C-12: International Property

CARe Seminar, May 21-22, 2014

New York, NY

John Buchanan, Principal – Excess and Reinsurance, Verisk / ISO
Enrico Biffis, Associate Professor of Actuarial Finance, Imperial College London
Li Zhang, Actuary, CPCR / China Re P&C

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CARe C-12 International Property
Description

This session will compare various benchmarking methodologies for International Property, with an emphasis on Per Risk covers on Large Commercial Risks and tail risk methodologies. Similarities and differences between US and various developed and developing country data sources and methodologies will be discussed.

- Various ground-up and excess curve applications and adjustments for differences such as construction, occupancy, and protection differences (COPE-FARM adjustments), resulting macro country-wide validations, and methodologies for combining non-cat and cat losses will be explored.
- This session will include a discussion surrounding a new LCR data source: Imperial-IICI (Insurance Intellectual Capital Initiative) spearheaded by Imperial College in London and Lloyd's, including implications for reserving and capital modeling.
- Also included will be an overview of the Chinese property market, and special considerations required in developing specific exposure curves.

Moderator / Presenter:
John W. Buchanan, Principal, Excess & Reinsurance, Verisk / ISO
Presenters:
Enrico Biffis, Associate Professor of Actuarial Finance, Imperial College London
Li Zhang, Actuary, CPCR / China Re P&C

CARe C-12 International Property
Agenda – May 22, 2014

- **Introduction / General Benchmarking**
  – John Buchanan 5 minutes
- **International Property Overview**
  – John Buchanan 20 minutes
- **Some New Insights into Large Commercial Risks**
  – Enrico Biffis 20 minutes
- **Overview of Chinese Property Insurance Market**
  – Li Zhang 20 minutes
- **Q&A** 10 minutes

To the extent there is time, will pause for questions after each of the Three main sections. Otherwise, will have questions at the end.

C-12 International Property Per Risk Benchmarking

CARe, May 22, 2014
New York, NY

John Buchanan, Verisk / ISO

C-12 International Property
Per Risk Benchmarking Agenda

- **Overview**
- **A. Non-cat Excess Loss Estimates**
  - Size of loss curves - survey
  - Important link between exposures and losses
  - US vs. International loss scales – COPE-ARM adjustments
  - Cross-country validations – macro and micro view
- **B. Non-cat Ground-up Loss Estimates**
  - Breakdown by perils – Fire, Wind, other causes of loss
  - Scaling adjustments
- **C. Cat Estimates**
  - Hazards by country
- **D. Bringing It All Together**
  - Workflow – individual vs. banded exposures
  - Class rating vs. building specific for construction AOI's
  - Combined EP curve
  - Geospatial - conflagration risk

International Property
A. Non-Cat Excess Loss Estimates

Size of Loss Curve Illustration – Non-Cat
$20M AOI; $5M Excess of $5M Layer

% of AOI	% of Loss
0.0%	0.0%
10.0%	40.0%
20.0%	50.0%
25.0%	**60.0%**
30.0%	65.0%
40.0%	70.0%
50.0%	**75.0%**
60.0%	80.0%
70.0%	85.0%
80.0%	90.0%
90.0%	96.0%
100.0%	100.0%

AOI = $20,000,000 (insured value)

- **Layer attachment point: $5M / $20M = 25%; per scale, 60% of losses are less than or equal to 25% of AOI. Therefore, 60% of the total ground-up loss costs pays for losses related to the first $5M of building value**
- **Layer limit: $10M / $20M =50%; per scale, 75% of the ground-up losses pays the losses for the first $10M of building value**
- **Layer charge: would want to collect 15% (75.0%-60.0%) of the total ground-up expected loss costs for the $5M excess of $5M layer.**

Therefore, if the total expected losses for this building was $40,000, then the amount for the excess layer would be $6,000 (15% x $40,000)

A Survey of International Property Size of Loss Curves

- **The Issues:**
  - o Plausible curves need to rely on link between losses and their exposed amounts of insurance
  - o Curves vary substantially by Amount of Insurance, occupancy, peril, territory, etc.
  - o Establishing connection between US & International experience – large loss occupancy test

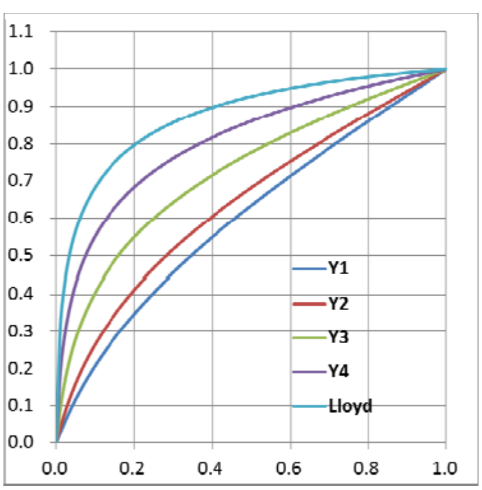
- **Lloyd's Scales** *(World War II-unknown)*
- **Salzman Scales** *(1960 – personal property)*
- **Ludwig Tables** *(mid 1980s – one company HO and small CP)*
- **Various Reinsurer Based Scales**
  - o Swiss Re, Munich Re, Skandia, Frankona, Cologne Re, Employers Re, brokers,…
- **MBBEFD Approximations** *(1990s - S. Bernegger)*
  - o Modeling loss severity with distributions from Physics
- **Extreme Value Theory** *(1990s- G. Ramachandran)*
  - o Factors affecting Fire Loss – Multiple regression models
- **ISO – PSOLD International**
  - o Based on US Proxy Approach, COPE (ARM), with validation
  - o Four countries released in 2013 (UK, Germany, France, Australia)
  - o Others in process (Netherlands, Japan, Brazil)

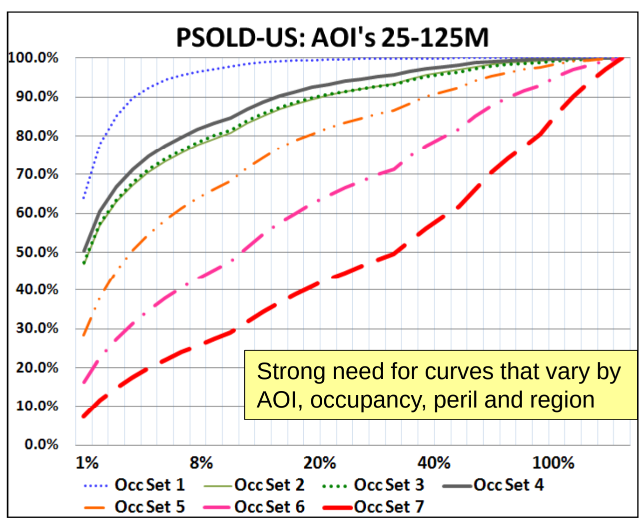
Many different curves, with varying levels of credibility and transparency, have been used over the decades

Source: CS2 International Property – June 2013
Perspectives from America: The Missing link: Rating property exposure globally – May 2012 by John Buchanan

Size of Loss Curve Comparisons - Illustrative

Importance of Amount of Insurance and Occupancy





China Re-CPCR curve comparison MBBEFD (Swiss Re Y1-Y4 parametric approximation) Lloyd's empirical from unknown data source

PSOLD uses over 3M individual linked losses and exposures to generate curves for 60 AOI bands, 38 occupancies, 4 sets of perils, 50 states, etc.

