The SOA Asia-Pacific Annual Symposium

6-7, July 2017

SOCIETY OF ACTUARIES

Institute and Faculty of Actuaries

SOCIETY OF ACTUARIES

P&C Reinsurance Pricing and Assessing Reinsurance Adequacy

SOA Symposium 6th – 7th July 2017

Paul Wee & Sie Lau
A Presentation by the IFOA's GI Asia International Working Party

6 July 2017

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?

Institute and Faculty of Actuaries

Agenda

1 Overview of Reinsurance

2 Reinsurance Pricing Process

3 Assessing Your Reinsurance Adequacy

4 Reinsurance Management

5 Conclusion

6 Appendix: About IFOA GI Asia International WP

Institute and Faculty of Actuaries

Agenda

Institute and Faculty of Actuaries

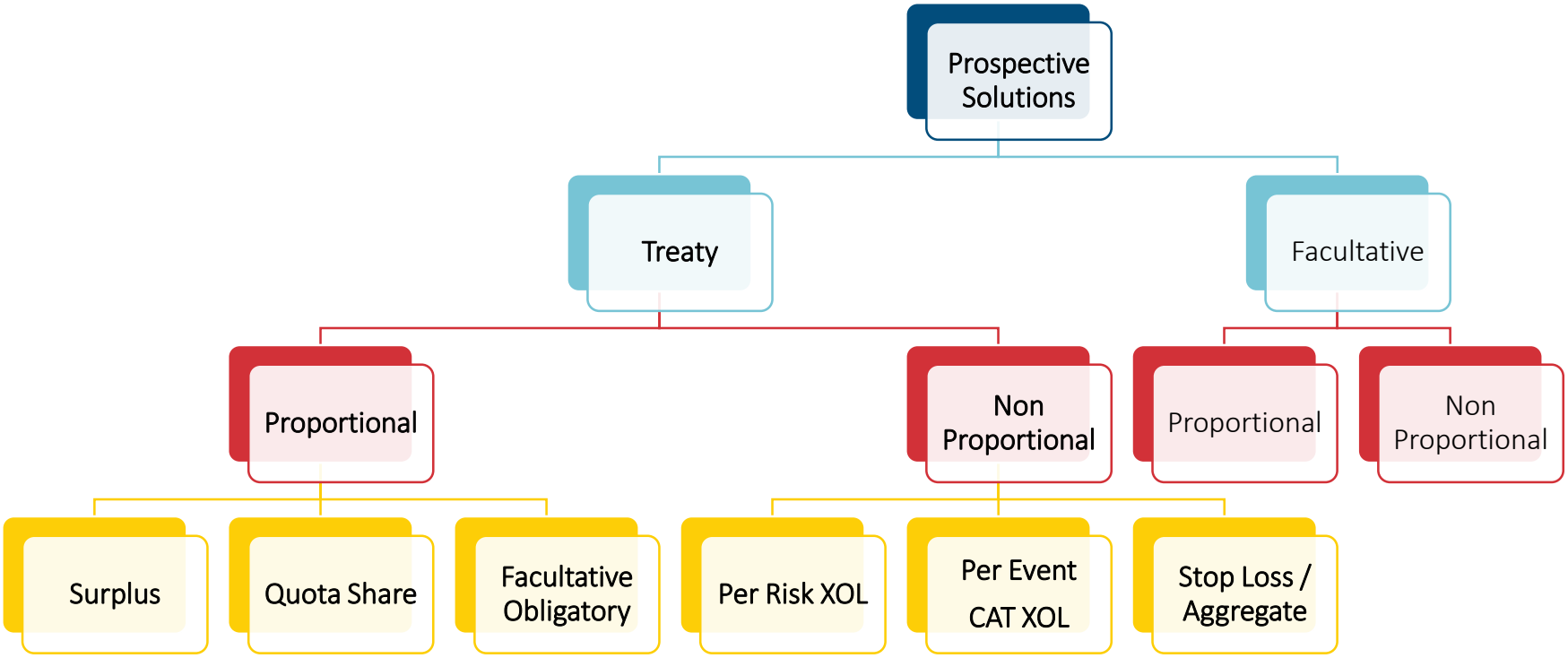
Overview of Reinsurance | Purpose

- ✓ Risk transfer
- ✓ Capacity
- ✓ Stabilisation
- ✓ Portfolio Management

- ✓ Catastrophe protection
- ✓ Spread of Risk
- ✓ Development of new Products

Institute and Faculty of Actuaries

Overview of Reinsurance | Types



Institute and Faculty of Actuaries

Overview of Reinsurance | Facultative

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

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

Institute and Faculty of Actuaries

Overview of Reinsurance | Treaty

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

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

Institute and Faculty of Actuaries

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

