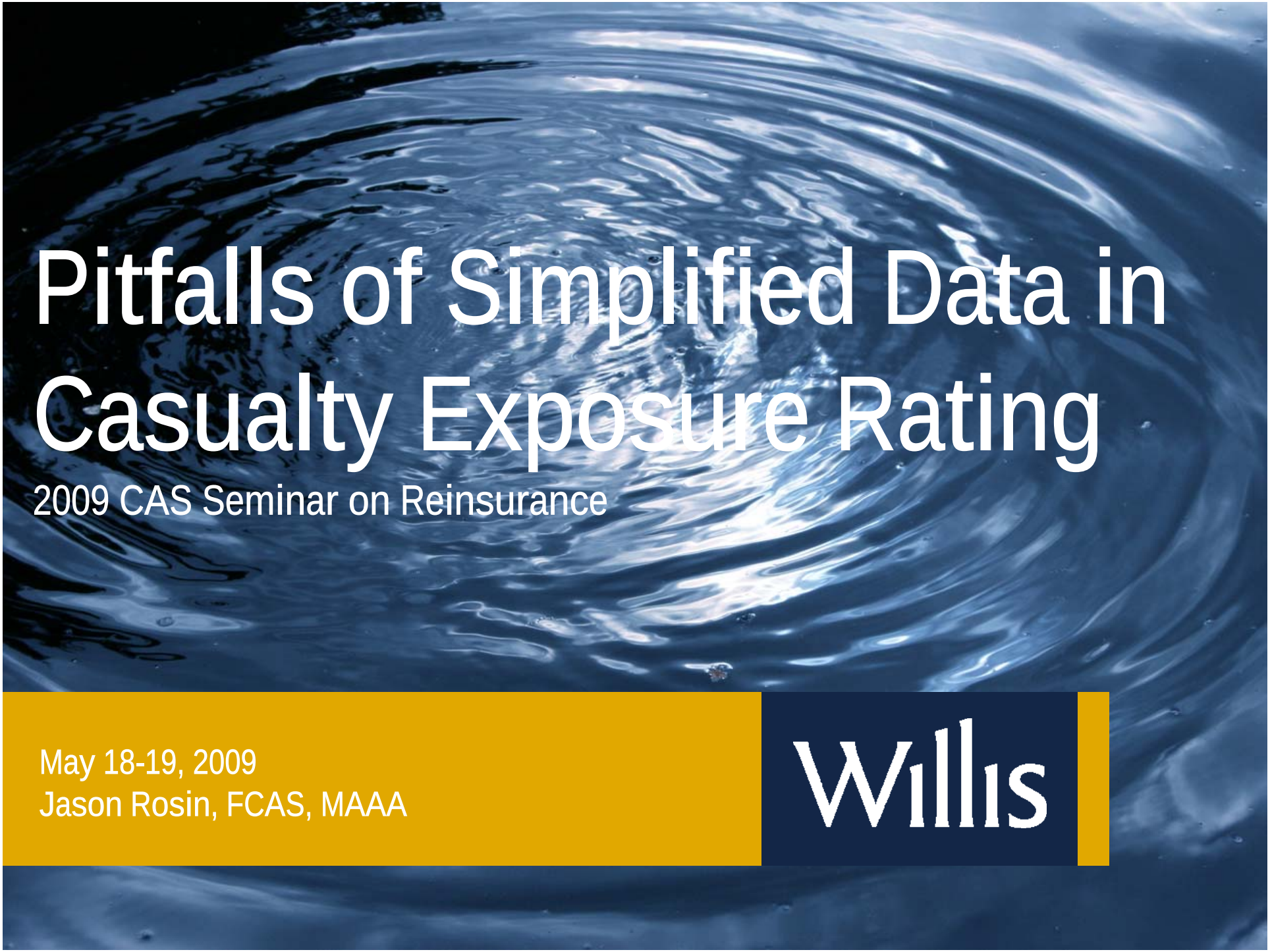

Pitfalls of Simplified Data in Casualty Exposure Rating

2009 CAS Seminar on Reinsurance

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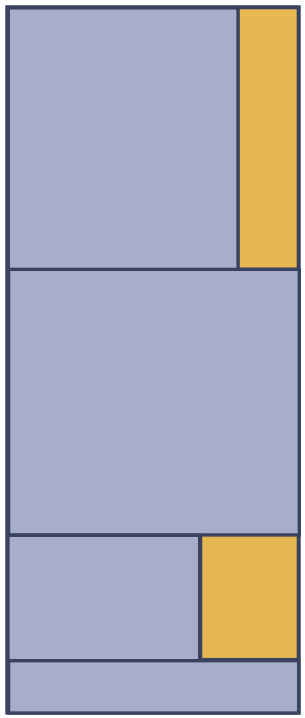
Willis

Agenda

- Exposure data fidelity loss
- Critical policy features
  - Co-participation
  - Ventilation
  - Stacking of limits
- Examples of consequences
- Working with summarized profiles
- Practical considerations

Exposure Data Fidelity Loss

Consider an excess casualty book, where the cedant provides the following coverage on a single insured…

