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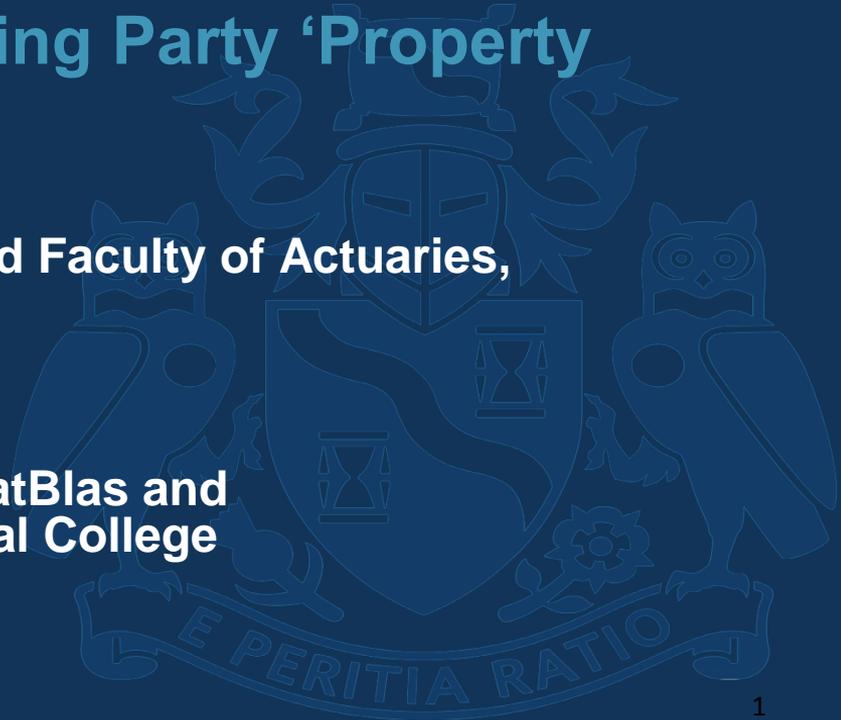


# Sessional Event: IFoA-CAS International Reinsurance Pricing Working Party 'Property Per Risk Pricing

Sessional Meeting of the Institute and Faculty of Actuaries,  
Staple Inn, London

20 February 2017

Overview by: Dr Ana Mata, ACAS, MatBlas and  
Dr Enrico Biffis, Imperial College



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# Sessional overview

***Monday 20 February 2017 17:00 - 19:00***

- In October 2016 at the GIRO conference of general insurance actuaries, the IFoA-CAS International Reinsurance Pricing Working Party was awarded the prestigious Brian Hey prize for their research paper on Analyzing the Disconnect Between the Reinsurance Submission and Global Underwriter's Needs - Property Per Risk.
- This research paper fills the literary void related to information required by the primary and reinsurance pricing practitioner, but often lacking when pricing property per risk coverages worldwide. Results from surveys of members in the UK, European and US actuarial communities, as well as others in the related insuring communities, clearly indicated a disconnect between the desired information and the information commonly available for pricing. This paper presents the broad ranging results of this research. Much of this information is also appropriate for usage in other property and casualty lines of business.
- Aimed at all stakeholders in GI pricing, this event is suitable for those at the most junior levels right up to board members. Suitable for actuaries and underwriters at primary companies, intermediaries, and reinsurance companies.

# Agenda

1. Motivation of the paper
2. Results of survey
3. Overview of key points of the paper
4. Conclusions
5. Q&A

# Working party formation

- Joint effort between IFoA-GIRO and CAS-CARe 2014-2016
- Initially focus on Property Per Risk Reinsurance
- Goals of WP:
  - Analyse gaps between data and information presented in a standard reinsurance submission and data required by reinsurance actuaries and underwriters to thoroughly price a treaty
  - Improve understanding across all parties (cedant, broker and reinsurer) of impact of incomplete submissions on pricing throughout a number of examples.
  - Create a reference framework for future property primary data collection and reinsurance submissions.

# Members of the working party

- John Buchanan – Chair of the working party
- 16 participants:

Mohamed S. Afify

Shayne Andrews

Enrico E Biffis

Chris Boggs

Lawrence Cheng

Paul Gates

Eric Greenhill

Yin Hang

Kevin Hilferty

Mandy Kisala

Xiao-Xuan (Sherwin) Li

Ana J. Mata

Eoin O'Baoighill

Josiah Ogungbesan

Adam P. Shrubshall

Bei Zhou

# Impetus for working party

- Focus: Property per risk insurance and reinsurance
- Insurance companies provide limited data in reinsurance submissions
- Reinsurance underwriters make more conservative assumptions – higher price
- Higher insurance premiums for commercial property insureds
- Better data from insured to insurer to reinsurers could benefit all parties – even brokers!

# Working party steps

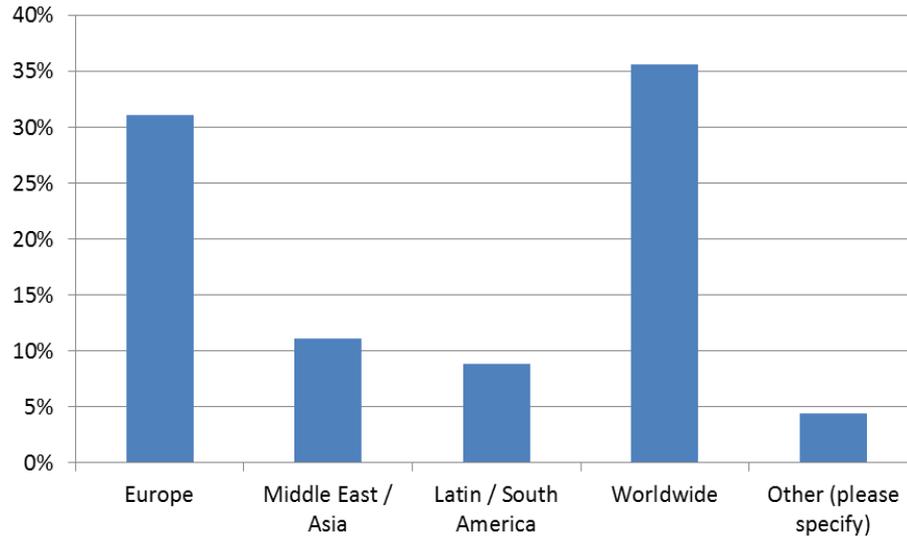
- Identified an ideal submission vs. most common submission.
  - A survey was prepared and circulated among reinsurance practitioners (actuaries and underwriters)
  - Results of the survey were presented at the annual CARE meeting in June 2015 in Philadelphia, USA and CAE in London in September 2015.
- Preparation of a white paper delivered in March 2016 with detailed examples showing illustrative price differences driven by lack of data
- Preparation of paper to be submitted to the BAJ for Publication in 2017
  - Includes additional reviewer comments regarding market interactions

