

Predictive Modeling for Reserving

Roosevelt Mosley, FCAS, MAAA
CAS Annual Meeting
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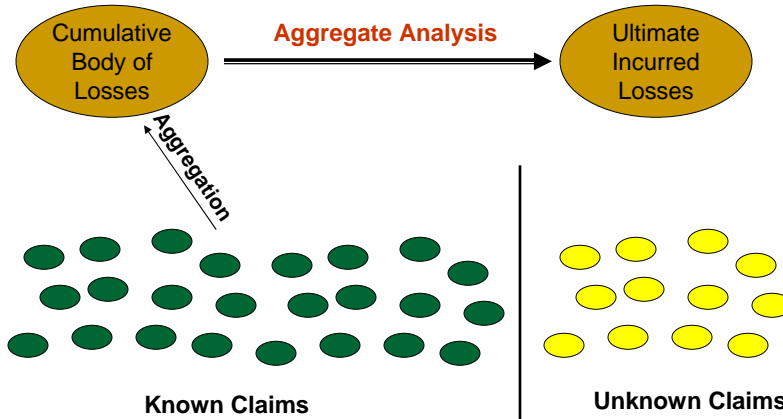


Reserve Elements

- Reserve Elements
 - Formula Reserve/Case Reserve
 - Development on Known Claims
 - Reopened Case Reserve
 - Incurred but not Reported
 - Reported but not Recorded
- Reserve Variability

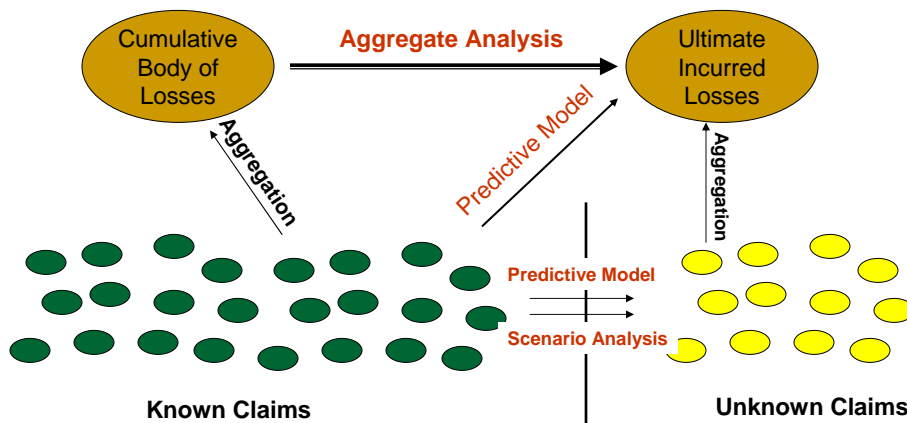


Traditional Reserve Analysis Process



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Predictive Analytics Reserving Process



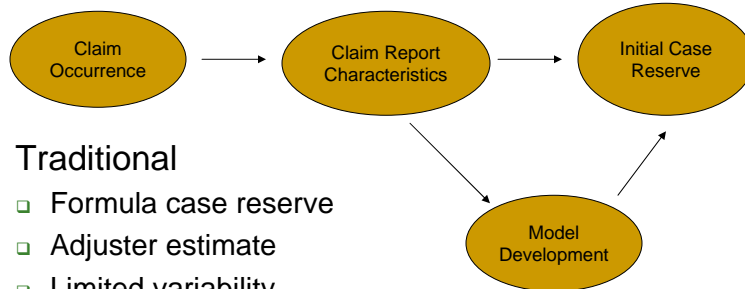
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Predictive Analytic Approaches – Ground Up Analysis of Reserve Estimates

- Reserve Elements
 - Formula Reserve/Case Reserve
 - Analysis of claims characteristics
 - Development on Known Claims
 - Analysis of claims characteristics
 - Development of claims characteristics
 - Reopened Case Reserve
 - Likelihood of claim reopen
 - Incurred but not Reported
 - Analysis of late reported claims
 - Scenario generator
 - Reported but not Recorded
- Reserve Variability
 - Results from the variability in predictive analytics