	Risk 1	Risk 2
Retention	**10m**	**10m**
Sum Insured	**100m**	**20m**
Cession	**90%**	**50%**

Institute and Faculty of Actuaries

Overview of Reinsurance
Treaty Proportional (continued)

- Advantages/Disadvantages of each arrangement

Quota Share		Surplus	
Advantages	Disadvantages	Advantages	Disadvantages
Relationship between cedant and reinsurer	Large amounts of income ceded away	Vary the retention on a particular risk	Cedant stand to fall by chosen retention
Unlimited coverage – sideways and vertical	Risks may not fall within the scope or capacity of the treaty	Unlimited sideways cover	Risk may not fall within the scope or capacity of the treaty
Flexibility in the amount of QS ceded	Cedant is bound by the treaty terms	Reinsurer can retain a greater proportion of its income in comparison to a QS	Reinsured is bound by the treaty terms
		Ceding commission and potentially a profit commission	Ceding commission is lower than that of a QS
			Fluctuating loss experience as well as less desirable business

Institute and Faculty of Actuaries

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 xs Deductible = 100m xs 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

Spill over 20m

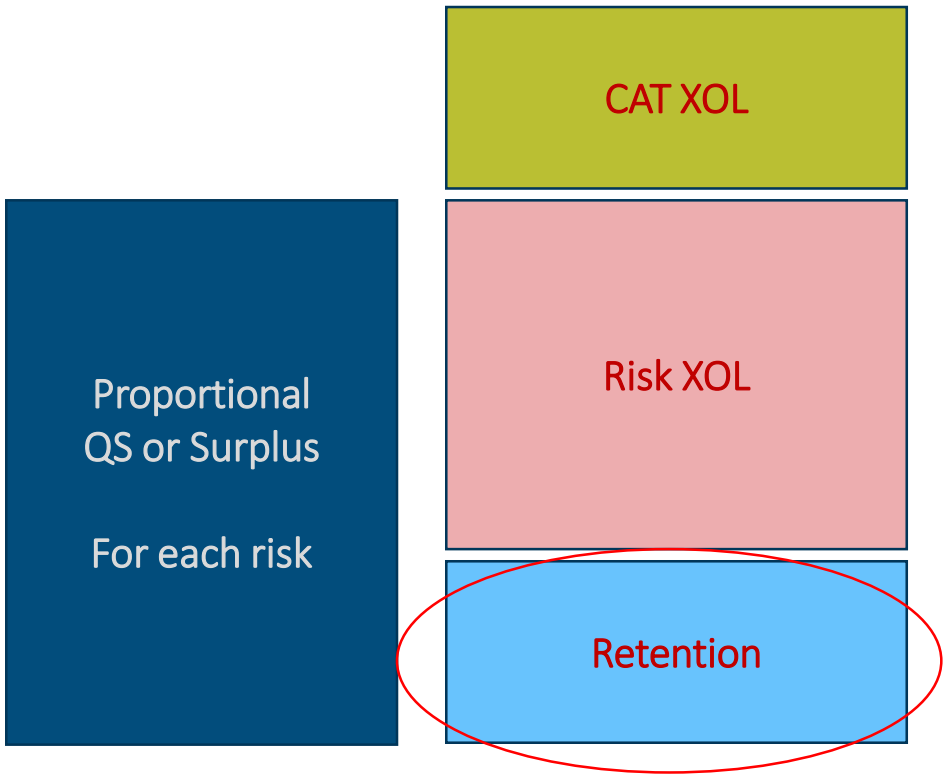
Institute and Faculty of Actuaries

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.

Institute and Faculty of Actuaries

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?