# Survey overview

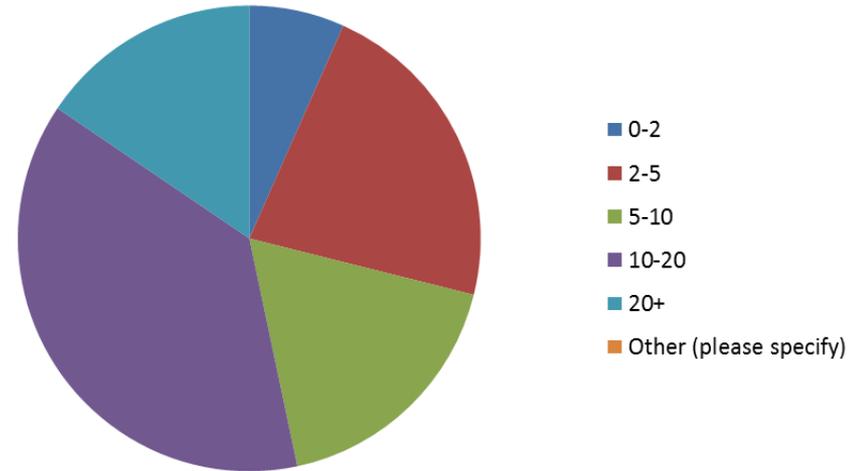
- 44 responses
  - 86% actuaries and 14% from other areas;
  - 25 members of CAS, 16 members of IFoA, 13 members of other organisations (some members of multiple organisations);
  - Representation from France, China and New Zealand.
- Risks priced in a wide variety of territories.

# Respondent demographics

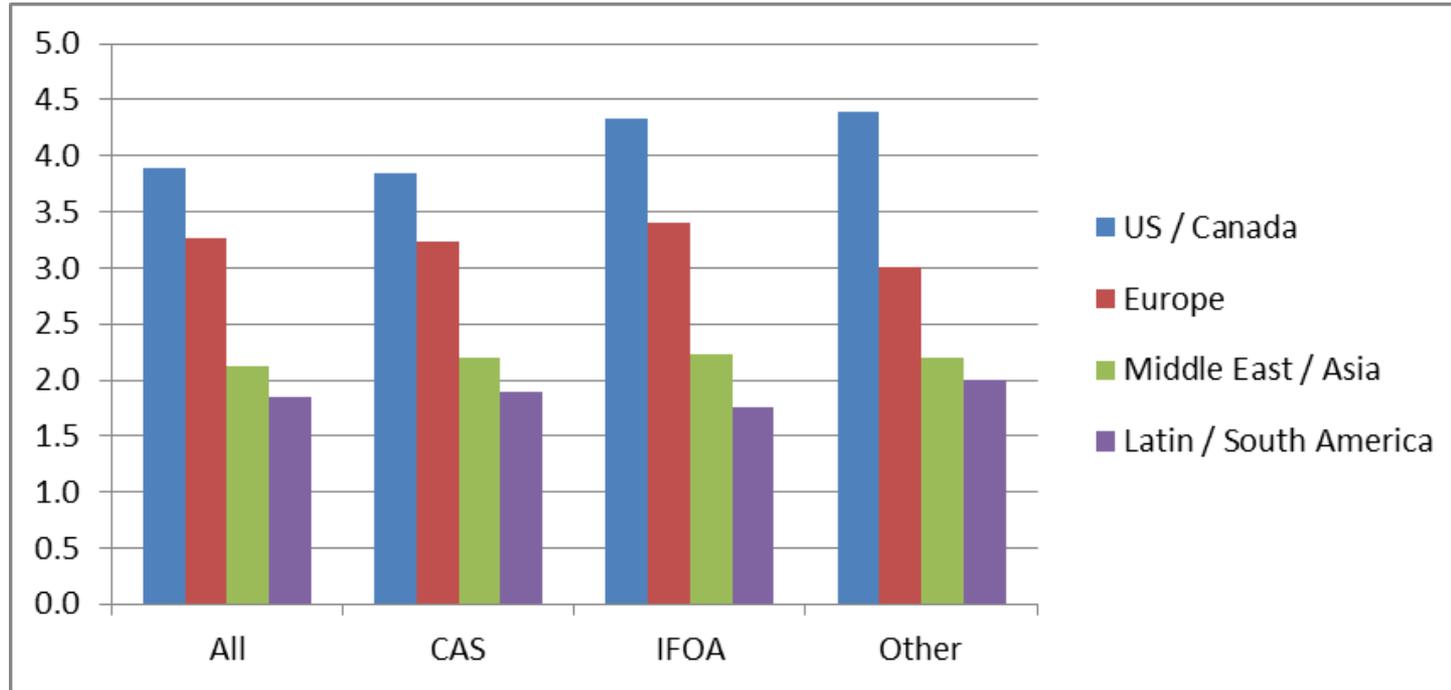
Which territories do you mainly price?



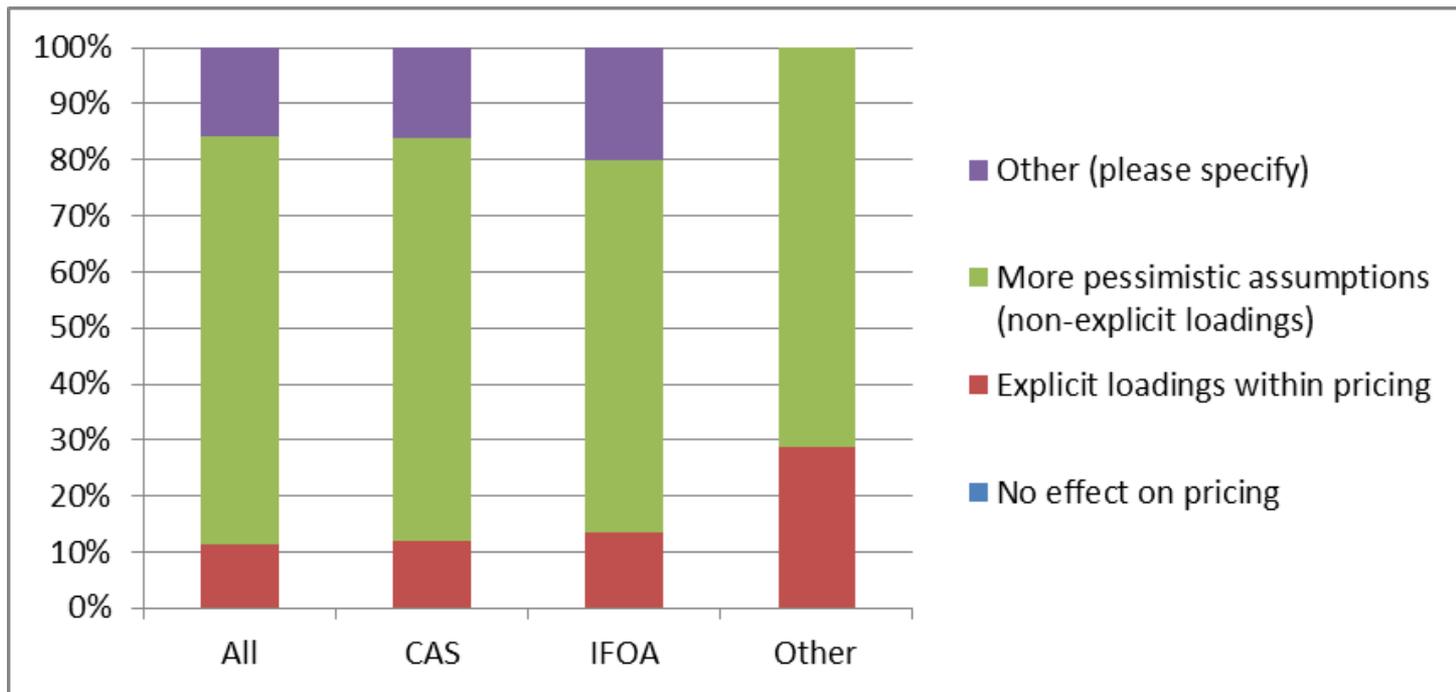
How many years have you been pricing insurance?



