GUY CARPENTER

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Pricing Property Per-Risk Advanced Topics

CAS Seminar on Reinsurance, 2008

Cambridge, Massachusetts

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Marsh & McLennan Companies

AGENDA

- Premium Allocation for Blanket Rated Policies
- Transforming PSOLD Curves to First-Loss Scales
- International Construction Cost Index

Allocating Blanket Premium

The Need for Premium Allocation to Location Level

- Most exposure rating models assume that the limits profile provided is on a per-location basis.
- For each location, we need to know TIV of the location, policy limit of the location, any deductibles, participation level, occupancy and the premium.
- Many policies are issued on a blanket limit basis – one policy that applies to a whole schedule of buildings/locations.
- Insurers often cannot provide premium on a location level

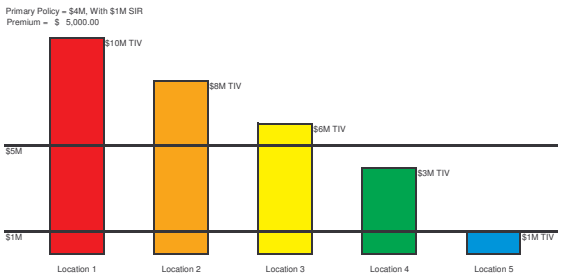
Policy Level Data

Policy Limit	Part of	Attachment Point	Percent Placed	Gross Premium	Num Locs
16,000,000	16,000,000	2,500,000	100.0%	9,600	4
18,000,000	18,000,000	5,000,000	100.0%	10,800	2
75,000,000	150,000,000	5,000,000	50.0%	45,000	4
40,000,000	100,000,000	2,500,000	40.0%	24,000	5
12,000,000	12,000,000	2,500,000	100.0%	7,200	3
5,000,000	5,000,000	2,500,000	100.0%	3,000	1
25,000,000	100,000,000	15,000,000	25.0%	15,000	1
12,000,000	12,000,000	5,000,000	100.0%	7,200	1

- What do you do when your data looks like this?
- Need LOCATION LEVEL data
- Does every location have the same value and represent the same amount of risk?

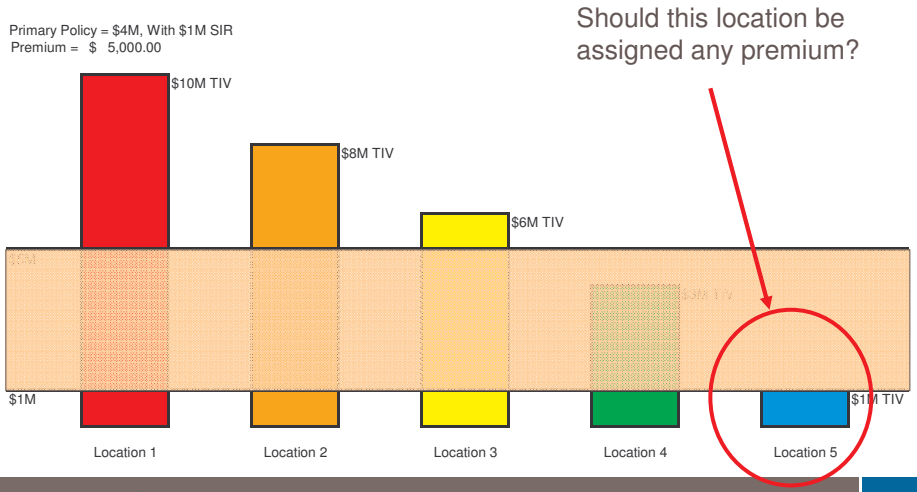
Allocation of Premium to Individual Location

- When policies cover multiple locations, it is necessary to allocate the premium to each individual location before exposure rating techniques can be properly applied.
- Traditional Methods
  - –By TIV
  - –All Premium Slotted to Highest Limit
  - –By Exposed TIV
- Can we do better?



Allocation of Premium to Individual Location

By TIV?