Basic Steps in Adjusting US Excess Loss Curves for International

- **Step 1: Validate US Curves – Want Strong Proxy Anchor**
  - US market is comparable to size of 7 initial target countries combined
  - Evaluate credibility of US original and fitted data – in total and by component
  - Validate using actual vs. expected large losses *(from 25mm to 250mm; NFPA 20 years)*
- **Step 2: Adjust US Curves to International – COPE (ARM)**
  - Assess differences in Amounts of Insurance, Occupancy, Protection, Construction, etc.
  - Using various industry exposure databases – US vs. International
  - Consolidate individual selections to total COPE adjustments
- **Step 3: Validate Proxy Curves with Industry Data**
  - Industry large loss information *(AXCO Insurance Information Services, FPA's, other sources)*
  - Compare actual vs. expected claim counts at various attachment points
  - Cross country comparisons – counts and occupancy differences
- **Step 4: Use Individual Account Information for Benchmark Refinement**
  - Submissions: individual large claims
  - Aggregated exposure information

Review Granularity – Results by Occupancy
Paired Average Severity Relativities

New PSOLD RG #	PSOLD RG name	Count of CSP	Sum of 20-year Total Claim Count	Relativity High/Low 20 yr	Relativity High/Low 5 yr
1	Apartment/Condo under 10 units	7	72,360	1.00	1.00
2	Apartment/Condo over 10 units	8	76,568	1.64	1.74
6	Hotels and Motels - With Restaurant	4	11,871	2.19	1.91
7	Hotels and Motels - Other	7	58,438	1.00	1.00
15	Other Mercantiles - Retail/Wholesale	4	79,980	1.81	1.78
16	Other Mercantiles - Other	17	440,504	1.00	1.00
25	Agricultural - Greenhouses	1	3,177	1.00	1.00
26	Agricultural - Grain Elevators	6	2,982	6.75	5.75
27	Food Processing - Other	7	16,221	1.00	1.00
28	Food Processing - Severe	3	1,324	1.98	2.82
31	Light Manufacturing - Printing	1	14,274	1.00	1.00
32	Light Manufacturing - Other	5	12,551	2.00	2.48
33	Heavy Manufacturing - Wood	4	23,910	1.48	1.73
34	Heavy Manufacturing - Other	7	32,300	1.00	1.00
36	Highly Protected Risks - Low	17	4,453	1.00	1.00
37	Highly Protected Risks - Medium	15	7,950	2.47	1.66
38	Highly Protected Risks - Heavy	46	4,703	8.28	5.41
Grand Total		230	2,520,239		

Underlying average severities in the 38 occupancy groups range from 9k (Billboards) to over 500k (Petrochemical Plants)

Significant credible differences in average severities of losses between subgroups within occupancy; e.g. the average severity of grain elevators is 5 to 7 times higher than greenhouses

Review Macro Industry Application for Validation (US)

Summary – Actual vs. Expected # of Claims (All Occupancies vs. Severe)

Threshold (mm's)	All Occupancies 20 year NFPA Actual	PSOLD 2012 2.5mm Scaled	PSOLD 2012 Fitted Range	Severe /All Occupancies
500	*3*	*0.5*	*0 - 1*	66.3%
400	*6*	*1.4*	*1 - 2*	66.1%
250	12	7.1	6 - 11	65.5%
200	13	12.4	11 - 19	64.8%
150	19	21.8	19 - 33	62.9%
100	40	43.7	38 - 67	57.7%
80	52	59.1	51 - 91	53.9%
50	89	108.4	93 - 166	43.7%
25	182	314.0	270 - 481	26.7%

Good all-industry validation of large claims from 25M to 200M, and perhaps 250M if accept potential protection improvements in the last 20 years

For example, over the last 20 years, there were 40 Fire claims (trended) above 100M, while all-industry validation would produce 43.7 claim

The most severe occupancies of severe manufacturing/petroleum and HPR-heavy account for almost 2/3rds of the largest claims

Actual claims from National Fire Protection Association largest claims 1991-2010
- trended to 2012, but not developed beyond 1st report; does not include indirect losses such as TE
- does not include potential protection improvement credits (9 of the 13 >=200mm are from 1990s-trended)

Fitted using all rating groups (38) and states combined; adj. for 50% market share (last 20 year 40-60%)

* Severe Manufacturing/Petroleum & Highly Protected Risks-Heavy (52 CSP Classes; PSOLD RGs-35,38)

US to International Property Risk Excess Loss Factors
COPE Assessment Matrix – Steps

1. **Start with a list of potential differences between the US and target countries**
   - Standard in Property Underwriting is COPE – Construction, Occupancy, Protection, and Exposure
   - To this list, we add ARM: Amounts of Insurance, Rebuilding costs, Miscellaneous (social, etc.)
2. **Assess whether each item would favorably or unfavorably impact expected loss results compared to the US**
   - expected to **reduce (positive)** or **increase (negative)** the excess losses, no impact or unknown
3. **Attempt to evaluate magnitude of the impact of each item**
   - **L**ow, **M**edium, **H**igh, or unknown
4. **Tally the expected cumulative effect of each of the COPE (ARM) items**
   - Include direction and magnitude of all items
   - Could vary for example by groups of occupancies (e.g. Facilities)
5. **Reconcile total impact assessment to historical excess loss layers vs. US**
   - Review actual number of large claims to US, using exposure base such as $B of subject premium
   - Review cross country comparisons
6. **Can do the same for Ground-up Loss Costs as proxy outside the US**

US to International Property Risk Excess Loss Factors
PSOLD International: COPE Assessment Matrix (for illustration only)

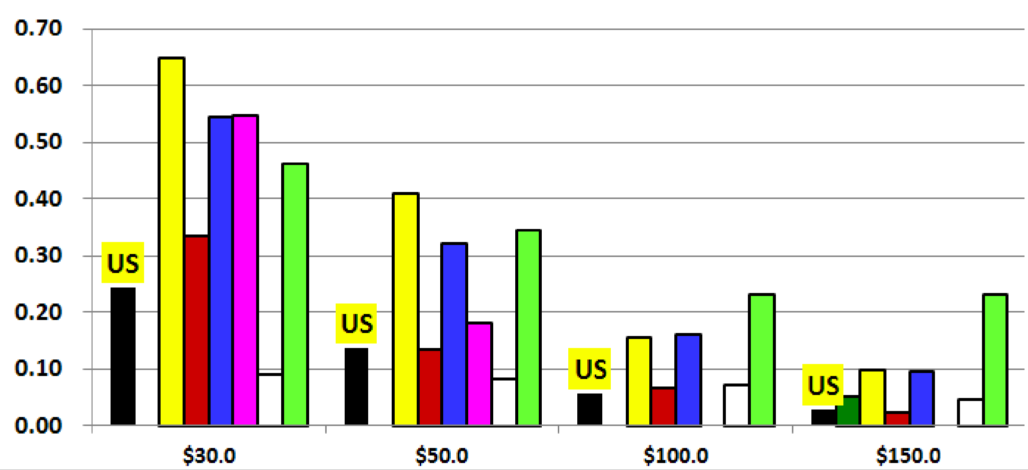
Commercial / Industrial

		US	Country A	Country B	Country C	Country D	Country E	Country F	Country G
Construction	C		H	M	L		M	M	M
Occupancy	O		L	H		M		H	L
Protection	P			M	M	M	H	M	H
Exposure (e.g. industrial facilities)	E			M	L	H			L
Amount of Insurance	A		M			M	L	H	M
Replacement Costs	R		M	L	H	L	L	H	M
Miscellaneous	M			M		L		H	
Total Indicated (before validation)				H		M	L	L	H

Impact Key *(compared to US)*	
Direction	Worse
	Better
	No difference
Magnitude	H = High
	M = Moderate
	L = Low

1. With US as base, compare each COPE+ attribute
2. Tally up expected impacts and qualitatively weigh them by COPE+ attribute
3. See how compares to actual large loss experience
4. Use same procedure for Ground-up Loss Costs, but include Frequency component – COPE+FARM

Cross-Country Comparison of Large Claims
of Large Claims per $B of Total Industry Premium



• Using US as the base, compare # of large claims per $B of total commercial property premium in excess of various thresholds. Shown are thresholds ranging from $30M to $150M
•Although varies significantly by country, the number of large claims on average is 40-50% higher than the US for these largest claims
•Protection/ sprinkler differences may account for a significant portion of the US vs. non-US experience