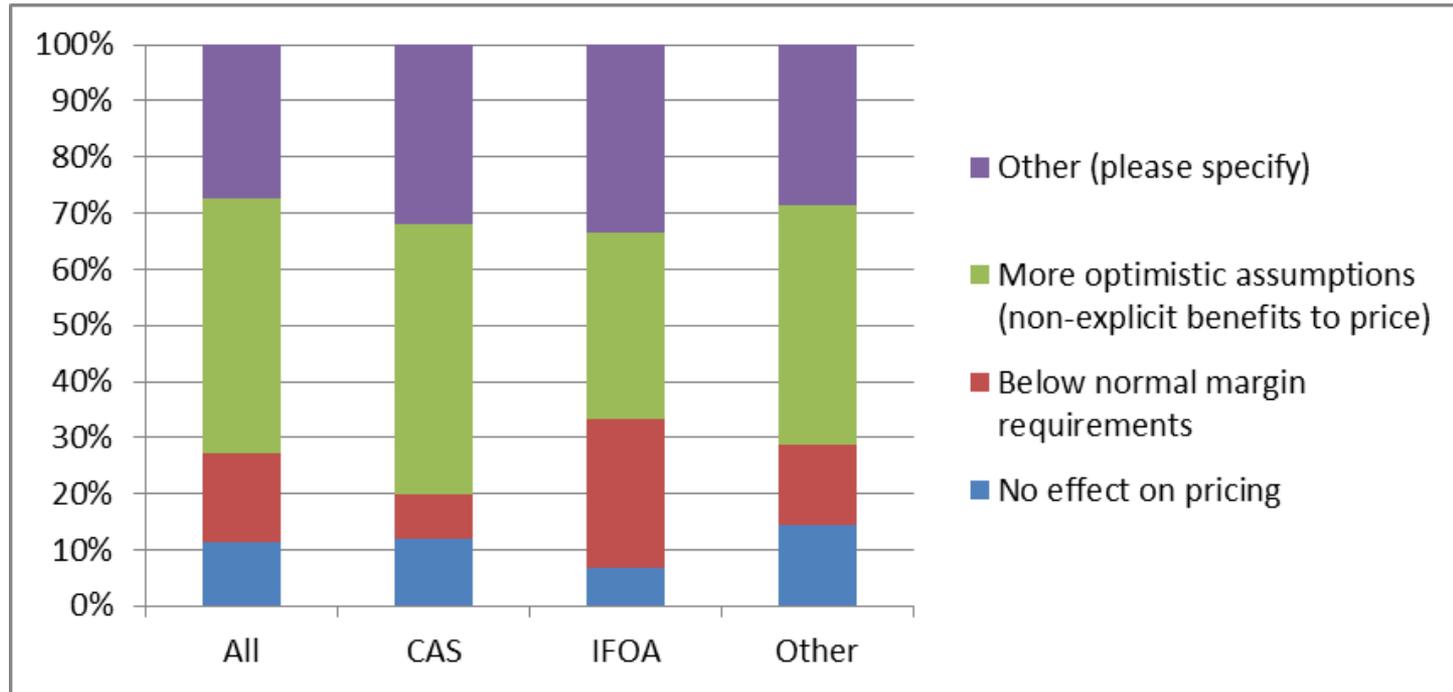
# Respondent demographics



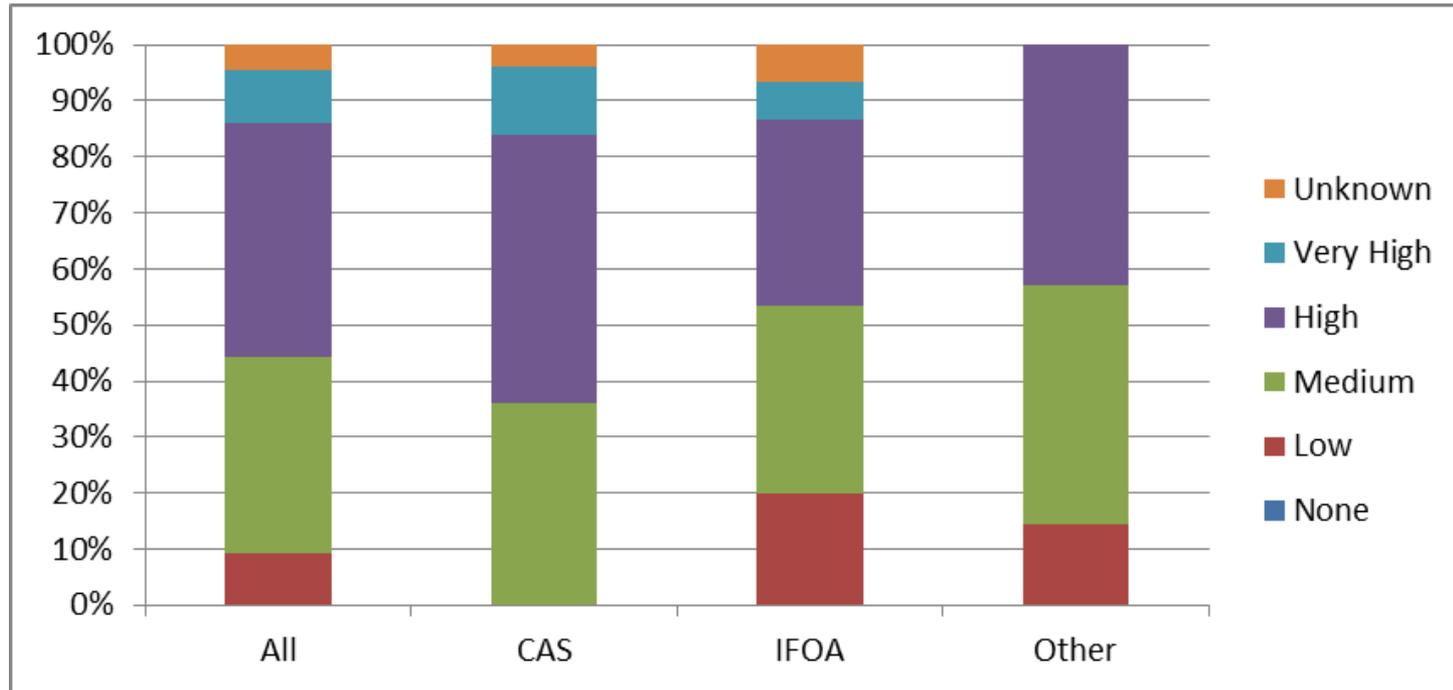
# How does a poor quality submission impact price?