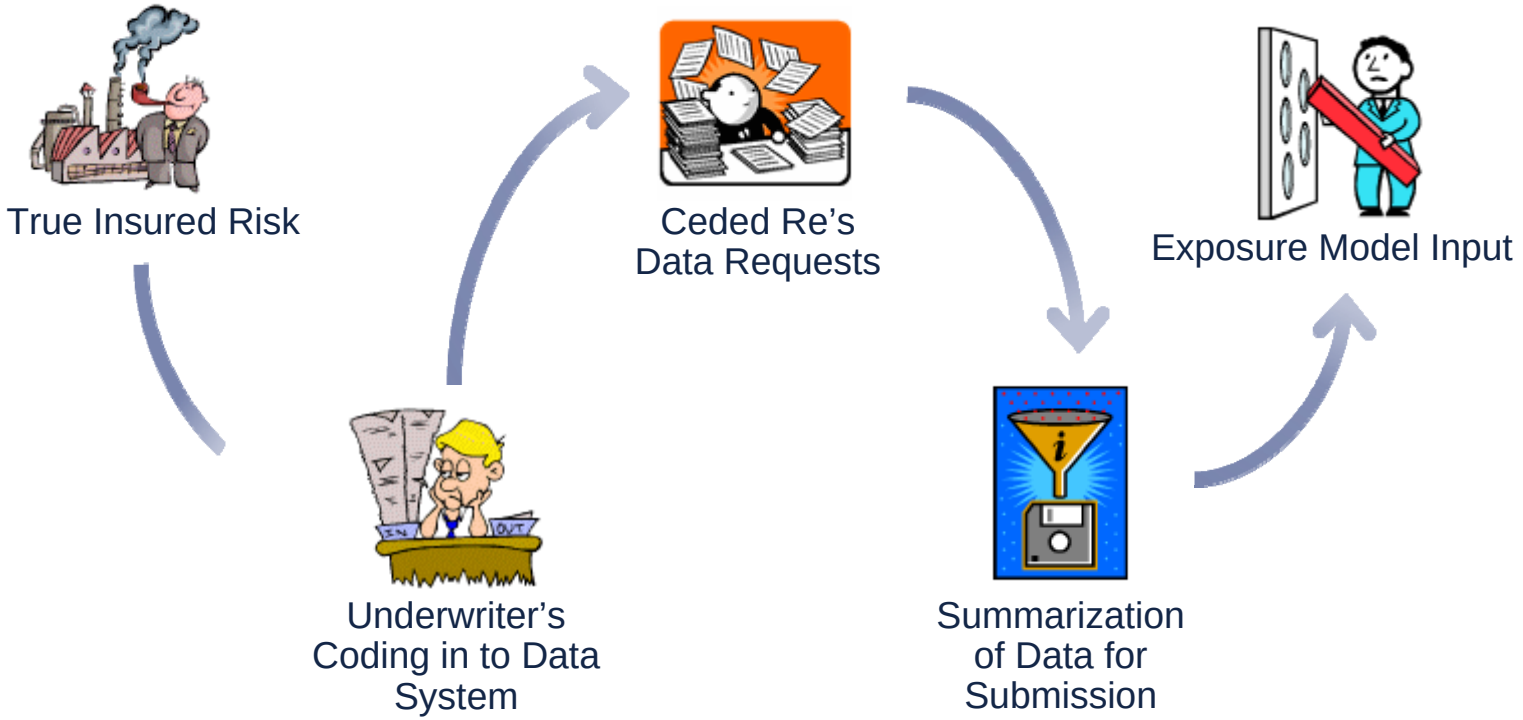


$3M p/o $30M xs $70M

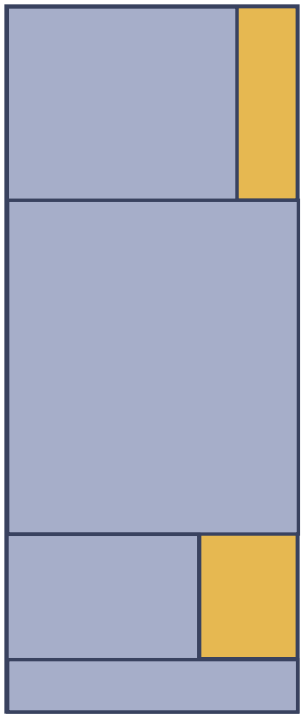
$2M p/o $8M xs $2M

… How is this data being represented by the time it reaches the exposure rating model?

Exposure Data Fidelity Loss



Exposure Data Fidelity Loss



$3M p/o $30M
xs $70M

$2M p/o $8M
xs $2M

Is this risk bring represented properly in the limits profile and/or policy bordereau?

Is this risk being analyzed properly by the exposure rating model?

Three important features that are at risk of getting lost:

- Stacking of Limits
- Ventilation between Layers
- Co-participation within Layers

What are the consequences?

Assumptions

Let's take a look at how various reinsurance layers would be exposure rated if we ignored or lost the following features:

1) Co-participation within Layers
2) Ventilation between layers
3) Stacking of Limits

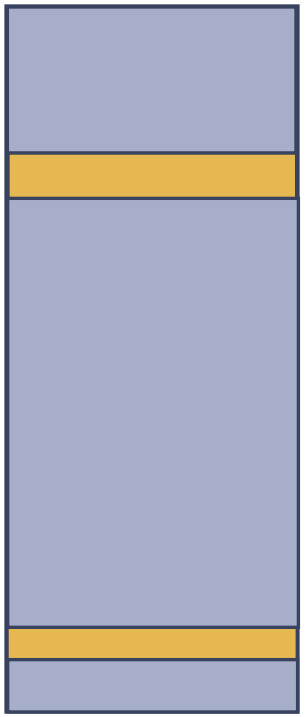
Riebesell (20%) distributed ILFs

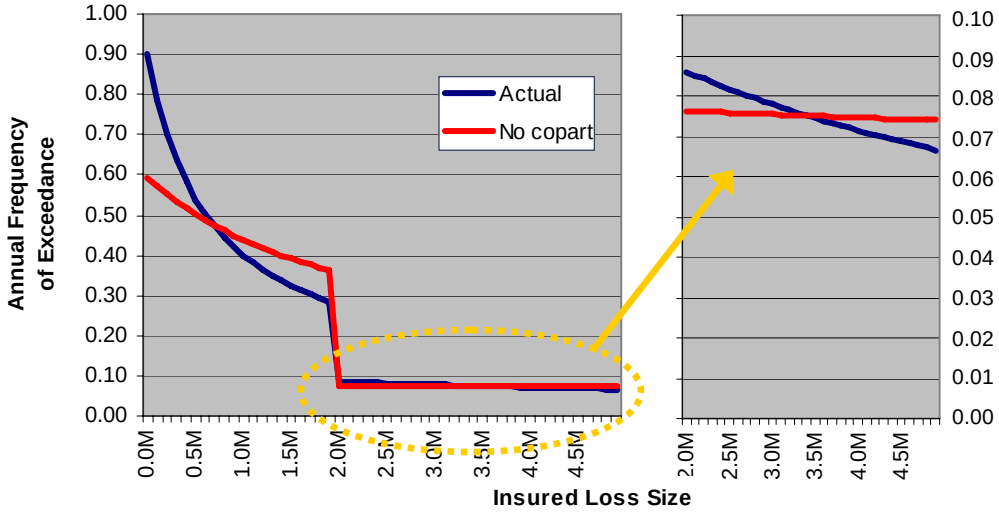
Lower policy premium share: $1,200k
Upper policy premium share: $300k

