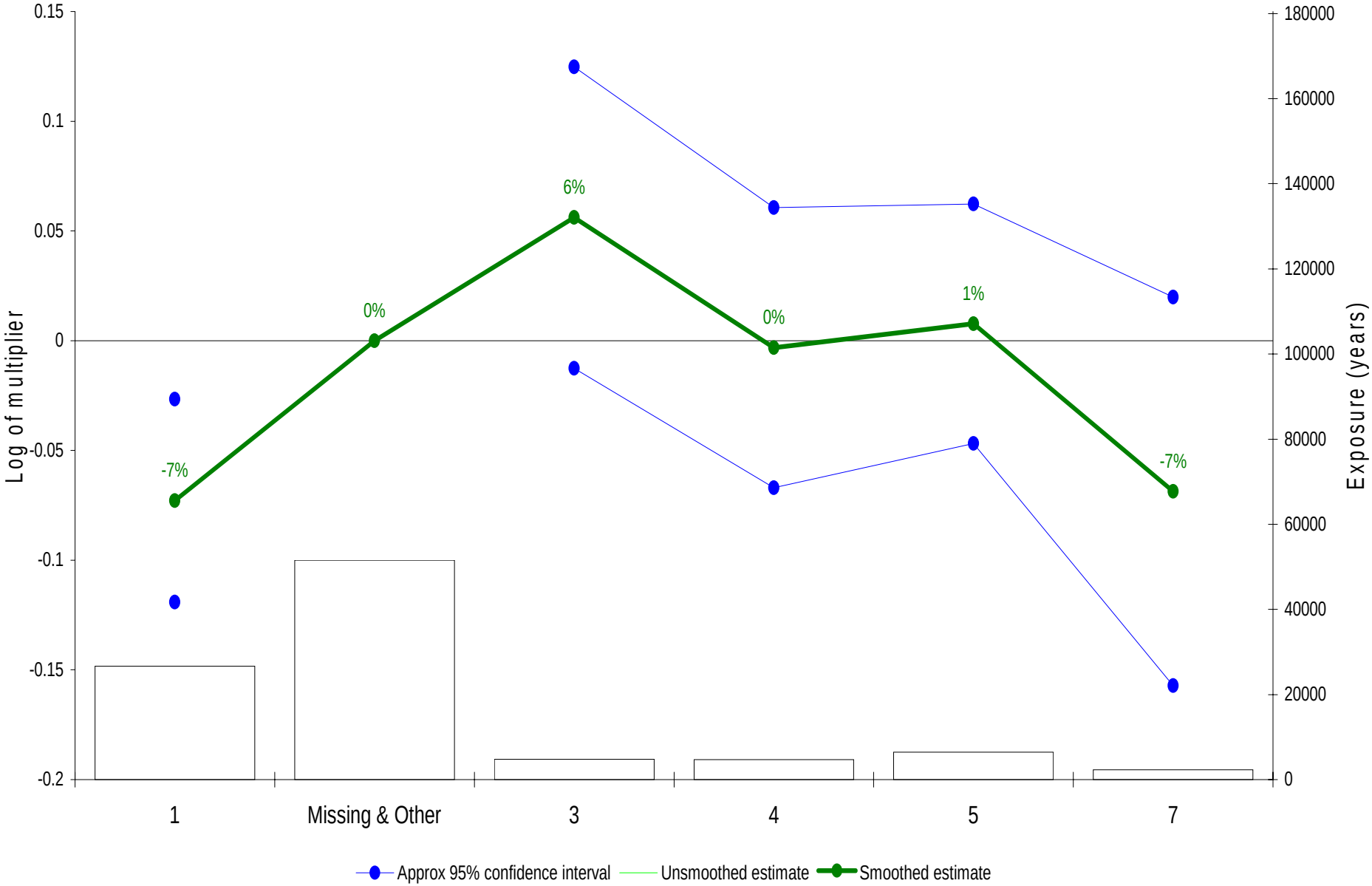
Credibility

- Traditional credibility: based on number of claims
  - Credibility increases in proportion to number of data points
- True credibility: based on variability of estimate
  - Credibility increases with the **stability** of the parameter estimate
  - Tends to increase with data volume, but not always