Formula/Case Reserves

Formula Case Reserve Process

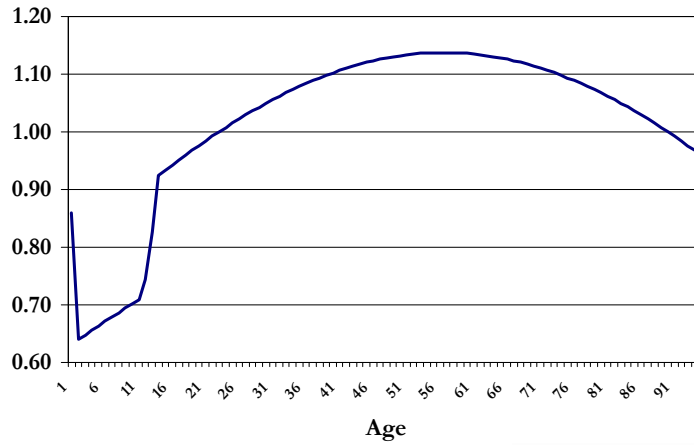


- Traditional
 - Formula case reserve
 - Adjuster estimate
 - Limited variability
- Predictive Analytics
 - Targeted estimate based on claim characteristics

Claims Settlement Value Modeling

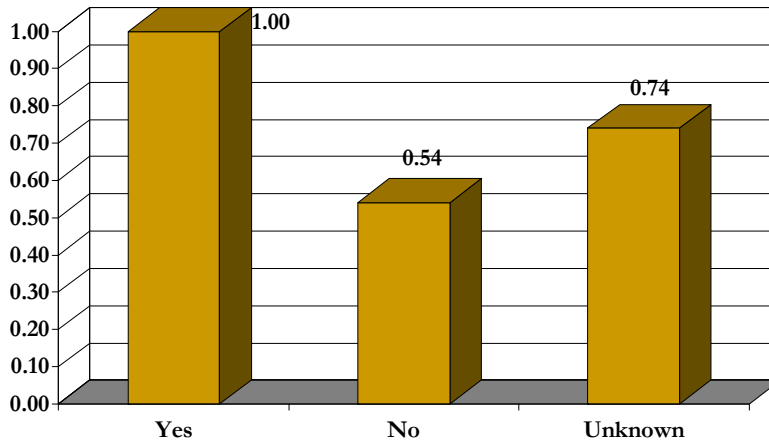
- Claim settlement value based on characteristics at time of report
 - Attorney involvement
 - “In-Network” Medical or Auto Repair
 - Extent of property damage
 - Coverages involved
 - Injuries
 - Claimant characteristics