Macro Validation of Large Claims – FPA

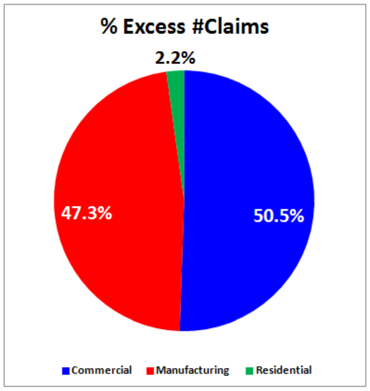
PSOLD - International

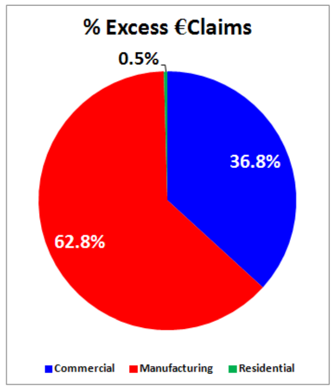
Netherlands Cross-Country Data Validation

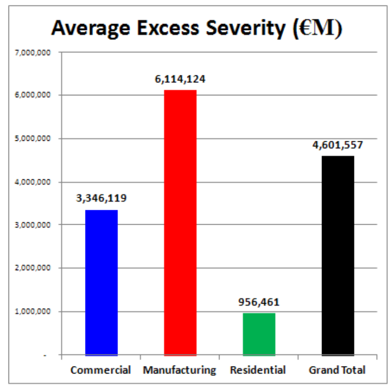
Source: N/VRE (Fire Protection Association Data)

Threshold (All) 2.5 in million Euro

Row Labels	Sum of #Claims > Threshold	Sum of |Claims > Threshold (M)	Sum of |Claims Excess of Threshold (M)	Average Loss	Average Excess Loss
Commercial	92	538	308	5,846,119	3,346,119
Manufacturing	86	741	526	8,614,124	6,114,124
Residential	4	14	4	3,456,461	956,461
Grand Total	182	1,292	837	7,101,557	4,601,557







International Property
B. Non-Cat Ground-up Losses

Various Non-Cat and Cat Perils
Relative size varies substantially by country

Non-Catastrophe Risks

- Fire
- Vandalism and theft
- Lightning
- Explosion
- Water leakage

Catastrophe Risks

- Tropical cyclone (hurricanes, typhoons)
- Severe thunderstorm (tornado, hail, straight-line wind)
- Extratropical cyclone (includes U.S. winter storm)
- Earthquake
- Flood
- Terrorism

•US data source splits losses into three components. Relative size varies dramatically by territory / occupancy, etc.

- ❑Basic Group I *(Fire, lightning, explosion, vandalism, sprinkler leakage)*
- ❑Basic Group II *(Windstorm, hail, smoke, aircraft, riot, sinkhole collapse, volcano,…)*
- ❑Special Causes of Loss *(all other perils such as weight of ice/snow, additional causes of collapse, water damage, theft,…*

Portability to Australia (Illustrative)
Ground-Up Loss Costs Run Post-Scaling

San Francisco, California


Bunbury, Australia

ISO Class Loss Costs from ISO Portal Database		
Amount of Insurance	$10,000,000	AU $10,000,000
Deductible	$2,500	AU $2,500
Occupancy	Restaurants and bars	Restaurants and bars
Construction Type	Noncombustible	Noncombustible
PPC	5	5 (equivalent)
Sprinklered Status	Sprinklered	Sprinklered
Combined Loss Cost Factor – Pre-COPE	0.250	0.250
Country Validations/Customizations		
Portfolio COPE Scalar	1.000	0.900
Account Experience Scalar	1.000	0.800
Expected Scaled Loss Costs	$25,000	AU $18,000
PSOLD % of Loss (vary by AOI, occupancy, region, and so forth)		
25% of AOI	60.0%	50.0%
50% of AOI	75.0%	75.0%
75% of AOI	87.5%	90.0%
Layer Loss Costs 2.5M xs 2.5M	$3,750	AU $4,500

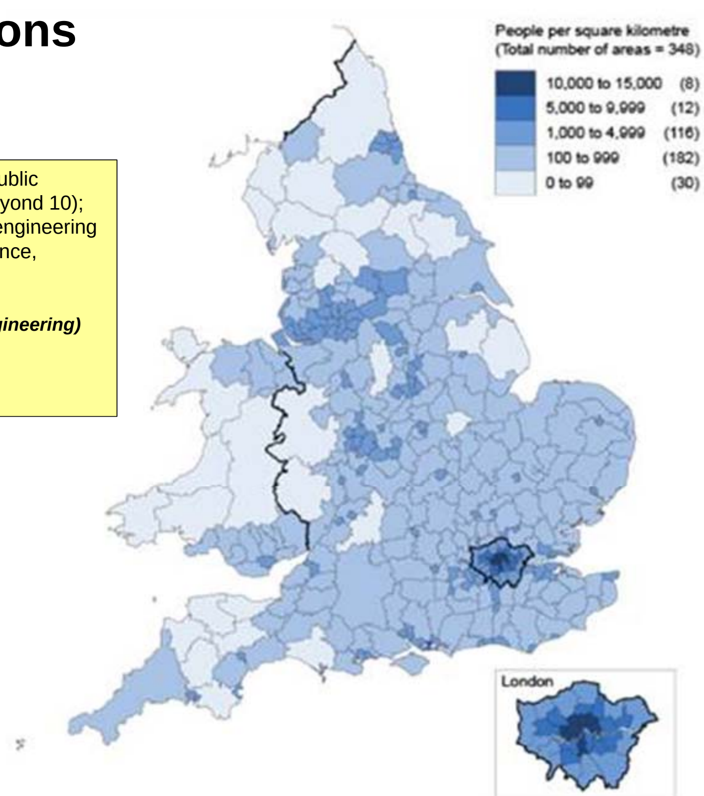
Ground-up Non-Cat Loss Costs
Portability to Other Countries

1. **Test assumption that US non-cat loss costs are appropriate for pricing up a non-US Risk (no initial scaling)**
   - Remove portions of BGI, BGII, SCL as appropriate
   - Will adjust for COPE (+FARM) differences
2. **Review actual ground-up non-cat loss experience for that account (or portfolio) over the last 5 or 10 years to estimate the actual loss ratio**
3. **Include country/region scalar as needed to balance back to credible actual expected loss ratio**
   - If unscaled non-cat loss ratio was 130%, while actual loss ratio has been around 65%, then indicated scalar would be .5
4. **This feedback mechanism approach could be done on either an account-by-account basis, portfolio, or as part of annual benchmarking exercise**

UK Protection Regions

UK is divided into four regions; distribute US Public Protection Class equivalents 1-10 (could be beyond 10); include other general expected fire protection engineering differences such as sprinkler usage / maintenance, industrial park pipe sizes, response times, etc.;

A. Major Cities ***(and highly maintained fire engineering)***
B. Other Cities
C. Suburban
D. Rural



Case Study 1: Portability to UK/Australia (Illustrative)
Ground-up Non-cat Loss Costs Pre-Scaling

Start with the assumption that US Portal class loss costs are appropriate for pricing up a non-US Risk (no initial scaling); this produces an indication of a 132.6% LR using standard class pricing

Company	ABC Global E&S Writer
Program	Selected risks
Date	1/1/2014
Comment	Initial US Run - pre Australia Scaling

Total Exposure Info	
Total Amount of Insurance	158,647,500
# of Exposures	12
Average Exposure	13,220,625
Largest Exposure	52,040,000

Total Premium & Loss Cost Info			
			ELR
100,000	Total	132,562	132.6%
0.06	Total / AOI	0.08	

Orig Sort	PSOLD Country - Region	Description/Record Index	BUILDING Amount of Insurance ($)	CONTENT Amount of Insurance ($)	TOTAL B&C Amount of Insurance ($)	TIME ELEMENT Amount of Insurance ($)	Actual Premium	GULC COPE+ Scalar	Portal Class Based Total Loss Costs	ELR (Portal GULC/ Actual Prem)
1	USA	1 - Joe's Bar	4,100,000	600,000	4,700,000	200,000	4,731	1.00	11,107	234.8%
2	USA	2 - OTB	7,500,000	2,500,000	10,000,000	500,000	10,349	1.00	15,456	149.4%
3	USA	3 - Puffy's Crab House	2,500,000	50,000	2,550,000	50,000	3,253	1.00	6,642	204.2%
4	USA	4 - Sleepy Inn and Eats	18,000,000	4,000,000	22,000,000	275,000	23,714	1.00	33,402	140.9%
5	USA	5 - Sleepy Inn	12,000,000	2,750,000	14,750,000	150,000	6,209	1.00	12,228	196.9%
6	USA	6 - Office A	4,500,000	25,000	4,525,000	-	8,279	1.00	2,604	31.4%
7	USA	7 - Office B	3,245,000	2,500	3,247,500	-	3,253	1.00	1,923	59.1%
8	USA	8 - Office C	215,000	50,000	265,000	35,000	296	1.00	404	136.7%
9	USA	9 - Office D	660,000	120,000	780,000	125,000	798	1.00	1,222	153.0%
10	USA	10 - Apt A	50,000,000	40,000	50,040,000	2,000,000	24,187	1.00	29,393	121.5%
11	USA	11 - Office E	15,000,000	335,000	15,335,000	1,500,000	8,900	1.00	6,682	75.1%
12	USA	12 - Office	25,000,000	170,000	25,170,000	450,000	6,032	1.00	11,501	190.7%

Source: Verisk / ISO Rapid Valuator–International with Portal – using class loss costs adjusted by peril
Individual exposure loss costs could be overrriden for building specific information on construction, protection, rebuilding costs, etc.

