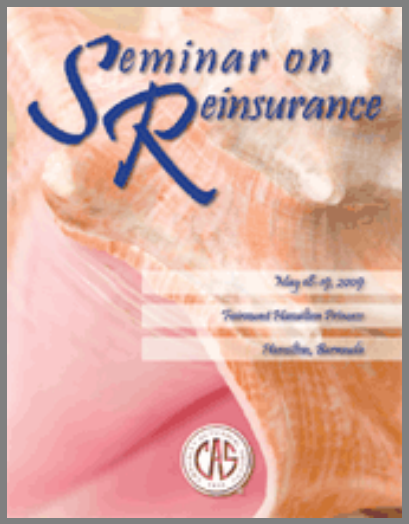
GUY CARPENTER



May 18 - 19, 2009

Pricing Property Per-Risk
Advanced Topics

CAS Seminar on Reinsurance, 2009

Bermuda

Kevin Hilferty, Guy Carpenter

SBW3

AGENDA

- Transforming PSOLD Curves to First-Loss Scales
- International Construction Cost Index

Slide 2

SBW3 Moved

Steve White, 5/26/2004

PSOLD Curves
First Loss Scale Methodology

PSOLD Curves – What are they?

- ISO product created to address two fundamental limitations of first-loss scales

- First-loss scales do not differentiate by size of risk

- First-loss scales do not differentiate by type of risk

PSOLD Curves – Components

Database of parameters for mixed exponential distributions

Weighted average of 11 exponential distributions with their corresponding means

Separate sets of weights for:

- Coverage
  - Building + Contents
  - Building+Contents+Business Interruption
  - (Building only, Contents only dropped in 2004)
  - Occurrence counts that act as weights when exposure bands span more than one AOI group

PSOLD Curves – Components

Separate sets of curves for:

- 22 - Occupancy Class
- **60 - Amount of Insurance Groups (AOI)**
- 2 - Net of Deductible vs Ground Up
- 50 – State Deductible Distributions

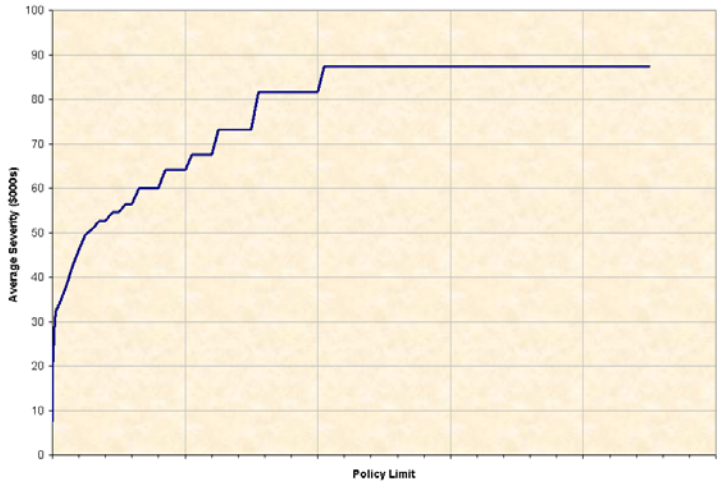
PSOLD Curves – Limitations

- If the PSOLD curves are so great, and First-Loss Scales are crude
  - Why would you want to turn a PSOLD curve into a First-Loss Scale?

- PSOLD curves have a different set of limitations

PSOLD Limitations

- **DISADVANTAGE: When you move into the realm of large limits, the curves go flat**
  - **Free cover dilemma**



- **QUESTION: What do you do? What do you use?**
  - **ANSWER: You have to fall back on first-loss scales.**
- **QUESTION: Which one?**

Which First-Loss Scale Do You Choose?

- Lloyds
- Reinsurer Curves (Swiss Re, Munich Re, etc)
- Salzmann (1960 INA Homeowners data)
- Ludwig (1984-1988 Homeowners and Small Commercial data)

Which First-Loss Scale Do You Choose?

- Can we build a new scale based on more recent data?

- Use the ISO PSOLD curves themselves.

Process

- Basic Formulas – referenced from **“Advanced Exposure Rating – Beyond the Basics.” - Steve White, 2004 CARe presentation**
- Constructing a database
- Additional Exposure Parameter
- Selecting a band of exposure to build your curve
- Building the Scale

