Analysing The Disconnect Between The Reinsurance Submission And Global Underwriters’ Needs – Property Per Risk

IFoA-CAS International Reinsurance Pricing Working Party ‘Property Per Risk Pricing

Presenter: Dr Ana J. Mata, ACAS
MatBlas Ltd
About the speaker

- Dr Ana J. Mata, ACAS
- Managing Director & Actuary
- Non-life actuarial pricing consultant, actuarial trainer and coach serving clients in London, Europe, Bermuda and the USA. Over 20 years of experience as consultant, pricing actuary, trainer, researcher and software developer.

MatBlas Ltd

- Founded in 2007, based in London
- Actuarial pricing and underwriting consultancy
- Actuarial training for non-actuaries
- Pricing software development
Working party formation

- Joint effort between IFoA-GIRO and CAS-CARe 2014-2017
- Chair: John W. Buchanan, FCAS
- 17 members of the working party worldwide
- Goals of working party
  - Analyze gaps between data provided in reinsurance submissions and actuarial and underwriting requirements
  - Improve understanding across all parties about rationale for data requirements
  - Create a reference framework for best practice of data collection and submission
Disclaimer

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Agenda

1. Motivation of the paper
2. Overview of key points of the paper
3. Conclusions
4. Q&A
About the working party

- Impetus
  - Focus: Property per risk insurance and reinsurance
  - Limitations of information provided by cedant to reinsurers
  - Conservative assumptions in the absence of complete data – higher premiums
  - Better data could benefit all parties

- Steps
  - Survey to actuaries and underwriters worldwide – 44 responses
  - Analysis of survey results and impact of data in pricing assumptions
  - Detailed paper discussing impact of data quality and completeness in overall assumptions and pricing results (to be published BAJ)
How much does quality of submission impact your price?
Overview of paper by chapter

1. Introduction
2. Motivation and results of survey
3. **Insurance company’s (cedant) considerations**
4. **Reinsurance company’s considerations**
5. **Experience and exposure data elements**
6. **Amount of insurance definition**
7. **Types of risk profiles**
8. Loss ratio information
9. **Historical risk profiles**
10. Traditional COPE and portfolio extensions
11. **Large claims information**
12. Rate monitoring information
13. Using property cat submission information
14. **Practical considerations: winner’s curse, overconfidence and submission bias**
15. Country specific issues
16. Conclusions
Chapter 3: Insurance company’s considerations (Cedant)

- Process starts when risk is presented to the insurance underwriter
- Data collection depends on insurance company’s rating models and databases
- Data quality and completeness benefit for all parties
Chapter 4: Reinsurance company’s considerations

- Reinsurers benchmark parameters based on market data
- Benchmarks used in the absence of credible data from cedant
- Fair Price vs. Smooth Price
- New vs. Renewal treaties
- Reinsurance brokers
- Long term relationships and consistent pricing
- Overconfidence and submission bias
Chapter 5: Data elements

Exposure rating

- Historical and prospective loss ratios
  - Gross of THIS treaty
  - Cat vs. non-cat (definition of cat loss)
  - Accident Year vs. UW Year

- In-force risk profile (banded) – what is a risk?

- Individual in-force risk listing
  - Amount of insurance
  - Excess/deductible
  - Premium allocated to each risk

Experience rating

- Large losses preferable with development
  - Amount of insurance and excess
  - Loss description
  - Date of loss vs. policy date

- Historical premium (earned vs. written)

- Historical and prospective rate changes
  - Basis of calculation
Chapter 6: Amount of insurance (AOI) definition

- **How does the treaty respond to a loss?**
  - Usually risk excess treaties respond per location/building

- **What is the amount of insurance?**
  - Policy limit is maximum loss an insurer would pay in the event of a loss.
  - The amount of information contained in that one single value is extremely limited.
  - Is it building only or does it include other coverages, e.g. business interruption?