Portability to UK/Australia (Illustrative)
Pre and Post Scaling Assumptions

- **Review actual ground-up non-cat loss experience for that account (or portfolio) over the last 5 or 10 years to estimate the actual loss ratio**
  - In this case actual loss ratio was closer to 65% than 130%
- **Adjust country scalars by country / region (and occupancy, etc.) to balance to experience indications**
  - In this case around .5, but vary by region

International - Pre-Scaling Assumptions

USA		1.00
Australia - L	OHIO	0.90
Australia - M	INDIANA	1.05
Australia - H	TENNESSEE	1.10
Australia - S	ARKANSAS	1.25
France - L	OHIO	0.90
France - M	INDIANA	1.05
France - H	TENNESSEE	1.10
France - S	ARKANSAS	1.25
Germany - L	OHIO	0.90
Germany - M	INDIANA	1.05
Germany - H	TENNESSEE	1.10
Germany - S	ARKANSAS	1.25
United Kingdom - L	OHIO	0.90
United Kingdom - M	INDIANA	1.05
United Kingdom - H	TENNESSEE	1.10
United Kingdom - S	ARKANSAS	1.25
TBD1 - L	US Low States	0.90
TBD1 - M	US Medium States	1.05
TBD1 - H	US High States	1.10
TBD1 - S	US Very High States	1.25

International - Post-Scaling Assumptions

USA		1.00
Australia - L	OHIO	0.45
Australia - M	INDIANA	0.53
Australia - H	TENNESSEE	0.55
Australia - S	ARKANSAS	0.63
France - L	OHIO	0.90
France - M	INDIANA	1.05
France - H	TENNESSEE	1.10
France - S	ARKANSAS	1.25
Germany - L	OHIO	0.90
Germany - M	INDIANA	1.05
Germany - H	TENNESSEE	1.10
Germany - S	ARKANSAS	1.25
United Kingdom - L	OHIO	0.45
United Kingdom - M	INDIANA	0.53
United Kingdom - H	TENNESSEE	0.55
United Kingdom - S	ARKANSAS	0.63
TBD1 - L	US Low States	0.90
TBD1 - M	US Medium States	1.05
TBD1 - H	US High States	1.10
TBD1 - S	US Very High States	1.25

Portability to UK/Australia (Illustrative)

Ground-up Loss Costs run Post-Scaling

- Include country/region scalar as needed to balance back to credible actual expected loss ratio
- After scaling, the exposure LR's line up closer to the experience LR's

Company	ABC Global E&S Writer
Program	Selected risks - UK / AU
Date	1/1/2014
Comment	Initial US Run - post Scaling

Total Exposure Info	
Total Amount of Insurance	158,647,500
# of Exposures	12
Average Exposure	13,220,625
Largest Exposure	52,040,000

Total Premium & Loss Cost Info			
			ELR
100,000	Total	68,783	68.8%
0.06	Total / AOI	0.04	

Orig Sort	PSOLD Country - Region	Description/Record Index	BUILDING Amount of Insurance ($)	CONTENT Amount of Insurance ($)	TOTAL B&C Amount of Insurance ($)	TIME ELEMENT Amount of Insurance ($)	Deductible ($)	CSP	Actual Premium	GULC COPE+ Scalar	Portal Class Based Total Loss Costs	ELR (Portal GULC/ Actual Prem)
1	United Kingdom - M	1 - Joe's Bar	4,100,000	600,000	4,700,000	200,000	500	0541	4,731	0.53	6,452	136.4%
2	United Kingdom - M	2 - OTB	7,500,000	2,500,000	10,000,000	500,000	500	0951	10,349	0.53	9,072	87.7%
3	United Kingdom - M	3 - Puffy's Crab House	2,500,000	50,000	2,550,000	50,000	500	0545	3,253	0.53	3,861	118.7%
4	United Kingdom - M	4 - Sleepy Inn and Eats	18,000,000	4,000,000	22,000,000	275,000	5,000	0743	23,714	0.53	19,670	82.9%
5	United Kingdom - M	5 - Sleepy Inn	12,000,000	2,750,000	14,750,000	150,000	5,000	0746	6,209	0.53	7,119	114.7%
6	United Kingdom - M	6 - Office A	4,500,000	25,000	4,525,000	-	10,000	0702	8,279	0.53	1,917	23.2%
7	United Kingdom - M	7 - Office B	3,245,000	2,500	3,247,500	-	500	0702	3,253	0.53	1,249	38.4%
8	Australia - L	8 - Office C	215,000	50,000	265,000	35,000	500	0702	296	0.45	177	59.9%
9	Australia - L	9 - Office D	660,000	120,000	780,000	125,000	500	0702	798	0.45	521	65.3%
10	Australia - L	10 - Apt A	50,000,000	40,000	50,040,000	2,000,000	25,000	0321	24,187	0.45	12,558	51.9%
11	Australia - L	11 - Office E	15,000,000	335,000	15,335,000	1,500,000	5,000	0702	8,900	0.45	2,878	32.3%
12	Australia - L	12 - Office	25,000,000	170,000	25,170,000	450,000	50,000	0702	6,032	0.45	3,308	54.8%

Source: Verisk / ISO Rapid Valuator–International with Portal

International Property
C. Cat Loss Estimates

Modeled Tropical Cyclone Locations

Caribbean

- Anguilla
- Antigua & Barbuda
- Aruba
- Bahamas
- Barbados
- Bermuda
- British Virgin Islands
- Cayman Islands
- Cuba
- Dominica
- Dominican Republic
- Grenada
- Guadeloupe
- Haiti
- Jamaica
- Martinique
- Montserrat
- Netherlands Antilles
- Puerto Rico
- Saint Barts, Saint Kitts & Nevis
- St. Lucia
- St. Maarten
- St. Martin
- St. Vincent & the Grenadines
- Trinidad & Tobago
- Turks & Caicos Island
- U.S. Virgin Islands

North America

- Hawaii
- Gulf of Mexico (Offshore Assets)
- Mexico
- United States

Central America

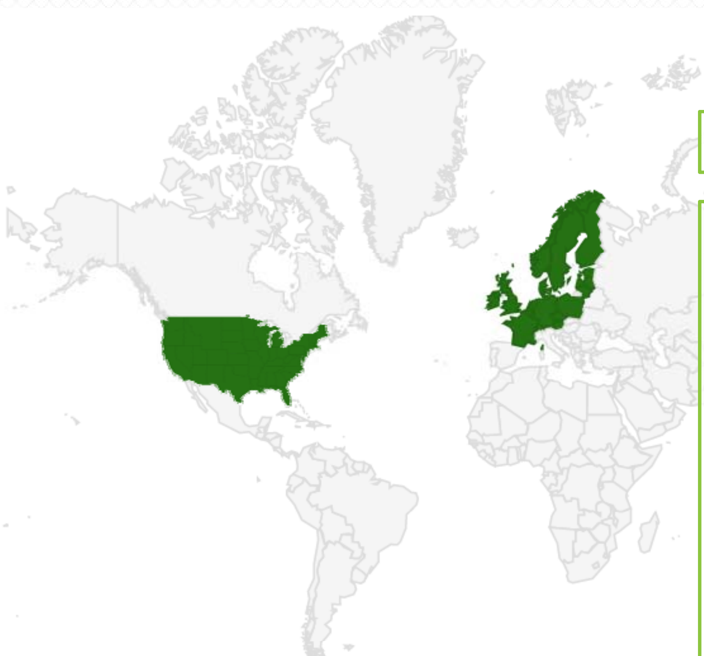
- Belize
- Costa Rica
- El Salvador
- Guatemala
- Honduras
- Nicaragua
- Panama

