Session 5B –
Understanding Reinsurance Pricing and Assessing Reinsurance Adequacy (P&C)

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Paul Wee
Purpose of This Presentation

- Understanding how reinsurance pricing is done
- Providing respective views from a direct insurer and a reinsurer
- Starting point of evaluating your reinsurance needs
- Introducing Flood Pricing

Agenda

1. Overview of Reinsurance
2. Reinsurance Pricing Process
3. Assessing Your Reinsurance Adequacy
4. Reinsurance Management
5. Conclusion
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Overview of Reinsurance | Purpose

- Risk transfer
- Capacity
- Stabilisation
- Portfolio Management
- Catastrophe protection
- Spread of Risk
- Development of new Products
Overview of Reinsurance | Types

Overview of Reinsurance | Facultative

- **Facultative Reinsurance** is specific reinsurance covering a single risk.

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risks considered individually</td>
<td>Administration is labour intensive</td>
</tr>
<tr>
<td>Increases cedants competitive edge</td>
<td>Cannot be certain of placement</td>
</tr>
<tr>
<td>Protect the treaty - Provides coverage for very large risks (energy, aviation) or risks excluded from treaty cover</td>
<td>Reinsurer may be competitor and the reinsured must disclose information</td>
</tr>
<tr>
<td>Reinsurer may provide knowledge regarding nature of the risk</td>
<td>Cedant may lose control over the U/W and handling of the risk</td>
</tr>
</tbody>
</table>
Overview of Reinsurance | Treaty

- **Treaty Reinsurance** is specific reinsurance covering a group of risks.

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automatic RI cover - Treaty Proportional reinsurance increases automatic capacity</td>
<td>No freedom to reinsurers as cession is obligatory</td>
</tr>
<tr>
<td>Ceding commission and potentially a profit commission</td>
<td>Too much premium is lost on good risks for the insurers</td>
</tr>
<tr>
<td>Administration is simpler than Facultative</td>
<td>Risks may not fall within the scope or capacity of the treaty</td>
</tr>
</tbody>
</table>

Overview of Reinsurance | Treaty Proportional

- Insurer cedes a percentage of each risk to the reinsurer
- **Quota Share**: Percentage is fixed for all risks
  - For example: With Cession of 40%, insurer passes 40% of gross premiums, and claims to reinsurer
- **Surplus**: Percentage depends on the size of each risk and the retention level, subject to specified limits

<table>
<thead>
<tr>
<th>Risk 1</th>
<th>Risk 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retention</td>
<td>10m</td>
</tr>
<tr>
<td>Sum Insured</td>
<td>100m</td>
</tr>
<tr>
<td>Cession</td>
<td>90%</td>
</tr>
</tbody>
</table>
Overview of Reinsurance Treaty Proportional (continued)

- Advantages/Disadvantages of each arrangement

<table>
<thead>
<tr>
<th>Quota Share</th>
<th>Surplus</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td><strong>Disadvantages</strong></td>
</tr>
<tr>
<td>Relationship between cedant and reinsurer</td>
<td>Large amounts of income ceded away</td>
</tr>
<tr>
<td>Unlimited coverage – sideways and vertical</td>
<td>Risks may not fall within the scope or capacity of the treaty</td>
</tr>
<tr>
<td>Flexibility in the amount of QS ceded</td>
<td>Cedant is bound by the treaty terms</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Flexibility in the amount of QS ceded</strong></th>
<th><strong>Advantages</strong></th>
<th><strong>Disadvantages</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ceding commission and potentially a profit commission</td>
<td>Fluctuating loss experience as well as less desirable business</td>
</tr>
</tbody>
</table>

Overview of Reinsurance Treaty Non-Proportional (XOL)

- Non-proportional reinsurance only responds if the loss suffered by the insurer exceeds the retention.

- **Per Risk:** Protection for a single loss on each risk
  - Loss = 160m
  - Limit x Deductible = 100m x 100m (Cover 200m)
  - Reinsurer takes 60m, Insurer retains 100m

- **Per Event (CAT):** Protection from accumulation of losses
  - Two Losses at 160m each in an event, on a 200m x 100m CAT XOL
  - Event loss = 160m + 160m = 320m
  - Reinsurer: 200m, Insurer: 120m
Overview of Reinsurance
Treaty Non-Proportional (XOL) (continued)

- Advantages
  - Retain more income.
  - Easy to administer, no bordereaux or quarterly accounts.
  - Easy to obtain.
  - Pre-agreed payments, can budget more effectively.
  - Reduces volatility of loss experience.