Institute and Faculty of Actuaries

Agenda

1 Overview of Reinsurance

2 Reinsurance Pricing Process

3 Assessing Your Reinsurance Adequacy

4 Reinsurance Management

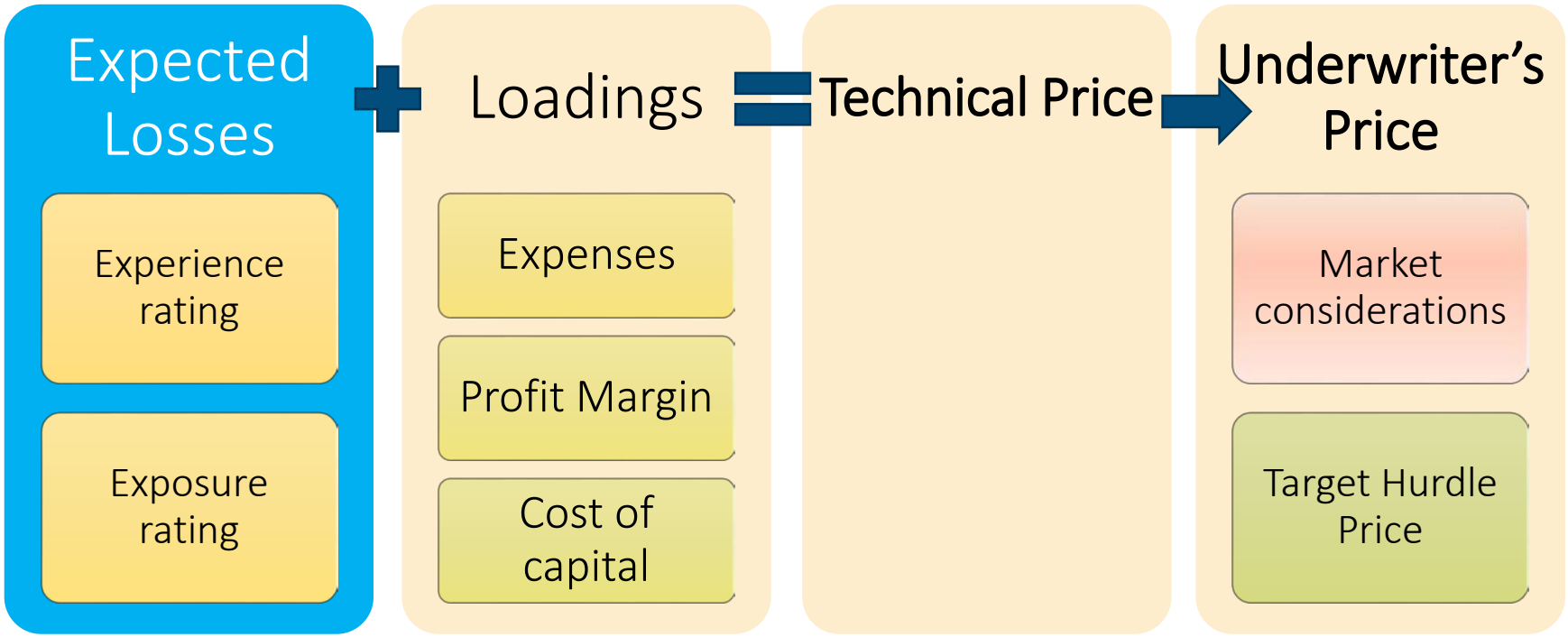
5 Conclusion

6 Appendix: About IFOA GI Asia International WP

Institute and Faculty of Actuaries

Reinsurance Pricing Process

- Pricing Components



Institute and Faculty of Actuaries

Reinsurance Pricing Process

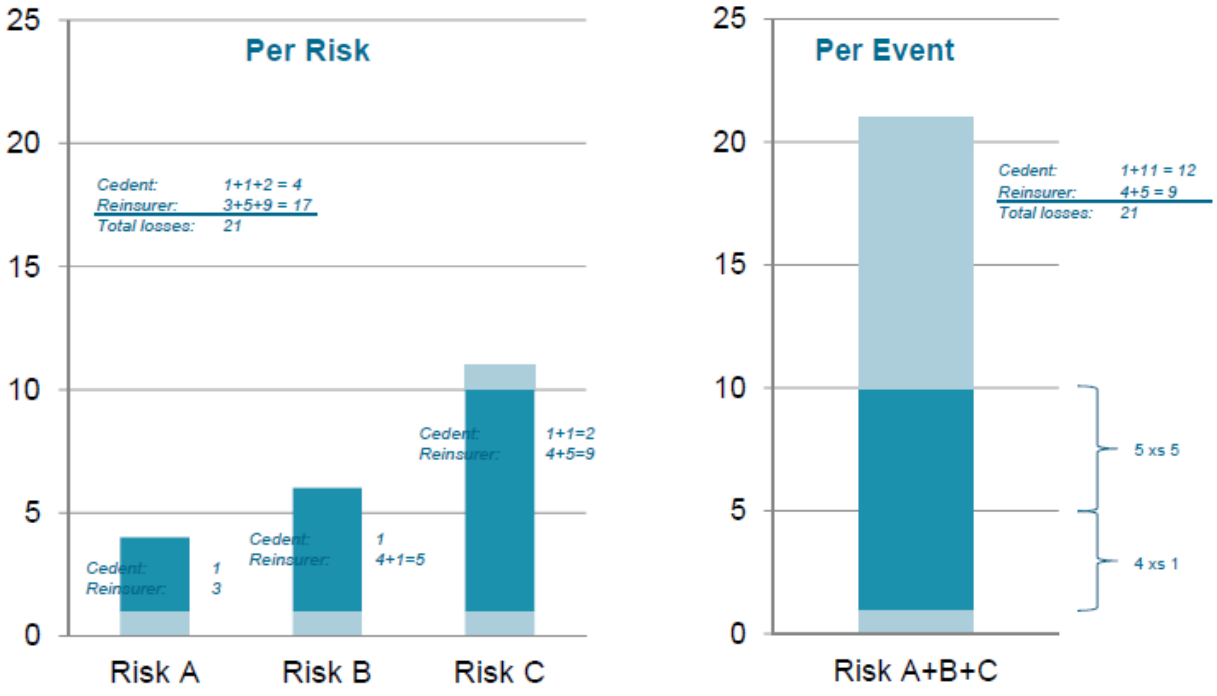
- Experience Rating (Non Proportional and Proportional)

- 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

Institute and Faculty of Actuaries

Reinsurance Pricing Process

- Experience Rating (Non Proportional Short Tail Example)
- *Layer 1: US$ 4m xs US$ 1m; Layer 2: US$ 5m xs US$ 5m*



Institute and Faculty of Actuaries

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-ye ar 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*

Institute and Faculty of Actuaries

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

UW Year	Premiums	Actual Losses	Actual Loss Ratio
2013	130	80	62%
2014	140	110	79%
2015	150	60	40%
2016	140	30	21%

  - 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

Institute and Faculty of Actuaries

Proportional Pricing - Example

UW Year	"As-If" Premiums	"As-If" Actual Losses	Actual Loss Ratio	Large Loss	Attritional Loss	Att. Loss Ratio	IBNR	Ult Att. Loss Ratio
2013	130	80	62%	0	80	62%	0	62%
2014	140	110	79%	40	70	50%	15	61%
2015	150	60	40%	0	60	40%	25	57%
2016	140	30	21%	0	30	21%	55	61%
2017	160							

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

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

Selected Attritional ULR =	60%
Large Loss cost over 5-Year Payback=	5%
1-in-200 year PML Flood Loss =	500
Flood CAT Loss Ratio=	2%
Pricing Ultimate Loss Ratio =	**66%**

3. Large: 40m over 5years 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.

Institute and Faculty of Actuaries

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

Institute and Faculty of Actuaries

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

Institute and Faculty of Actuaries

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 detariffication)
  - 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-detariffication – 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 the direct side due to limited insurance experience.
  - Start simple (non-modelled PML%, flood footprint)

Institute and Faculty of Actuaries

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

Institute and Faculty of Actuaries

Reinsurance Pricing Process

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

Rebate Curves	ILFs
Used for Property business	Used for Liability business
Example: Swiss Re curves (MBBEFD)	Example: Riebesell
Generally dependent on ratios	Generally dependent on absolute limit amounts