PSOLD
Calculations using the Mixed Exponential

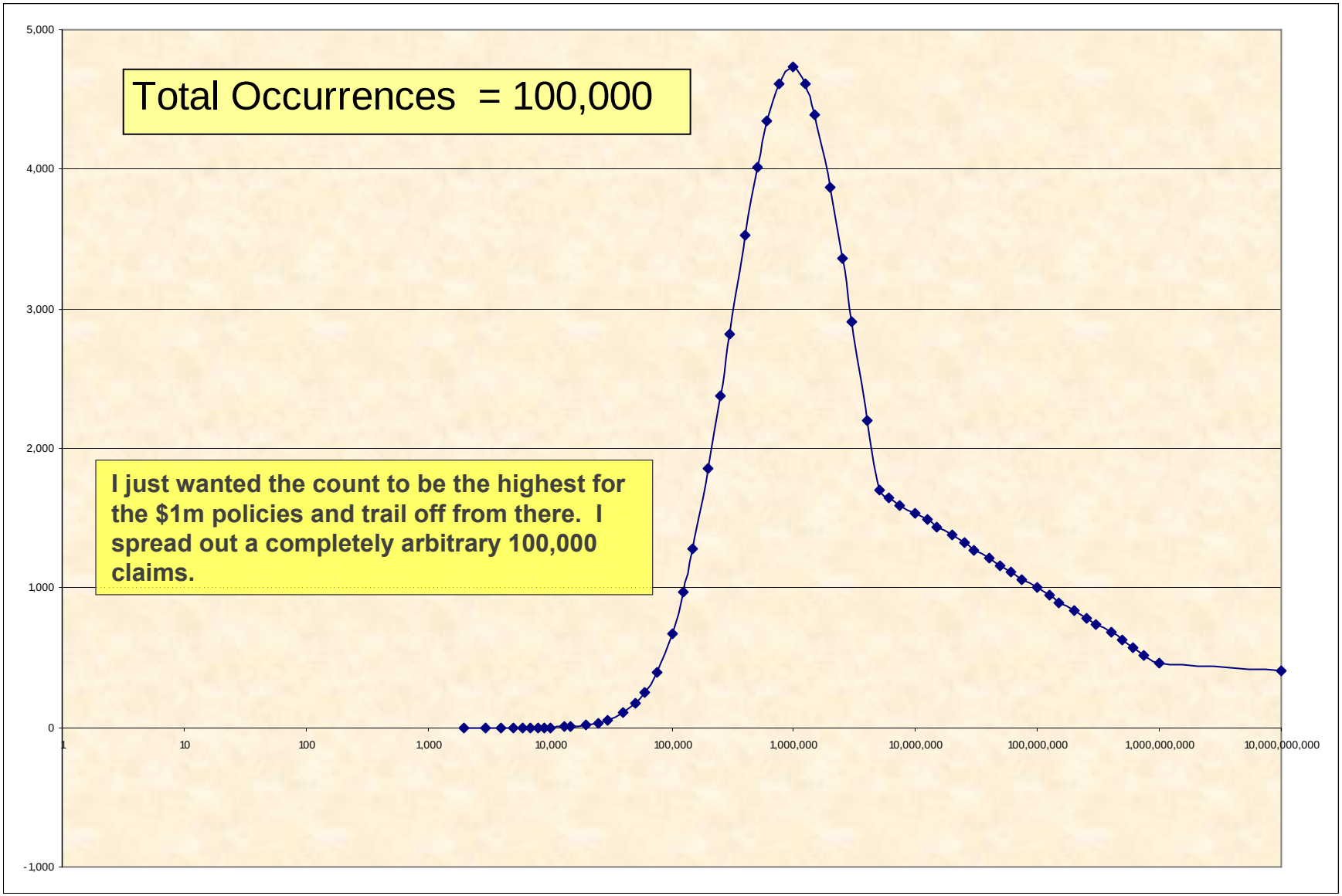
$$LAS_{ME}(x) = \sum_{i=1}^{\#Lags} w_i \mu_i \times \left(1 - e^{-\frac{x}{\mu_i}}\right)$$

PSOLD

- Since ISO PSOLD curves are proprietary data, we need to construct a fictional database for demonstration and discussion.

- We need a set of 11 weights for each of the 60 Amount of Insurance (AOI) groups along with some fictional occurrence counts.

Constructing a Fictional Database



Constructing a Fictional Database

- Mixed Exponential distribution consists of 11 means and 11 weights
- Selected 11 means from 10,000 to 200M

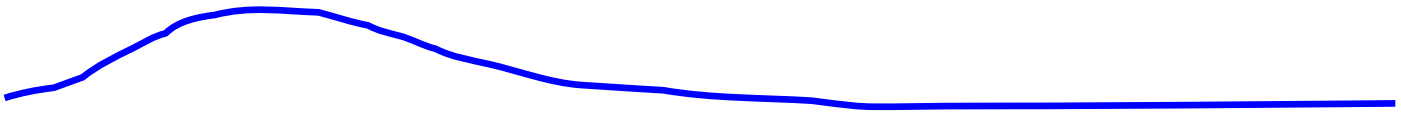
CONSTRUCTION OF ARBITRARY FACTORS

Min Max Interpolation

Group	1	2	3	4	5	6	7	8	9	10	11
MEANS	10,000	50,000	150,000	500,000	1,500,000	5,000,000	15,000,000	50,000,000	75,000,000	100,000,000	200,000,000

- Arbitrarily picked a min and a max weight for each of the 11 means.

Group	1	2	3	4	5	6	7	8	9	10	11
MEANS	10,000	50,000	150,000	500,000	1,500,000	5,000,000	15,000,000	50,000,000	75,000,000	100,000,000	200,000,000
Max	0.300	0.500	0.600	0.500	0.400	0.350	0.300	0.200	0.100	0.010	0.001
Min	0.000	0.100	0.300	0.200	0.100	0.001	0.000	0.000	0.000	0.000	0.000