Overview of Reinsurance | Typical Structure

Example
A building might have a sum insured of 100m (gross before RI)
Gross Sum Insured 100m
Net Sum Insured Retained might be 10m (90% cession)

The Risk XOL protects any losses on the net TSI (up to a 10m loss each risk).
The CAT XOL protects against accumulated losses from the net risks.

How much should be retained?
Agenda

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2. Reinsurance Pricing Process
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Reinsurance Pricing Process

- Pricing Components

  - Expected Losses
    - Experience rating
    - Exposure rating
  - Loadings
  - Technical Price
    - Expenses
    - Profit Margin
    - Cost of capital
  - Underwriter's Price
    - Market considerations
    - Target Hurdle Price
Reinsurance Pricing Process

• Experience Rating (Non Proportional and Proportional)

Data Adjustments, “as-of” premiums and claims → Projections to Ultimate and Trending → Deriving Frequency and Severity Parameters, Or distribution for the loss rate → Fitting the curves to defined paybacks → Aggregating curves by simulation → Expected Loss

• Considerations
  • Data quality and completeness, number of losses above chosen threshold level
  • Burning cost average
  • Splitting up loss components Attritional, Large & Cat
  • Changes in terms and conditions
  • Changes in underlying risks and rates

Reinsurance Pricing Process

• Experience Rating (Non Proportional Short Tail Example)

Layer 1: US$ 4m xs US$ 1m; Layer 2: US$ 5m xs US$ 5m
Reinsurance Pricing Process

- Experience Rating (Non Proportional Short Tail Example) (Continued)
  - Experience data from individual losses allows separate analysis of loss frequency and loss severity
    - Fit severity distributions taking account of
      - Selection of underwriting years representative of treaty experience
      - Exclusion of certain losses
      - In exceptional cases, assignment of a return period to (one or very few of) the largest loss(es) if it is deemed that the loss has a higher return period than the observation period
      - Adjustment of the exposure measures to reflect historical year-by-year or tariff/premium rate changes
      - Indexation of the historical losses to values anticipated to be representative of the period being priced (note: different indexation algorithms apply to per risk and per event covers)
    - Similarly, indexation of loss reporting thresholds
  - From these severity distributions, compare statistical ‘fit’ and use judgment to select the most appropriate
  - Estimation of loss frequency using a weighted average approach on as-if frequencies from historical years, where the weight of a given year is its exposure measure

Reinsurance Pricing Process

- Experience Rating (Proportional Example)
  - Use historical experience data for premiums and losses to estimate ultimate loss ratios for each past underwriting year
  - From these ultimate loss ratios, compare statistical fits of various distributions to select the best for projection
    - Company XYZ, reported as at 2017

<table>
<thead>
<tr>
<th>UW Year</th>
<th>Premiums</th>
<th>Actual Losses</th>
<th>Actual Loss Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>130</td>
<td>60</td>
<td>82%</td>
</tr>
<tr>
<td>2016</td>
<td>140</td>
<td>110</td>
<td>79%</td>
</tr>
<tr>
<td>2017</td>
<td>190</td>
<td>60</td>
<td>40%</td>
</tr>
<tr>
<td>2018</td>
<td>140</td>
<td>30</td>
<td>21%</td>
</tr>
</tbody>
</table>

- Premiums and losses develop over time, earlier UW years more developed than recent ones; development-to-ultimate values is essential
- Historical data needs to be indexed so is at same level of treaty period being priced (‘as-if’ basis)
- Experience data may not reflect the full extent of cover being priced, so ‘unused capacity’ gap between modelled losses and treaty capacity must be assessed
- Simulate losses/results using lognormal distribution, with loss-sensitive features
Proportional Pricing - Example