# How does an excellent quality submission impact price?



# How much does quality of submission impact your price?



# Exposure rating

	All		CAS		IFOA		Other	
	% Receiving	Rank						
a. In-force risk profile (banded)	93%	1	92%	1	87%	1	86%	1
b. Historic risk profiles (banded)	23%	5	8%	6	60%	4	29%	3
c. Individual risk listing (all cat/non-cat exposures)	30%	3	24%	2	33%	2	43%	6
d. Individual risk listing (above certain threshold)	48%	7	48%	7	53%	5	29%	8
e. Historic from ground up loss ratios (cat and non-cat)	57%	2	68%	3	40%	3	71%	2
f. Written explanation of risk profile	25%	4	20%	5	27%	5	29%	4
g. Risk profile detail	34%	6	32%	4	40%	7	29%	5
h. Link of claims to risk profiles	7%	8	4%	8	7%	8	29%	7

# Experience rating

	All		CAS		IFOA		Other	
	% Receiving	Rank						
a. Large loss listing (no triangle)	100%	1	100%	1	100%	1	100%	1
b. Historic large loss listing (triangle)	30%	3	24%	3	33%	2	29%	4
. Large loss claim description including cat/non-cat indicator	82%	4	96%	4	73%	4	71%	3
d. Historic premium	93%	2	96%	2	87%	3	100%	2
e. Historic exposures (# of risks, # of exposures / risk)	30%	6	20%	6	40%	5	57%	5
f. Projected rate change	43%	7	56%	6	27%	7	29%	7
g. Historic rate change	59%	5	84%	5	33%	6	57%	6
h. Rate monitor (renewal policies)	18%	8	24%	8	20%	8	0%	8

# Chapter 3: Insurance company's considerations (Cedant)

- **Process starts when risk/policy is presented to the insurance underwriter**
  - Proposal form relevant questions (PDF or printed format).
  - List of individual locations with insured values vs. Total amount of insurance under the policy (Excel vs. PDF format).
  - Risk factors per location: construction, occupancy, presence of sprinklers, etc.
  - Brokers and agents benefit from faster response, more refined and consistent pricing.
- **Data collection depends on insurance company's rating models and databases**
  - Rating models often in Microsoft Excel not linked to a database.
  - Policy premium not always allocated to individual locations.
  - Limited information is systematically collected in a database (amount of insurance, limits, excess, main territory and policy premium).

# Chapter 3: Insurance company's considerations (Cedant)

- **Benefits to the insurance company**
  - Insurance company's pricing actuaries would benefit from having a robust database for ratemaking (GLMs) and portfolio segmentation.
  - Primary underwriters would have more granular data to analyse and manage their portfolio and make decisions.
  - Facilitates preparation of reinsurance submission.
  - Reinsurers would have more data to work with; hence fewer assumptions.
  - Potentially better more consistent reinsurance pricing results in better pricing for the buyer of insurance
- **Understanding what information the reinsurer needs benefits all parties involved in the property insurance transaction**

# Chapter 4: Reinsurance company's considerations

- **Reinsurers have sets of benchmarks based on market data**
  - Exposure curves
  - Gross loss ratios
  - Rate changes
  - Claims development patterns
  - Claims inflation
- **Benchmarks (often conservative) are used to price in the absence of credible data from cedant**
- **'Fair Price' and 'Smooth Price'**
  - Demonstrable that price is directly based on data; fewer loadings.
  - Stable pricing even after a loss

# Chapter 4: Reinsurance company's considerations

- **New vs. Renewal treaties**
  - Maximize opportunity vs trying to avoid mistakes
- **Reinsurance brokers**
  - Clean and complete submission leads to faster response
  - Have a check list – same questions and requests each year
- **Long term relationships and consistent pricing**
  - Reinsurance actuaries reconciliation with prior year's pricing
  - Easier to measure changes in risk and reinsurance programme
  - Facilitates internal decision making and referrals/sign off
- **Other market considerations**
  - Winner's curse
  - Submission bias
  - Overconfidence

# Chapter 5: Data elements

## Exposure rating

- Historical and prospective loss ratios
  - Gross of THIS treaty
  - Cat vs. non-cat (definition of cat loss)
  - Accident Year vs. UW Year
- In-force risk profile (banded) – what is a risk?
- Individual in-force risk listing
  - Amount of insurance
  - Excess/deductible
  - Premium allocated to each risk

## Experience rating

- Large losses preferable with development
  - Amount of insurance and excess
  - Loss description
  - Date of loss vs. policy date
- Historical premium (earned vs. written)
- Historical and prospective rate changes
  - Basis of calculation

# Chapter 6: Amount of insurance (AOI) definition

- **How does the treaty respond to a loss?**
  - Usually risk excess treaties respond per location/building
- **What is the amount of insurance?**
  - Policy limit is maximum loss an insurer would pay in the vent of a loss.
  - The amount of information contained in that one single value is extremely limited.
  - Is it building only or does it include other coverages, e.g. business interruption?
- **What is a risk?\***
  - A policy covering multiple locations
  - The location with highest amount of insurance (top location)
  - A single location (building)

*\*Source: Riegel, U. (2010). On fire exposure rating and the impact of the risk profile type. ASTIN Bulletin, 40(02):727–777.*

# Chapter 6: Amount of insurance

- **Common presentations**

- Total insured value (TIV)
- Maximum probable loss (MPL)
- Possible maximum loss (PML)
- Maximum feasible loss (MFL)
- Average TIV across all locations in the policy
- Largest/top location or key location

} Could be per location or aggregated for the policy

- **Subscription market policies**

- Common presentation: one policy with lowest attachment and total programme participation.
- Cedant's participation per layer: % share, limit and attachment with stack code

# Chapter 7: Types of risk profile submissions

- **Banded profile with TIV, Premium and number of risks per band**
  - normally received by 93%, ranked 1 in exposure rating importance

TIV Band	%TIV	TIV in band	Avg TIV	No Risks	% Prem	Premium	
0	1,000,000	35%	437,500,000	759,549	576	44.12%	6,562,500
1,000,001	2,000,000	25%	312,500,000	1,554,726	201	24.16%	3,593,750
2,000,001	3,000,000	20%	250,000,000	2,688,172	93	16.47%	2,450,000
3,000,001	4,000,000	15%	187,500,000	3,232,759	58	11.60%	1,725,000
4,000,001	5,000,000	5%	62,500,000	4,166,667	15	3.66%	543,750
Total		100%	1,250,000,000		943	100.00%	14,875,000

Risks exposing a \$4m xs \$1m layer

- What is a risk? A policy or a single location?
  - Significant impact on exposure rating results