Institute and Faculty of Actuaries

Agenda

Institute and Faculty of Actuaries

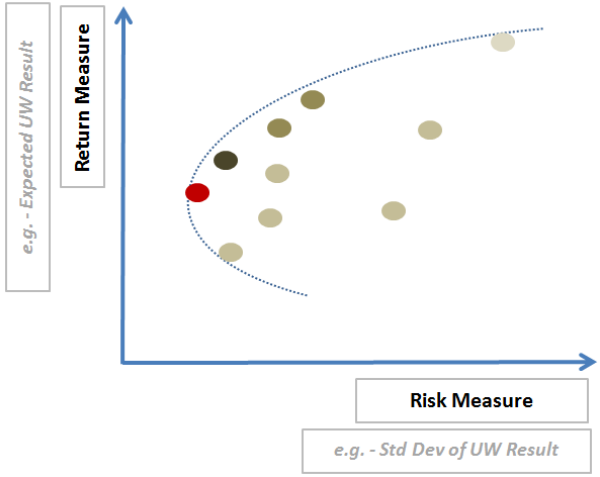
Assessing Reinsurance Adequacy

- 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 = LGD x PD
  - Concentration limits per reinsurer
  - Stress & Scenario Testing

Institute and Faculty of Actuaries

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)

Institute and Faculty of Actuaries

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

Institute and Faculty of Actuaries

Agenda

Institute and Faculty of Actuaries

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).

Institute and Faculty of Actuaries

Reinsurance Management
Actuarial Function Under Solvency II (Continued)

Typical Report Components

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

Institute and Faculty of Actuaries

Agenda

Institute and Faculty of Actuaries

Conclusion

Difference Between Direct and Reinsurer During the Reinsurance Renewal

Direct Insurer

- Renewal is a major exercise.
- Assessment in the form of reinsurance optimization at entity level.
- Economic capital approach / solvency based view normally used.
- Reinsurer counterparty risk is important.

Reinsurer

- Account / contract specific pricing and underwriting.
- Technical pricing process, data adjustments, loss assumptions.
- Price needs to meet internal requirements.
- Portfolio level overview and steering.

Institute and Faculty of Actuaries

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.

Institute and Faculty of Actuaries

THANK YOU

Institute and Faculty of Actuaries

Agenda

Institute and Faculty of Actuaries

Who we are

- GI Asia International Working Party created in Q2 2016
- The first in Asia for the Institute & Faculty of Actuaries UK
- We have members from Singapore, the UK, Hong Kong, India, China and Malaysia
- We are from across the broad background from brokers, reinsurers, insurers, and working in various functions

Institute and Faculty of Actuaries

Working Party Vision

The vision for the framing of the objectives of the working party is captured by the following mission statement:

*"The goal is to be the **first regional working party** formed outside UK of the IFoA, reaching out to **support GI actuaries** in the APAC region, to **deliberate issues in the region** specifically and in turn to support career growth for members in the region more specifically as well as to promote and raise **awareness of the profession** in the region as a whole, paving way for more such forum for the regions outside UK, and for other actuarial disciplines."*