<table>
<thead>
<tr>
<th>Yr</th>
<th>Premiums</th>
<th>Actual Losses</th>
<th>Actual Loss Ratio</th>
<th>Large Loss</th>
<th>Attritional Loss</th>
<th>Attritional Loss Ratio</th>
<th>IBNR</th>
<th>Ur Loss Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>150</td>
<td>80</td>
<td>60%</td>
<td>0</td>
<td>60</td>
<td>82%</td>
<td>0</td>
<td>62%</td>
</tr>
<tr>
<td>2014</td>
<td>140</td>
<td>110</td>
<td>79%</td>
<td>40</td>
<td>70</td>
<td>50%</td>
<td>15</td>
<td>61%</td>
</tr>
<tr>
<td>2015</td>
<td>150</td>
<td>60</td>
<td>40%</td>
<td>0</td>
<td>60</td>
<td>40%</td>
<td>25</td>
<td>57%</td>
</tr>
<tr>
<td>2016</td>
<td>140</td>
<td>30</td>
<td>21%</td>
<td>0</td>
<td>30</td>
<td>21%</td>
<td>55</td>
<td>63%</td>
</tr>
<tr>
<td>2017</td>
<td>150</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. “As-If”: Adjusted for premium rate changes, inflation, changes in cover.

2. Attritional ULR: Average of ultimate attritional loss ratios developed to ultimate.

3. Large: 40m over 5 years divided by 160m

4. CAT/Flood: 500m over 200 years divided by 160m

5. Finally, apply the underwriting terms and simulate to find the expected result.

Issues in Treaty Reinsurance Pricing

- No losses or low number of losses
  - Apply benchmarks or use exposure pricing
  - Consider re-segmenting the business with other classes
- Unused capacity charge (Gap from the largest loss to limit)
  - Price similarly as large loss in line with minimum payback
  - Consider un-balanced treaties and need to engage underwriter
- Retention changes
  - Need to restate past losses to the same retention basis.
  - The net losses to the XOL would be re-calibrated
Reinsurance Pricing Process
Treatment of CAT / Large Losses

- Flood Modelling (Exposure/Experience)
  - Using CAT models (Re.Banjir by Malaysian Re) to get the OEP curves
  - Select payback and related loss amount
  - Price this amount on top of the attritional loss projected

- Large Loss Pricing (Experience only)
  - Use frequency / severity approach
  - Fit curve (example pareto-poisson) to the target payback
  - Select payback and related loss amount
  - Price this amount on top of the attritional loss projected

Natural Peril Events / Flooding in Malaysia

- Mostly Flood but also includes storm and landslide.
- Market practice: Price flexibility is low due to the tariff (for motor, a period of transition from tariff to detarification)
  - Motor Own Damage: Flood has historically not been a major contributor to insured losses as opt-in cover is not popular at the price of 0.5% of TSI for special perils.
  - Motor Own Damage flood losses may form a greater part of the loss experience going forward given the increase in flexibility of policy terms/coverage post-detarification – this will need to be factored into pricing.

- Historical Flood Losses
  - Largest insured loss in December 2014, at USD 63mil (source: Axco)

- Pricing approaches
  - Flood is still considered implicitly within the rating factors on due to limited insurance experience.
  - Start simple (non-modelled PML%, flood footprint)
Reinsurance Pricing Process

• Exposure Rating
• Very useful method if:
  • We have little or no loss history (e.g. high excess layers where experience is sparse, new covers/companies)
  • Underlying business has changed over time
  • Always recommended to compare with experience-based results
• To use this technique, we need information on:
  • Cedent’s risk profile, such as type of business, exposure (premiums, number of policies), size of risks (sums insured, EML), policy limits
  • Appropriate exposure curves, for instance type of business affects whether losses are related to sum insured or policy limits

Reinsurance Pricing Process

• Exposure Rating (Example)
• Two main approaches – rebate curves and increased limit factors (ILFs)

<table>
<thead>
<tr>
<th>Rebate Curves</th>
<th>ILFs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Used for Property business</td>
<td>Used for Liability business</td>
</tr>
<tr>
<td>Example: Swiss Re curves (MBBEFD)</td>
<td>Example: Riebesell</td>
</tr>
<tr>
<td>Generally dependent on ratios</td>
<td>Generally dependent on absolute limit amounts</td>
</tr>
</tbody>
</table>
Assessing Reinsurance Adequacy