Claim Settlement Value by Age of Claimant – Bodily Injury Coverage

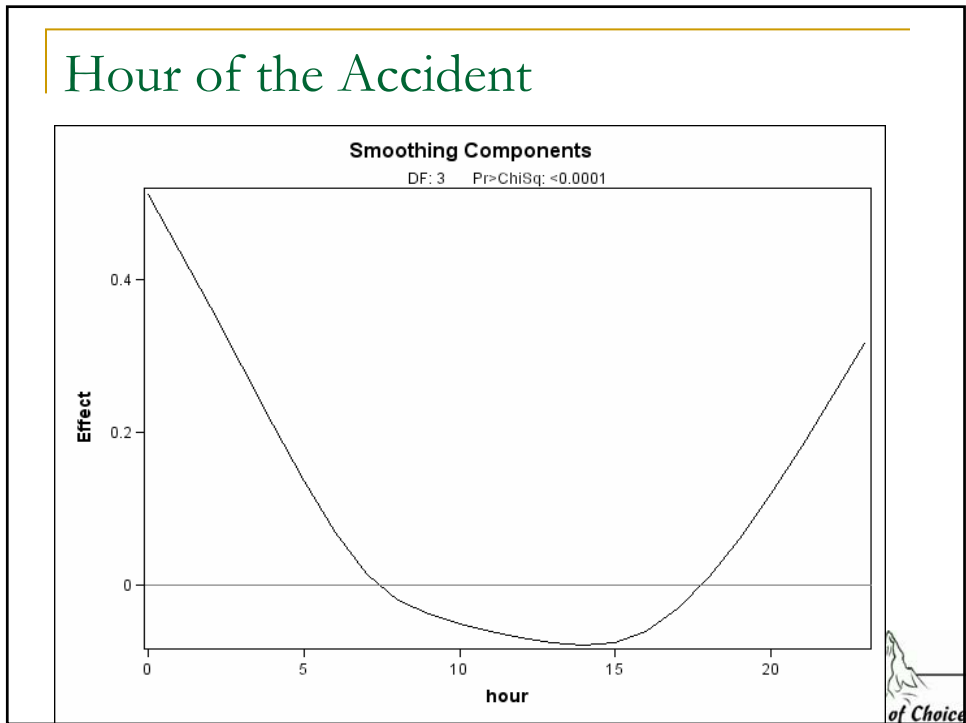
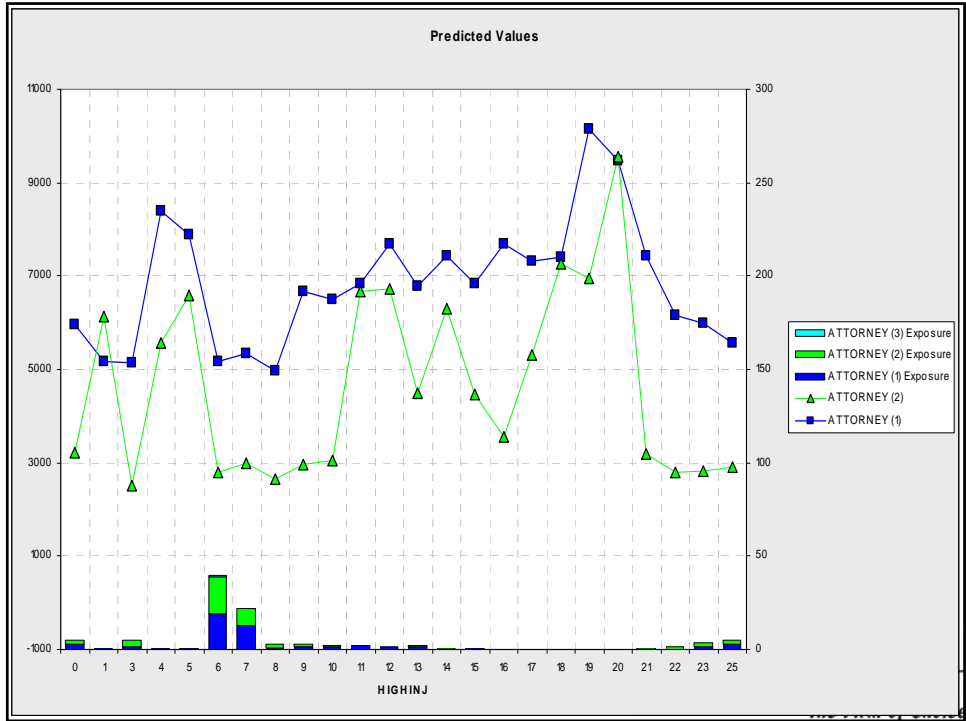