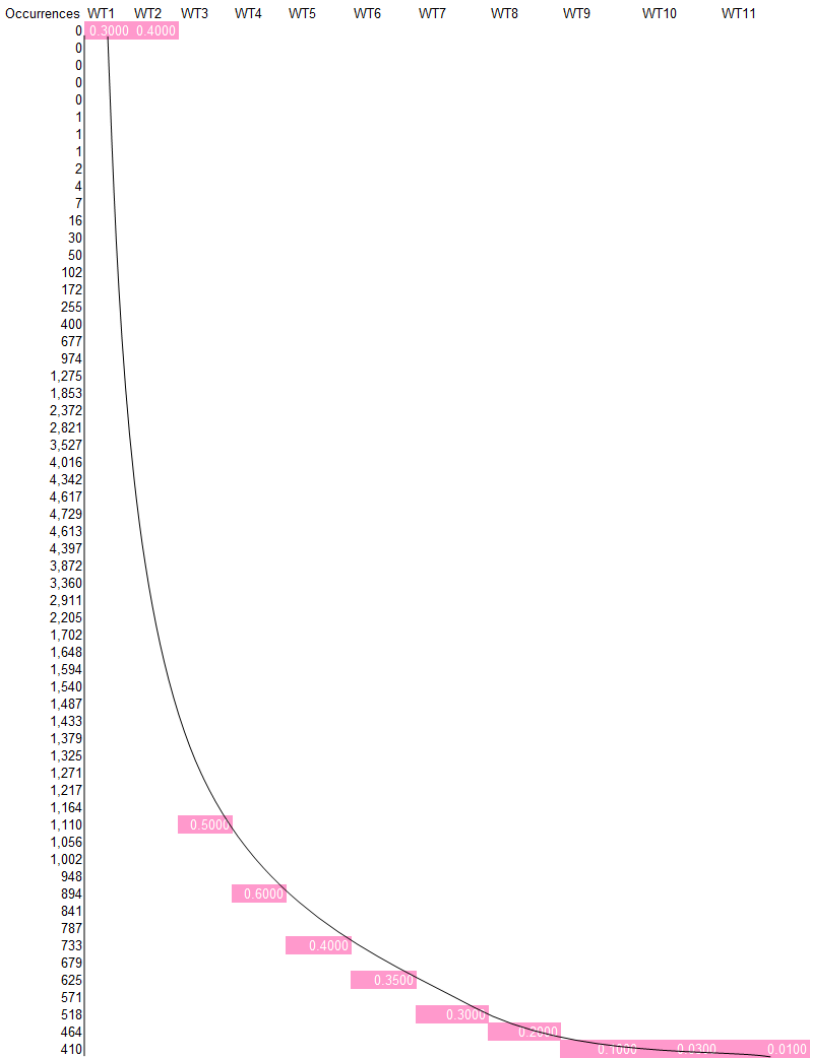


Constructing a Fictional Database

- As limit increases, we want the weight to shift from the smaller means to the larger means, yielding larger losses.

- So we want:

Constructing a Fictional Database



•So I did just that, I drew a line and put the max weight for each mean on the line and then interpolated down to the minimum at each end.

•Then I re-scaled the weights on each row to make sure they all added to 1.

Constructing a Fictional Database

- **The final database!**

Group	Occurrences	WT1	WT2	WT3	WT4	WT5	WT6	WT7	WT8	WT9	WT10	WT11
1	0	0.3000	0.5000	0.3000	0.2000	0.1000	0.0010	0.0001	0.0000	0.0000	0.0000	0.0000
2	0	0.29	0.49	0.3065	0.2060	0.1057	0.0073	0.0054	0.0034	0.0017	0.0002	0.0000
3	0	0.29	0.49	0.3130	0.2120	0.1113	0.0137	0.0106	0.0069	0.0034	0.0003	0.0000
4	0	0.28	0.48	0.3196	0.2180	0.1170	0.0200	0.0159	0.0103	0.0051	0.0005	0.0001
5	0	0.28	0.47	0.3261	0.2240	0.1226	0.0264	0.0211	0.0138	0.0068	0.0007	0.0001
6	1	0.27	0.47	0.3326	0.2300	0.1283	0.0327	0.0264	0.0172	0.0085	0.0008	0.0001
7	1	0.27	0.46	0.3391	0.2360	0.1340	0.0391	0.0317	0.0207	0.0102	0.0010	0.0001
8	1	0.26	0.45	0.3457	0.2420	0.1396	0.0454	0.0369	0.0241	0.0119	0.0012	0.0001
9	2	0.26	0.45	0.3522	0.2480	0.1453	0.0518	0.0422	0.0276	0.0136	0.0014	0.0001
10	5	0.25	0.44	0.3587	0.2540	0.1509	0.0581	0.0475	0.0310	0.0153	0.0015	0.0002
11	8	0.25	0.43	0.3652	0.2600	0.1566	0.0645	0.0527	0.0345	0.0169	0.0017	0.0002
12	20	0.24	0.43	0.3717	0.2660	0.1623	0.0708	0.0580	0.0379	0.0186	0.0019	0.0002
13	38	0.24	0.42	0.3783	0.2720	0.1679	0.0771	0.0632	0.0414	0.0203	0.0020	0.0002
14	62	0.23	0.41	0.3848	0.2780	0.1736	0.0835	0.0685	0.0448	0.0220	0.0022	0.0002
15	128	0.23	0.41	0.3913	0.2840	0.1792	0.0898	0.0738	0.0483	0.0237	0.0024	0.0002
16	215	0.22	0.40	0.3978	0.2900	0.1849	0.0962	0.0790	0.0517	0.0254	0.0025	0.0003
17	319	0.22	0.39	0.4043	0.2960	0.1906	0.1025	0.0843	0.0552	0.0271	0.0027	0.0003
18	500	0.21	0.38	0.4109	0.3020	0.1962	0.1089	0.0895	0.0586	0.0288	0.0029	0.0003
19	846	0.21	0.38	0.4174	0.3080	0.2019	0.1152	0.0948	0.0621	0.0305	0.0031	0.0003
20	1,218	0.20	0.37	0.4239	0.3140	0.2075	0.1216	0.1001	0.0655	0.0322	0.0032	0.0003
21	1,594	0.20	0.36	0.4304	0.3200	0.2132	0.1279	0.1053	0.0690	0.0339	0.0034	0.0003
22	2,316	0.19	0.36	0.4370	0.3260	0.2189	0.1343	0.1106	0.0724	0.0356	0.0036	0.0004
23	2,965	0.19	0.35	0.4435	0.3320	0.2245	0.1406	0.1159	0.0759	0.0373	0.0037	0.0004
24	3,527	0.18	0.34	0.4500	0.3380	0.2302	0.1469	0.1211	0.0793	0.0390	0.0039	0.0004
25	4,408	0.18	0.34	0.4565	0.3440	0.2358	0.1533	0.1264	0.0828	0.0407	0.0041	0.0004
26	5,020	0.17	0.33	0.4630	0.3500	0.2415	0.1596	0.1316	0.0862	0.0424	0.0042	0.0004
27	5,428	0.17	0.32	0.4696	0.3560	0.2472	0.1660	0.1369	0.0897	0.0441	0.0044	0.0004
28	5,772	0.16	0.32	0.4761	0.3620	0.2528	0.1723	0.1422	0.0931	0.0458	0.0046	0.0005
29	5,911	0.16	0.31	0.4826	0.3680	0.2585	0.1787	0.1474	0.0966	0.0475	0.0047	0.0005
30	5,767	0.15	0.30	0.4891	0.3740	0.2642	0.1850	0.1527	0.1000	0.0492	0.0049	0.0005
31	5,496	0.15	0.30	0.4957	0.3800	0.2698	0.1914	0.1579	0.1034	0.0508	0.0051	0.0005
32	4,840	0.14	0.29	0.5022	0.3860	0.2755	0.1977	0.1632	0.1069	0.0525	0.0053	0.0005
33	4,200	0.14	0.28	0.5087	0.3920	0.2811	0.2041	0.1685	0.1103	0.0542	0.0054	0.0005
34	3,638	0.13	0.28	0.5152	0.3980	0.2868	0.2104	0.1737	0.1138	0.0559	0.0056	0.0006
35	2,756	0.13	0.27	0.5217	0.4040	0.2925	0.2167	0.1790	0.1172	0.0576	0.0058	0.0006
36	2,128	0.12	0.26	0.5283	0.4100	0.2981	0.2231	0.1842	0.1207	0.0593	0.0059	0.0006
37	2,060	0.12	0.26	0.5348	0.4160	0.3038	0.2294	0.1895	0.1241	0.0610	0.0061	0.0006
38	1,993	0.11	0.25	0.5413	0.4220	0.3094	0.2358	0.1948	0.1276	0.0627	0.0063	0.0006
39	1,926	0.11	0.24	0.5478	0.4280	0.3151	0.2421	0.2000	0.1310	0.0644	0.0064	0.0006
40	1,858	0.10	0.24	0.5543	0.4340	0.3208	0.2485	0.2053	0.1345	0.0661	0.0066	0.0007
41	1,791	0.10	0.23	0.5609	0.4400	0.3264	0.2548	0.2106	0.1379	0.0678	0.0068	0.0007
42	1,724	0.09	0.22	0.5674	0.4460	0.3321	0.2612	0.2158	0.1414	0.0695	0.0069	0.0007
43	1,656	0.09	0.22	0.5739	0.4520	0.3377	0.2675	0.2211	0.1448	0.0712	0.0071	0.0007
44	1,589	0.08	0.21	0.5804	0.4580	0.3434	0.2739	0.2263	0.1483	0.0729	0.0073	0.0007
45	1,522	0.08	0.20	0.5870	0.4640	0.3491	0.2802	0.2316	0.1517	0.0746	0.0075	0.0007
46	1,455	0.07	0.19	0.5935	0.4700	0.3547	0.2865	0.2369	0.1552	0.0763	0.0076	0.0008
47	1,387	0.07	0.19	0.6000	0.4760	0.3604	0.2929	0.2421	0.1586	0.0780	0.0078	0.0008
48	1,320	0.06	0.18	0.5769	0.4820	0.3660	0.2992	0.2474	0.1621	0.0797	0.0080	0.0008
49	1,253	0.06	0.17	0.5538	0.4880	0.3717	0.3056	0.2526	0.1655	0.0814	0.0081	0.0008
50	1,185	0.05	0.17	0.5308	0.4940	0.3774	0.3119	0.2579	0.1690	0.0831	0.0083	0.0008
51	1,118	0.05	0.16	0.5077	0.5000	0.3830	0.3183	0.2632	0.1724	0.0847	0.0085	0.0008
52	1,051	0.04	0.15	0.4846	0.4667	0.3887	0.3246	0.2684	0.1759	0.0864	0.0086	0.0009
53	983	0.04	0.15	0.4615	0.4333	0.3943	0.3310	0.2737	0.1793	0.0881	0.0088	0.0009
54	916	0.03	0.14	0.4385	0.4000	0.4000	0.3373	0.2790	0.1828	0.0898	0.0090	0.0009
55	849	0.03	0.13	0.4154	0.3667	0.3500	0.3437	0.2842	0.1862	0.0915	0.0092	0.0009
56	782	0.02	0.13	0.3923	0.3333	0.3000	0.3500	0.2895	0.1897	0.0932	0.0093	0.0009
57	714	0.02	0.12	0.3692	0.3000	0.2500	0.2628	0.2947	0.1931	0.0949	0.0095	0.0009
58	647	0.01	0.11	0.3462	0.2667	0.2000	0.1755	0.3000	0.1966	0.0966	0.0097	0.0010
59	580	0.01	0.11	0.3231	0.2333	0.1500	0.0883	0.1501	0.2000	0.0983	0.0098	0.0010
60	512	-	0.10	0.3000	0.2000	0.1000	0.0010	0.0001	0.0000	0.1000	0.0100	0.0010