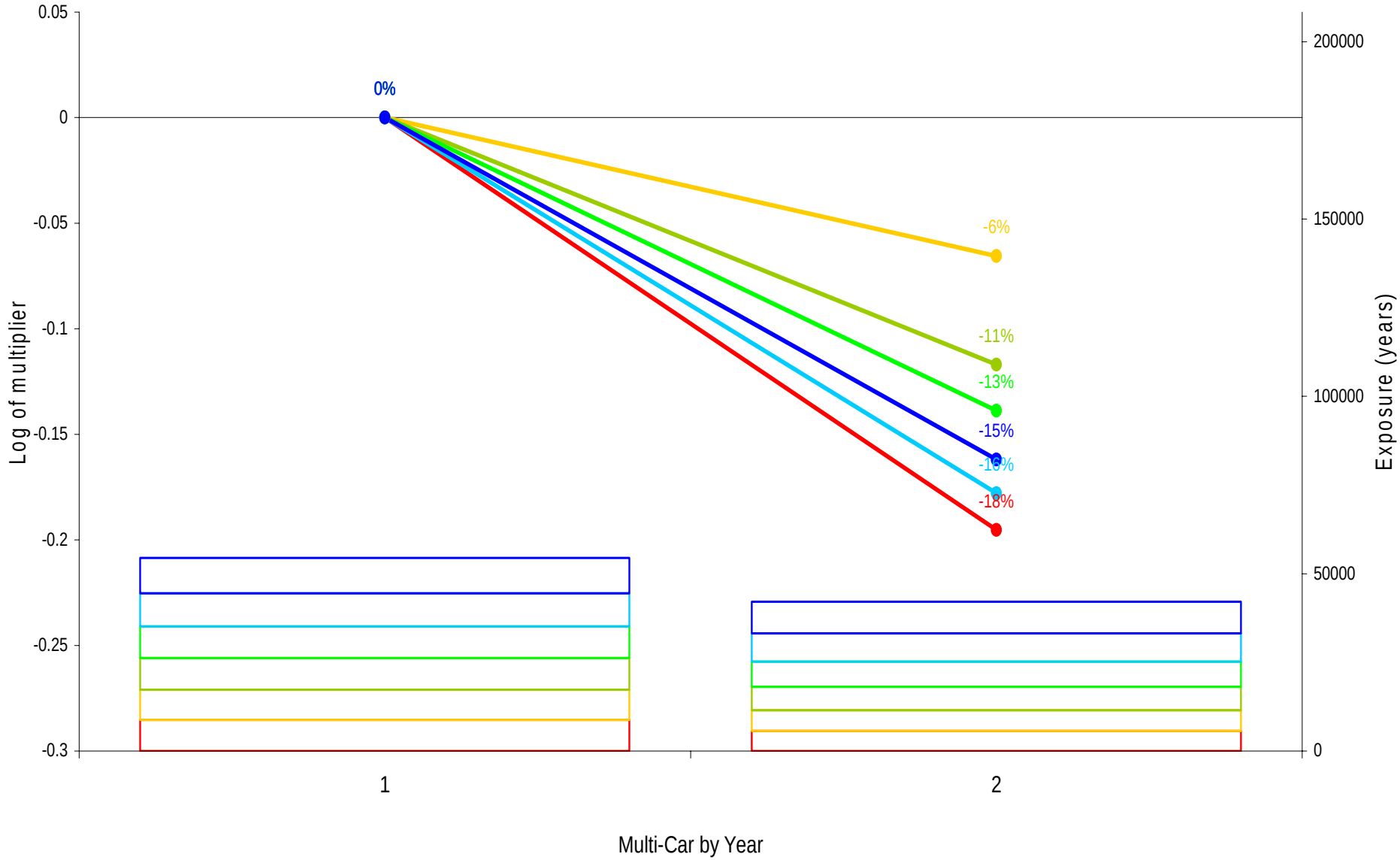
Example Output



Example Output



Example Output



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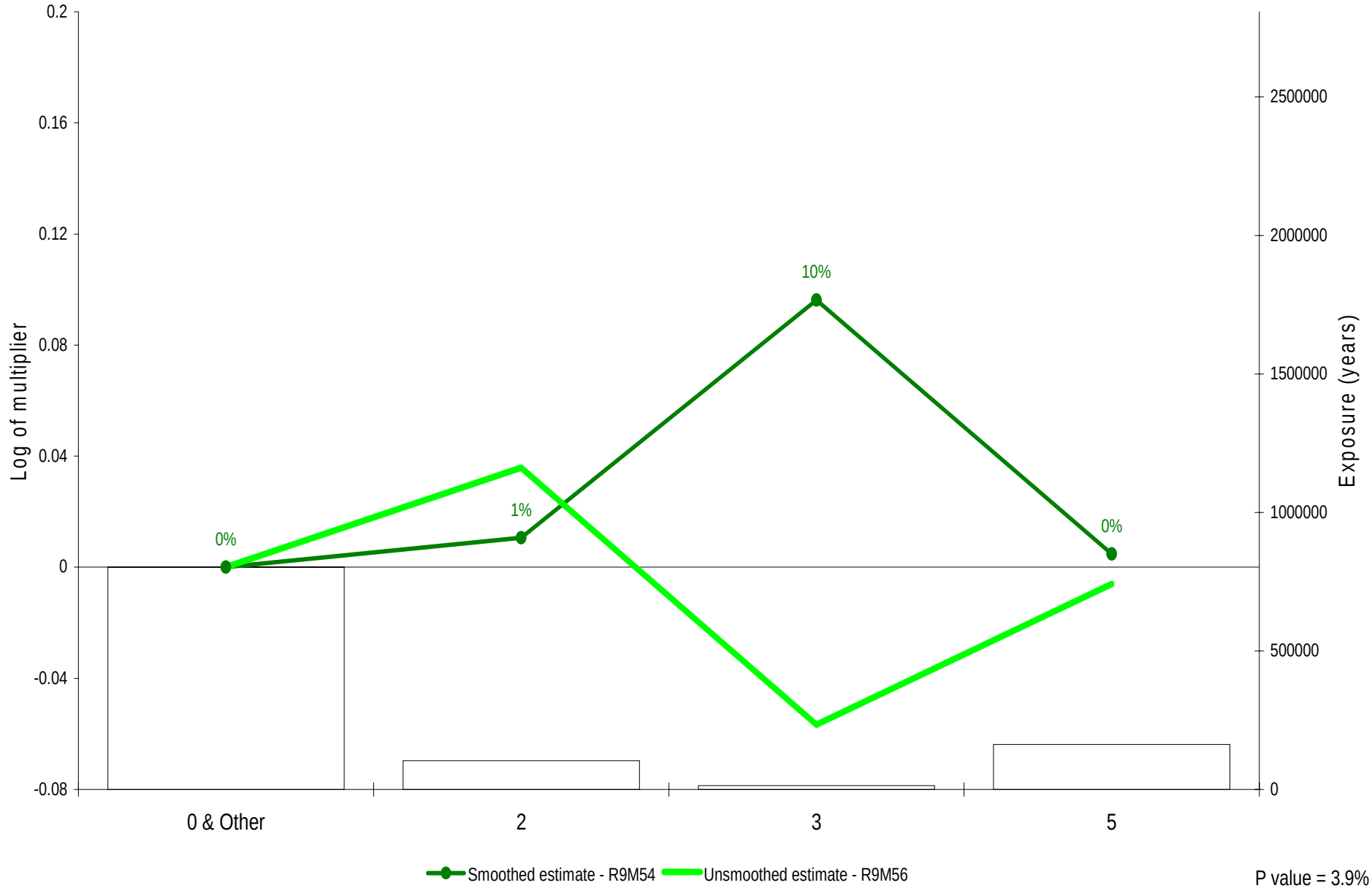

