



Global Advances In Reserving

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Meeting the Challenges of Change

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Agenda

- Stochastic Methods
- Advanced Deterministic Methods
- New Developments
- Methods for Non-traditional exposures



Stochastic Methods

Popular Methods:

Mack's Distribution-free method

- Uses standard chain-ladder assumptions
- Extends chain-ladder assumptions to make an assumption on variance of $C_{i,j+1}$
- Calculates the variance formulae for ultimate losses

Advantages:

- No distribution assumptions for loss data

Disadvantage:

- Only gives variance estimate, not the full loss distribution

Popular Methods:

England's Bootstrapping Method

- Use standard chain-ladder method to obtain future (lower) triangle as well as past (upper) triangle.
- Use the fitted past and actual payment values to calculate the scaled residuals.
- Resample from the residuals.
- Create pseudo triangle using the resampled residuals
- Use chain-ladder method to get future triangle for each pseudo triangle.
- Create the incremental future payments
- Simulate a future payment using the above created future payments as the mean and appropriate distribution
- Iterate above process N times to get a distribution of unpaid losses

Advanced Methods

Incorporating Expert Opinion in Stochastic Methods

- Through Bayesian technique
- Using prior distribution for parameters to standard stochastic methods e.g. prior distribution for development parameter of Negative Binomial whose mean is based on expert opinion
- Leads to stochastic interpretation of Bornhuetter-Ferguson model by assuming a prior distribution for the accident year ultimate with mean equal to the initial expected loss for that accident year
- Can be implemented using Markov Chain Monte Carlo simulations

Does Bootstrapping Underestimate Variance?

- Based on study performed by Jessica Leong
- Actual unpaid losses concentrated on extreme percentiles, calculated based on bootstrapping on data with an old evaluation date
- Reason: Bootstrapped distribution will not reflect systemic changes (like tort reforms, legislative changes, etc.) if they are not present in the triangle being used for bootstrapping
- Variability due to such systemic changes need to be estimated to get a correct idea of overall variability

Incorporating Correlation

Two broad approaches:

1. Known correlation matrix

- a) Generate multivariate normal using same correlation matrix
- b) Rank-order the simulated normal random numbers
- c) Rearrange the simulated loss reserves using the same rank order

2. Bootstrapping:

- a) No correlation matrix required
- b) Use the residuals from the same positions in the triangles for each line of business , while resampling

Berquist-Sherman Method

- To address the effect of changes in case reserving or claim closure rates Berquist & Sherman suggests the following techniques for quantitative adjustments to the data prior to application of traditional development techniques.
 - The first technique adjusts the historical case outstanding triangle to the case reserving level after changes
 - The second technique adjusts the paid claim count triangle where there have been changes in the rate of claims settlement.
- To confirm a shift in case outstanding adequacy compare the annual change in the average case outstanding to the annual change in the average paid claims
- For paid claims adjustment determine the disposal rates by accident year and maturity by we first projecting the number of ultimate claims based on reported claim counts.

Cape Cod Method

- The Cape-Cod method is a special case of the Bornhuetter-Ferguson(BF) method and a blend of the claim development method and the expected claims method
- In this method the expected ultimate losses using a weighted average from the prior accident periods
- The calculated weighted in proportional to the exposure and inversely proportional to the development in that accident period
- The Cape Cod method is not necessarily as appropriate if the data is extremely thin or volatile or both

Adler Kline Method

- This method projects the number of claims which will close and the average closure amounts at each development age to derive the ultimate claim counts for each accident period.
- The proportion closed ratios is used to predict when the projected ultimate claims will be closed where "Proportion closed" is the ratio of the claims closed at each age to claims remaining as of the prior age.
- The severities for claims closed at each development period can be separately estimated and will be combined to estimate ultimate losses
- The model has an advantage of being independent of changes in case reserving procedures.
- It is flexible to adjustments for changes in severities or claim closure rates over accident years or development periods

Non-traditional Exposures

Asbestos

Issues for insurance companies:

- No definite loss date
- Unclear terms in old policies
- Claim emergence affected by legislative changes