This would represent a single occupancy class for a single coverage type

Limited Average Severity by Policy Limit

			MEANS	10,000	50,000	150,000	500,000	100,000,000	200,000,000		X= 260,000						
											= Wi x Mi x (1-Exp(-X/Mi))						
AOI Group	AOI Min	AOI Max	OCC	WT1	WT2	WT3	WT4	WT10	WT11	Σ(Wi x Mi)	LAS1	LAS2	LAS3	LAS4	LAS10	LAS11	LAS_TOT
1	1,000	2,000	0	0.2141	0.3569	0.2141	0.1427	0.0000	0.0000	235,172	0	0	0	0	0	0	0
2	2,000	3,000	0	0.21	0.35	0.2152	0.1446	0.0001	0.0000	542,069	0	0	0	0	0	0	0
3	3,000	4,000	1	0.20	0.34	0.2162	0.1464	0.0002	0.0000	839,106	0	0	0	0	0	0	0
4	4,000	5,000	2	0.19	0.33	0.2173	0.1482	0.0003	0.0000	1,126,751	0	0	0	0	0	0	0
5	5,000	6,000	5	0.19	0.32	0.2182	0.1499	0.0005	0.0000	1,405,442	0	0	0	0	0	0	0
6	6,000	7,000	8	0.18	0.31	0.2192	0.1516	0.0006	0.0001	1,675,591	0	0	0	0	0	0	0
7	7,000	8,000	12	0.17	0.30	0.2201	0.1532	0.0007	0.0001	1,937,585	0	0	0	0	0	0	0
8	8,000	9,000	18	0.17	0.29	0.2210	0.1547	0.0008	0.0001	2,191,787	0	0	0	0	0	0	0
9	9,000	10,000	25	0.16	0.28	0.2219	0.1563	0.0009	0.0001	2,438,541	0	0	0	0	0	0	0
10	10,000	13,000	53	0.16	0.27	0.2227	0.1577	0.0009	0.0001	2,678,168	0	0	0	0	0	0	0
11	13,000	15,000	79	0.15	0.26	0.2236	0.1592	0.0010	0.0001	2,910,973	0	0	0	0	0	0	0
12	15,000	20,000	166	0.15	0.26	0.2244	0.1605	0.0011	0.0001	3,137,243	0	0	0	0	0	0	0
13	20,000	25,000	282	0.14	0.25	0.2251	0.1619	0.0012	0.0001	3,357,250	0	0	0	0	0	0	0
14	25,000	30,000	423	0.14	0.24	0.2259	0.1632	0.0013	0.0001	3,571,250	0	0	0	0	0	0	0
15	30,000	40,000	755	0.13	0.23	0.2266	0.1645	0.0014	0.0001	3,779,486	0	0	0	0	0	0	0
16	40,000	50,000	1,130	0.13	0.23	0.2273	0.1657	0.0015	0.0001	3,982,187	0	0	0	0	0	0	0
17	50,000	60,000	1,523	0.12	0.22	0.2280	0.1669	0.0015	0.0002	4,179,572	0	0	0	0	0	0	0
18	60,000	75,000	2,115	0.12	0.21	0.2287	0.1681	0.0016	0.0002	4,371,847	0	0	0	0	0	0	0
19	75,000	100,000	3,038	0.11	0.21	0.2294	0.1693	0.0017	0.0002	4,559,207	0	0	0	0	0	0	0
20	100,000	125,000	3,839	0.11	0.20	0.2300	0.1704	0.0017	0.0002	4,741,839	0	0	0	0	0	0	0
21	125,000	150,000	4,508	0.11	0.20	0.2306	0.1715	0.0018	0.0002	4,919,919	0	0	0	0	0	0	0
22	150,000	200,000	5,493	0.10	0.19	0.2313	0.1725	0.0019	0.0002	5,093,617	0	0	0	0	0	0	0
23	200,000	250,000	6,108	0.10	0.18	0.2319	0.1736	0.0019	0.0002	5,263,090	0	0	0	0	0	0	0