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Application

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Application Topics

- Systems restrictions
- Impacts
- Competition

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System Restrictions

- Addition of new variables
- Expansion of current variables
- Examples
  - Homeowners rating by peril
  - Tier rating
- Handling of policyholder impacts

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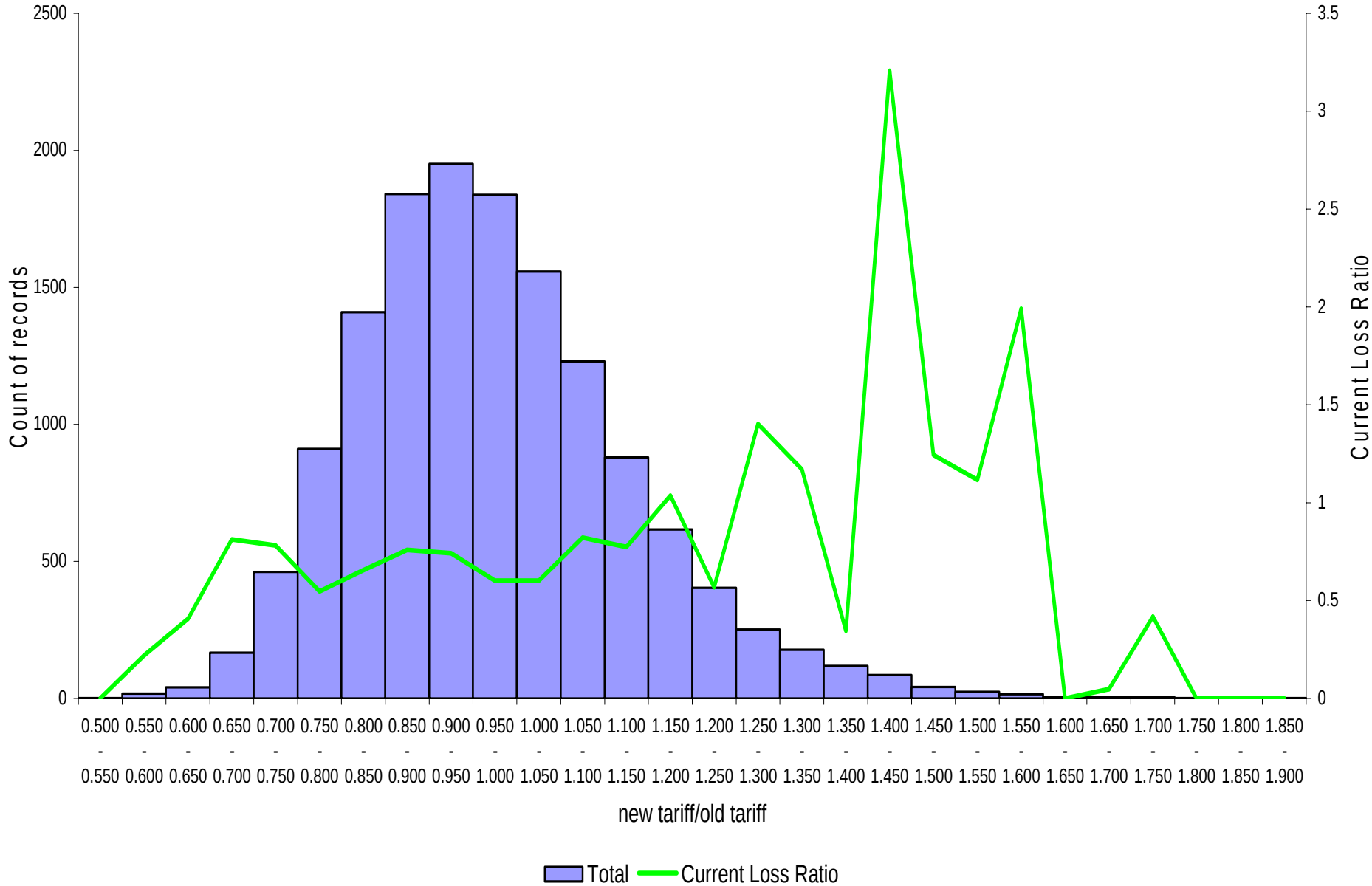
Example Impact Graph