75% Expected Loss Ratio

Limit	ILF
1,000,000	1.000
2,000,000	1.200
3,000,000	1.335
4,000,000	1.440
5,000,000	1.527
6,000,000	1.602
7,000,000	1.668
8,000,000	1.728
9,000,000	1.782
10,000,000	1.832
.	.
.	.
.	.

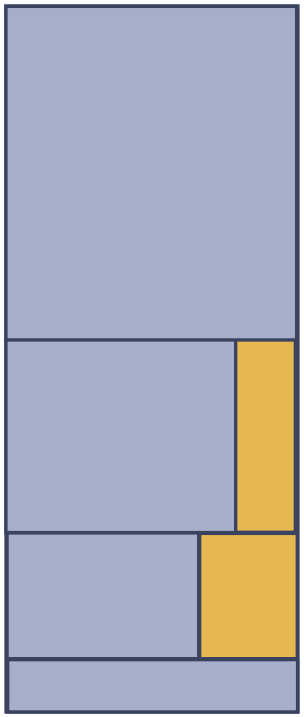
No Co-participation Within Layers





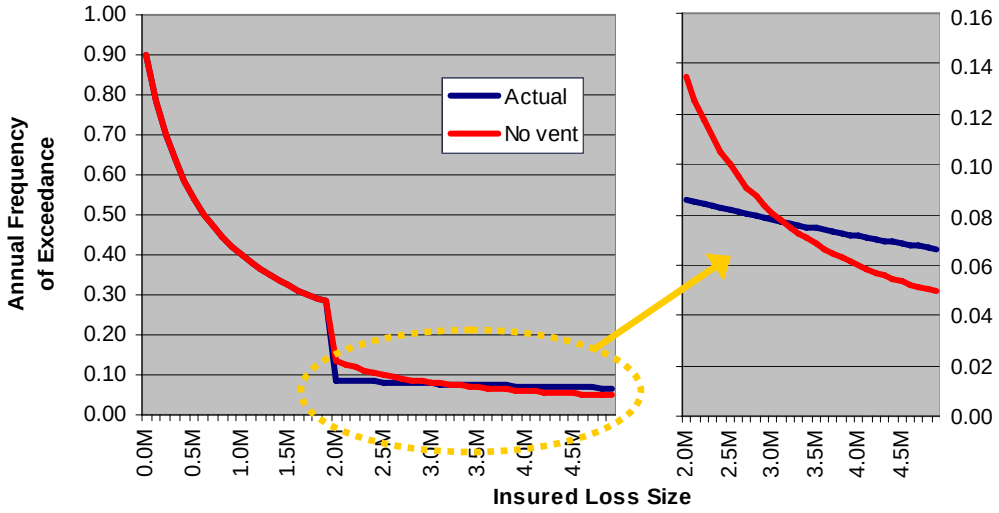
Limit	Retention	Actual Loss Cost	No Co-Part Loss Cost	Difference
500k	-	341.5k	272.0k	**-20.3%**
500k	0.5M	230.6k	234.4k	**1.6%**
500k	1.0M	179.2k	207.2k	**15.6%**
500k	1.5M	148.6k	186.4k	**25.4%**
500k	2.0M	41.9k	38.0k	**-9.3%**
500k	2.5M	39.9k	37.8k	**-5.2%**
500k	3.0M	38.1k	37.6k	**-1.3%**
500k	3.5M	36.5k	37.4k	**2.6%**
500k	4.0M	35.0k	37.2k	**6.3%**
500k	4.5M	33.7k	37.0k	**9.9%**