- Setting Your Risk Appetite
  - Able to withstand vertical losses (EQ, Flood) up to 200 years payback
  - Sufficient reinstatements for number of frequency losses
- Setting Your Retention
  - Rules of Thumb
  - DFA / Economic Capital Modelling approach
- Managing Likelihood of Reinsurer Default
  - Expected loss = RI Recovery x LGD% x PD%
  - Concentration limits per reinsurer
  - Stress & Scenario Testing
Assessing Reinsurance Adequacy
Setting Your Retention

• Common “Rules of Thumb”
  • Applying factors based on financial structure and in line with management view, for each risk and event
  • x% of Net Income
  • y% of Current Assets or Equity
  • z% of Gross Written Premium

• Economic Capital Modelling approach
  • Stochastic analysis to find the optimal retention level
  • Maximising risk-return, via an efficient frontier
  • Reflect risk appetite and metrics (VaR, solvency)

Assessing Reinsurance Adequacy
Factors which Influence the Retention

➢ Assets, Solvency, Capital and free reserves
➢ Size of portfolio and premium
➢ Type of Risks
➢ Frequency and severity of Risk
➢ Reinsurance type and cost
➢ Corporate Strategy
➢ Market Environment
➢ Exposure to accumulations/natural perils
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Reinsurance Management
Actuarial Function Under Solvency II

- Nature of the Opinion
  - Explain context, analysis and concerns in reviewing reinsurance; in how performance of the RI would enable firm to achieve target risk profile.

- Risk Profile
  - Consider how consistent is the risk profile with the reinsurance

- Credit Profile
  - Consider credit worthiness of the reinsurer, in particular “dispute risk”
  - Potential losses due to inability of unwillingness to pay

- Stress Test
  - Consider performance under expected plan and stress scenarios
  - Potential impact of risk aggregation, and exhaustion of cover (vertically from CAT, horizontally from frequency losses).
Reinsurance Management
Actuarial Function Under Solvency II (Continued)

Typical Report Components

<table>
<thead>
<tr>
<th>Outline</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive Summary and Recommendations</td>
<td>Actuarial opinion on whether the RI structure is adequate</td>
</tr>
<tr>
<td>Governance</td>
<td>Discuss governance structure, opinion on process of review and approval</td>
</tr>
<tr>
<td>Underwriting Risk Profile, Existing Reinsurance Cover</td>
<td>Discuss changes expected to underwriting (mix, premiums...). Risk of vertical, horizontal exhaustion. Risk of not meeting placement terms.</td>
</tr>
<tr>
<td>Profitability</td>
<td>Analysis of impact of RI on profitability</td>
</tr>
</tbody>
</table>

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Difference Between Direct and Reinsurer During the Reinsurance Renewal

<table>
<thead>
<tr>
<th>Direct Insurer</th>
<th>Reinsurer</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Renewal is a major exercise.</td>
<td>• Account / contract specific pricing and underwriting.</td>
</tr>
<tr>
<td>• Assessment in the form of reinsurance optimization at entity level.</td>
<td>• Technical pricing process, data adjustments, loss assumptions.</td>
</tr>
<tr>
<td>• Economic capital approach / solvency based view normally used.</td>
<td>• Price needs to meet internal requirements.</td>
</tr>
<tr>
<td>• Reinsurer counterparty risk is important.</td>
<td>• Portfolio level overview and steering.</td>
</tr>
</tbody>
</table>

Conclusion

• Understand the reinsurance pricing process so that the renewal structure reflects your portfolio and risk appetite.

• Importance of data is crucial for a robust assessment, otherwise it could lead to pricing inefficiencies and higher reinsurance cost.

• More information on this subject can be found in the paper “Analyzing the Disconnect Between the Reinsurance Submission and Global Underwriter's Needs” by the IFoA-CAS International Pricing Research Working Party

• Assess reinsurance adequacy holistically in line with the risk appetite of your firm, using a DFA approach if possible.

• Flood pricing: Consider how to develop and price this risk to differentiate your firm in transitioning from the tariffed market.
THANK YOU

Discussion and Q&A
END OF SLIDES