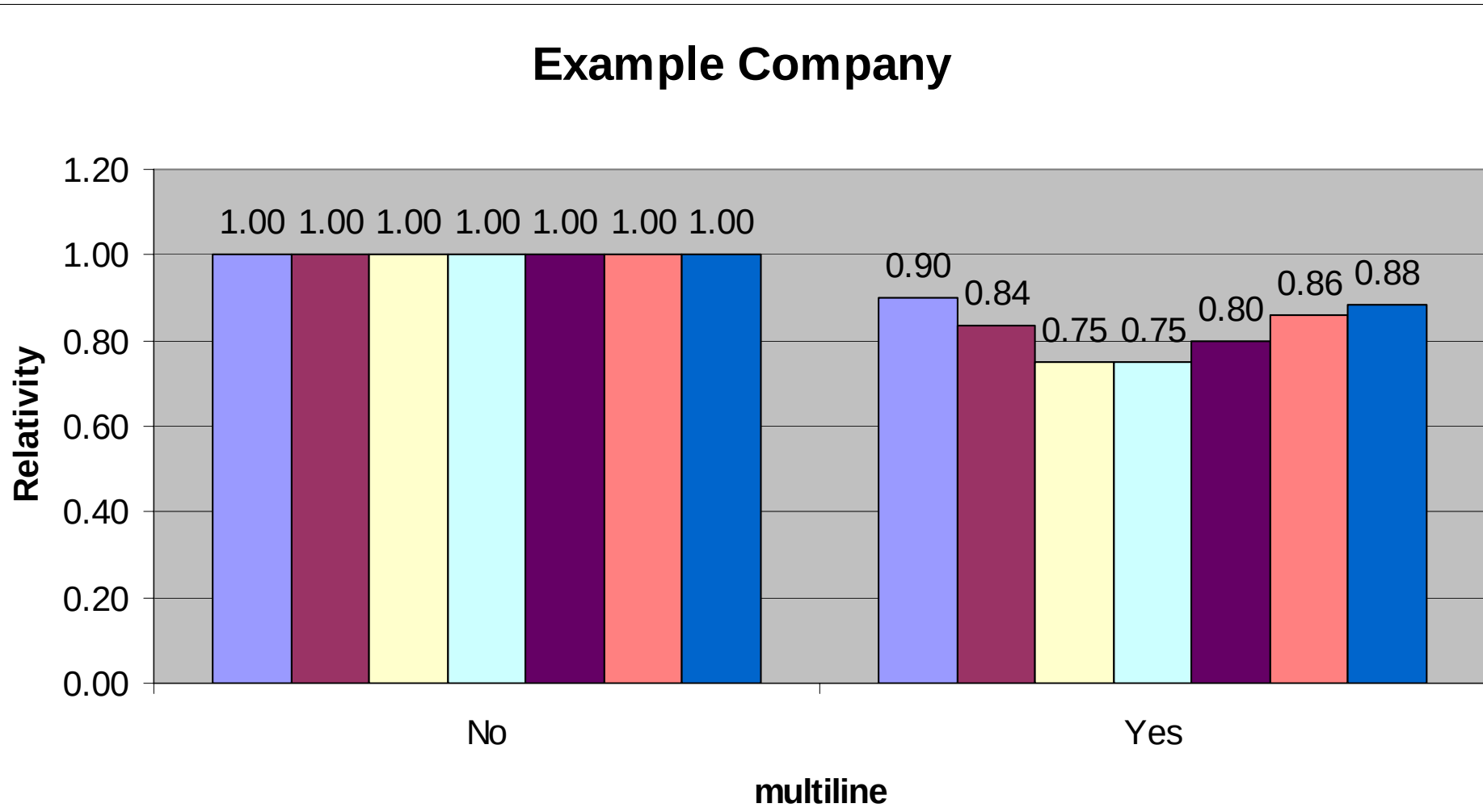
Handling of Policyholder Impacts

- New company or program
  - May not be an option for smaller companies
- Applying new program to new business and renewals
  - Impacts may be painful
- Capping of rate changes
  - Systems nightmare
- Dampening of relativities
  - May not be an option if a company is already behind the curve