No Ventilation Between Layers



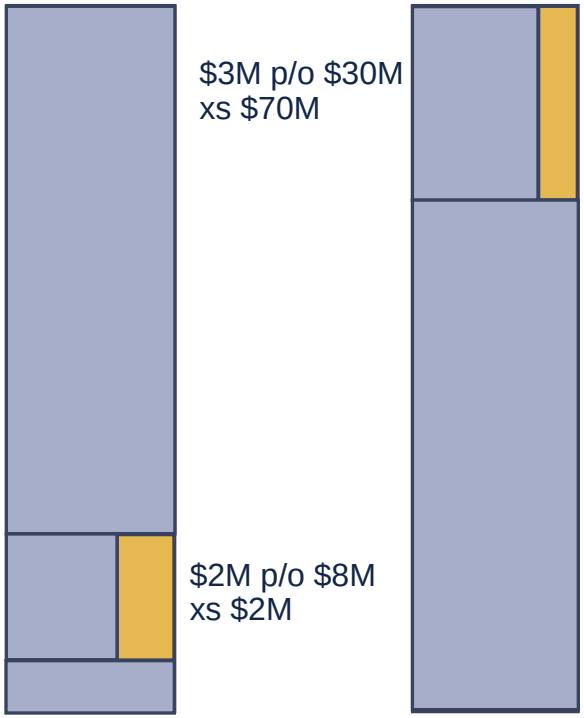
$3M p/o $30M
xs $10M

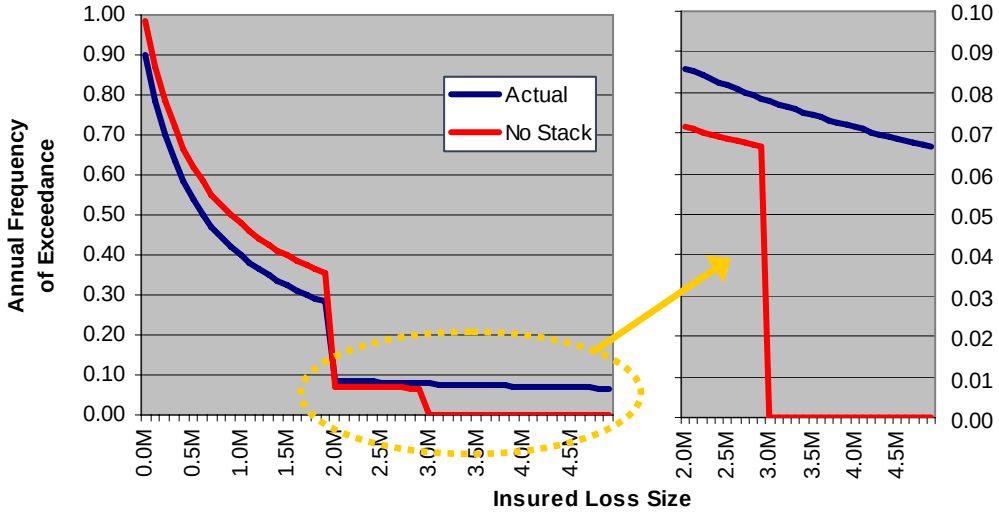
$2M p/o $8M
xs $2M



Limit	Retention	Actual Loss Cost	No Vent Loss Cost	Difference
500k	-	341.5k	341.5k	**0.0%**
500k	0.5M	230.6k	230.6k	**0.0%**
500k	1.0M	179.2k	179.2k	**0.0%**
500k	1.5M	148.6k	148.6k	**0.0%**
500k	2.0M	41.9k	57.6k	**37.4%**
500k	2.5M	39.9k	44.7k	**12.1%**
500k	3.0M	38.1k	37.1k	**-2.6%**
500k	3.5M	36.5k	32.0k	**-12.3%**
500k	4.0M	35.0k	28.3k	**-19.3%**
500k	4.5M	33.7k	25.4k	**-24.5%**