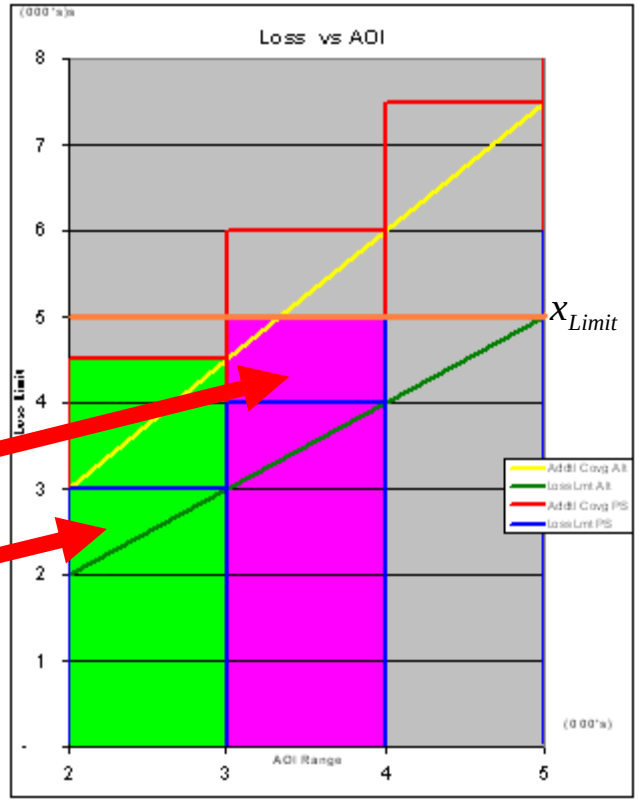
AOI Group	OCC	WT1	WT2	WT3	WT4	WT5	WT6	WT7	WT8	WT9	WT10	WT11	Σ(Wi x Mi)
1	0	0.2141	0.3569	0.2141	0.1427	0.0714	0.0007	0.0001	0.0000	0.0000	0.0000	0.0000	235,172
2	0	0.21	0.35	0.2152	0.1446	0.0742	0.0052	0.0038	0.0024	0.0012	0.0001	0.0000	542,069
3	1	0.20	0.34	0.2162	0.1464	0.0769	0.0095	0.0073	0.0048	0.0023	0.0002	0.0000	839,106
4	2	0.19	0.33	0.2173	0.1482	0.0795	0.0136	0.0108	0.0070	0.0035	0.0003	0.0000	1,126,751
5	5	0.19	0.32	0.2182	0.1499	0.0821	0.0177	0.0142	0.0092	0.0045	0.0005	0.0000	1,405,442
6	8	0.18	0.31	0.2192	0.1516	0.0846	0.0216	0.0174	0.0114	0.0056	0.0006	0.0001	1,675,591
55	0	0.01	0.06	0.1882	0.1661	0.1586	0.1557	0.1288	0.0844	0.0415	0.0041	0.0004	10,888,845
56	0	0.01	0.06	0.1863	0.1583	0.1425	0.1662	0.1375	0.0901	0.0443	0.0044	0.0004	11,571,968
57	0	0.01	0.06	0.1932	0.1570	0.1308	0.1375	0.1543	0.1011	0.0497	0.0050	0.0005	12,682,928
58	0	0.01	0.07	0.2017	0.1554	0.1166	0.1023	0.1748	0.1146	0.0563	0.0056	0.0006	14,046,316
59	0	0.00	0.08	0.2366	0.1709	0.1098	0.0646	0.1099	0.1464	0.0720	0.0072	0.0007	15,845,476
60	0	-	0.07	0.22	0.16	0.10	0.06	0.10	0.14	0.1266	0.0127	0.0013	20,001,193

Exposure Amount

PSOLD Methodology
PSOLD LAS Calculations over Single AOI Range ("Dtl")

LAS for an Mixed Exponential

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



PSOLD constrains the LAS Calculation

PSOLD has two Ranges of Interest:

$$x_{Limit} < AOI^*_{Upper} : LAS_{PSOLD}(x_{Limit}) = LAS_{ME}(x_{Limit})$$

$$x_{Limit} \geq AOI^*_{Upper} : LAS_{PSOLD}(x_{Limit}) = LAS_{ME}\left(AOI^*_{Upper}\right)$$

$$where\ AOI^*_{Upper} = AOI_{Upper} \times (1 + Additional\ \ Exposure\ \ \%)$$

PSOLD Methodology
Alternate LAS Calculations over a Continuous AOI Range ("Grp")