# Chapter 7: Types of risk profile submissions

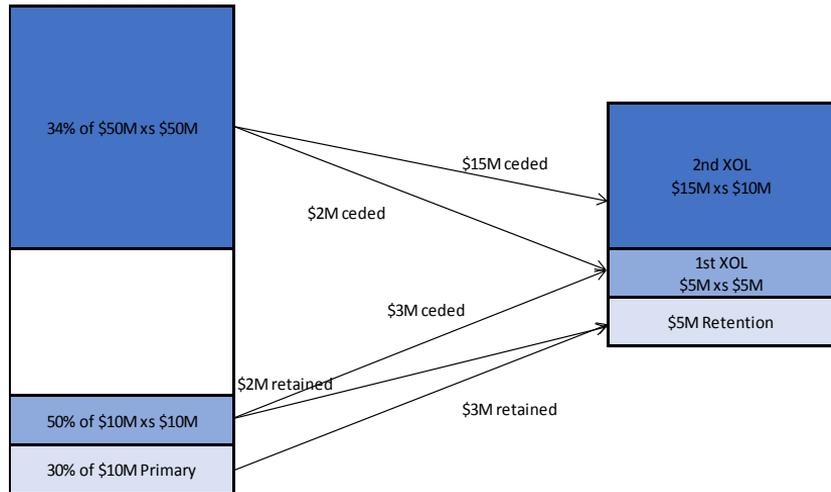
- **In-force risk profile banded by TIV/MPL and Attachment**
  - normally received by 93%, ranked 1 in exposure rating importance

PREMIUM		Limits						Grand Total
		0 - 1,000,000	1,000,001 - 2,000,000	2,000,001 - 3,000,000	3,000,001 - 4,000,001	4,000,001 - 5,000,001	5,000,001 - 7,500,000	
Attachments	0 - 1,000,000	100,000	200,000	300,000	400,000	500,000	600,000	2,100,000
	1,000,001 - 2,000,000	0	50,000	0	0	0	0	50,000
	2,000,001 - 3,000,000	0	50,000	0	0	0	0	50,000
	3,000,001 - 4,000,001	0	0	50,000	0	0	0	50,000
	4,000,001 - 5,000,001	0	0	0	100,000	0	0	100,000
	5,000,001 - 7,500,000	0	0	0	150,000	0	0	150,000
	7,500,001 - 10,000,000	0	0	0	0	200,000	0	200,000
	10,000,001 - 15,000,000	0	0	0	0	400,000	0	400,000
	15,000,001 - 20,000,000	0	0	0	0	0	160,000	160,000
	20,000,001 - 30,000,000	0	0	0	0	0	80,000	80,000
	30,000,001 - 50,000,000	0	0	0	0	0	40,000	40,000
<b>Grand Total</b>	<b>100,000</b>	<b>300,000</b>	<b>350,000</b>	<b>650,000</b>	<b>1,100,000</b>	<b>880,000</b>	<b>3,380,000</b>	

# Chapter 7: Types of risk profile submissions

- **Shared and layered programmes with ventilation**
  - Standard practice: aggregate cedant's participation (limit) with lowest attachment for the cedant.

\$25M Capacity spread over multiple layers



Stack code	Participation	Policy Limit	Attachment	Cedant's premium
A	30%	10,000,000 xs	0	145,000
A	50%	10,000,000 xs	10,000,000	72,000
A	34%	50,000,000 xs	50,000,000	32,500

In a banded profile the total premium of \$249,500 for this risk will be counted in the band with 0 attachment and \$25M limit

# Chapter 7: Types of risk profile submissions

- **Individual risk listing (all cat / non-cat exposures)**
  - normally received by 30%, ranked 3

Orig Sort	Country - Region	Description/Record Index	BUILDING AOI	CONTENTS AOI	Deductible	State/ Country Region	Zip or Postal Code
1	United States	1 - Apartments with Mercantile Occupancies - Over 30 Units	40,500,000	4,050,000		Alabama	
2	United States	2 - Residential Apartments without Mercantile Operations	38,000,000	3,800,000		Alabama	
3	United States	3 - Non-Governmental Offices and Banks	35,500,000	3,550,000		Arizona	
4	United States	4 - Non-Governmental Offices and Banks	33,000,000	3,300,000		Arizona	
5	United States	5 - Churches and Synagogues	30,500,000	3,050,000		Connecticut	
6	United States	6 - Buildings under Construction	28,000,000		50,000	Connecticut	06928
7	United States	7 - Bakeries	25,500,000		25,000	Illinois	62999
8	United States	8 - Multiple Occupancy Mercantile	23,000,000		5,000	Illinois	62999
9	United States	9 - Waste and Reclaimed Materials, including Yard	20,500,000	2,050,000		Wisconsin	54990
10	Australia	10 - Motels and Hotels with Restaurant - Up to 10 Units	2,000,000	500,000		Sydney	

# Chapter 7: Types of risk profile submissions

- **Impact on pricing:** using exposure curve of the “Swiss Re” type with parameter  $c=5$  (approximation to Lloyd’s industrial curve)\*

Policy limit	Attachment	TIV	Share of Premium	Ceded premium	
				\$5m xs \$5m	\$15m xs \$10m
25,000,000	0	25,000,000	249,500	26,435	26,073

Policy limit	Attachment	TIV	Share of Premium	Ceded premium	
				\$5m xs \$5m	\$15m xs \$10m
10,000,000	0	100,000,000	145,000	0	0
10,000,000	10,000,000	100,000,000	72,000	33,765	0
50,000,000	50,000,000	100,000,000	32,500	26,317	6,183
				60,082	6,183

\*Bernegger, S. (1997) “The Swiss Re exposure curves and the MBBEFD distribution class.”. Astin Bulletin, Vol.27, No.1, 99-111.

# Chapter 8: How is the gross loss ratio used?

- **Exposure rating method**
  - What % of the gross loss cost is allocated to the reinsurance layer based on TIV profile and selected exposure curve.
- **The gross loss cost**
  - Gross loss ratio for the treaty year x gross premium – most commonly used
  - Extended exposures - allocate a loss cost to each location based on risk profile
- **Cat vs. non-cat**
  - Non-cat loss ratio to exposure rate using non-cat curves (typically fire)
  - Cat exposures from cat models if covered by risk excess treaty

# Chapter 8: Loss ratio information

- **Historical gross premium and losses**
  - Accident year vs. underwriting year;
  - Split non-cat and cat (definition of cat)
- **Actuarial analysis**
  - Premiums adjusted for rate changes and inflation;
  - Claims adjusted for inflation.
- **Reconcile with cedant's business plan gross loss ratio.**
- **If not provided benchmarks are used.**

# Chapter 8: Loss ratio example

Year of Account	Ultimate Written Premium	Cedant's ULRs	Ultimate losses	Rate Changes	Premium On-Level Factor	Trend Factor @ 3% p.a.	On-level premium	Trended ultimate losses	"As-if" ULR
2007	20,455,785	48.63%	9,947,648	-3.50%	0.804	1.344	16,448,368	13,368,807	81.28%
2008	22,547,855	65.48%	14,764,335	-2.00%	0.821	1.305	18,500,600	19,264,109	104.13%
2009	27,856,963	85.56%	23,834,418	3.50%	0.793	1.267	22,083,810	30,192,727	136.72%
2010	31,772,519	45.23%	14,370,710	-7.50%	0.857	1.230	27,230,158	17,674,161	64.91%
2011	45,265,489	53.26%	24,108,399	-3.50%	0.888	1.194	40,201,144	28,786,690	71.61%
2012	65,789,632	68.45%	45,033,003	-2.00%	0.906	1.159	59,621,456	52,205,593	87.56%
2013	72,145,223	72.37%	52,211,498	2.50%	0.884	1.126	63,786,509	58,764,501	92.13%
2014	75,214,665	70.31%	52,883,431	-1.50%	0.898	1.093	67,513,022	57,787,153	85.59%
2015	78,415,223	71.00%	55,674,808	-3.60%	0.931	1.061	73,014,375	59,065,404	80.90%
2016	76,245,145	72.00%	54,896,504	-4.50%	0.975	1.030	74,339,016	56,543,400	76.06%

2017\* 74.00%

-2.50%

\* 2017 are business plan figures

10-year wgt average 85.07%

- Need to reconcile 85% estimated ULR for 2017 with 74% business plan.