Asia-Pacific

- Australia
- China
- Hong Kong
- India
- Japan
- Philippines
- Taiwan
- South Korea

Source: AIR Touchstone™

Modeled Extratropical Cyclones Locations



North America

- United States

Europe

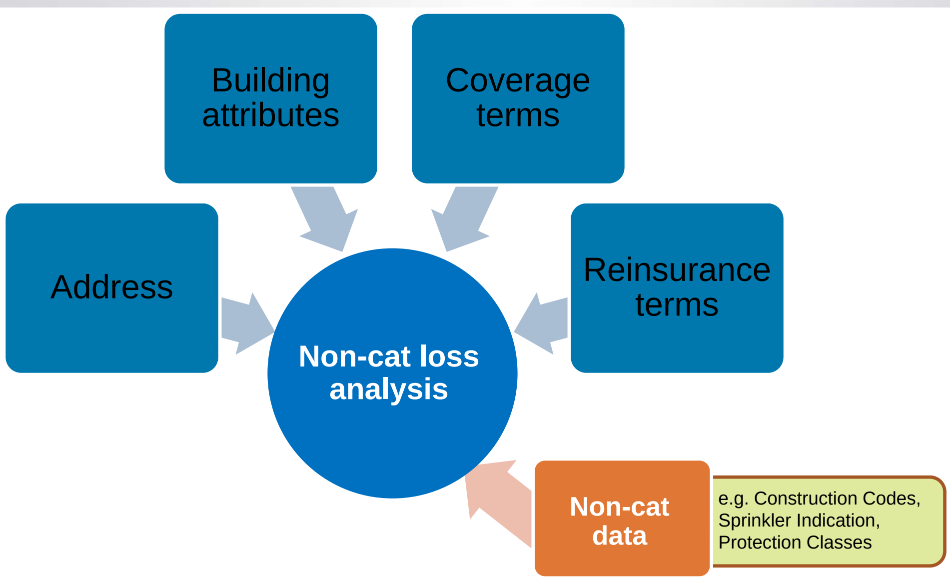
- Austria
- Belgium
- Czech Republic
- Denmark
- Estonia
- Finland
- France
- Germany
- Ireland
- Latvia
- Lithuania
- Luxembourg
- Netherlands
- Norway
- Poland
- Sweden
- Switzerland
- United Kingdom*

** Includes coastal storm surge flooding*

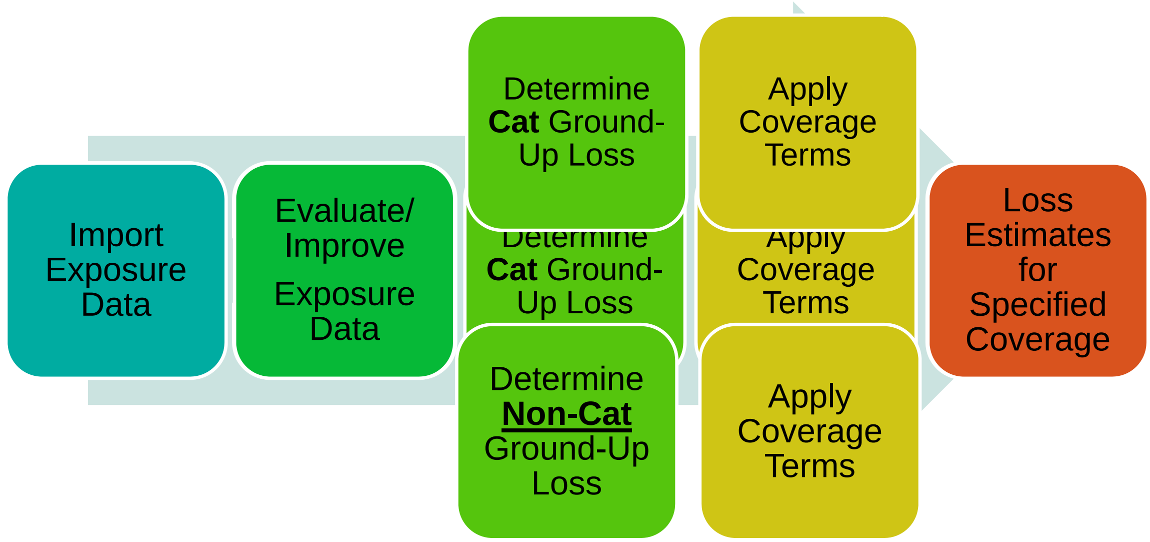
Source: AIR Touchstone™

International Property
D. Bringing it All Together

Exposure Data Structure Is Valuable to Both Cat and Non-Cat Analysis



Touchstone Workflow Supports the Evaluation of Non-Cat Perils



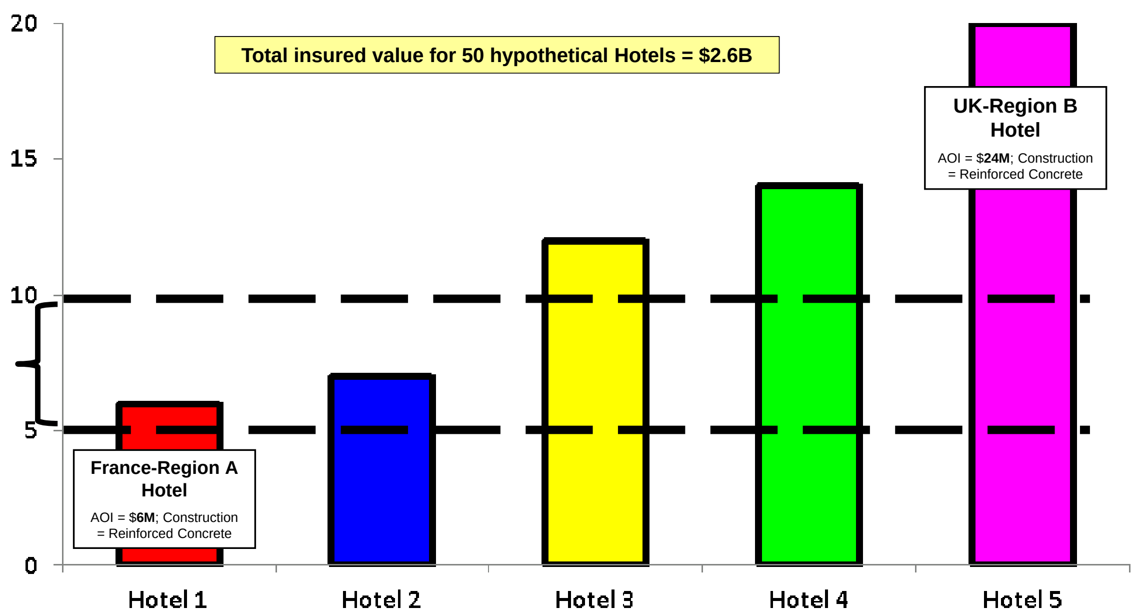
Case Study 2: UK, FR Hotels Including Excess and Cat Component

- **Ground-up Loss Costs**
  - Can use US as proxy to estimate non-US class based loss costs with individual exposure information
  - Use similar feedback loop as Case Study 1 to scale to actual portfolio or account experience
- **Excess Pricing**
  - Use selected size of loss curves, adapted to country specific circumstances using COPE+ methodology
- **Cat Pricing**
  - Incorporate cat model results, generated using the same individual exposure information as with the Ground-up Loss Costs

