

# Comparison of IBNR Methods

2009 Spring ACSW Meeting



## Background & Purpose

- Health actuaries' need to deliver reliable estimates of claim costs
- Number of methods available
- Time span since practical analysis & guidance provided
- Desire to add to body of knowledge on how methods compare and can be used



## Claim Lag Simulation

- Block Types
- Crystal Ball & MS Excel use
- Fit of probability distribution to observed claim lag patterns
- Excess claim simulation
- Stress testing



## Definition of Accuracy

- Error:  $(\text{Reserve Estimate} - \text{Actual Runout}) / (\text{Actual Runout})$
- Attempt to recognize that recent incurral months are often “plugged” (e.g. PMPM or loss ratio driven incurred claim estimates)
- Valuation actuary relies on incurral months with “credible” completion factors
- Accuracy: Of those methods with mean positive error %, which have the lowest standard deviation of error %



## Stress Tests

- Seasonality
- Days in a month to adjudicate
- Days in a month to generate claim
- Claim cost trends
- Growing/Diminishing Blocks
- Claim Administration Disruption/Backlogs
- High/low number and amount of shock claims
- Premium changes (e.g. rate increases)
- Claims shifts



## IBNR Calculation Types

- Deterministic vs. Stochastic
- Single-Approach Development Methods
- Hybrid Development Methods
- Paid PMPM Method
- Regression Methods
- Stochastic Simulation Methods
- Neural Network Methods



## Basic Development Methods

- 3, 6, 9, & 12-Month average factors
- Dollar-weighted average factors
- Average factors with outliers removed
- Geometric average factors
- Harmonic average factors
- Cross-incurral month average factors



## Exposure Methods

- Loss Ratio Method
- Average Claim Per Policy Method
  - a.k.a. PMPM Method
- Paid PMPM Method



## Hybrid Development Methods

- Benktander method
- Bornhuetter method
- Credibility-weighting method
- Hybrid method(s):
  - Example: Bornhuetter with 9-month average factors & dropping outliers



## Newer Methods

- Stochastic
  - Theory
  - Difficulties
- Neural Networks
  - Theory
  - Independent source & testing



## Findings

Mean % error for most methods under most block types show relatively-slight positive bias (i.e. reserve is conservative)

Question: Is positive, or conservative, bias desired by health valuation actuary?



## Findings

Go beyond simple averaging...

When lag methods were tested, the more robust average lag methods and hybrid methods produced better results than straight average methods.

Hybrid methods also produced fairly low mean errors and standard deviations



## Findings

For the IBNR methods and scenarios tested, the one exhibiting the most consistency, in terms of relatively lower variance and mean error was the Paid PMPM method.

The method also often provided useful claim reserve estimates in recent incurral months as well as handling claims administration disruptions relatively better.



## Findings

Traditional lags still have value...

Traditional lag methods exhibited the least amount of variation in mean IBNR error when tested under an alternative business situation that entailed material shifts in per capita claims costs at various time points prior to the valuation date.



## Findings

Running IBNR results with multiple methods...

Most health care actuaries use a variety of methods to estimate IBNR and the preferred method may be a combination of methods.

For example, lag methods while commonly used, have the highest standard deviations. Thus, the use of a second method is suggested in order to obtain reasonable results in the more recent incurral months.

## Findings

Stresses to accurate IBNR results...

- The two most problematic business situations tested:
  - Very recent upward increases in claims costs and
  - Rate spirals.
- Seasonality will affect reserve sufficiency.
- Certain IBNR methods are “immune” to premium shifts.



## Additional Considerations for Health Actuaries

- Handling atypical claim submission and/or adjudication levels
- Using Pending Claims Data
- Claim grids with Incurred-to-Reported Lags



## Excel Tools/Add-Ins for Stochastic & Neural Network Analysis

- Examples
  - Crystal Ball from Oracle
  - Risk Solver from Frontline Systems
  - @Risk by Palisade Corporation
  - NeuralTools from Palisade Corporation
- Cost: \$1,000-\$2,000+ per year



## Next Steps in Study Effort

- Draft report released to SOA Health Section
- Draft spreadsheet IBNR tool released