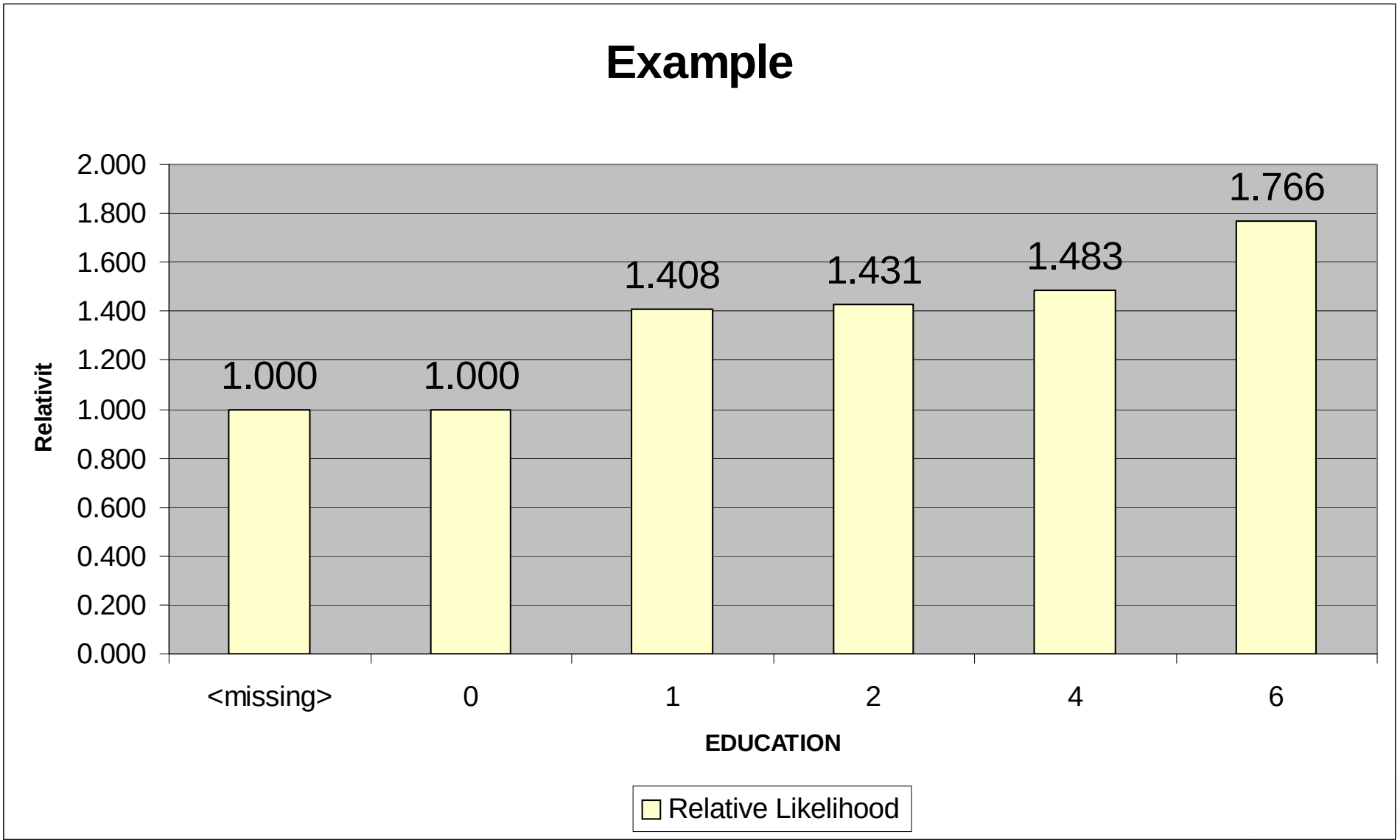
Competition

- Difficulties of competitive analysis mentioned earlier
- Still would like to compare factor relativities to competition
- Consider modeling of batch rater results to get “effective” relativities
- Consider retention and conversion as an indicator of competitiveness

Effective Competitor Relativities



Conversion Analysis Example



Extended Applications

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Extended Applications

- Custom insurance scoring
- Territory definitions
- Vehicle classification

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Custom Insurance Scoring

- All but the largest companies are using commercially available scores
  - May not be reflective of who you are
  - Gives a company no real competitive advantage
- Alternative approach: analyze the components of insurance score
- Application
  - Custom insurance score
  - Modification to commercially available score

Insurance Score Components

- Late payment information
- Percent of credit limit being used
- Type of credit cards
- Length of credit history
- Bankruptcy
- Inquiries

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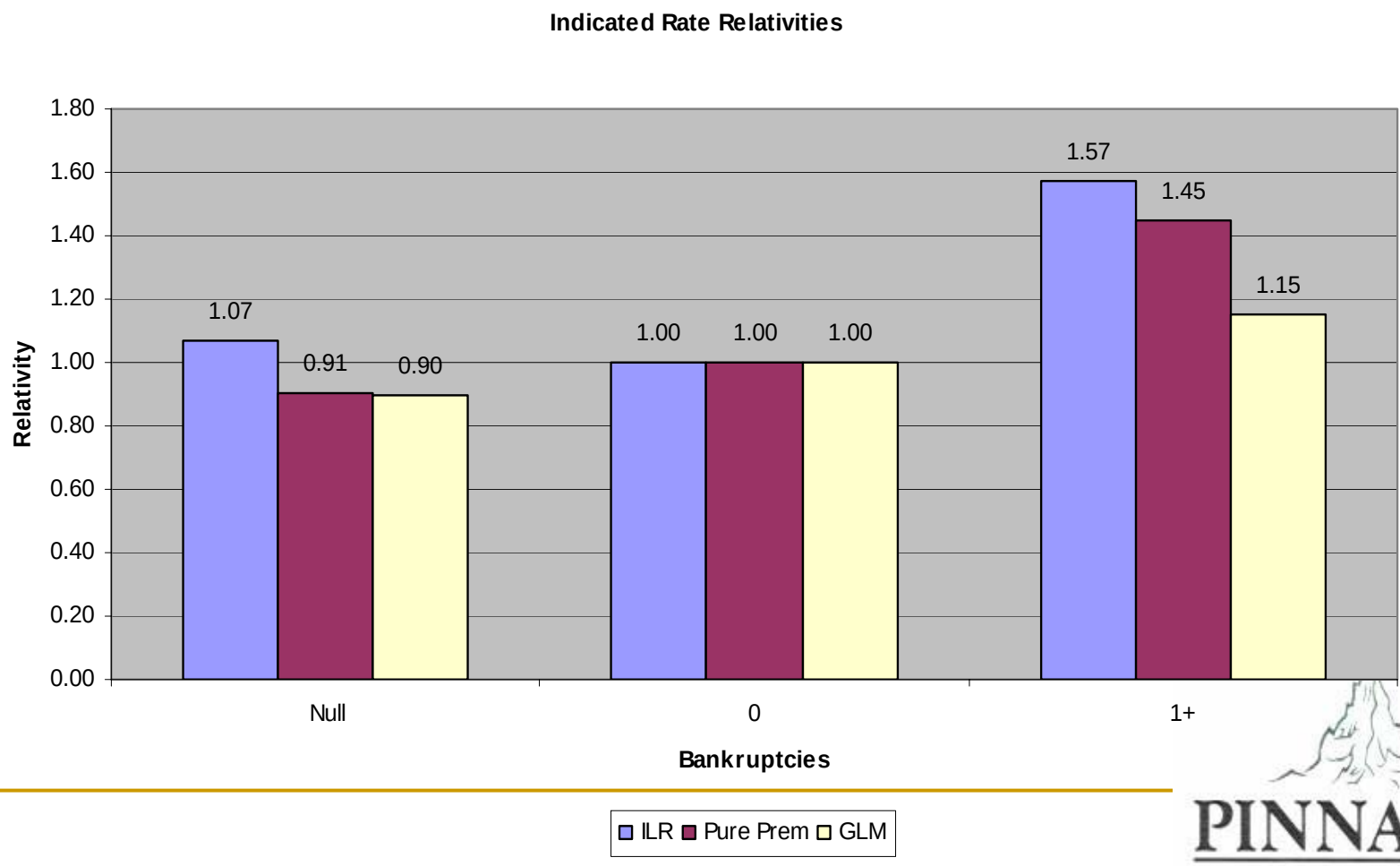
Bankruptcies – Indicated Relativities