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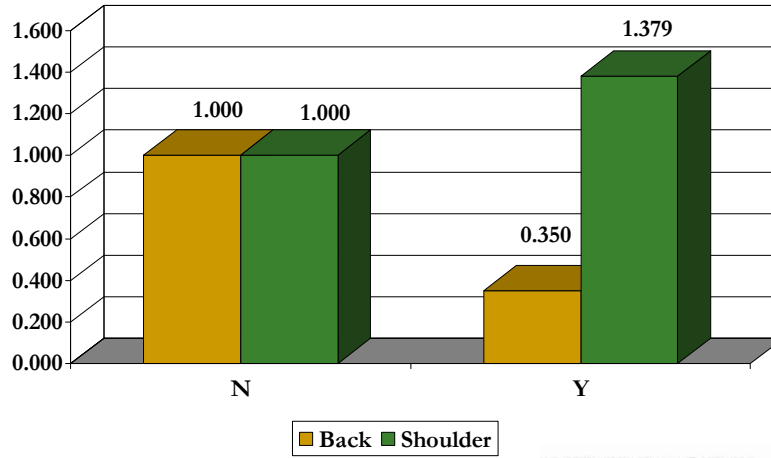
Limited Claim Settlement Value Modeling – Attorney Involvement



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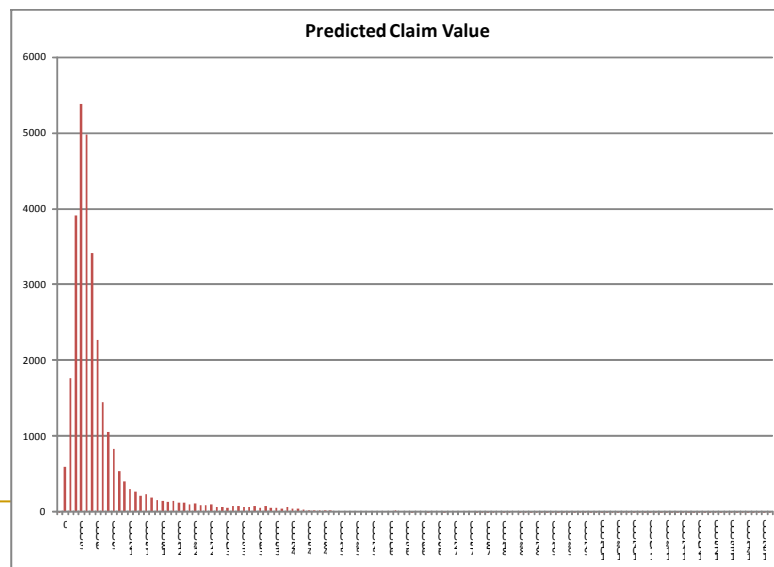


Large Loss Likelihood – Type of Injury



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Case Reserve Estimate



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Incurred but not Reported

- More difficult part of the analysis
- Predictive analytics
 - Analysis of historically late reporting claims
 - Make use of a priori predictive model results
- Scenario analysis
 - Determination of estimate of number of subsequent reported claims
 - Aggregation
 - Result of predictive model
 - Estimate of associated severity of claim
 - Run repeated scenarios to understand sensitivity of estimates