- **What is a risk?**
  - A policy covering multiple locations
  - The location with highest amount of insurance (top location)
  - A single location (building)

Chapter 6: Amount of insurance

- **Common presentations**
  - Total insured value (TIV)
  - Maximum probable loss (MPL)
  - Possible maximum loss (PML)
  - Maximum feasible loss (MFL)
  - Average TIV across all locations in the policy
  - Largest/top location or key location

- **Subscription market policies**
  - Common presentation: one policy with lowest attachment and total programme participation.
  - Cedant’s participation per layer: % share, limit and attachment with stack code

Could be per location or aggregated for the policy.
### Chapter 6: Amount of Insurance - Reference

#### Figure 4 - Reference List for AOI Definitions

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Short For:</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOI TSI</td>
<td>Amount of Insurance / Total Sum Insured</td>
<td>The amount of insurance (AOI) purchased, the policy limit, the total sum insured (TSI), or total insured value (TIV) (but TIV could have two meanings as below). Includes <strong>direct loss</strong> such as buildings and business personal property (contents), as well as <strong>indirect loss</strong> such as business interruption (also called time element). Different policy limits are typically purchased for buildings, contents, and business interruption.</td>
</tr>
<tr>
<td>TIV</td>
<td>Total Insured Values / Or Total Insurable Values</td>
<td><strong>Total Insured Values</strong> can be defined as the total AOI or policy limit. Or <strong>Total Insurable Values</strong> can be a reduction to the full AOI values and relates to the MPL and other estimated values. Statistically, buildings and contents are unlikely to suffer a total loss. The MPL, PML, EML, and NLE are all percentages less than the MPL. Estimating these values will depend on many variables specific to the risk including combustibility of the building, various COPE attributes and may include complex engineering scenarios with extensive exposure and loss simulations.</td>
</tr>
<tr>
<td>MPL</td>
<td>Maximum Possible Loss</td>
<td>The <strong>MPL</strong> is the <strong>maximum amount of loss possible</strong>. From a <strong>direct loss</strong> perspective, the MPL of a building and the business personal property (contents) within the building is 100% of the total values at risk which are measurable. From an <strong>indirect loss</strong> perspective, the MPL of business income can only be estimated because there is no definitive measure of the period of restoration (POR) following a worst-case, business closing loss. The <strong>MPL may be larger than the AOI or policy limits issued</strong>.</td>
</tr>
<tr>
<td>MFL</td>
<td>Maximum foreseeable Loss</td>
<td>The <strong>MFL</strong> is the worst loss that is likely to occur if a <strong>key loss reduction system fails</strong> such as automatic fire alarms and sprinklers, watchman services, public fire suppression, etc.</td>
</tr>
<tr>
<td>PML</td>
<td>Probable Maximum Loss</td>
<td>The <strong>PML</strong> is an estimate of the largest loss the risk is likely to suffer when <strong>critical protection systems are functioning as expected and takes into account any relevant COPE attributes</strong>.</td>
</tr>
<tr>
<td>EML</td>
<td>Estimated Maximum Loss</td>
<td>The <strong>EML</strong> can and usually will <strong>ignore any particularly unlikely events</strong> or “remote coincidences” even if they are possible.</td>
</tr>
<tr>
<td>NLE</td>
<td>Normal Loss Expectancy</td>
<td>The <strong>NLE</strong> may assume that all active and passive protection systems and features are <strong>fully operating as expected under normal conditions</strong>.</td>
</tr>
<tr>
<td>SOV</td>
<td>Statement of Values</td>
<td>A declaration of the value held at each location to be insured. The <strong>SOV should state which of the above valuation measures are used to estimate the displayed AOIs</strong>.</td>
</tr>
</tbody>
</table>
Chapter 7: Types of risk profile submissions

- **Banded profile with TIV, Premium and number of risks per band**
  - normally received by 93%, ranked 1 in exposure rating importance