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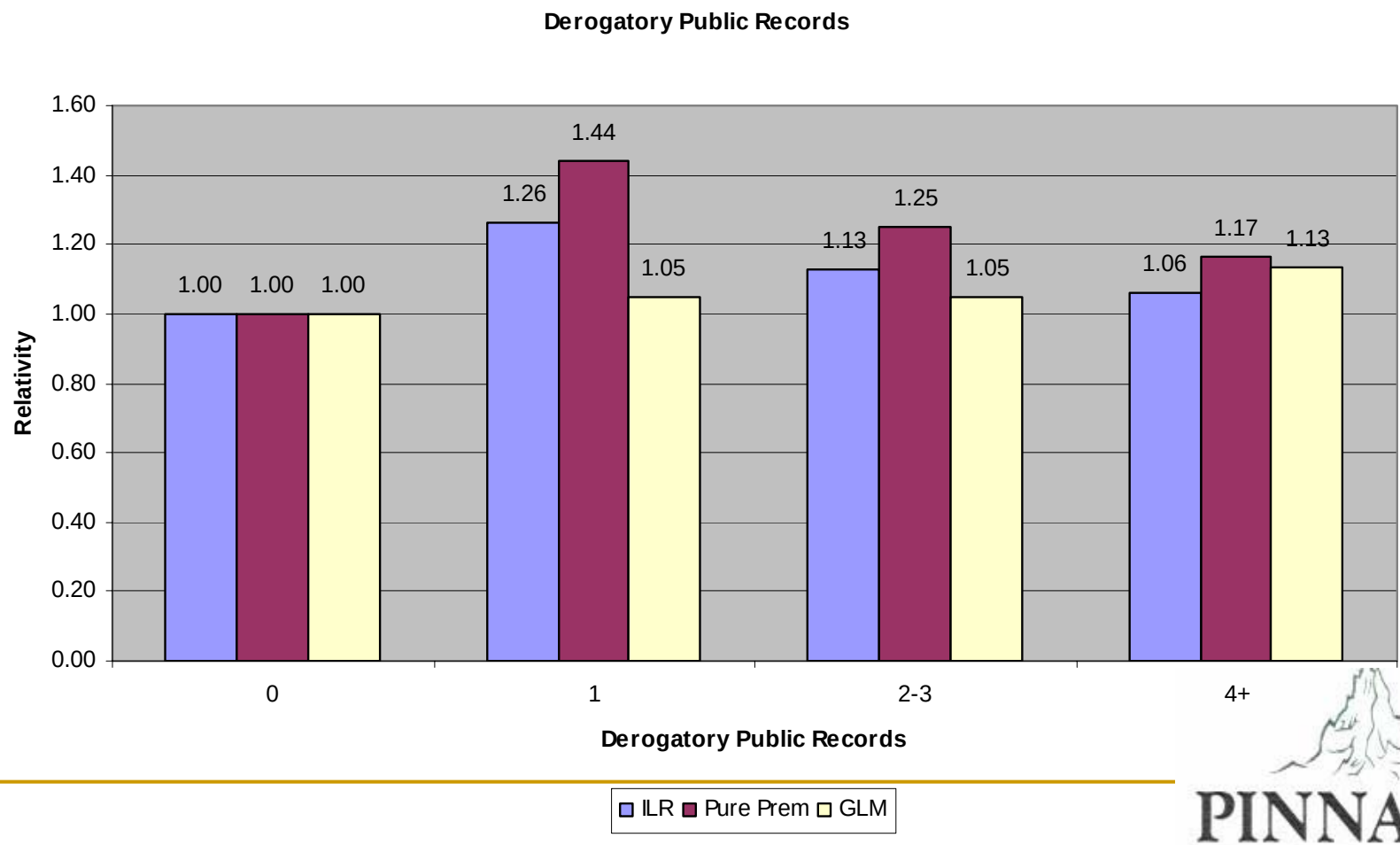
Derogatory Public Records – Indicated Relativities



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Summary of Territorial Issues

- Issues
  - Frequently outdated
  - Boundaries are less than optimal
  - Do not vary by coverage
  - Developed in less than optimal ways
- Leads to
  - Misclassification
  - Mis-interpretation of other factors
  - Anti-selection

Geographical Risk Rating

- Explain geographical risk by specific factors
  - Population density
  - Theft rates
  - Vehicle density
  - Crime rates
- If risk can be explained by specific factors the importance of territory definition
- Apply as new or modified territory definitions