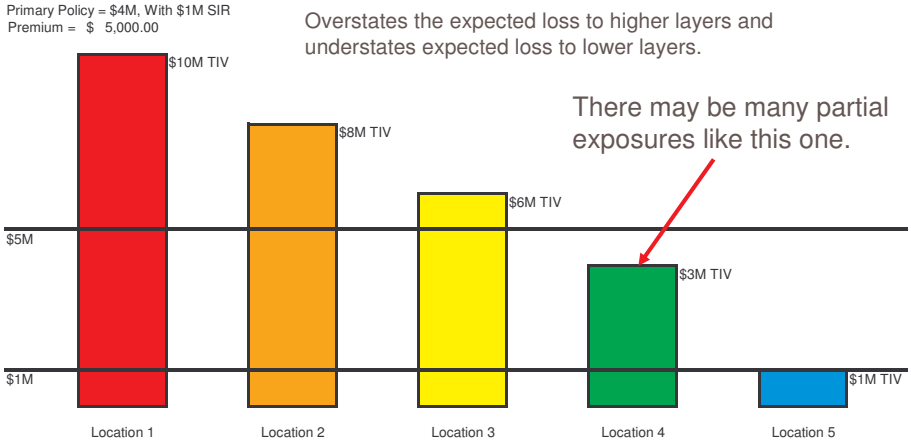


Allocation of Premium to Individual Location

All Premium Slotted to Highest Limit?

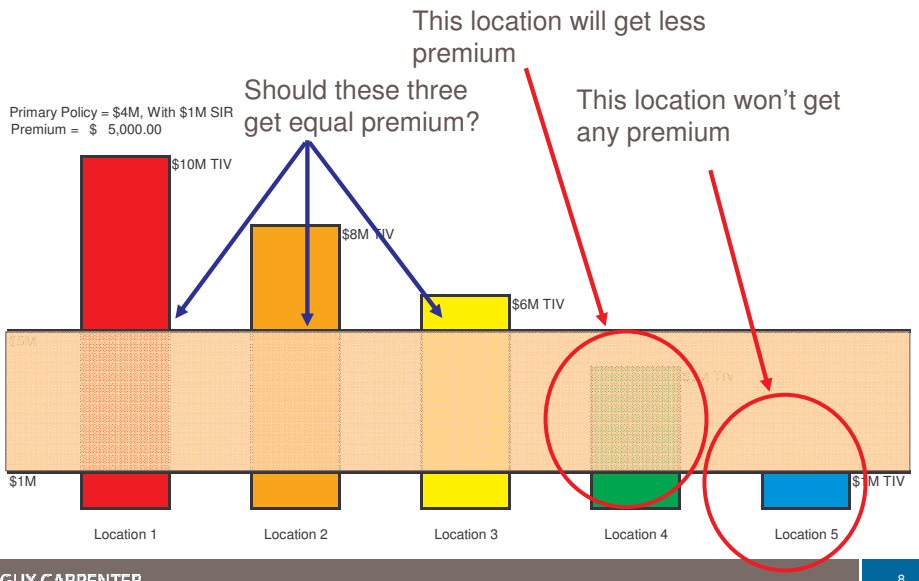
Would assume the entire premium fully exposes the policy to the same amount of risk.

Overstates the expected loss to higher layers and understates expected loss to lower layers.



Allocation of Premium to Individual Location

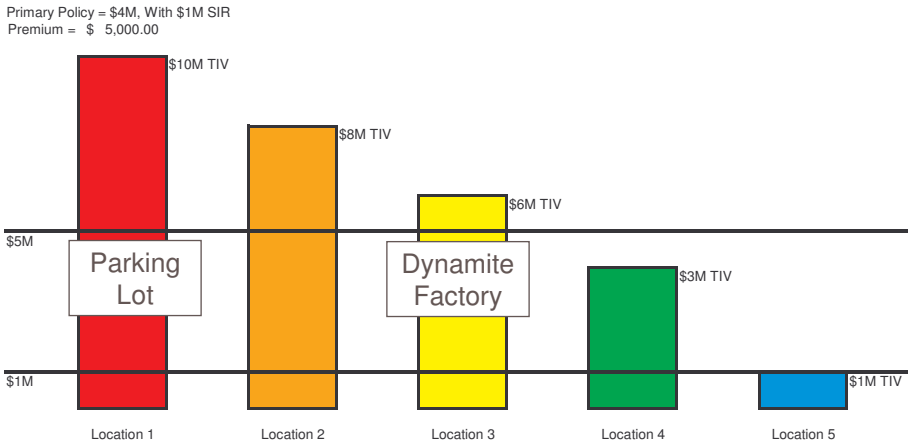
By Exposed TIV?