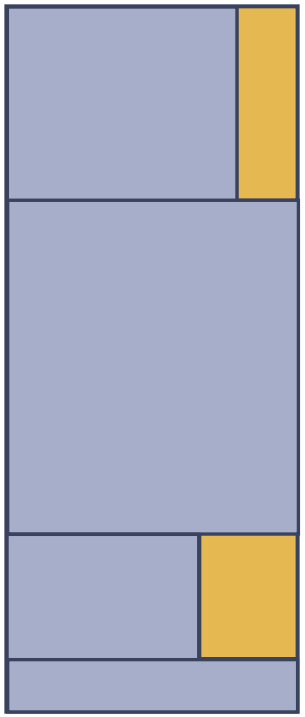
No Stacking of Limits





Limit	Retention	Actual Loss Cost	No Stack Loss Cost	Difference
500k	-	341.5k	383.4k	**12.3%**
500k	0.5M	230.6k	270.5k	**17.3%**
500k	1.0M	179.2k	217.3k	**21.3%**
500k	1.5M	148.6k	185.1k	**24.5%**
500k	2.0M	41.9k	35.0k	**-16.4%**
500k	2.5M	39.9k	33.7k	**-15.6%**
500k	3.0M	38.1k	0.0k	**-100.0%**
500k	3.5M	36.5k	0.0k	**-100.0%**
500k	4.0M	35.0k	0.0k	**-100.0%**
500k	4.5M	33.7k	0.0k	**-100.0%**

Exposure Data Fidelity Loss (cont.)



$3M p/o $30M xs $70M

$2M p/o $8M xs $2M

Aside from obscuring the three attributes discussed, there are many other ways to misrepresent this risk.

Is it possible to accurately capture all of these attributes in a summarized exposure profile?

Even if the data is correctly summarized, is anything important being lost in the summary?

Working With Summarized Profiles

Consider a cedant's book, containing the following groups of risks:

Attachment	Policy Limit	Participation	Insured Limit	Premium
1,000,000	1,000,000	100%	1,000,000	1,000,000
2,000,000	3,000,000	33%	1,000,000	1,000,000
10,000,000	10,000,000	20%	2,000,000	1,000,000
50,000,000	25,000,000	10%	2,500,000	1,000,000
75,000,000	25,000,000	10%	2,500,000	1,000,000

There are certain qualities that can only be captured accurately by having complete policy-level detail.

Important relationships get lost in the summary:

- Policy Limit vs. Attachment Point
- Co-Participation vs. Policy Limit

Working With Summarized Profiles

Consider the same book, summarized via the following profiles:

Attachment	Premium
1,000,000	1,000,000
2,000,000	1,000,000
10,000,000	1,000,000
50,000,000	1,000,000
75,000,000	1,000,000

Insured Limit	Premium
1,000,000	2,000,000
2,000,000	1,000,000
2,500,000	2,000,000

Participation	Premium
100%	1,000,000
33%	1,000,000
20%	1,000,000
10%	2,000,000

Some assumption must be made about how these pieces of information relate to each other.

Easiest assumption: Each attribute applies proportionally throughout the entire book, independent of the other attributes.

- When working with a book that has a much more complex profile, this may be the only quantifiable assumption.

Working With Summarized Profiles

For example, with the $10M attachment policies:

Attachment	Premium
1,000,000	1,000,000
2,000,000	1,000,000
10,000,000	1,000,000
50,000,000	1,000,000
75,000,000	1,000,000

Insured Limit	Premium
1,000,000	2,000,000
2,000,000	1,000,000
2,500,000	2,000,000