# Chapter 8: Loss ratio considerations

- **Cedant's claims inflation assumptions**
- **What is included in the rate change and how is calculated?**
  - Does it include new business premium or only renewals?
- **Natural catastrophe losses by year of account**
- **Treatment of large non-cat losses above a certain threshold**
- **Changes in mix of business and geographical spread over time**
- **How is the business plan loss ratio calculated?**
  - Key assumptions

# Chapter 9: Historical AOI Profiles

- Increase TIVs over time main reason experience lacks credibility.
- Layer more exposed than prior years
- Traditional approach is to apply exposure adjustment based on total sum insured or premium
- Chapter shows how the use of historic TIV profile could help refine experience rating results compared to standard exposure adjustment

# Adjusting experience for changes in historical profile

2007							
Low	High	%TIV	TIV in band	Avg TIV	No Risks	% Prem	Premium
0	1,000,000	35%	437,500,000	759,549	576	44.12%	6,562,500
1,000,001	2,000,000	25%	312,500,000	1,554,726	201	24.16%	3,593,750
2,000,001	3,000,000	20%	250,000,000	2,688,172	93	16.47%	2,450,000
3,000,001	4,000,000	15%	187,500,000	3,232,759	58	11.60%	1,725,000
4,000,001	5,000,000	5%	62,500,000	4,166,667	15	3.66%	543,750
Total		100%	1,250,000,000		943	100.00%	14,875,000
2009							
Low	High	%TIV	TIV in band	Avg TIV	No Risks	% Prem	Premium
0	1,000,000	30%	487,500,000	755,814	645	39.32%	7,215,000
1,000,001	2,000,000	22%	357,500,000	1,588,889	225	21.82%	4,004,000
2,000,001	3,000,000	24%	390,000,000	2,635,135	148	20.19%	3,705,000
3,000,001	4,000,000	17%	276,250,000	3,410,494	81	13.40%	2,458,625
4,000,001	5,000,000	7%	113,750,000	4,375,000	26	5.27%	966,875
Total		100%	1,625,000,000		1,125	100.00%	18,349,500
2016							
Low	High	%TIV	TIV in band	Avg TIV	No Risks	% Prem	Premium
0	1,000,000	27%	607,500,000	778,846	780	35.90%	8,808,750
1,000,001	2,000,000	22%	495,000,000	1,661,074	298	22.79%	5,593,500
2,000,001	3,000,000	23%	517,500,000	2,640,306	196	19.82%	4,864,500
3,000,001	4,000,000	15%	337,500,000	3,515,625	96	11.83%	2,902,500
4,000,001	5,000,000	13%	292,500,000	4,642,857	63	9.66%	2,369,250
Total		100%	2,250,000,000		1,433	100.00%	24,538,500

Exposure rating  
\$3m xs \$2m layer:  
growth is not  
uniform across  
bands

# Adjusting experience for changes in historical profile

Policy year	On-level premium	Inflation adjusted TIV	Exposure rate using historical profiles	Trended ultimate losses in layer	Burn cost	Exposure adjusted losses		
						With OL Premium	With adjusted TIV	With exposure rate in layer
2007	14,427,641	1,380,777,657	1.327%	1,015,706	7.040%	1,865,600	1,839,011	1,621,911
2008	13,509,518	1,725,835,360	1.327%	0	0.000%	0	0	0
2009	16,343,110	1,759,642,147	1.731%	0	0.000%	0	0	0
2010	17,100,229	1,801,187,392	1.731%	646,389	3.780%	1,001,700	897,170	791,663
2011	18,733,394	1,857,660,264	1.935%	0	0.000%	0	0	0
2012	18,592,448	2,049,469,598	1.935%	736,261	3.960%	1,049,400	898,112	806,487
2013	21,119,854	2,133,238,221	1.943%	1,926,131	9.120%	2,416,800	2,257,285	2,101,777
2014	22,383,158	2,215,147,150	1.943%	957,999	4.280%	1,134,200	1,081,191	1,045,360
2015	23,943,359	2,295,225,000	1.943%	0	0.000%	0	0	0
2016	25,274,655	2,444,200,000	2.120%	0	0.000%	0	0	0
2017 (proj)	26,500,000	2,500,000,000	2.120%		842,513	829,744	774,752	707,466
2017 Projected average loss cost excludes 2016					3.179%	3.131%	2.924%	2.670%

Burn cost method: take straight average and multiply by subject premium for 2017

Exposure adjusted with OL premium: adjust trended ultimate losses with relative growth in on-level premium to 2017

Exposure adjusted with TIV: adjust trended ultimate losses with relative growth in inflation adjusted TIV to 2017

Exposure adjusted with exposure rate in layer: adjust trended ultimate losses with relative growth exposure rate to 2017

# Chapter 10: Traditional COPE and portfolio extensions

## 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	Yellow	H	M	L	Yellow	M	M	M
Occupancy	O	Yellow	L	H	Yellow	M	Yellow	H	L
Protection	P	Yellow	Yellow	M	M	M	H	M	H
Exposure (e.g. industrial facilities)	E	Yellow	Yellow	M	L	H	Yellow	Yellow	L
Amount of Insurance	A	Yellow	M	Yellow	Yellow	M	L	H	M
Replacement Costs	R	Yellow	M	L	H	L	L	H	M
Miscellaneous	M	Yellow	Yellow	M	Yellow	L	Yellow	H	Yellow
Total Indicated (before validation)		Yellow	Yellow	H	Yellow	M	L	L	H

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

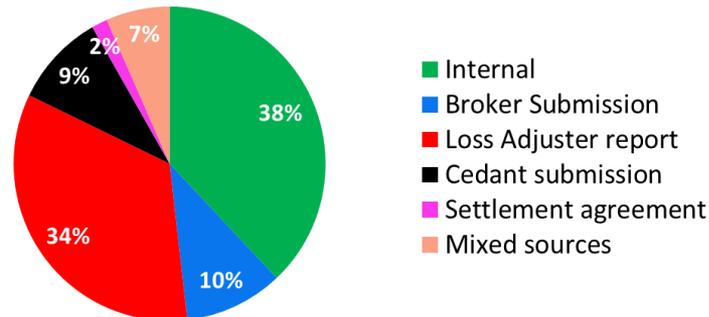
1. With US as base, compare each COPE+ attribute
2. Tally up expected impacts and qualitatively weigh them by COPE+ attribute
3. See how compares to actual large loss experience
4. Use same procedure for Ground-up Loss Costs, but include Frequency component – COPE+FARM