Allocation of Premium to Individual Location

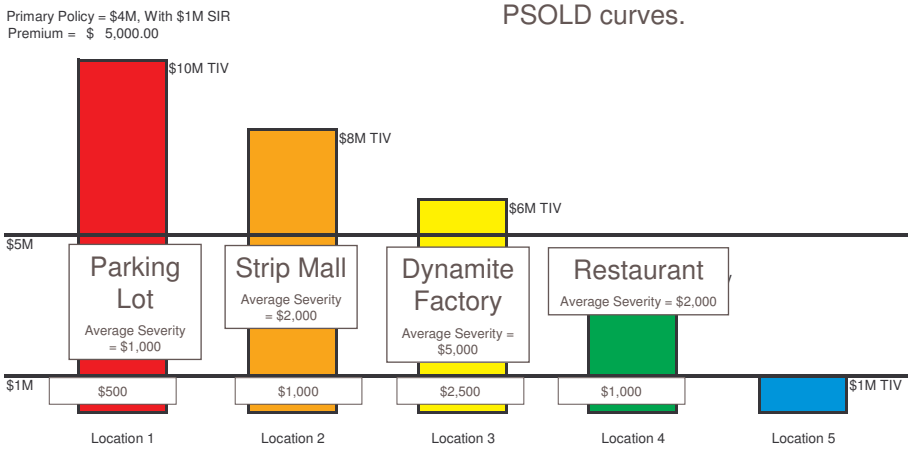
BY Exposed TIV?

Do they subject the policy to equal risk?



Allocate Based on Potential for Loss

Average Severity of loss can be based on First Loss Scales or PSOLD curves.



Premium Allocation

- This method assumes each location is equally likely to experience a loss.
- Improvement: Include expected frequency and allocate by expected loss.
- Take-away: We should contemplate a way to account for the risk posed by each location to properly allocate the blanket premium.

PSOLD Curves
First Loss Scale Methodology

Process

- Basic Formulas – refer to **"Advanced Exposure Rating – Beyond the Basics." - Steve White, 2004 CARe presentation**
- Additional Exposure Parameter
- Selecting a band of exposure to build your curve
- Building the Scale

PSOLD
Calculations using the Mixed Exponential

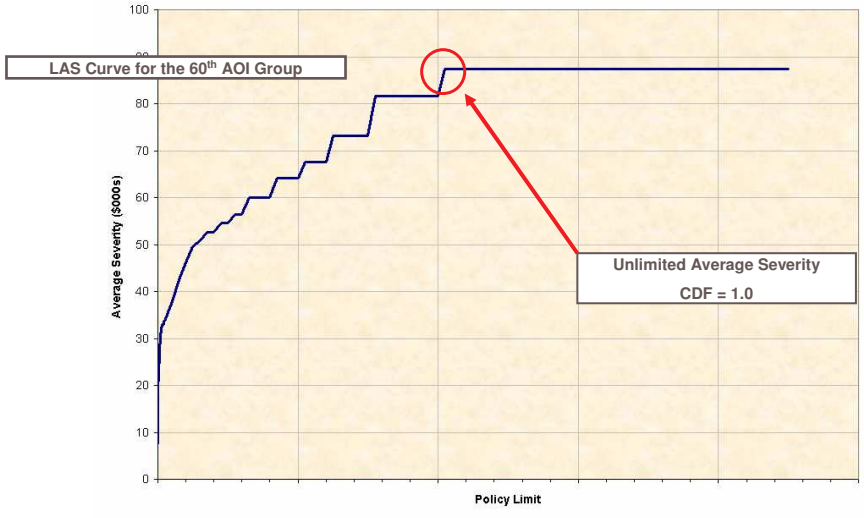
$$LAS_{ME}(x) = \sum_{i=1}^{\#Lags} w_i \mu_i \times \left(1 - e^{-\frac{x}{\mu_i}}\right)$$

$$\mu_{i,psold} = 10^{.5\times(i+1)}$$

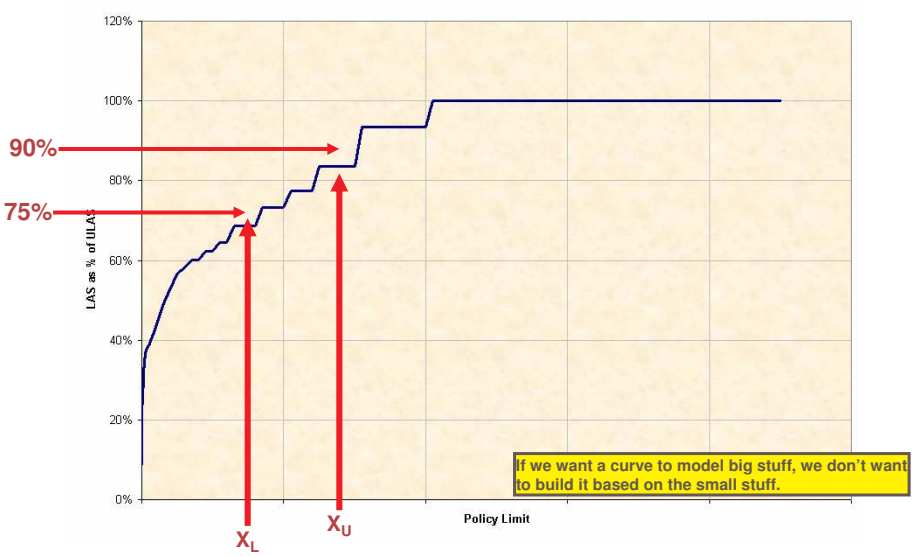
w_i varies by:

2 - Coverage (Building+Contents,
Building+Contents+Business Interruption)
(Building only, Contents only dropped in 2004)
4 - Peril (Basic Group 1, Basic Group 2, Special Causes, All)
22 - Occupancy Class
60 - Amount of Insurance (AOI)
2 - Net of Deductible vs Ground Up
50 – State Deductible Distributions

Limited Average Severity by Policy Limit



Percentage of Unlimited Average Severity (ULAS) by Policy Limit



PSOLD Methodology
Additional Exposure Percentage

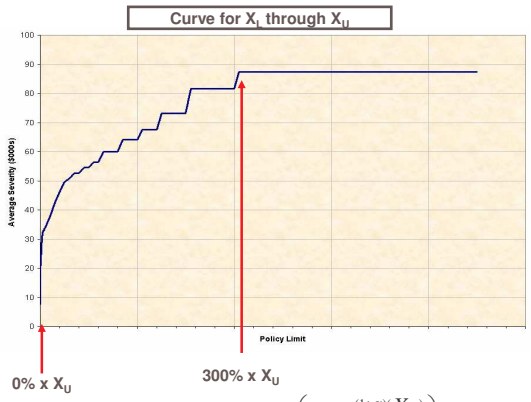
PSOLD uses the following additional exposure percentage

- Building+Contents Only – 200% (50% 2004 and prior)
- Building+Contents+Business Interruption – 200% (Unlimited – 2004 and prior)
- These percentages are based on ISO claims experience

You may want to select a different percentage

- Stacking of Excess Policies – you do not want the policies to overlap
- Margin Clause – contractually limits exposure greater than the limit
- Company Experience
- Judgment
- By making it *NEGATIVE*, we can produce a First-Loss Scale!

PSOLD Methodology
Additional Exposure Percentage



$$LAS\ (\%TIV * X_U) = \sum_{i=1}^{\#Lags} w_i \mu_i \times \left(1 - e^{-\frac{(1+\alpha)(X_U)}{\mu_i}}\right)$$

$$\%\ \ of\ \ Loss = \frac{LAS\ ((1+\alpha) * X_U)}{LAS\ (300\% * X_U)}$$

α = % Additional Exposure	% TIV = 1 + α
-100%	0%
-90%	10%
-80%	20%
-70%	30%
-60%	40%
-50%	50%
-40%	60%
-30%	70%
-20%	80%
-10%	90%
0%	100%
10%	110%
20%	120%
30%	130%
40%	140%
50%	150%
60%	160%
70%	170%
80%	180%
90%	190%
100%	200%
110%	210%
120%	220%
130%	230%
140%	240%
150%	250%
160%	260%
170%	270%
180%	280%
190%	290%
200%	300%

PSOLD+ Methodology
Homeowners Curves

New in 2005

- Newest update of Homeowners Curves since Ludwig
- Curves vary by
  - Insured Value (values don't go as high as the commercial curves)
    - ***Means are the same, but AOI Group definitions are different!***
  - State (excludes TX)
  - Policy Form (Homeowners, Condo, both)
  - Construction (Brick, Frame, both)
  - Protection Class (Protected, Unprotected, both)
- *INPUT IS **COVERAGE A***

PSOLD Curves
International Construction Cost Index

International Construction Cost Index

- The ISO PSOLD curves are based on US business.
- Can they be used on Non-US business?
- How would you adjust them for use in other countries?

Data Source

- http://www.fgould.com/files/2007_mar.apr_intl%20const%20cost%20index.pdf
- Published by Faithful+Gould, Atlanta, GA

international construction intelligence

march/april 2007 volume 19, issue 2

international construction cost index

The five most expensive countries to build in are Greece, Great Britain, Denmark, Norway, and Sweden according to our 2007 survey. Greece maintains the top spot for a

increase relative to the US for all locations was 0.6 percent. Japan had the lowest relative change and the UAE had the highest.