<table>
<thead>
<tr>
<th>TIV Band</th>
<th>%TIV</th>
<th>TIV in band</th>
<th>Avg TIV</th>
<th>No Risks</th>
<th>% Prem</th>
<th>Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1,000,000</td>
<td>35%</td>
<td>437,500,000</td>
<td>759,549</td>
<td>576</td>
<td>44.12%</td>
</tr>
<tr>
<td>1,000,001</td>
<td>2,000,000</td>
<td>25%</td>
<td>312,500,000</td>
<td>1,554,726</td>
<td>201</td>
<td>24.16%</td>
</tr>
<tr>
<td>2,000,001</td>
<td>3,000,000</td>
<td>20%</td>
<td>250,000,000</td>
<td>2,688,172</td>
<td>93</td>
<td>16.47%</td>
</tr>
<tr>
<td>3,000,001</td>
<td>4,000,000</td>
<td>15%</td>
<td>187,500,000</td>
<td>3,232,759</td>
<td>58</td>
<td>11.60%</td>
</tr>
<tr>
<td>4,000,001</td>
<td>5,000,000</td>
<td>5%</td>
<td>62,500,000</td>
<td>4,166,667</td>
<td>15</td>
<td>3.66%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>1,250,000,000</td>
<td>943</td>
<td>100.00%</td>
<td>14,875,000</td>
<td></td>
</tr>
</tbody>
</table>

- **What is a risk? A policy or a single location?**
  - Significant impact on exposure rating results
Chapter 7: Types of risk profile submissions

- Shared and layered programmes with ventilation
  - Standard practice: aggregate cedant’s participation (limit) with lowest attachment for the cedant.

$25M Capacity spread over multiple layers

<table>
<thead>
<tr>
<th>Stack code</th>
<th>Participation</th>
<th>Policy Limit</th>
<th>Attachment</th>
<th>Cedant’s premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>30%</td>
<td>10,000,000 xs</td>
<td>0</td>
<td>145,000</td>
</tr>
<tr>
<td>A</td>
<td>50%</td>
<td>10,000,000 xs</td>
<td>10,000,000</td>
<td>72,000</td>
</tr>
<tr>
<td>A</td>
<td>34%</td>
<td>50,000,000 xs</td>
<td>50,000,000</td>
<td>32,500</td>
</tr>
</tbody>
</table>

In a banded profile the total premium of $249,500 for this risk will be counted in the band with 0 attachment and $25M limit.
Chapter 7: Types of risk profile submissions

Impact on pricing: using exposure curve of the “Swiss Re” type with parameter c=5 (approximation to Lloyd’s industrial curve)*

<table>
<thead>
<tr>
<th>Policy limit</th>
<th>Attachment</th>
<th>TIV</th>
<th>Share of Premium</th>
<th>Ceded premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>25,000,000</td>
<td>0</td>
<td>25,000,000</td>
<td>249,500</td>
<td>26,435</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>26,073</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Policy limit</th>
<th>Attachment</th>
<th>TIV</th>
<th>Share of Premium</th>
<th>Ceded premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000,000</td>
<td>0</td>
<td>100,000,000</td>
<td>145,000</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>10,000,000</td>
<td>10,000,000</td>
<td>100,000,000</td>
<td>72,000</td>
<td>33,765</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>50,000,000</td>
<td>50,000,000</td>
<td>100,000,000</td>
<td>32,500</td>
<td>26,317</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6,183</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>60,082</td>
</tr>
</tbody>
</table>

Chapter 9: Historical AOI Profiles

- Increase TIVs over time main reason experience lacks credibility.
- Layer more exposed than prior years
- Traditional approach is to apply exposure adjustment based on total sum insured or premium
- Chapter shows how the use of historic TIV profile could help refine experience rating results compared to standard exposure adjustment
### Adjusting experience for changes in historical profile