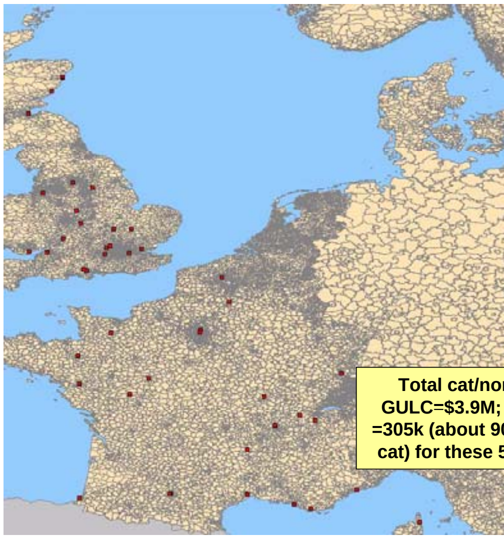
Illustrative Case Study 2
Large European Hotels

- A hypothetical hotel chain needs insurance on 50 hotels spread over UK and France
- Individual property values range from $6M to $120M; aggregate value: $2.6B
- Coverage: "All Risks of Direct Physical Loss, Damage, or Destruction….”; terrorism exclusion
- Layers starting: $5M xs $5M, …, $200M xs $100M
- Sublimit of $100M for Earthquake peril only

Illustration of Excess Layering: $5M excess of $5M
*What are the expected **cat** and **noncat** losses for this layer?*



Case Study: 50 European Locations



Total cat/non-cat GULC=$3.9M; $5x5M =305k (about 90% non-cat) for these 50 risks

Cat / Non-Cat Inputs

Loc ID	Country	City	Region (Prot)	Cresta	Stories	YearBuilt	Construction Desc	Total Value
33	FR	Paris	A	75009	5	1988	Reinforced Concrete	5,873,617
69	FR	Toulon	B	83000	12	1984	Light Metal	7,067,592
1	FR	Biarritz	C	64200	8	1987	Steel	11,979,678
35	UK	Cheltenham	A	GL52 8SF	2	1989	Precast Concrete	14,394,014
64	UK	Edinburgh	B	EH9 3JL	9	1986	Reinforced Concrete	24,049,661
61	UK	Montrose	C	D10 9SL	7	1982	Light Metal	36,282,526
3	FR	Le Puy	A	43000	5	1985	Reinforced Masonry	37,006,477
70	FR	Limonest	B	69760	10	1984	Reinforced Concrete	37,097,538
68	FR	Marseille	C	13005	17	1987	Unknown	37,299,874
67	UK	Cardiff	A	CF4 7YJ	8	1981	Reinforced Concrete	37,532,053
							Total - 50 Hotels	2,645,540,948

Cat / Non-Cat Results

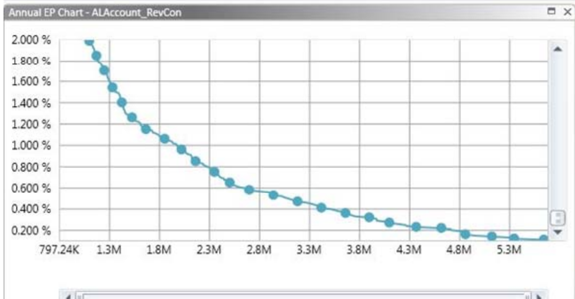
	Cat Expected Losses		NonCat Expected Losses		Combined	
Loc ID	Total (GroundUp)	5xs5	Total (GroundUp)	5xs5	Total	5xs5
33	245	24	25,000	190	25,245	214
69	869	72	12,075	373	12,944	445
1	865	89	14,140	1,102	15,005	1,191
35	1,777	120	12,425	866	14,202	986
64	3,525	153	7,210	724	10,735	877
61	19,576	1,004	11,655	1,302	31,231	2,306
3	1,064	94	27,510	1,193	28,574	1,286
70	755	71	32,235	1,612	32,990	1,683
68	2,746	213	43,505	3,826	46,251	4,039
67	3,812	260	43,680	3,363	47,492	3,622
	334,008	24,004	3,566,510	281,113	3,900,518	305,117

Source: Verisk Cat/Non-cat Integrated Solution (Tripod)
cat: AIR Touchstone™
non-cat: ISO Rapid Valuator with Portal and PSOLD™-International

Cat / Non-Cat Integration – EP Curves

Summary EP Table

Agg/Occ	Perspective	NonCat EV	AAL(EV)	SD	20	50	100	250	500	1,000
AGG	Ground Up	100,732	142,369	437,013	553,056	1,215,398	2,127,070	3,704,020	4,841,222	5,690,857
	Retained	75,400	92,914	333,227	313,948	622,868	1,393,345	2,859,510	4,082,789	4,936,934
	Gross	25,332	49,455	126,379	241,550	601,460	739,460	780,275	867,893	1,025,649
	Net of Pre-Cat	25,332	49,455	126,379	241,550	601,460	739,460	780,275	867,893	1,025,649
OCC	Ground Up		111,856	415,662	480,643	1,088,154	1,971,218	3,503,271	4,714,895	5,677,718
OCC	Retained		72,956	322,216	265,093	539,060	1,260,612	2,793,080	3,960,289	4,927,728
	Gross		39,499	115,704	220,400	557,659	695,363	749,361	749,990	749,997
	Net of Pre-Cat		39,499	115,704	220,400	557,659	695,363	749,361	749,990	749,997



Event Loss Summary Table - ALAccount_RevCon

Year	Event ID	Peril	Ground I Mean	Retained Mean	Gross Mean	Net of I Mean	Event Information
4096	77176	EQ	6,831,129	6,071,615	759,514	759,514	M11: IndustryLoss=32763070003.0; Mw=7.:
6340	119157	EQ	4,714,895	3,960,289	754,606	754,606	M11: IndustryLoss=11841827848.0; Mw=5.:
8362	225736	TC	5,121,679	4,371,680	749,999	749,999	M27:IndustryLoss=73053561526.0;SS=4;Stc
1591	42810	TC	4,616,104	3,866,105	749,999	749,999	M27:IndustryLoss=31556276553.0;SS=4;Stc
2773	74624	TC	3,895,566	3,145,568	749,998	749,998	M27:IndustryLoss=37558188588.0;SS=3;Stc
8024	216630	TC	4,365,124	3,615,126	749,998	749,998	M27:IndustryLoss=30133096398.0;SS=4;Stc
8708	234922	TC	3,956,638	3,206,641	749,998	749,998	M27:IndustryLoss=31180051529.0;SS=3;Stc
1969	53277	TC	4,268,313	3,518,315	749,997	749,997	M27:IndustryLoss=24226765315.0;SS=4;Stc
8364	225788	TC	4,943,687	4,193,690	749,997	749,997	M27:IndustryLoss=68419090074.0;SS=4;Stc

Source: AIR Touchstone™

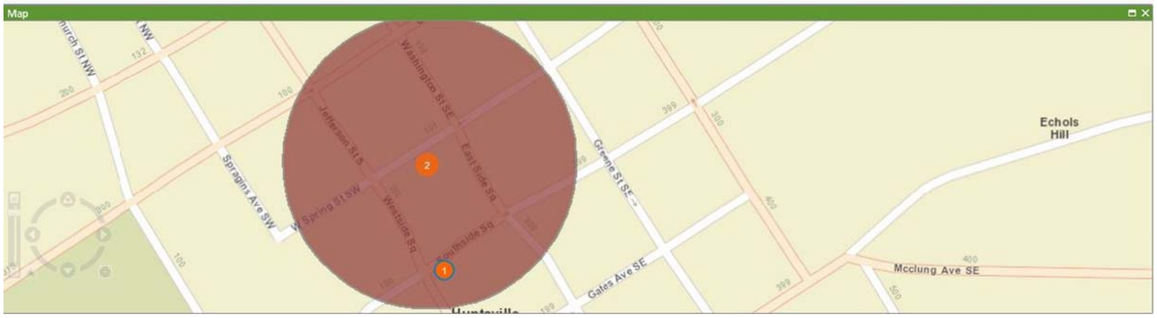
Geospatial Analysis Is Highly Valuable for Recognizing Conflagration Risk