10.4 percent. During the past year, the US dollar experienced minimal gains against the currencies of Japan and Mexico.

Faithful+Gould International Construction Cost Index

table 1: cost model parameters

one-story manufacturing facility, owner-built, owner-occupied

statistics	office	manufacturing	total
gross floor area	47,344 sf / 4,400 m^2	102,220 sf / 9,500 m^2	149,564 sf / 13,900 m^2
floor-roof height	16 ft / 4.90 m	28 ft / 8.55 m	--
volume	761,385 cf / 21,560 m^3	2.9 mcf / 81,225 m^3	3.6 mcf / 102,785 m^3
perimeter	--	--	1,821 ft / 555 m
exterior wall area	8,070 sf / 750 m^2	26,093 sf / 2,425 m^2	34,163 sf / 3,175 m^2

specifications	office	manufacturing
foundations	spread footing	spread footing
structure	girders	girders
bay size	20 ft x 20 ft / 6 m x 6 m	39 ft x 59 ft / 12 m x 18 m
roof	adhered single-ply EPDM	adhered single-ply EPDM
exterior wall	metal siding	metal siding
fenestration	aluminum w/ insulated glass	none
finishes	standard	minimal
mechanical	heated, vented & air conditioned	heated, vented
electrical	recessed fluorescent light fixtures	metal halide high bay light fixtures; copper bus duct

Faithful+Gould International Construction Cost Index

- "Faithful+Gould and associated companies price a "market basket" of 26 items to represent all building construction items."
- "Prices are trade contractors' in-place prices, including labor, material, equipment, overhead and profit. To produce a composite comparison, we weight each item according to its contribution to total cost."
- "Pricing in-place rates, rather than basic construction inputs (material, labor and equipment), inherently measures differences in productivity, and to some extent differences in market and bidding conditions."
- Limitation: "Any cost comparison has limitations. A model building approach will not include changes to the design for local regulatory and code requirements, seismic design guidelines, design styles and climate influences."

Faithful+Gould International Construction Cost Index

- Independent of Exchange Rate
  - Measures ***Parity Range***, and ***Exchange Rate*** separately to create an ***Index***.
  - Suppose a building in the US costs USD 1,000 per square meter and the same building in China costs CNY 4,300 per square meter.
  - The building **parity** is 4.30 (4,300 / 1,000).
- We use only the Parity Range for our calculations.
- A weaker $US should have no effect on the price that a Dutch citizen pays for a house in Holland.

Non-US Limits Profile

Lower Limit (AUS)	Upper Limit (AUS)	Sir/Ded (AUS)	Prem. (AUS)
1,000,000	2,000,000	10,000	500

Layer Limit (AUS)	500,000
Layer Retention (AUS)	1,000,000

- **International Construction Cost Index = 1.31 (AUS/USD)**
- **Divide all Limits, Deductibles and Retentions by 1.31**

$$\%\ \ Losses\ \ in\ Layer = \frac{\left(LAS_{Exp}(X_U) - LAS_{Exp}(X_L)\right)}{LAS_{Exp}(\infty)}$$

- **Losses are still = Prem x Loss Ratio, regardless of currency.**

Non-US Limits Profile

- **Input – All in Local Currency**

Lower Limit (AUS)	Upper Limit (AUS)	Sir/Ded (AUS)	Prem. (AUS)
1,000,000	2,000,000	10,000	500

Layer Limit (AUS)	500,000
Layer Retention (AUS)	1,000,000

- **Output – Also in Local Currency**
  - **Expected Loss = % of Loss In Layer x LR**
- **Decomposition into Frequency and Severity**

$$LayerCount = \frac{\frac{LAS(Min(GrPolLmt, LayRet + \Delta)) - LAS(Min(GrPolLmt, LayRet))}{LAS(GrPolLmt)} \times Prem \times CurrencyAdj \times LR}{\Delta}$$

- **Severity = E(Loss) / Frequency**

Faithful+Gould International Construction Cost Index

- **Problems:**
  - Fire protection will be different in other countries
  - Only valid to the extent that a building in another country will have the same loss characteristics as the exact same building in the US.
  - An "owner-built, owner-occupied single-story manufacturing facility with a significant amount of office space" is assumed to be representative of all Commercial Property types.

- **Question:**
  - What else is there?

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Thank You

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