# Chapter 11: Large claim information and link to AOI

- **Claims and exposures are notoriously difficult to link**
  - but are required for any kind of reliable size-of-loss analysis
- **Data collection**
  - Data sourcing is complicated by the fact that different departments within a company may store different information
- **Data quality and granularity**
  - An important proxy for the exposure would be the TIV at location, however, this is often not available
- **Small sample issues**
- **Integration of data sources:**
  - there is very limited availability of public data sources

# Chapter 11: Large claims information and links to AOI

- **(Re) insurers**
  - FGU loss available through a variety of sources, but often in no systematic way
  - Data sourcing / validation can be a long and costly process
- **London market**
  - FGU loss typically not available via Xchanging
- **Illustration:** Asia-Pacific FGU loss data sources across anonymous contributors



# Chapter 11: Example - Occupancy classification

- **IICI data snapshot (anonymized figures)**
  - Claims and exposures inflated to 2014 levels to ensure comparability
  - USD as reference currency, but original currency (Ocy) info available
  - Data validated across contributors (London market overlap rate clearly high)

Policy ID	Claim ID	YoA	Ocy	Region	Country	Lloyd's risk code	Occ1	Occ2	Occ3	FGU	TIV	TSI	Narrative
xxx	yyy	2002	MYR	AS	MY	EF	EON	P	19	USD x,x10,344	USD yy,y37,218	USD v,v52,095	CONTAMINATION OF PROPYLENE FOLLOWING LEAKAGE IN HEAT EXCHANGER

- **Refinements**
  - FGU split into PD, BI, TPL, fees often available
  - TIV information still a challenge (both sourcing and anonymization): band, average, median, min/max, top location, etc.

# Chapter 11: Some recent data projects

- **London market large commercial risks dataset**
  - Lloyd's syndicates, Insurance Intellectual Capital Initiative (IICI), and Imperial College London
- **Asia-Pacific large commercial risks dataset**
  - SCOR, Hiscox, Liberty, Nanyang Business School, and Imperial College London
- **Fire Protection Agencies**
  - Verisk/ISO and Imperial College London
- **LMA Loss & Exposure Data Working Group**
  - Property & Energy, Cargo & Hull data enrichment strategies
  
- Limited claims data for some geographical regions
- Linking claims and exposures is a challenge
- Significant heterogeneity by occupancy type & location

# Chapter 12: Price monitoring (Rate changes)

- Property reinsurance submissions provide limited information about rate changes
- Cedants do not provide examples or explanations of how they calculate rate changes
- Rate changes may not be aligned with historical premium presented (written vs. earned)
- Paper presents detailed examples of how rate changes should be calculated according to Lloyd's Minimum Underwriting Standards

# Chapter 12: Price monitoring (Rate changes)

- Premium rate change
  - Changes in premium rate
  - Changes in exposure (TIV), coverage and limit/attachment
- Risk Adjusted Rate Change
  - Also includes elements of experience
    - Changes in view of risk: better/worse than expected experience
    - Claims inflation
    - View as the change in expected loss ratio

# Chapter 12: Price monitoring (Rate changes)

## Premium rate change

- 5% reduction in rate
- No changes in exposure, coverage of limits/attachment
- Rate change = -5%

## Risk adjusted rate change

- Assume average claims inflation is 3% p.a.
- Apart from -5% rate reduction, expected loss cost is adjusted by 3% from previous year
- Renewal IELR = Expiring IELR\*1.03/0.95 = 1.0842 x Exp. IELR
- RARC = -7.77%

# Chapter 12: Price monitoring (Rate changes)

- Rate change is key assumption in experience rating
  - Gross loss ratio for exposure rating
  - Burning cost for excess of loss layers
- If RARC takes into account inflation could be double counting
  - Previous example RARC -7.77 including 3% claims inflation
  - For experience rating no need to further adjust claims for inflation
  - Explicit explanation to reinsurers

# Rate monitoring at Lloyd's (Underwriting Minimum Standards)

- Monthly report (PMDR)
- Breakdown overall rate change in key components
  - Change in limits, deductibles, attachments (L/D/A)
  - Change in coverage
  - Change in other factors (everything else)
- Convention
  - (+ %) means more coverage or exposure
  - (- %) means less coverage or exposure
- Prescriptive approach but not consistently followed

# Rate change example

Rate change should be done on ultimate premium on a 100% basis, not including your share of the policy.

<b>Expiring premium</b>	<b>£100,000</b>
Change due to L/D/A	120%
Change due to coverage	110%
Other factors	
Change due to exposure	130%
Change due to mix	<u>x 90%</u>
Change due to other factors	117%
Risk Adjusted Expiring premium	$£100,000 \times 1.2 \times 1.1 \times 1.17 =$ £154,440
RARC = (Renewal Premium / RA Expiring Premium)	$£125,000 / £154,440 =$ 80.94% (19.06% rate reduction)
Renewal premium	£125,000

# Chapter 13: Winner's curse – Competitive bidding - 1 company

## SCENARIO 1



	Pillow Manufacturer w/sprinkler	Pillow Manufacturer w/o sprinkler	Pillow & Dynamite Manufacturer	Dynamite Manufacturer w/sprinkler	Dynamite Manufacturer w/o sprinkler	Total
<b>Company A</b>	0.50	0.75	1.25	2.50	5.00	10.00

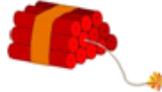
Actual Premium	1.00	1.50	2.50	5.00	10.00	20.00
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	Company A	Industry
# of Winning Bids	5	5
Winning Bid - Actual Loss	10.00	10.00
Winning Bid - Actual Premium	20.00	20.00
Loss Ratio	50%	50%

Assumptions: Company A has superior pricing model with model results = actual losses  
Winner takes all and a 50% illustrative loss ratio