Location-based Ring Results Overview

Ring Info								Attributes			
Street	City	Area	Postal	Country	Geocode Match Level	Latitude	Longitude	Total Replacement Value	Risk Cou	Location Count	Peril
123 NORTHSIDE SQ	HUNTSVILLE	Alabama	35801	United States	Exact Address	34.7306	-86.58523	3,282,746	3	3	ST
203 S WALNUT ST	FLORENCE	Alabama	35630	United States	Exact Address	34.80085	-87.6712	4,653,072	2	2	ST
102 E DOCTOR HICKS BLVD	FLORENCE	Alabama	35630	United States	Relaxed Address	34.79751	-87.67393	4,653,072	2	2	ST
122 E MAIN ST	ALBERTVILLE	Alabama	35950	United States	Exact Address	34.26762	-86.20838	1,861,817	2	2	ST
2200 9 AVE N	BIRMINGHAM	Alabama	35203	United States	Exact Address	33.52444	-86.80849	27,596,838	1	1	ST
2112 2 AVE N	BIRMINGHAM	Alabama	35210	United States	Exact Address	33.51628	-86.8046	14,578,697	1	1	ST
85 BAGBY DR	BIRMINGHAM	Alabama	35209	United States	Exact Address	33.47119	-86.83143	6,096,654	1	1	ST
3262 DAUPHIN ST	MOBILE	Alabama	36606	United States	Exact Address	30.68906	-88.123	4,479,441	1	1	ST

First | Prev 1 2 3 4 ... Next | Last

Map



Source: AIR Touchstone™

Appendix

The Property Per Risk Benchmarking Issues

Illustrative comparison of Fire Costs between countries

Table 1.1 International fire costs comparisons

Country	*Direct fire losses (%)*[a]	*Indirect fire losses (%)*[a]	*Costs of fire fighting organisations (%)*[a]	*Costs of fire insurance administration (%)*[a]	*Costs of fire protection to buildings (%)*[a]	*Total cost of fire (%)*[a]	*Fire deaths per 100,000 persons (%)*[b]
Austria	0.21 (79–80)	0.029 (79–80)	N.A.	0.14 (79–80)	N.A.	N.A.	0.74
Belgium	0.40 (88–89)	N.A.	0.18 (87–89)	0.28	0.21 (87–88)	N.A.	1.47
Canada	0.24	N.A.	0.16 (85)	0.21 (80–81)	0.34	N.A.	1.58
Denmark	0.26	0.034	0.09 (87–88)	0.08 (87–88)	0.40 (86–88)	0.864	[illegible]
Finland	0.17 (88–89)	0.021	0.18 (85–86)	0.05	N.A.	N.A.	
France	0.23	0.037	N.A.	0.16 (79–80)	0.18	[illegible]	
Germany, West	0.20	0.037	N.A.	0.09	N.A.		
Hungary	0.12 (86–88)	0.028	N.A.	0.01 (87–88)	0.42		
Japan	0.08	0.016 (85–86)	0.27	0.11	0.27		
Netherlands	0.19	0.03	0.16 (87–88)	0.04 (87–88)	0.32		
New Zealand	0.20	N.A.	0.18	0.22	0.12		
Norway	0.24	0.005	0.12	0.11	0.28		
Spain	0.12 (1984)	N.A.	N.A.	0.05 (86)	N.A.		
Sweden	0.25	0.009	0.21	0.06	0.12		
Switzerland	0.23 (1989)	0.095	N.A.	N.A.	0.29		
UK	0.19	0.019	0.27	0.11	0.14		
USA	0.15	0.013	0.29	0.06	0.30		

Notes
[a] Average percentage of gross domestic product (1991–3)
[b] 1991–3
N.A. = estimate not available
The years are indicated in brackets wherever they are not 1991–3.

- Fire costs vary significantly by country
- Although dated, US has one of lowest fire loss % of GDP and one of highest cost of fighting fires

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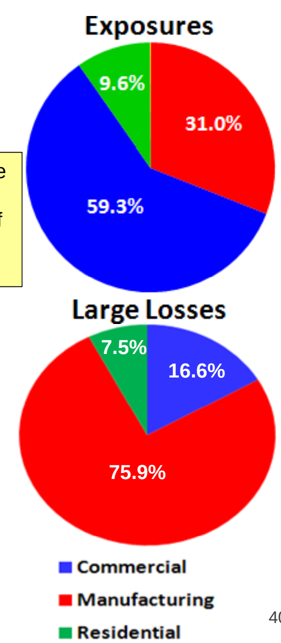
First Loss Scale Comparisons

Importance of Type of Occupancy

US Large Fire Loss Experience by Occupancy (NFPA 20 years: 1991-2010)

Row Labels	Sum of Estimated Loss (in $mm)	Count of Estimated Loss (in $mm)2	% Total Counts	US $XS Threshold 25mm	% XS Threshold
Commercial	**2,727.6**	**33**	**16.6%**	**1,903**	**15.2%**
Aircraft	409.9	9	4.5%	185	1.5%
Cafeteria	27.7	1	0.5%	3	0.0%
Casino	382.7	1	0.5%		
Casino/Hotel	46.7	1	0.5%		
College/University	69.1	2	1.0%		
Film/Movie Studio	44.1	1	0.5%		
Hangar	50.4	1	0.5%		
Hospital	71.6	1	0.5%		
Hotel	76.3	2	1.0%		
Hotel/Casino	115.9	1	0.5%		
Office	921.8	6	3.0%		
Office/Stores	231.4	1	0.5%		
Residential/Commercial	124.6	1	0.5%		
School	99.6	3	1.5%	25	0.2%
Store	55.8	2	1.0%	6	0.0%
Manufacturing	**14,053.3**	**151**	**75.9%**	**10,278**	**82.3%**
Chemical Waste	33.4	1	0.5%	8	0.1%
Electric Sub-station	26.9	1	0.5%	2	0.0%
Lumber Yard	38.7	1	0.5%	14	0.1%
Mall	263.7	3	1.5%	189	1.5%
Manufacturing	8,700.8	80	40.2%	6,701	53.6%
Meat Prep Plant	56.3	1	0.5%	31	0.3%
Mill	31.0	1	0.5%	6	0.0%
Packing Plant	119.4	1	0.5%	94	0.8%
Pipeline	146.7	2	1.0%	97	0.8%
Plant	534.1	11	5.5%	259	2.1%
Power Plant	102.4	2	1.0%	52	0.4%
Ship	90.3	1	0.5%	65	0.5%
Special Property	385.1	8	4.0%	185	1.5%
Tractor Trailor	49.5	1	0.5%	25	0.2%
Truck	119.4	1	0.5%	94	0.8%
Warehouse	3,355.6	36	18.1%	2,456	19.7%
Residential	**689.0**	**15**	**7.5%**	**314**	**2.5%**
Apartment	456.6	9	4.5%	232	1.9%
Condo	33.1	1	0.5%	8	0.1%
Residential	199.3	5	2.5%	74	0.6%
Grand Total	**17,469.9**	**199**	**100.0%**	**12,495**	**100.0%**

Very different Exposure and Large Loss distributions for Commercial & Manufacturing; Mfg with 31% of exposures, but 76% of the large losses (151 out of 199 >25M)