Institute and Faculty of Actuaries

What is the intention of the working party

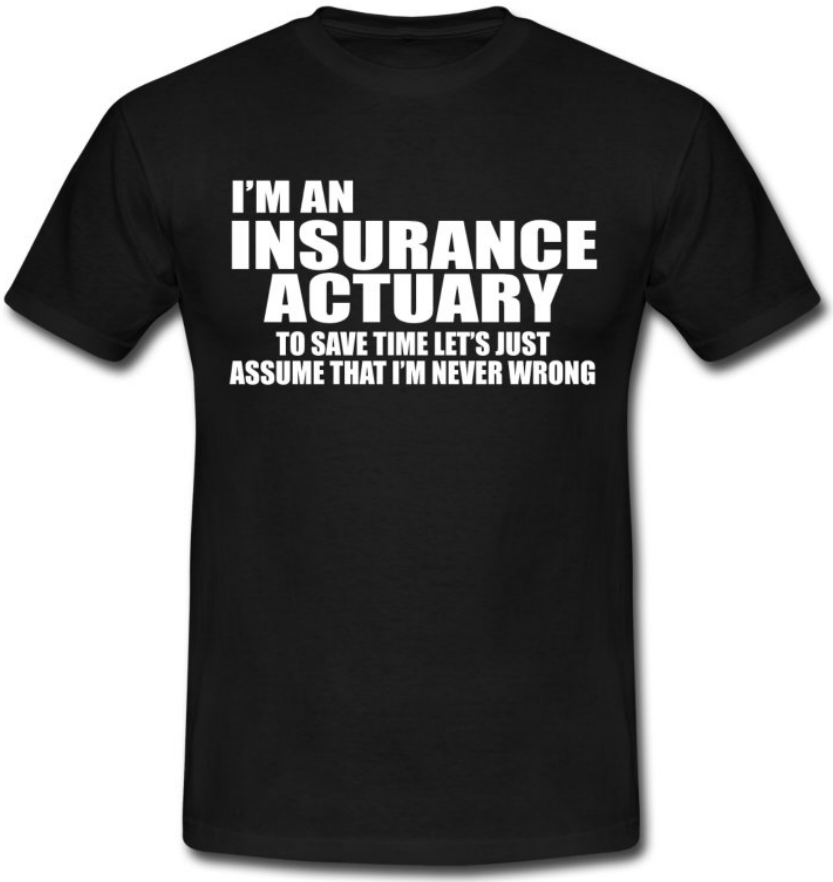
- To facilitate a market wide research on risks specific for the APAC region
- To develop relationships with regulators and local actuarial bodies
- To develop initially an understanding of the GI insurance and actuarial issues / hot topics
- To identify the perceived relative importance of these issues / hot topics for GI actuaries
- To focus on specific topics of interest, common to multiple markets, and to provide fresh light and new understanding

Institute and Faculty of Actuaries

Who are you?

IFoA The

1. Integrity
2. Competence
3. Impartiality
4. Compliance
5. Communica



ant knowledge and skill; or

ividual who has the appropriate level of
nterested parties are aware that this is

vision of another member who is taking
c.

nt and available to them to ensure that
ociated is accurate and not misleading,
e its subject matter to be put in proper

Responsibility is o

Institute and Faculty of Actuaries

Who are you?

IFoA The Actuaries' Code

1. Integrity
2. Competence and Care
3. Impartiality
4. Compliance
5. Communication

2.2 Members will not act unless:

a) they have an appropriate level of relevant knowledge and skill; or

b) they are acting on the advice of an individual who has the appropriate level of relevant knowledge and skill and all interested parties are aware that this is the case; or

c) they are acting under the direct supervision of another member who is taking professional responsibility for that work.

5.3 Members will take such steps as are sufficient and available to them to ensure that any communication with which they are associated is accurate and not misleading, and contains sufficient information to enable its subject matter to be put in proper context.

Responsibility is on all of us to ensure we understand and communicate risk

Institute and Faculty of Actuaries

What are the Next Steps for Working Party

- We want to hear from you
  - Local, Regional Challenges
  - Key issues within your market
  - Data challenges
  - Our immediate focus is on Nat-Cat Risk

- How will the working party engage you
  - Survey
  - One-on-one
  - Continuous Feedback
  - Industry events

Institute and Faculty of Actuaries

Who we are

Members

- Sie Liang LAU (Chair, Singapore); slau@scor.com
- Paul WEE (Malaysia)
- Brad WEIR (Singapore)
- Lyon CHEU (Singapore)
- Michael CROUCH (Singapore)
- Sherwin (Xiao Xuan) LI (China)
- Pallaw SAXENA (India)
- Sarthak MAHAJAN (India)
- Chiew Yee NG (Hong Kong)
- Cynthia LIU (Hong Kong)
- Nam NGUYEN (UK)

GI Board Rep

- Martin NOBLE (UK); martin.noble@uk.zurich.com

Executive Staff

- Caryn CHUA (Singapore); caryn.chua@actuaries.org.uk
- Sharon CUMBERBATCH (UK); sharon.cumberbatch@actuaries.org.uk
- Lynn RICHARDSON (UK); lynn.richardson@actuaries.org.uk

Institute and Faculty of Actuaries

END OF SLIDES