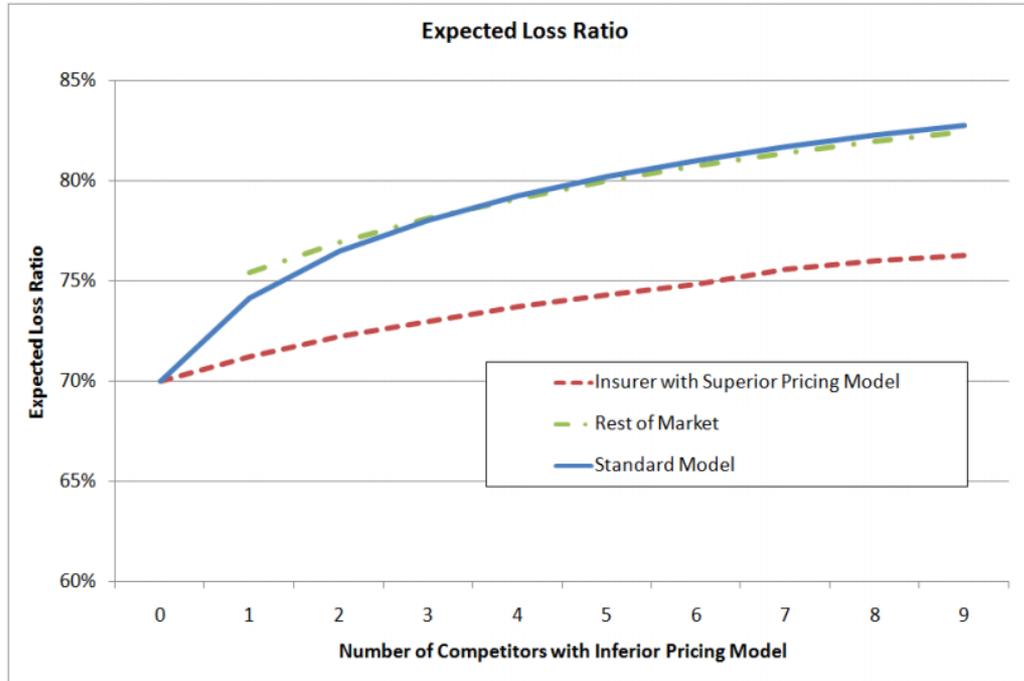
# Winner's curse – Competitive bidding - 4 companies

## SCENARIO 2

	 Pillow Manufacturer w/sprinkler	 Pillow Manufacturer w/o sprinkler	 Pillow & Dynamite Manufacturer	 Dynamite Manufacturer w/sprinkler	 Dynamite Manufacturer w/o sprinkler	Total
<b>Company A</b>	0.50	0.75	1.25	2.50	5.00	10.00
Company B	2.50	2.50	2.50	2.50	2.50	12.50
Company C	0.55	0.68	1.38	2.75	5.50	10.85
Company D	0.60	0.90	1.50	2.00	4.00	9.00
Actual Premium	1.00	1.35	2.50	4.00	5.00	13.85
<b># of Winning Bids</b>	2	1	1	1	5	3
<b>Winning Bid - Actual Loss</b>	1.75	5.00	0.75	2.50	10.00	8.25
<b>Winning Bid - Actual Premium</b>	3.50	5.00	1.35	4.00	13.85	10.35
<b>Loss Ratio</b>	50%	100%	56%	63%	72%	80%

**Assumptions:** Company B uses one rate for all Manufacturing, with no adjustments for COPE characteristics  
 Companies C and D have somewhat inferior pricing models compared to Company A  
 Winner takes all and a 50% illustrative loss ratio

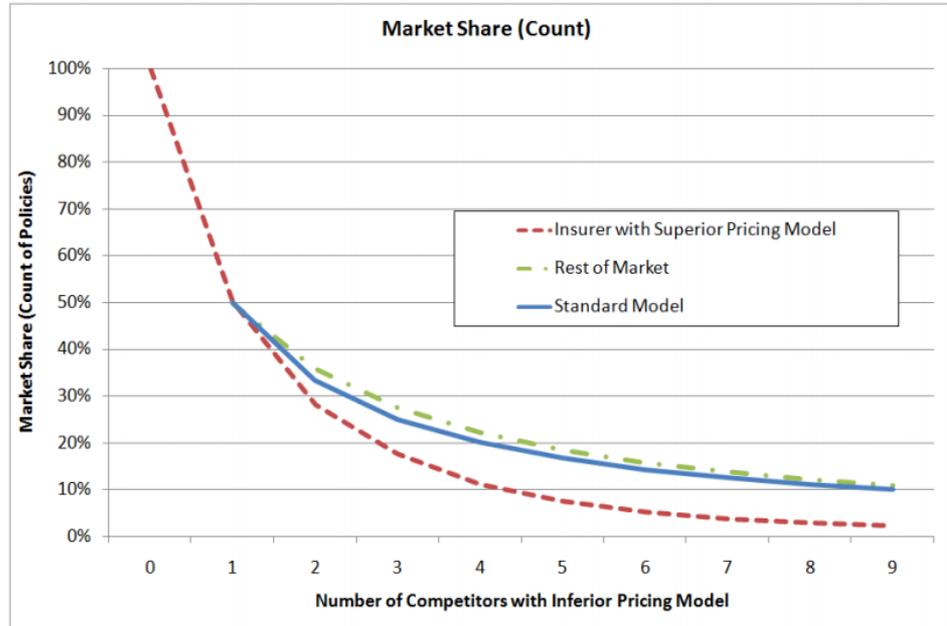
# Winner's curse illustration – Superior model, but...



- The insurer with the superior pricing model and benchmarking data has a significantly better loss ratio. However...

Source: GIRO (2010). *Winner's Curse: The Unmodelled Impact of Competition*, Report of the Winner's Curse GIRO Working Party, August 2009.

# Winner's curse illustration – Loss of market share



- By getting the price more accurate, the insurer with the superior model loses business to competitors with inferior models
- The insurers with inferior models will underprice sufficiently enough to win the business on a more frequent basis.

Source: GIRO (2010). *Winner's Curse: The Unmodelled Impact of Competition*, Report of the Winner's Curse GIRO Working Party, August 2009.

# Bias in data provision

- **Cedants incentives**

- Better data may lead to more accurate risk assessment (expected loss cost)
- Would only better risks provide such data?
- Would risks with insufficient data be assumed to be worse risks?
- Hard vs. soft market incentives

- **Reinsurers incentives**

- Not all reinsurers request same information
- Internal referral processes greatly drive request for information
- Detailed modelling vs. timeliness – first one to quote

# Chapter 14: Link risk excess submission to cat programme submission

- Cat submissions contain an immense amount of detail
- Cat submissions can supplement, augment or inform the basic limit profiles that often accompany property risk submissions
- If premium is allocated to location and a non-cat limit is coded, exposure rating calculations on an individual location basis are possible
- Things to check to avoid a distorted view of the business:
  - Does the cat file represent ALL or only PART of the business?
  - Is the file coded with the proper limits and deductibles?

# Chapter 15: Country specific issues

- Issues related to specific countries, as well as the quality of information available, varies greatly by geographic region
- In the US, valued policy statutes alter the application of indemnification, total insurable value, and the concept of or limit assignable to a specific property's Probable Maximum Loss (PML). Twenty US states currently maintain valued policy statutes.
- The submission in Japan reinsurance market is very unique because the PML estimation is very common.
- Emerging markets have issues such as: rate change not available, large loss threshold amounts not provided, only the diagonal of a triangle is available, cat exposures not provided, etc.
- In emerging markets, many insurers grow very quickly and the structure of their reinsurance arrangement is often changed every few years.

# Closing remarks

- Considerable gap between information provided in submission and requirements for thorough reinsurance pricing
- Problem builds up from insurance company's rating models
- Key data items significant impact on pricing
- Commercial considerations
  - Incentives: hard vs. soft market
  - Winner's curse
  - Bias in data



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# QUESTIONS?