Calculating the LAS over a continuous range adds one more degree of complexity

$$x_{Limit} < AOI^*_{Lower} : LAS_{ALT}(x_{Limit}) = LAS_{ME}(x_{Limit})$$

$$x_{Limit} \geq AOI^*_{Upper} : LAS_{ALT}(x_{Limit}) = \frac{LAS_{ME}\left(AOI^*_{Upper}\right) + LAS_{ME}\left(AOI^*_{Lower}\right)}{2}$$

$$AOI^*_{Upper} \geq x_{Limit} \geq AOI^*_{Lower} :$$

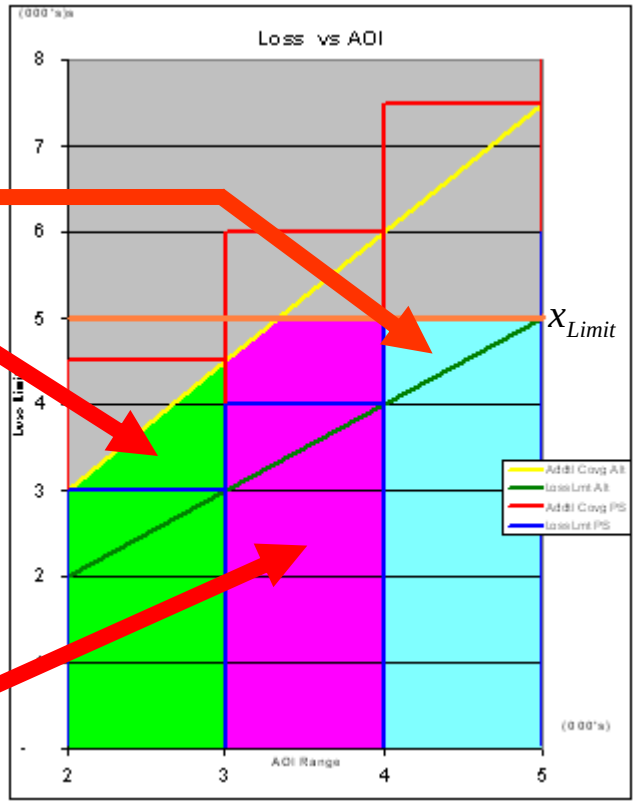
$$LAS_{ALT}(x_{Limit}) = \left(\frac{LAS_{ME}\left(AOI^*_{Lower}\right) + LAS_{ME}\left(x_{Limit}\right)}{2}\right)\left(\frac{x_{Limit} - AOI^*_{Lower}}{AOI^*_{Upper} - AOI^*_{Lower}}\right) + LAS_{ME}\left(x_{Limit}\right)\left(\frac{AOI^*_{Upper} - x_{Limit}}{AOI^*_{Upper} - AOI^*_{Lower}}\right)$$

Which simplifies to

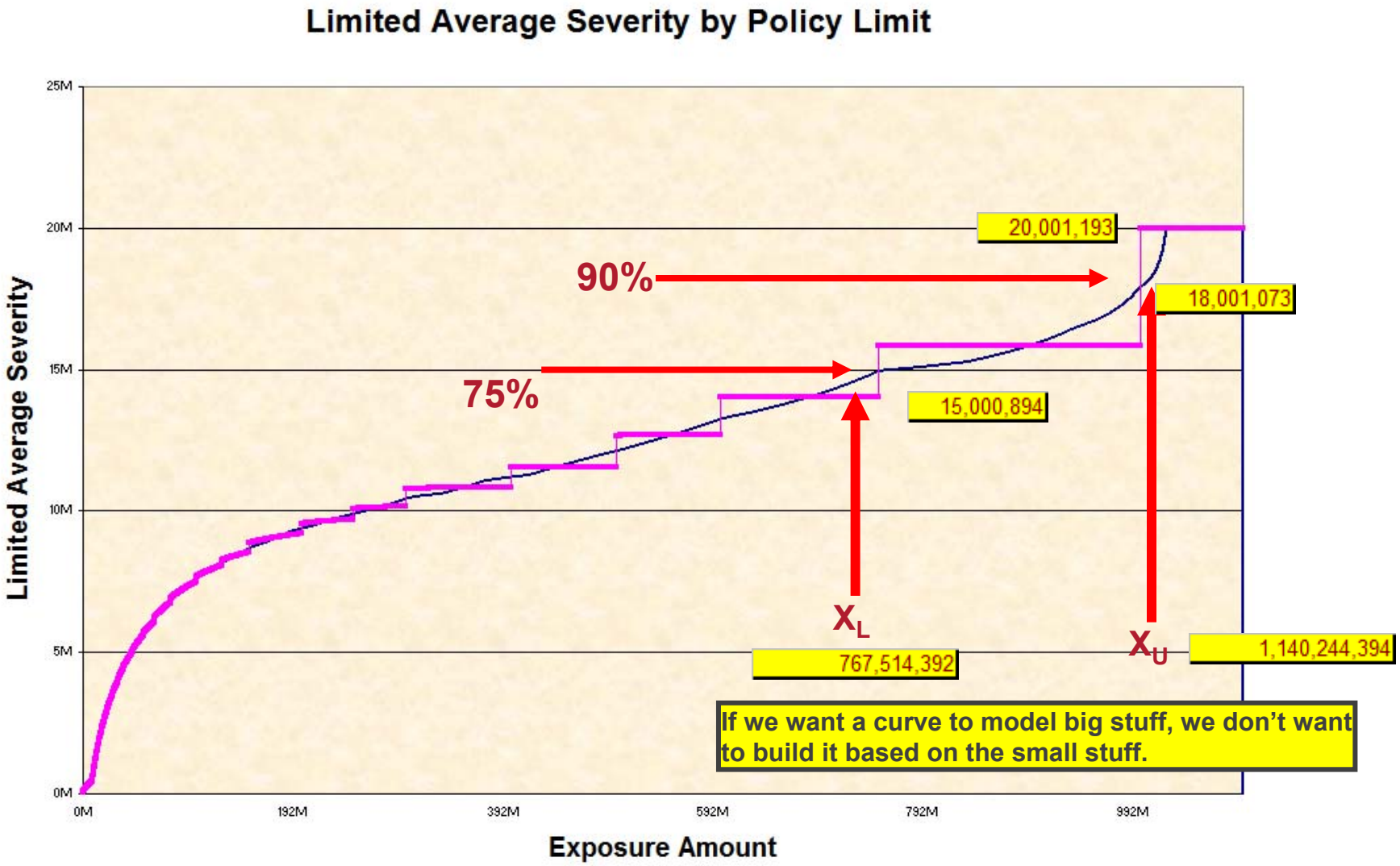
$$LAS_{ALT}(x_{Limit}) = LAS_{ME}\left(AOI^*_{Lower}\right)\left(\frac{x_{Limit} - AOI^*_{Lower}}{2\left(AOI^*_{Upper} - AOI^*_{Lower}\right)}\right) + LAS_{ME}\left(x_{Upper}\right)\left(1 - \frac{x_{Limit} - AOI^*_{Lower}}{2\left(AOI^*_{Upper} - AOI^*_{Lower}\right)}\right)$$