Development on Known Claims

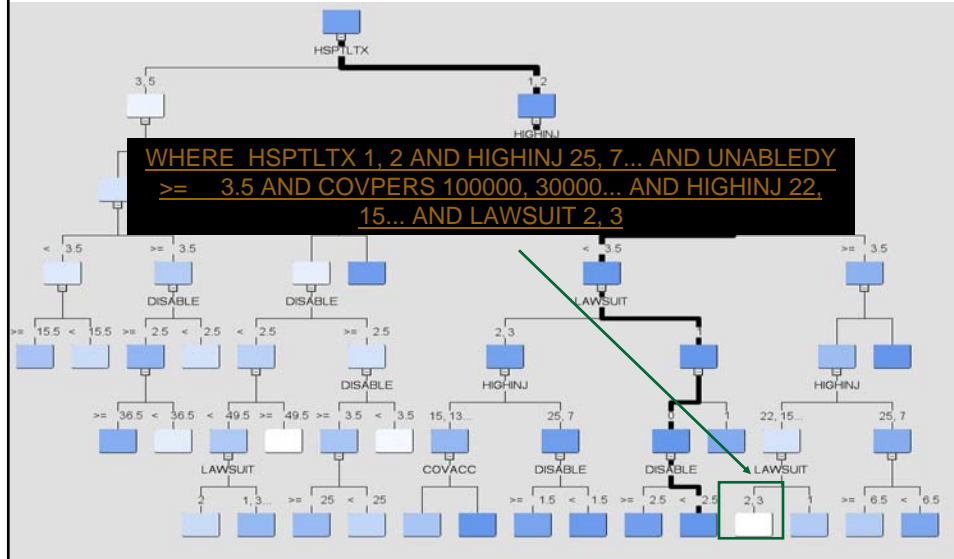
Development on Known Claims

- Causes
 - Incomplete information
 - Inaccurate estimate of initial claim value
 - New developments in the claim
- Traditionally, use aggregate loss development methods
- Predictive analytics
 - Better prediction of initial case reserve
 - Likelihood of claim characteristic development
 - Analysis of aggregate loss development

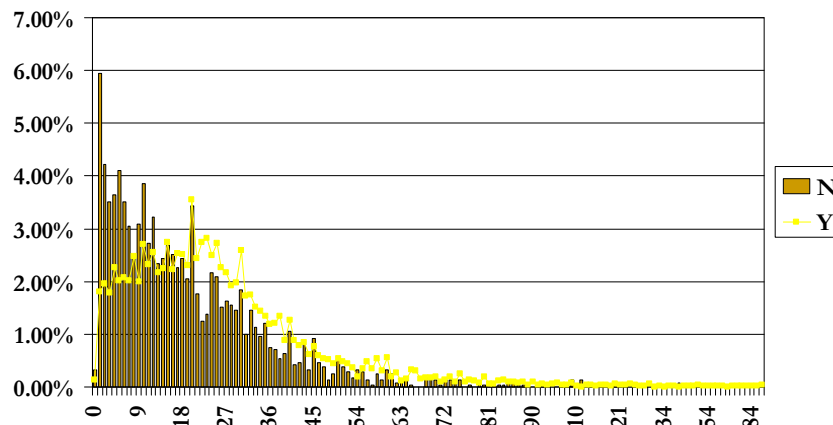
Examples of Claim Development

- Large claims
- Exceptional claims
- Delayed recovery
- Exceptional number of medical treatments
- Lawsuit development
- Coverage development
- Types of treatments

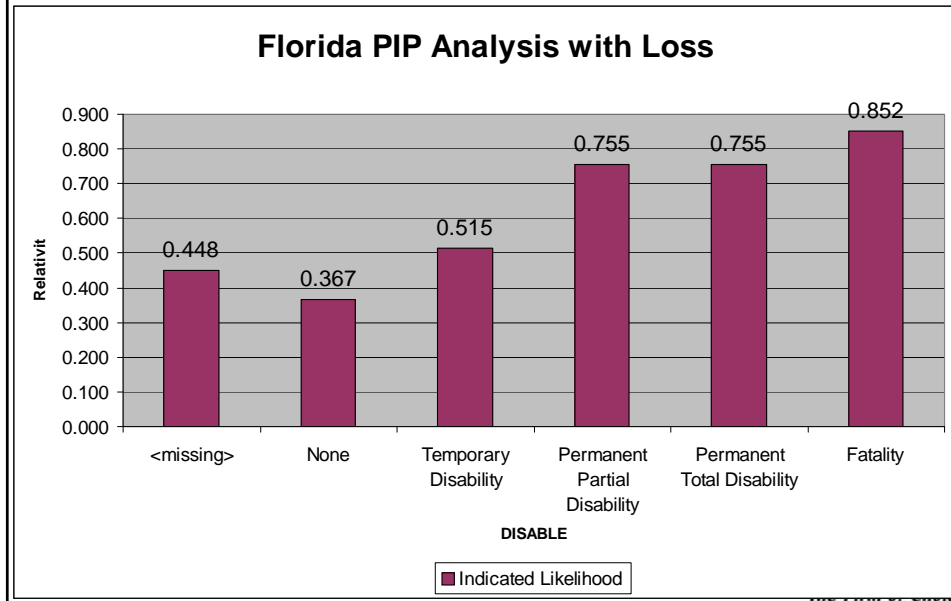
Likelihood of Large Loss Decision Tree – Rules Based Approach