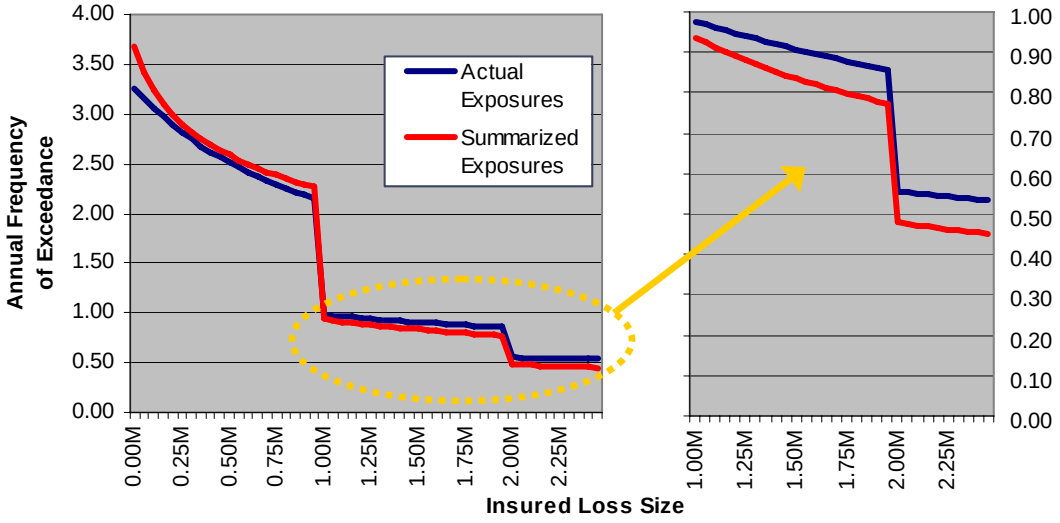
Participation	Premium
100%	1,000,000
33%	1,000,000
20%	1,000,000
10%	2,000,000

Attachment	Insured Limit	Participaiton	100% Limit	Premium
10,000,000	1,000,000	100%	1,000,000	80,000
10,000,000	1,000,000	33%	3,000,000	80,000
10,000,000	1,000,000	20%	5,000,000	80,000
10,000,000	1,000,000	10%	10,000,000	160,000
10,000,000	2,000,000	100%	2,000,000	40,000
10,000,000	2,000,000	33%	6,000,000	40,000
10,000,000	2,000,000	20%	10,000,000	40,000
10,000,000	2,000,000	10%	20,000,000	80,000
10,000,000	2,500,000	100%	2,500,000	80,000
10,000,000	2,500,000	33%	7,500,000	80,000
10,000,000	2,500,000	20%	12,500,000	80,000
10,000,000	2,500,000	10%	25,000,000	160,000

What are the consequences of making this assumption?

Working With Summarized Profiles

- Significant disparities are evident in the resulting exposure rating.
- In the given example, higher excess layers would be underpriced.



Limit	Retention	Actual Loss Cost	Summarized Loss Cost	Difference
250k	-	753.8k	800.3k	**6.2%**
250k	0.25M	663.8k	681.7k	**2.7%**
250k	0.50M	599.9k	619.4k	**3.3%**
250k	0.75M	551.2k	576.9k	**4.7%**
250k	1.00M	239.7k	226.7k	**-5.4%**
250k	1.25M	231.0k	214.2k	**-7.3%**
250k	1.50M	223.2k	204.0k	**-8.6%**
250k	1.75M	216.0k	195.4k	**-9.5%**
250k	2.00M	137.1k	117.7k	**-14.1%**
250k	2.25M	134.1k	113.7k	**-15.2%**

Practical Considerations

Risk Profiles vs. Policy Bordereaus

- Summarized profiles may be insufficient for risks with complex attributes.
- How would stacking of limits be represented in a profile?
- Even when a full bordereau is available, sorting out issues such as the stacking of limits may involve working with questionable data and making judgment calls.
- The actuary needs to be aware of when these issues are likely to exist, and when to pursue clarification of exposure data.

Practical Considerations

Certain lines of business are very likely to have these complexities:

- Excess Casualty
- D&O
- E&O
- Employment Practices Liability
- Fidelity
- Aviation and Marine
- Commercial & Industrial Property

Practical Considerations

Exposure models must be designed to be robust to these attributes.

When acceptable exposure data is not completely available, loss experience may need to be given more credibility.

When data is known to contain imperfect information, the actuary needs to be aware of the biases that are introduced into the analysis.

The combination of building the proper tools and undertaking a critical review of the provided data is essential to producing an accurate exposure rating analysis.

Disclaimer

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