Value-Added Loss Reserving for General Insurance

-- Loss Reserving Actuaries in the New Epoch

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Value-Added Loss Reserving Discussion Topics

- A Different Approach to Loss Reserving
  - What?
  - Why?
  - Who?
  - When?
  - How?

- Deliverables
Different Approach: What?  The Pillars of Value-Added Reserving (VAR)

- Traditional:
  - Data → Actuarial Methods → Loss Reserve Indication
- The Pillars of Value-Added Reserving
  - Significant, two-way operational focus
  - The best tools and techniques
    - Actuarial methods
    - Benchmarking
  - Evaluation and quantification of reserve uncertainty
  - Communication of findings and implications

Value-Added Reserving uses input from all of a company’s functional areas:

- Underwriting Effectiveness
- Claim Effectiveness
- Pricing Effectiveness
- Reinsurance Effectiveness
- Loss Reserve
- Marketing Effectiveness
- Risk Management Effectiveness
Different Approach: What? Best Tools and Techniques

- Proven effectiveness
- Historical track record; hindsight testing
- Responsiveness to environmental and operational circumstances and changes
- Operational information guides the choice of methods, adjustments to historical data, parameters, weights
- Benchmarks

Different Approach: What? Range Analysis

Actuarial Pricing and Reserving Problem

The “funnel of doubt”

- Reserving analysis is not just about looking backwards!
Different Approach: What?
Effective Communications

- Traditional Reserve Analysis:
  - Lack of adequate communication with non-actuarial functions
  - Sometimes viewed as a mysterious process
  - Reserving results and implications not fully understood by the management team → might miss some significant business issues and opportunities

Myth:
Actuary = Fortune Teller?

Different Approach: Why?
Higher Expectations – Internal Audiences

- Management decision requires more quantifiable information from reserving actuaries
- Environmental and operational changes created new challenges to the traditional actuarial reserving methods
- New tools are needed to satisfy more complex and competitive business environment
- Peer pressure from key competitors
- Need to understand uncertainty
### Different Approach: Why?
#### Higher Expectations – External Audiences

<table>
<thead>
<tr>
<th>Regulators</th>
<th>Asian Example: Malaysia Insurance Regulator (BNM) recently introduced new RBC requirement, which requires the company to estimate the reserve liability at 75% percentile confidence level</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEC</td>
<td>Require public companies to discuss reserve uncertainty in 10-K filings</td>
</tr>
<tr>
<td>Rating Agencies</td>
<td>Capital adequacy analyses reflect reserve shortfalls and reserve risks</td>
</tr>
<tr>
<td></td>
<td>Prudent management is expected to consider more than just the best estimate</td>
</tr>
<tr>
<td>Investor</td>
<td>Management is expected to demonstrate understanding and effective control of risks</td>
</tr>
<tr>
<td>Actuarial Profession</td>
<td>Raising the performance bar—especially regarding ranges and communications</td>
</tr>
</tbody>
</table>

### Different Approach: Who will get involved?

- Value-Added Reserving
  - Adequate communications with **operational functions** are emphasized in VAR
  - Reserving function should provide key input to **senior management's** decision making process

![Diagram of Management/Decision Making](image-url)
Different Approach: When?

Traditional Reserving
- Regularly (annual or quarter) to fulfill the need of financial statements

Value-Added Reserving
- Regularly (annual or quarter) to fulfill the need of financial statements
- Supplemental information and insights to enrich the basic actuarial results
- Ongoing monitoring of results vs expectations
- Ad hoc analysis to support requirements of management’s decision making

Different Approach: How?
Document Operational Changes: Claim Log

Claim Log

<table>
<thead>
<tr>
<th>Nature of change</th>
<th>Dates initiated and completed</th>
<th>Reason for change</th>
<th>Details of change</th>
<th>Target effect and actuarial impact</th>
<th>Observed effects</th>
<th>Lines of business affected</th>
<th>Percentage of business affected</th>
</tr>
</thead>
</table>

- The types of changes to track include:

Claim

| New markets/exposures/types of claims/limits | Claim department organization and procedures |
| Case reserving | Management/staffing/vendor selection or process |
| Express claim settlement initiative | Legal environment or processes |
| Settlement authority | IT changes |
| Problems (e.g., claim handling backlog) | |

Similarly, document issues and changes in other operational units
Different Approach: How?
Best Tools and Techniques

<table>
<thead>
<tr>
<th>Actuarial Methods</th>
<th>Reflect Operational Insights</th>
<th>Benchmarking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject the methods used to “hindsight” testing</td>
<td>Choice of actuarial methods</td>
<td>Most actuarial analyses benefit from having robust benchmarking data</td>
</tr>
<tr>
<td>Keep the more accurate methods</td>
<td>Interpretation/adjustment of historical data</td>
<td>Rate/price monitoring</td>
</tr>
<tr>
<td>Discard or adjust the less accurate ones</td>
<td>Choice of parameters</td>
<td>Loss ratios</td>
</tr>
<tr>
<td>Introduce new methods</td>
<td></td>
<td>Trend rates</td>
</tr>
<tr>
<td>Continuous improvement</td>
<td></td>
<td>Reporting and payment patterns</td>
</tr>
<tr>
<td>Diagnostic analyses of the data</td>
<td></td>
<td>Other</td>
</tr>
<tr>
<td>Test for key trends and shifts</td>
<td></td>
<td>Multiple levels can be used</td>
</tr>
<tr>
<td>Use efficient approaches for interim (e.g., monthly or quarterly) updates</td>
<td></td>
<td>Industry</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Peer companies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Economic data</td>
</tr>
<tr>
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<td></td>
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</tbody>
</table>