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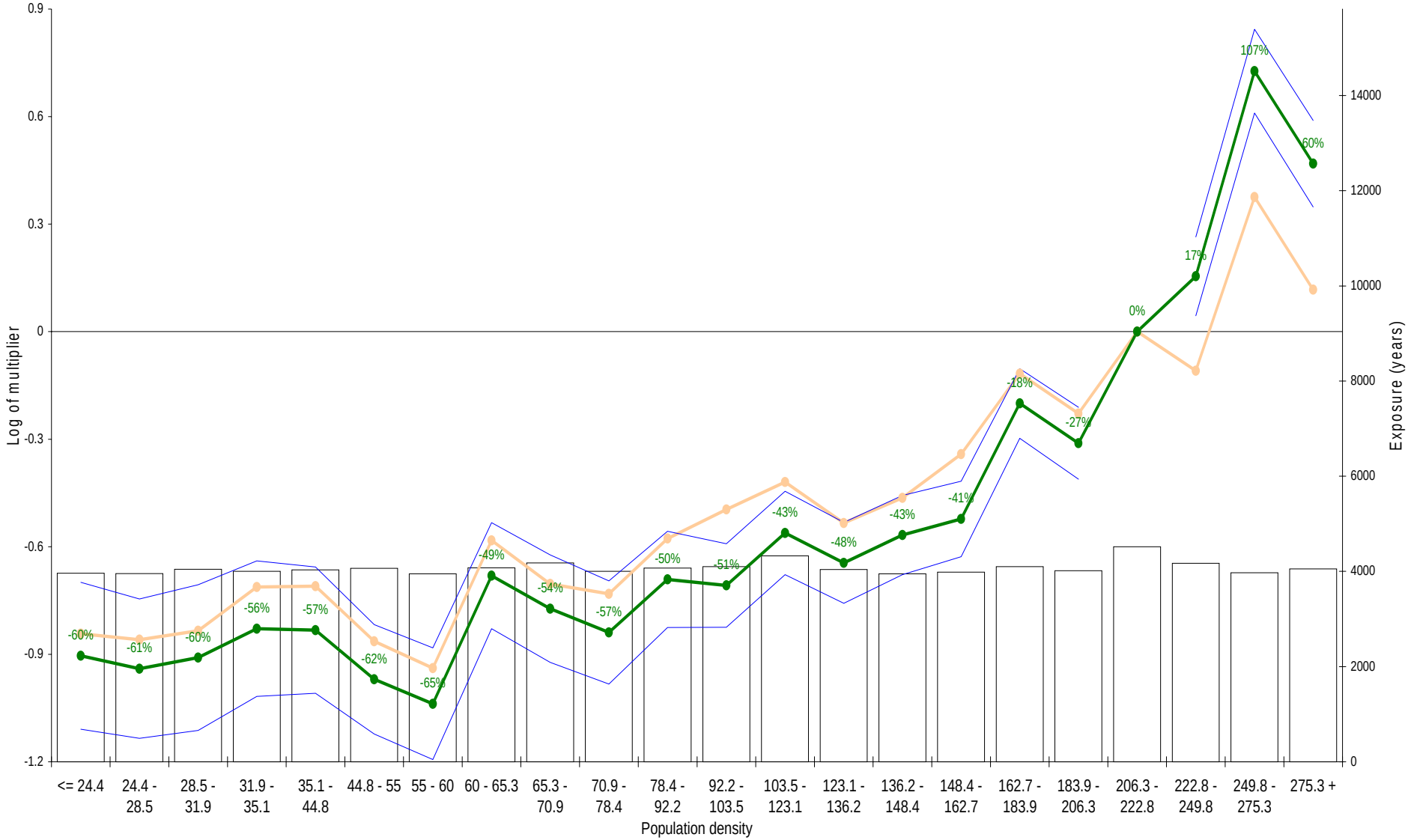
Fully worked example of the tutorial job

Run 1 Model 1 - Initial models - TPPD numbers



Vehicle Classification

- Issues
  - Only the largest companies maintain independent symbols
  - No complete liability symbol standard
- Alternative approach
  - Use of vehicle characteristics for rating
- Application
  - Independent symbols
  - Adjustment to current symbol

Vehicle Data

- Body style
- Number of doors
- Number of cylinders
- Vehicle weight
- Engine displacement
- Vehicle performance
- Payload capacity
- Base price

