

## Pricing Excess Aggregates Using Increased Limits Factors

With examples from Professional Indemnity Lines  
David Hughes 27 July 2007

### What we are going to cover...

- Introduction to basics
- ILF tables : Standard vs Aggregated
- Pricing Excess Layers
  - Unlimited Excess
  - Aggregated Retention and Limits (no drop down)
  - Aggregated Retention and Limits (drop down)
- Closing thoughts
- Q&A...

### Introduction to Professional Indemnity Risks

- Protects against a claim for an alleged negligent act, error or omission resulting in a loss for an injured party
- Professional groups covered :- doctors, hospitals, lawyers, actuaries, accountants, IFAs etc
- Typical policy limits \$1million with \$3million aggregate.

## Introduction to Excess Aggregates

- Excess layer which sits above the primary coverage or large SIR
- Found in large professional service providers e.g. large law firms, hospitals etc
- Example
  - \$20m/\$20m excess \$5m/\$25m

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## Introduction to Increased Limit Factors

- The additional loading to increase the basic policy limit i.e.
  - \$1m/\$3m to the higher limit \$2m/\$4m.
- ILFs are also applied to increase/reducing deductibles
- An ILF is a unique representation of a loss distribution
- WHY?

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## Introduction: Why use ILFs?

Pricing Steps:-

1) Determine Basic Limits Loss Cost

- 1) Develop \$1m limited losses to ultimate
- 2) Calculate the \$1m limited loss cost per exposure unit

2) Credibility adjust the basic limits loss cost

3) Use ILF to estimate excess loss cost

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## Standard ILFs

- Typically defined without reference to an aggregate limit thus
  - Independent of base frequency
  - Represents severity of claims only
  - Fully defined by the loss distribution

Limit	ILF
5m	1.00
10m	1.13
20m	1.22
30m	1.26
40m	1.29
50m	1.30

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## Aggregated ILFs

- Each claim limit also has an aggregate limit thus
  - Not independent of base frequency
  - Represents limited aggregate loss distribution
  - Complex to calculate from closed form (requires convolution)
    - Fast Fourier transform
    - Simulation
    - Empirical analysis

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## Aggregated ILFs: Medical Malpractice example.

New York :- Class A  
Expected Number of Claims:- 50 to 75  
Excess \$50,000

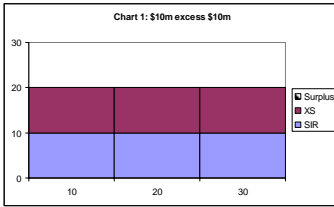
Limit	No Agg	Aggregate as multiple of Limit			
		1	2	3	4
5m	1.00	0.26	0.51	0.73	0.88
10m	1.13	0.45	0.80	0.95	0.99
20m	1.22	0.74	0.96	0.99	1.00
30m	1.26	0.87	0.99	1.00	1.00
40m	1.29	0.93	1.00	1.00	1.00
50m	1.30	0.96	1.00	1.00	1.00

Standard ILF

Aggregate Limit Factor

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## Example ILFs

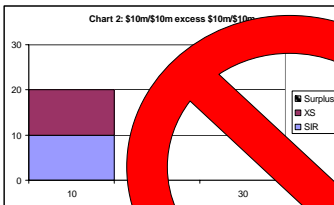


Limit	ILF
5m	1.00
10m	1.13
20m	1.22
30m	1.26
40m	1.29
50m	1.30

$$ILF(10xs10) = ILF(20) - ILF(10) = 1.22 - 1.13 = 1.09$$

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## Example ILFs : \$10m/\$10m xs \$10m/\$10m

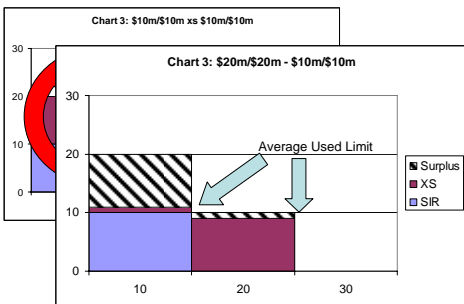


Limit	ILF	1
5m	1.00	0.26
10m	1.13	0.45
20m	1.22	0.74
30m	1.26	0.87
40m	1.29	0.93
50m	1.30	0.96

Proposed:-  
 $ILF(10xs10) = ILF(20) - ILF(10/10)$   
 $= 1.22 \times 0.74 = 0.9028$

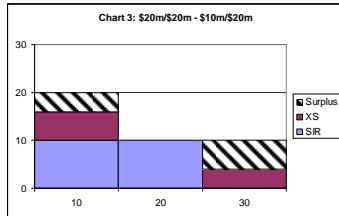
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## Example ILFs : \$10m/\$10m xs \$10m/\$10m (Drop down)



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### Example ILFs : Increasing the SIR aggregate



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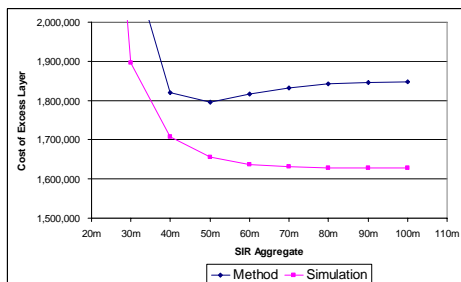
### Example ILFs : Increasing the SIR aggregate

Q. Will the subtraction technique hold for increasing SIR aggregates?

SIR Aggregate	Method
10,000,000	7,745,736
20,000,000	3,832,309
30,000,000	2,163,684
40,000,000	1,819,570
50,000,000	1,796,192
60,000,000	1,816,806
70,000,000	1,832,991
80,000,000	1,841,901
90,000,000	1,846,375
100,000,000	1,848,569

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### Example ILFs : Increasing the SIR aggregate



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### Closing Conclusions

- Aggregated ILFs are complex
- Aggregated ILF tables require much more detail..e.g
  - Frequency ranges
  - Aggregate
- Subtracting Aggregated ILFs produces undesirable results
- A new approach is required...

**To be continued**

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QUESTIONS...

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