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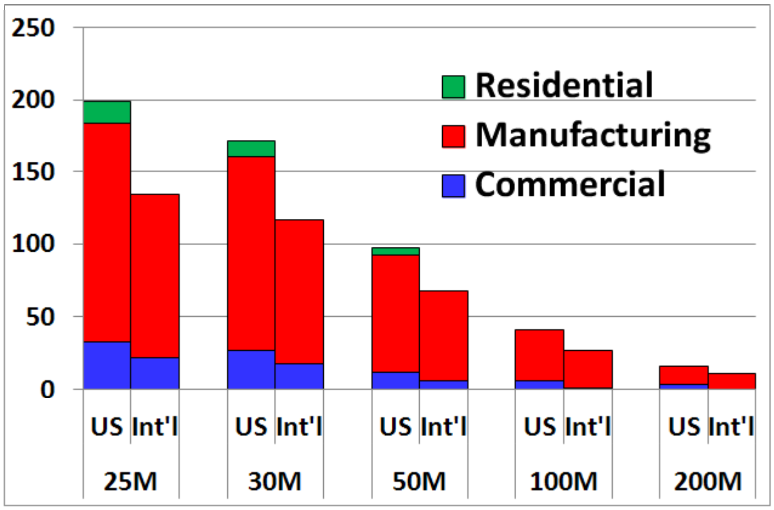
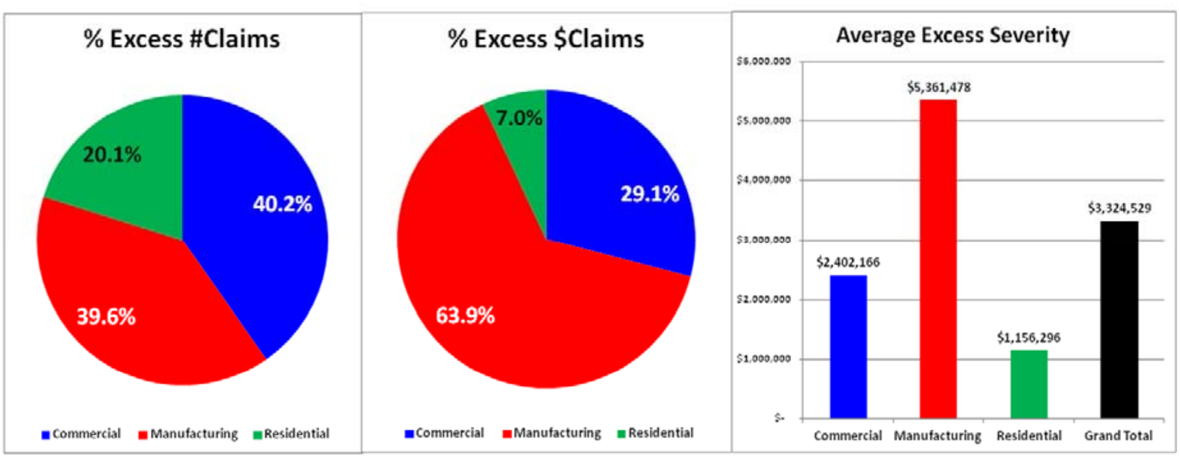
The Property Per Risk Benchmarking Issues

Comparison of Large Fire Losses by Occupancy – US vs. International



- Very similar large loss distributions for Commercial and Manufacturing – US vs. International
- Drop off from 25M to 200M also quite similar across aggregated 7 International countries
- International counts used is validating PSOLD International results

Additional Validation: Imperial-IICI Dataset
Imperial College – IICI Large Commercial Risks (LCR)

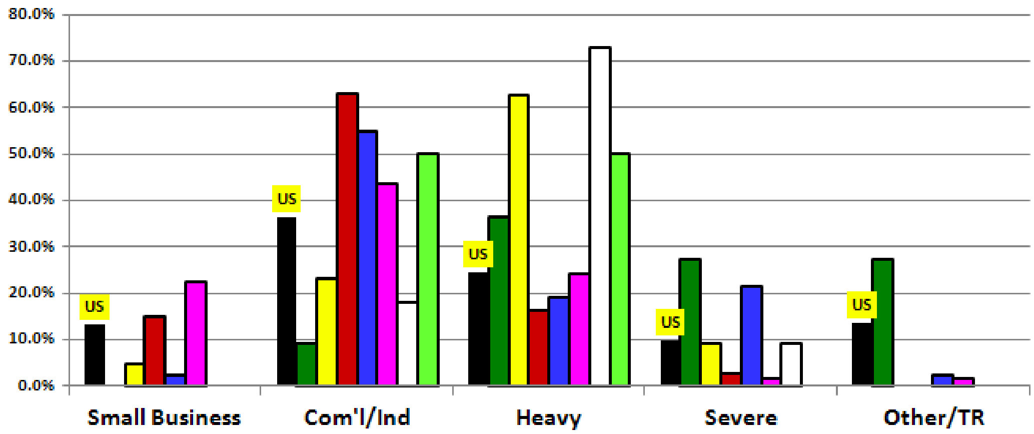


Threshold: All Claims >= $0M
n= 3,080

- •Insurance Intellectual Capital Initiative (IICI)
- •New dataset from Syndicate submissions shows similar major Occupancy group distributions as PSOLD
- •Occupancy split by North America vs. Rest of the World also similar

Source: International Congress of Actuaries (Wash DC – April 2014 – Enrico Biffis-Imperial)

Cross-Country Comparison of Large Claims
Distribution by Occupancy



- Using US as the base, compare occupancy distribution of large losses using same definitions as underlying PSOLD-International
- On average, US has a larger proportion of large claims in the less severe occupancies, and less in the heavy and severe occupancies
- Occupancy mixes also account for a significant portion of the cross-country differences

Questions

Speaker Bios

John W. Buchanan

Verisk / ISO - Principal, Excess and Reinsurance
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John Buchanan, FCAS, MAAA, is a principal in charge of ISO's Excess and Reinsurance Division. He has over 30 years of experience as a front-line pricing actuary and consultant in the US, London, and other international reinsurance marketplaces.

In John's career, he has conceptualized, developed and implemented extensive benchmarking and modeling services for various reinsurers, excess carriers, and industry groups. He has pioneered extensive work to extend information gathered in mature benchmarking markets, and extending that information to other International markets making use of local and customized knowledge. He was a frontline sign-off actuary for many domestic and international lines of business. While a consultant, he was also the main contact for many years for the Reinsurance Association of America and the Reinsurance Research Council of Canada as well as having worked extensively with the London and European reinsurance market through the Casualty Actuaries in Reinsurance in London.

John's professional accomplishments in the property area also include being heavily involved with many international meteorological groups including NOAA, UK-Met, GLOBE, ACRE, and as chairperson of the CAS Climate Change Student Outreach subcommittee. He is in charge of the reinsurance educational tracks at the annual CARe conference, and previously at the CAS Ratemaking Seminar. He has also been a moderator and panelist at dozens of industry seminars on the topic of domestic and international reinsurance pricing, the underwriting cycle, international benchmarking, etc.

Prior to joining Verisk, John was a Senior Vice President at Platinum Underwriters (previously St. Paul Reinsurance), a Principal at Tillinghast (now Towers Watson), and a Senior Consultant at KPMG, Peat Marwick. He also has competed as an amateur in the Global Salsa Championships, and is determined to write the book "The Mathematician's Guide to Salsa Dancing".

Enrico Biffis

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Enrico Biffis is an Associate Professor of Actuarial Finance at Imperial College Business School, a fellow of the Pensions Institute London, a member of the Munich Risk and Insurance Center at LMU Munich, and an editor of ASTIN Bulletin – The Journal of the International Actuarial Association. His area of expertise is asset-liability management, with emphasis on risk analysis and market consistent valuation for the insurance and pensions industry, as well as optimal risk transfers for catastrophe and long term risks.

His research has attracted funding from leading insurers and governmental organizations, and has been published in the Journal of Risk and Insurance, Insurance: Mathematics and Economics, North American Actuarial Journal, Scandinavian Actuarial Journal, among others. Enrico has also worked with industry bodies on the benchmarking of stochastic asset models, and the impact of Dodd-Frank/EMIR regulation on OTC derivative markets.

Enrico is a regular speaker at academic and industry events, including Risk Theory Society (American Risk and Insurance Association), Risk Minds Insurance, and Global Derivatives. Enrico holds a BSc and MSc in Statistics, a MSc in Actuarial Management, and a PhD in Mathematics for Economic Decisions. Prior to joining Imperial College London in 2007, Enrico held positions at Bocconi Milan, Association of British Insurers, and Cass Business School.

Li Zhang

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Li Zhang is Director of China Re P&C Insurance Experience Research Center. He joined China Re P&C in 2011 working as a senior actuary, and in 2013 he become director of China Re P&C insurance experience research center. His main areas of expertise include pricing, data mining, cat modelling, economic capital modeling, and risk management.

Prior joining China Re P&C, Li was a senior actuarial analyst at ISO working on auto insurance and specialty commercial line pricing.

He holds a PhD degree in Chemistry from University of California at Riverside and a Master Degree in Mathematical Finance from Rutgers. He is a FCAS, MAAA, and also a Fellow of China actuarial Association(FCAA).

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