Peer Review
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Different Approach: How?
Range Analysis

■ Define “Range”
  ■ Range of best estimates
  ■ Range of normal variance around a mean
  ■ Range of most likely outcomes
  ■ Range of possible outcomes

■ Analysis methods
  ■ Compare results of the various deterministic methods
  ■ Scenario testing: e.g. alternative medical inflation rates
  ■ Hindcast testing: historical performance of consistently-applied method
  ■ Stochastic methods that are calibrated based on observed variability in your historical data
  ■ Industry-based benchmarks regarding inherent variability

■ Link potential environmental, operational, or behavioral factors to their effects
Different Approach: How?
Distinct Types of Risk

- **Process Risk**: Roll of fair die, equal chance of one to six
  - Decreases with volume

- **Parameter Risk**: Roll of loaded die, no longer sure of probabilities
  - Constant with volume

- **Model Risk**: Roll of trick die not numbered one to six, not sure what is on each side

**Total Risk**

**Actual Outcome**

**True Expected Outcome**

**Model Estimate of Expected Outcome**

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Different Approach: How?
Claim Variability Analysis

**Common stochastic reserving methods**

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mack Method</strong></td>
<td>Produces a measure of the variability of the projected unpaid claims by examining the variability of the historical loss development factors</td>
</tr>
<tr>
<td><strong>Bootstrapping Method</strong></td>
<td>Produces a distribution of unpaid claims by simulation; differences between actual historical loss development and idealized development based on selected loss development factors are treated as sampling errors</td>
</tr>
<tr>
<td><strong>Practical Method</strong></td>
<td>Incorporates judgments about loss development factors and ultimate loss ratios; produces a distribution of claim liabilities via simulation</td>
</tr>
<tr>
<td><strong>Christofides Method</strong></td>
<td>Fits regression model to incremental loss development triangle; regression equation has both accident year and development year parameters</td>
</tr>
</tbody>
</table>
Value-Added Loss Reserving
Discussion Topics

A Different Approach to Loss Reserving

Deliverables
- Loss reserve indications
- Claim variability
- Standard of materiality
- Loss reserve implications
- Operational insights
- Input to the Enterprise Risk Management process

Deliverables
Loss Reserve Indications

- Best estimate
- Comparison to other actuary’s results
  - For example, internal actuary vs. external actuary
- Comparison to management’s booked loss reserve
- Changes from last year’s projections
  - And why?
- Gross and net of reinsurance
- Loss, Loss adjustment expenses
- Results by business segment, line of business, years
Deliverables
Claim Variability

- Anticipating “negative surprises”
  - Rigorous range analysis allows assessment of the probability of “worse than expected” results
  - Identify circumstances likely to produce “surprises”
  - Allows for risk management interventions

- More effective results monitoring
  - Distinguish truly exceptional results from random noise
  - More effective early recognition of problem areas

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Deliverables
Standard of Materiality

- In this illustration, there is significant overlap between management’s view and the external actuary’s view of the underlying distribution
- Differences in estimates of ultimate liabilities are likely to represent “noise”
**Deliverables**
**Alternative scenario – “Not Reasonable” Opinion**

- In this illustration, differences between the actuary’s estimate and management’s estimate are statistically significant.
- Differences in estimates of ultimate liabilities represent a real difference of opinion.
- The Statement of Actuarial Opinion may need to be “inadequate”.

**Management’s View**

- $H_0$: $\mu_0 = 25\%$
- $\alpha / 2 = 25\%$

**Independent Actuary’s View**

- $H_0$: $\beta = 50\%$

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**Deliverables**
**Loss Reserve Implications**

- Adequacy of booked provisions
- Profitability of various segments of business
- Trends
- Claim management effectiveness
- Areas for future refinement and more analysis
- Reinsurance effectiveness
Deliverables
Input to Enterprise Risk Management (ERM) Process

Cumulative Probability

Percent Change in Economic Capital
-100% 0%

Economic Capital covers the downside scenarios in all but the most extreme scenarios
Policyholder/depositor security risk relates to insolvency and non-performance

Operational Insights: Hypothetical Operational Summary

<table>
<thead>
<tr>
<th>Area</th>
<th>Opportunity for Improvement</th>
<th>Comments/Observations</th>
</tr>
</thead>
</table>
| Claims                | Low                         | - Case reserve strengthening appears to have occurred
- Average settlements also increased
- Appears to be more than severity trend
- May be related to recent changes in authority levels
- Higher case reserves driving higher settlements |
| Underwriting/Pricing  | Medium                      | - Recent years’ loss ratios do not track with company expectations
- Estimates show higher loss ratios than expected
- Price monitoring system not capturing price cuts
- Quality/mix of business may have slipped
- Line of business X has high and volatile loss ratio |
| Reinsurance           | High                        | - Recent years’ ceded ratios very favorable for two coverages (WC and GL), and improving
- May be an opportunity to discuss possible revision in terms |

Low  Medium  High
1. Considerations Regarding Standards of Materiality in Estimates of Outstanding Liabilities, Bardis E., Gwilliam C., Malhotra A.  
http://www.casact.org/pubs/forum/06fforum/5.pdf
2. Measuring the Variability of Chain Ladder Reserve Estimates, Mack T.  
3. Analytic and Bootstrap Estimates of Prediction Errors in Claims Reserving, England P. and Verrall R.  
http://www.sciencedirect.com/
4. Value-added Reserving, Ghezzi T.  
5. Statement of Actuarial Principles Regarding Property and Casualty Loss and Loss Adjustment Expense Reserves  

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