#### Exposure rating $3m vs $2m layer: growth is not uniform across bands

<table>
<thead>
<tr>
<th>Year</th>
<th>Low</th>
<th>High</th>
<th>%TIV</th>
<th>TIV in band</th>
<th>Avg TIV</th>
<th>No Risks</th>
<th>% Prem</th>
<th>Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>0</td>
<td>1,000,000</td>
<td>35%</td>
<td>437,500,000</td>
<td>759,549</td>
<td>576</td>
<td>44.12%</td>
<td>6,562,500</td>
</tr>
<tr>
<td></td>
<td>1,000,001</td>
<td>2,000,000</td>
<td>25%</td>
<td>312,500,000</td>
<td>1,554,726</td>
<td>201</td>
<td>24.16%</td>
<td>3,593,750</td>
</tr>
<tr>
<td></td>
<td>2,000,001</td>
<td>3,000,000</td>
<td>20%</td>
<td>250,000,000</td>
<td>2,688,172</td>
<td>93</td>
<td>16.47%</td>
<td>2,450,000</td>
</tr>
<tr>
<td></td>
<td>3,000,001</td>
<td>4,000,000</td>
<td>15%</td>
<td>187,500,000</td>
<td>3,232,759</td>
<td>58</td>
<td>11.60%</td>
<td>1,725,000</td>
</tr>
<tr>
<td></td>
<td>4,000,001</td>
<td>5,000,000</td>
<td>5%</td>
<td>62,500,000</td>
<td>4,166,667</td>
<td>15</td>
<td>3.66%</td>
<td>543,750</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>943</td>
<td></td>
<td>14,875,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Low</th>
<th>High</th>
<th>%TIV</th>
<th>TIV in band</th>
<th>Avg TIV</th>
<th>No Risks</th>
<th>% Prem</th>
<th>Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>0</td>
<td>1,000,000</td>
<td>30%</td>
<td>487,500,000</td>
<td>755,814</td>
<td>645</td>
<td>39.32%</td>
<td>7,215,000</td>
</tr>
<tr>
<td></td>
<td>1,000,001</td>
<td>2,000,000</td>
<td>22%</td>
<td>357,500,000</td>
<td>1,588,889</td>
<td>225</td>
<td>21.82%</td>
<td>4,004,000</td>
</tr>
<tr>
<td></td>
<td>2,000,001</td>
<td>3,000,000</td>
<td>24%</td>
<td>390,000,000</td>
<td>2,635,135</td>
<td>148</td>
<td>20.19%</td>
<td>3,705,000</td>
</tr>
<tr>
<td></td>
<td>3,000,001</td>
<td>4,000,000</td>
<td>17%</td>
<td>276,250,000</td>
<td>3,410,494</td>
<td>81</td>
<td>13.40%</td>
<td>2,458,625</td>
</tr>
<tr>
<td></td>
<td>4,000,001</td>
<td>5,000,000</td>
<td>7%</td>
<td>113,750,000</td>
<td>4,375,000</td>
<td>26</td>
<td>5.27%</td>
<td>966,875</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1,125</td>
<td></td>
<td>18,349,500</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Low</th>
<th>High</th>
<th>%TIV</th>
<th>TIV in band</th>
<th>Avg TIV</th>
<th>No Risks</th>
<th>% Prem</th>
<th>Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>0</td>
<td>1,000,000</td>
<td>27%</td>
<td>607,500,000</td>
<td>778,846</td>
<td>780</td>
<td>35.90%</td>
<td>8,808,750</td>
</tr>
<tr>
<td></td>
<td>1,000,001</td>
<td>2,000,000</td>
<td>22%</td>
<td>495,000,000</td>
<td>1,661,074</td>
<td>298</td>
<td>22.79%</td>
<td>5,593,500</td>
</tr>
<tr>
<td></td>
<td>2,000,001</td>
<td>3,000,000</td>
<td>23%</td>
<td>517,500,000</td>
<td>2,640,306</td>
<td>196</td>
<td>19.82%</td>
<td>4,864,500</td>
</tr>
<tr>
<td></td>
<td>3,000,001</td>
<td>4,000,000</td>
<td>15%</td>
<td>337,500,000</td>
<td>3,515,625</td>
<td>96</td>
<td>11.83%</td>
<td>2,902,500</td>
</tr>
<tr>
<td></td>
<td>4,000,001</td>
<td>5,000,000</td>
<td>13%</td>
<td>292,500,000</td>
<td>4,642,857</td>
<td>63</td>
<td>9.66%</td>
<td>2,369,250</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1,433</td>
<td></td>
<td>24,538,500</td>
</tr>
</tbody>
</table>
## Adjusting experience for changes in historical profile