$$where\ AOI^*_{Upper} = AOI_{Upper} \times (1 + Additional\ \ Exposure\%)$$

$$where\ AOI^*_{Lower} = AOI_{Lower} \times (1 + Additional\ Exposure\%)$$



Percentage of Unlimited Average Severity (ULAS) by Policy Limit



PSOLD Methodology
Additional Exposure Percentage

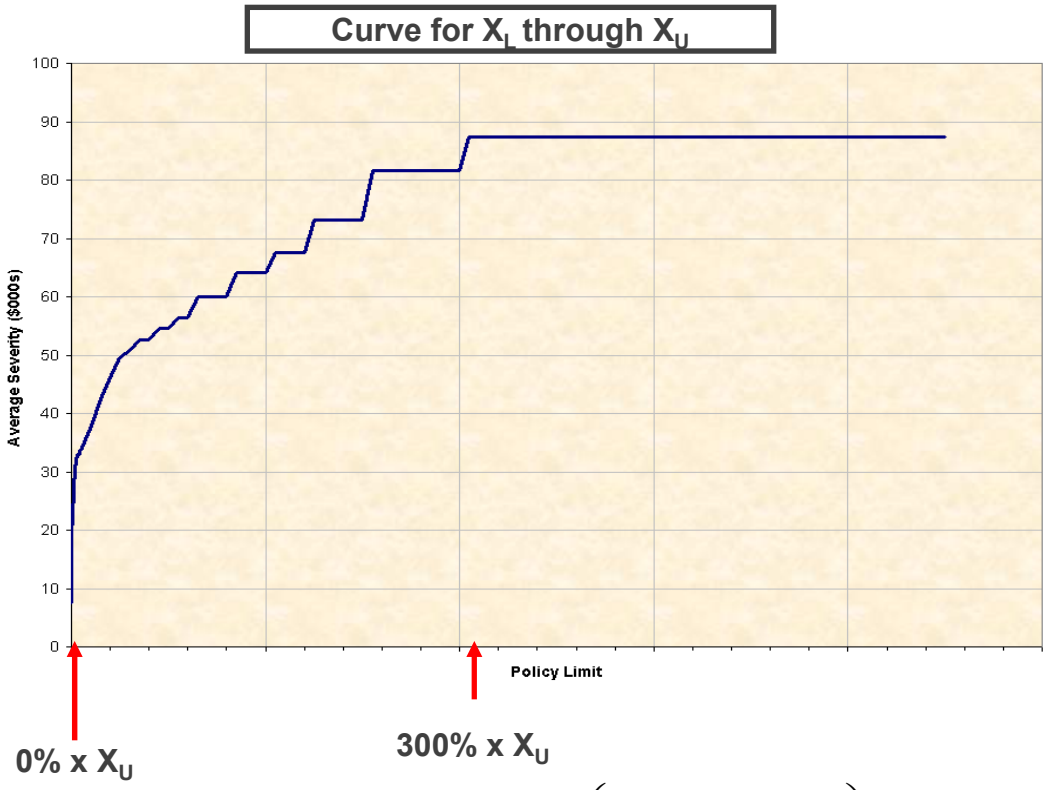
PSOLD uses 200% additional exposure percentage based on ISO claims experience

- Which means that the top of our scale needs to be 300%.

We have our band:

Lower Limit	Upper Limit
767,514,392	1,140,244,394

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%

The Final Step

X	LOWER LIMIT	UPPER LIMIT	LOWER TIV	UPPER TIV	ADDITIONAL COVERAGE	% TIV (1 + Add'l Cvg)	LAS CALCULATION	% LOSS
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	-90%	10%	12,794,507	80.02%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	-80%	20%	15,129,678	94.62%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	-75%	25%	15,518,425	97.05%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	-70%	30%	15,722,289	98.33%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	-60%	40%	15,894,363	99.41%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	-50%	50%	15,950,931	99.76%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	-40%	60%	15,971,904	99.89%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	-30%	70%	15,980,662	99.95%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	-25%	75%	15,983,064	99.96%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	-20%	80%	15,984,752	99.97%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	-10%	90%	15,986,856	99.98%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	0%	100%	15,988,022	99.99%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	10%	110%	15,988,700	100.00%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	20%	120%	15,989,074	100.00%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	30%	130%	15,989,252	100.00%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	40%	140%	15,989,318	100.00%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	50%	150%	15,989,330	100.00%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	60%	160%	15,989,330	100.00%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	70%	170%	15,989,330	100.00%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	80%	180%	15,989,330	100.00%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	90%	190%	15,989,330	100.00%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	100%	200%	15,989,330	100.00%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	110%	210%	15,989,330	100.00%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	120%	220%	15,989,330	100.00%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	130%	230%	15,989,330	100.00%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	140%	240%	15,989,330	100.00%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	150%	250%	15,989,330	100.00%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	160%	260%	15,989,330	100.00%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	170%	270%	15,989,330	100.00%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	180%	280%	15,989,330	100.00%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	190%	290%	15,989,330	100.00%
1,140,244,394	767,514,392	1,140,244,394	767,514,392	1,140,244,394	200%	300%	15,989,330	100.00%

- **Although coverage goes up to 300%, for this band, all losses are expected in the first 110% of TIV, and 80% of losses are expected to be less than or equal to 10% of TIV.**
- **…BUT, these numbers are purely fictional – don't attach too much meaning to them.**

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/media/files/ici_2008_marapr.pdf
- Published by Faithful+Gould, Atlanta, GA
- Last update was dated March/April 2008
  - New edition should be out soon.