Frequency of Chiropractor Visits by Presence of Back Injury



Likelihood of Development of BI Claims



Reopened Case Reserves

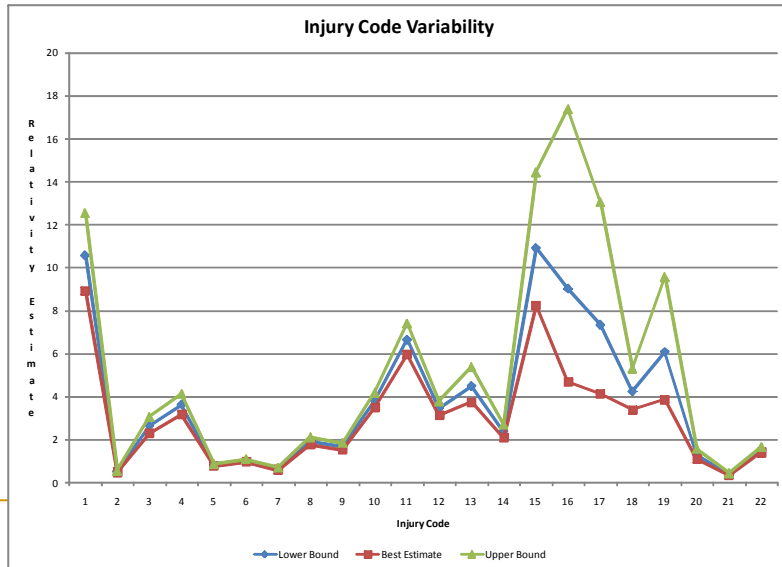
- When claim closed, review claim characteristics
- Based on claim characteristics, assign a probability of reopen
 - Decreasing function based on time since closure
- Estimated provision for closed claims being reopened again

Reserve Variability

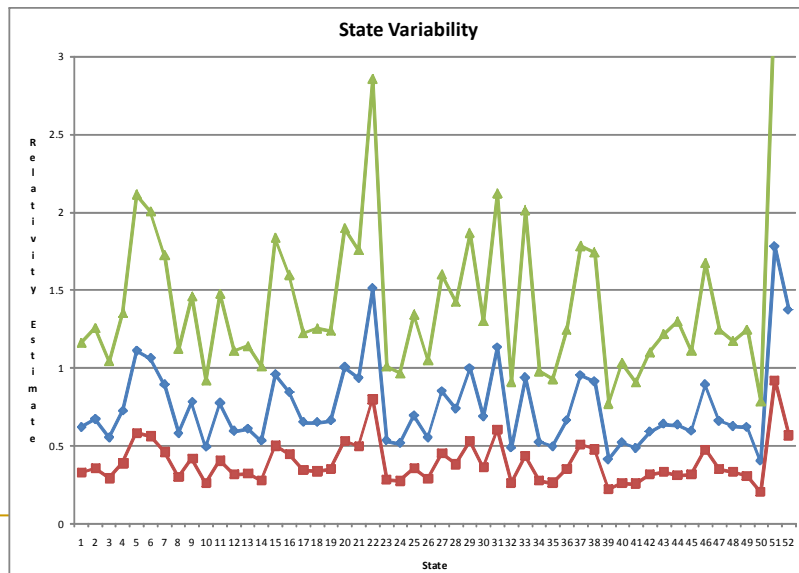
Reserve Variability

- Predictive analytics
 - Point estimate of parameters
 - Point estimate for individual claims
 - Also provides variability around point estimate and individual claim
- Determining reserve variability
 - Generate randomness around parameter estimates
 - Generate randomness around individual claim estimates

Variability in Injury Code Parameter



Variability in State Parameter



Example in Individual Reserve Estimates