### Exposure adjusted losses

<table>
<thead>
<tr>
<th>Policy year</th>
<th>On-level premium</th>
<th>Inflation adjusted TIV</th>
<th>Exposure rate using historical profiles</th>
<th>Trended ultimate losses in layer</th>
<th>Burn cost</th>
<th>With OL Premium</th>
<th>With adjusted TIV</th>
<th>With exposure rate in layer</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>14,427,641</td>
<td>1,380,777,657</td>
<td>1.327%</td>
<td>1,015,706</td>
<td>7.040%</td>
<td>1,865,600</td>
<td>1,839,011</td>
<td>1,621,911</td>
</tr>
<tr>
<td>2009</td>
<td>13,509,518</td>
<td>1,725,835,360</td>
<td>1.327%</td>
<td>0</td>
<td>0.000%</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2010</td>
<td>16,343,110</td>
<td>1,759,642,147</td>
<td>1.731%</td>
<td>646,389</td>
<td>3.780%</td>
<td>1,001,700</td>
<td>897,170</td>
<td>791,663</td>
</tr>
<tr>
<td>2011</td>
<td>17,100,229</td>
<td>1,801,187,392</td>
<td>1.731%</td>
<td>0</td>
<td>0.000%</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2012</td>
<td>18,733,394</td>
<td>1,857,660,264</td>
<td>1.935%</td>
<td>736,261</td>
<td>3.960%</td>
<td>1,049,400</td>
<td>898,112</td>
<td>806,487</td>
</tr>
<tr>
<td>2013</td>
<td>18,592,448</td>
<td>2,049,469,598</td>
<td>1.935%</td>
<td>1,926,131</td>
<td>9.120%</td>
<td>2,416,800</td>
<td>2,257,285</td>
<td>2,101,777</td>
</tr>
<tr>
<td>2014</td>
<td>21,119,854</td>
<td>2,133,238,221</td>
<td>1.943%</td>
<td>957,999</td>
<td>4.280%</td>
<td>1,134,200</td>
<td>1,081,191</td>
<td>1,045,360</td>
</tr>
<tr>
<td>2015</td>
<td>22,383,158</td>
<td>2,215,147,150</td>
<td>1.943%</td>
<td>0</td>
<td>0.000%</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2016</td>
<td>23,943,359</td>
<td>2,295,225,000</td>
<td>1.943%</td>
<td>0</td>
<td>0.000%</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2017</td>
<td>25,274,655</td>
<td>2,444,200,000</td>
<td>2.120%</td>
<td>0</td>
<td>0.000%</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2018 (proj)</td>
<td>26,500,000</td>
<td>2,500,000,000</td>
<td>2.120%</td>
<td>842,513</td>
<td>3.179%</td>
<td>829,744</td>
<td>774,752</td>
<td>707,466</td>
</tr>
</tbody>
</table>

| 2018 Projected average loss cost excludes latest year | 3.179% | 3.131% | 2.924% | 2.670% |

- **Burn cost method**: take straight average and multiply by subject premium for 2018
- **Exposure adjusted with OL premium**: adjust trended ultimate losses with relative growth in on-level premium to 2018
- **Exposure adjusted with TIV**: adjust trended ultimate losses with relative growth in inflation adjusted TIV to 2018
- **Exposure adjusted with exposure rate in layer**: adjust trended ultimate losses with relative growth exposure rate to 2018
Chapter 11: Large claim information and link to AOI

- **Claims and exposures are notoriously difficult to link**
  - but are required for any kind of reliable size-of-loss analysis

- **Data collection**
  - Data sourcing is complicated by the fact that different departments within a company may store different information

- **Data quality and granularity**
  - An important proxy for the exposure would be the TIV at location, however, this is often not available

- **Small sample issues**

- **Integration of data sources:**
  - there is very limited availability of public data sources
Chapter 14: Bias in data provision

- **Cedants incentives**
  - Better data may lead to more accurate risk assessment (expected loss cost)
  - Would only better risks provide such data?
  - Would risks with insufficient data be assumed to be worse risks?
  - Hard vs. soft market incentives

- **Reinsurers incentives**
  - Not all reinsurers request same information
  - Internal referral processes greatly drive request for information
  - Detailed modelling vs. timeliness – first one to quote
Closing remarks

- Considerable gap between information provided in submission and requirements for thorough reinsurance pricing
- Problem builds up from insurance company’s rating models
- Key data items significant impact on pricing
- Commercial considerations
  - Incentives: hard vs. soft market
  - Winner’s curse
  - Bias in data
Thank you very much for your attention!

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