International Construction
INTELLIGENCE

Volume 20, Issue 2
March/April 2008

INTERNATIONAL CONSTRUCTION COST INDEX

Greece, Norway, Sweden, Denmark and Switzerland are the five most expensive countries to build in according to our 2008 survey. Greece maintains the top spot for a third year. Great Britain falls out of the top five because the British Pound had little appreciation against the US dollar. Switzerland moves back into the top five because of its currency appreciation.

Europe remains the most expensive continent for construction, particularly the Scandinavian region. Only Japan, ranked at 15, and Australia, ranked at 19, broke the monolith of European countries at the top of the list.

The ranking for the five least expensive countries to build was nearly unchanged from 2007. This year they are India, Malaysia, China, Thailand and Mexico—replacing the Brazil. Appreciation of the Brazilian Real pushed its index higher.

On average, inflation for 2007 was higher than in 2006 and continues to be a concern. However, currency fluctuations continue real driving force behind changes to the index values as inflation. With a few exceptions, inflation tended to be roughly 5 to 7 percent lifting the costs for everyone uniformly. Average year-on-year construction price inflation was about 6 percent, slightly higher than last year's inflation of 5.7 percent.

Twelve countries reported annual inflation over the 6 percent group average. Inflation in most countries remained below 10 percent, but the UAE continues to experience double-digit inflation. Regionally, inflation was about 6 percent in the Americas, over 7 percent in the Asia/Pacific and about 5.5 percent in Europe.

Inflation relative to the US determines changes in parity values. Fourteen countries had inflation higher than the US. Seventeen reported lower inflation. The average increase relative to the US for all locations was 0.6 percent. Japan had the lowest relative change and the UAE had the highest.

As the US dollar continues to fall, index values continue to rise. The currencies for all the countries included in our comparison, except the UAE dirham, appreciated against the US dollar since March 2007. The UAE pegs the dirham to the dollar. The euro—eleven countries in our comparison—gained 15.6 percent against the dollar. The 23 percent increase was 23 percent by the Czech Koruna and the Polish Zloty. Great Britain, Mexico and Thailand had modest gains of less than 3 percent.

Shifts in the parity and exchange rate values produced the following index changes:

- Index values increased for all countries covered by the index. The average index increase for all locations was 14.6 percent. The average currency appreciation was over 12 percent showing that exchange rates are the principal cause for the large shifts. The higher UAE index, which is due strictly to its high inflation, is an exception.
- The USA dropped in the ranking again this year—from 20 to 24. With the dollar trading at or near record lows the relative cost of construction in the US is less expensive.

Construction investment periods will span years, not months. So exchange rate volatility is important to consider as they will most certainly occur during a project' planning, design and execution. Parities will provide a more consistent comparison over time.

The construction industry typically uses "location factors" to calculate expected construction cost for a location knowing the cost at another location. Most sources for indexes focus on locations within a specific country so exchange rates and parity are of no concern.

A model-building index allows comparison of the exact same building at different locations. In reality, the building will change for a variety of reasons—local industry practices, codes and regulations. Therefore, the cost relationship predicted by the model-based index may not hold true.

a publication of **Faithful+Gould** with **RSMeans**

Faithful+Gould International Construction Cost Index

THE TABLES

TABLE 1

summarizes the physical characteristics of our model building. It is an owner-built, owner-occupied single-story manufacturing facility with a significant amount of office space.

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 m²	• 102,220 sf / 9,500 m²	• 149,564 sf / 13,900 m²
• floor-roof height	• 16 ft / 4.90 m	• 28 ft / 8.55 m	—
• volume	• 761,385 cf / 21,560 m³	• 2.9 mcf / 81,225 m³	• 3.6 mcf / 102,785 m³
• perimeter	—	—	• 1,821 ft / 555 m
• exterior wall area	• 8,070 sf / 750 m²	• 26,093 sf / 2,425 m²	• 34,163 sf / 3,175 m²

SPECIFICATIONS	OFFICE	MANUFACTURING
• foundations	• spread footing	• spread footing
• structure	• girders	• girders
• bay size	• 20ft x 20ft / 6m x 6m	• 39ft x 59ft / 12m x 18m
• 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 Premium x LR

- **Decomposition into Frequency and Severity**

$$LayerCount = \frac{\frac{LAS\left(Min(GrPolLmt, Lay\,\mathrm{Re}t + \Delta\right) - LAS\left(Min(GrPolLmt, Lay\,\mathrm{Re}t)\right)}{LAS\left(GrPolLmt\right)} \times Premium \times CurrencyAdj \times LR}{\Delta}$$

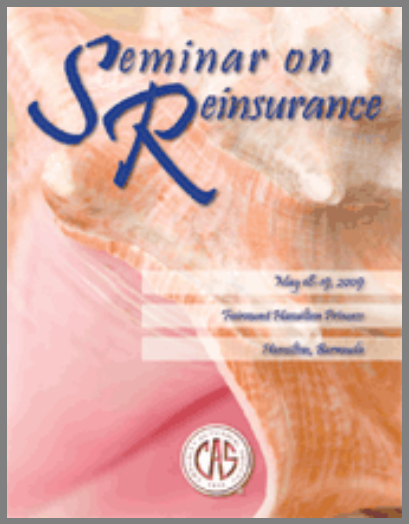
- **Severity = E(Loss) / Frequency**

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?

GUY CARPENTER



Thank You

Kevin A. Hilferty
Senior Vice President
KHilferty@guycarp.com
Guy Carpenter & Company, LLC
44 Whippany Road
P.O. Box 1926
Morristown, NJ 07962-1926
Phone: 973-285-7923