Two Broad Approaches

1. Industry-based

- a) Based on overall market estimates and insurer's own experience
- b) Use market share, survival ratios, IBNR to case ratios, RAA development factors

2. Ground-up

- a) Uses insurer's experience to estimate future reported losses, resolution rates, indemnity and defense costs
- b) Estimates ultimate losses are allocated to appropriate coverage blocks

Non-traditional Exposures

Construction Defects

Issues for insurance companies:

- Difficulty in assigning specific accident year (continuous trigger theory)
- Lengthening of loss emergence pattern
- Lack of historical data
- Calendar year effects

Approach

1. Report Year Based

- a) Estimate IBNER through report year development
- b) The exposure is allocated to RY basis
- c) Based on observed RY frequency, the IBNR claims are estimates
- d) The observed RY severity is used to calculate the pure IBNR loss amount

2. Other Methods

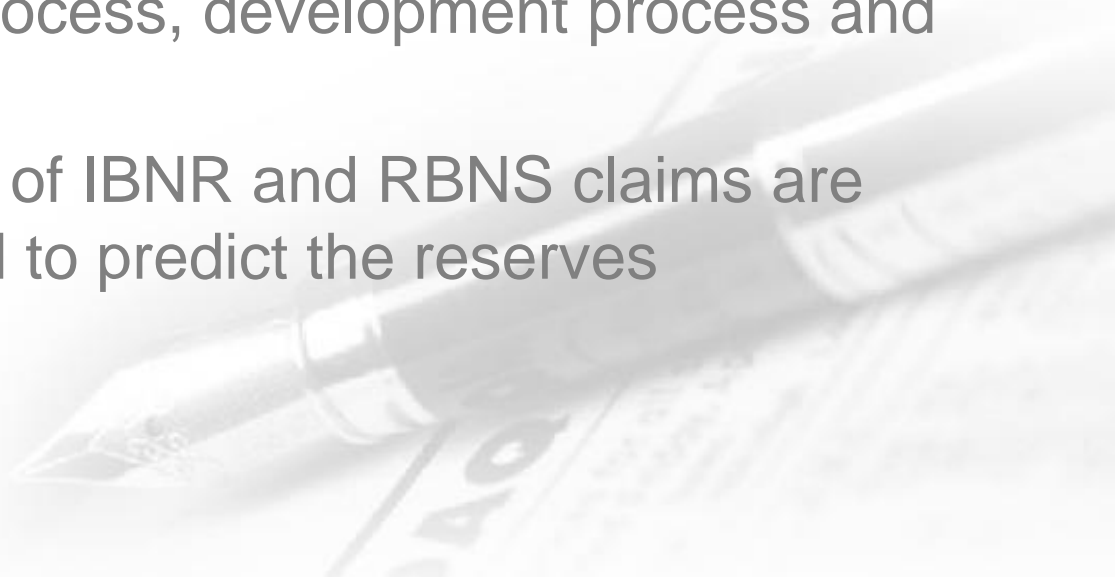
- a) Montrose Adjustment Method
- b) Incremental Paid Loss Method

New Developments

Adjustments For Reserve Cycle:

- Study of booked ultimate losses reveal that good accident years get worse and bad accident years get better
- Most pronounced in WC. Less in Homeowners
- Traditional methods are not able to capture the magnitude of deterioration/improvements
- Suggested approach: use time series modelling to analyze the effects of reserve cycles, adjust for correlation between accident year results

Claim-level Modelling Approach

- A claim is defined by time of claim, reporting delay, and claim process (showing the payment process)
 - This is modelled using a Position Dependent Marked Poisson Process
 - Separate distribution assumptions are made for reporting delay, occurrence process, development process and actual payments
 - Each of the features of IBNR and RBNS claims are separately simulated to predict the reserves
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Acknowledgment & References

Acknowledgment:

Simran Kalra, Dharmesh Sharma: CRISIL Global Research and Analytics

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- *Evaluating Bodily Injury Liabilities Using a Claims Closure Model: Martin Adler, Charles D. Kline, Jr*
- *Reserving for Construction Defects: Michael D. Green, Michael Larrick, Carolyn D. Wettstein, Toby L. Bennington*