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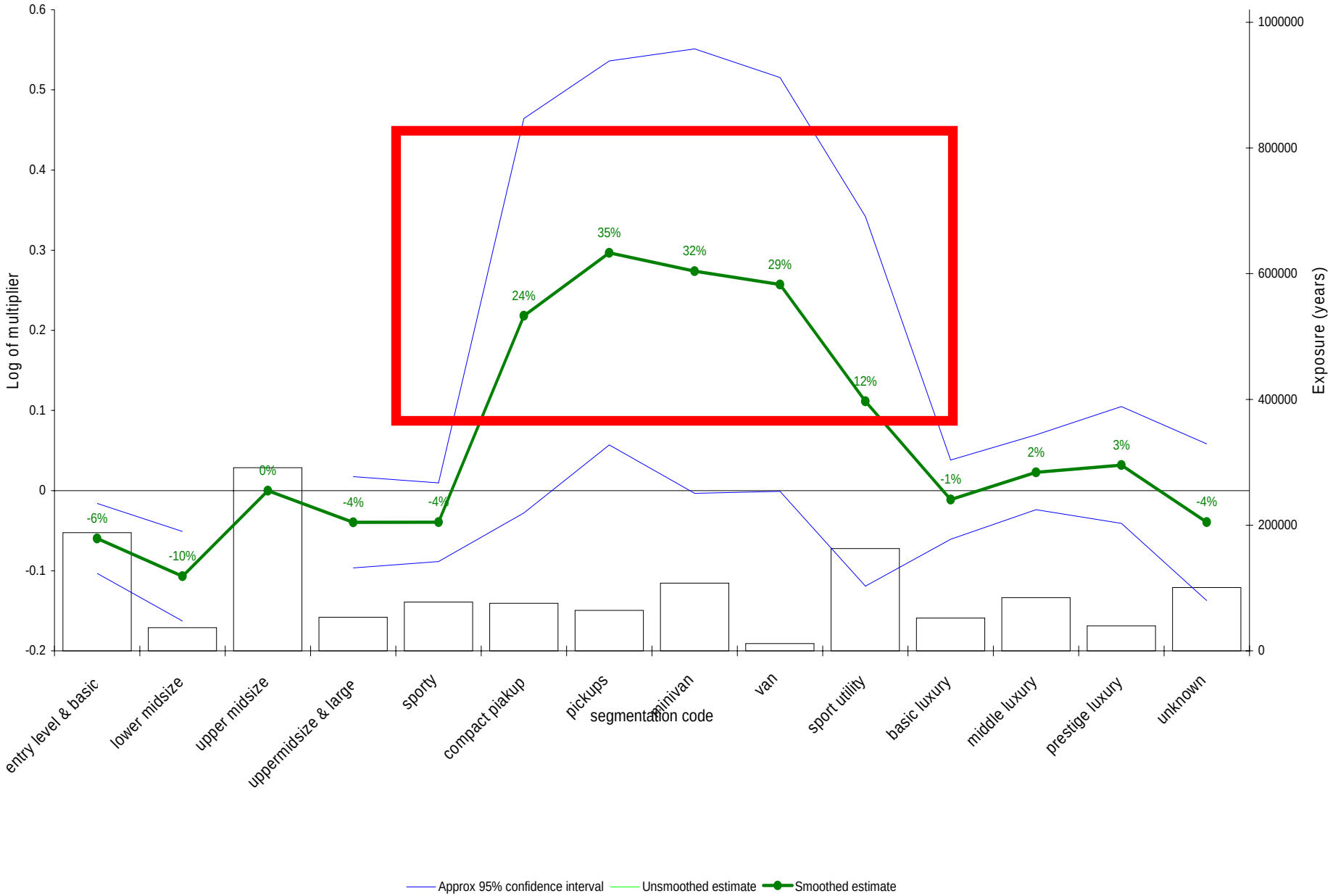
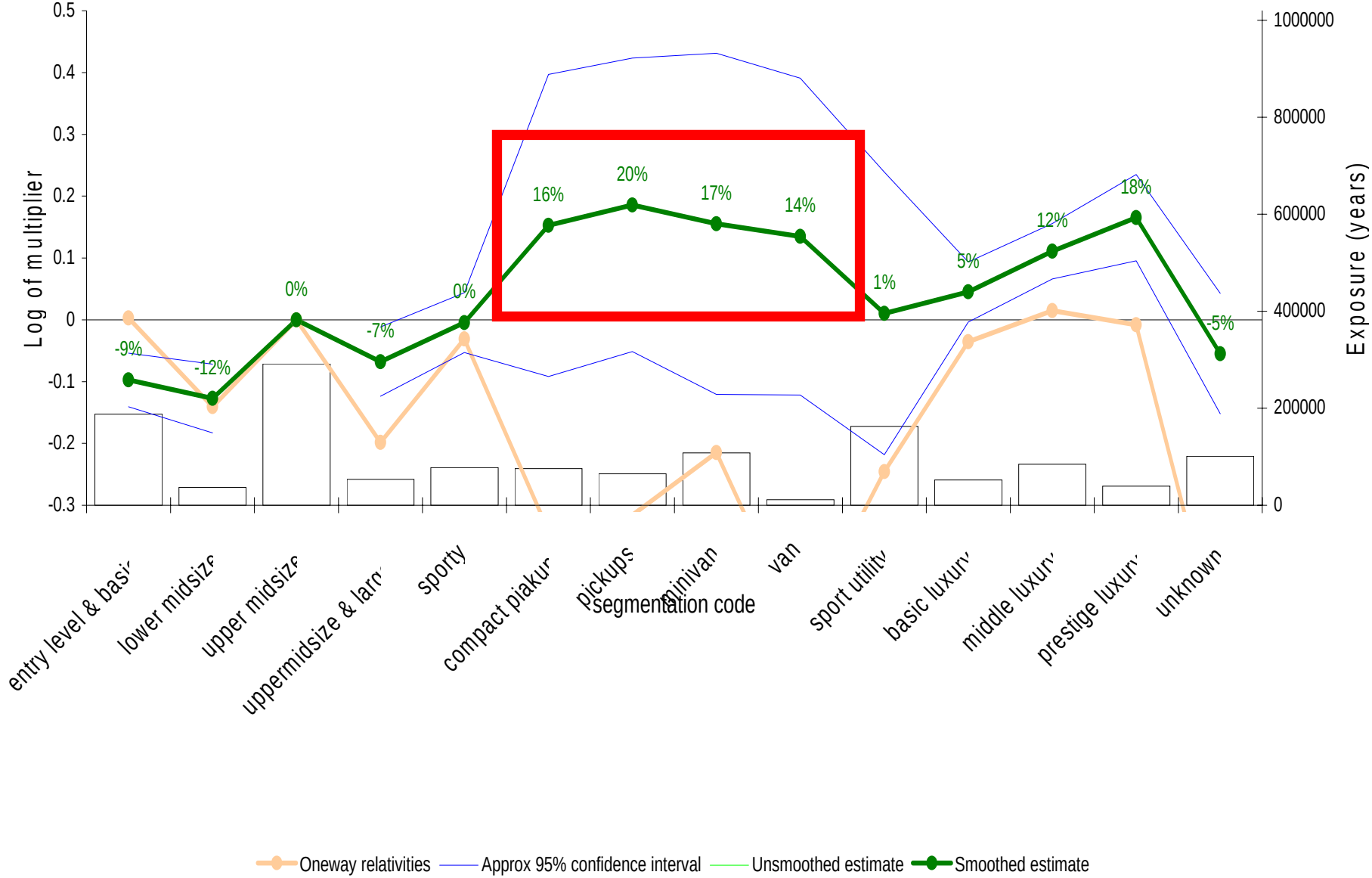
Collision Vehicle Classification Analysis

Run 1 Model 1 - Claim Frequency - Collision Frequency



Collision Vehicle Classification Analysis

Run 2 Model 1 - Model without Symbol - Collision Frequency



Finally…

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Remember…

- Results of analysis reflect business you have written historically
- You are unique
- Rating and underwriting does not occur in a vacuum, it is one piece of the puzzle
- Predictive modeling is not a project, but a way of life