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of Actuaries



GIRO Conference 20 October, 2015 Liverpool, UK

B04: GIRO / CARE International Pricing Research Working Party – Property Risk

John Buchanan, ISO/Verisk
Enrico Biffis, Imperial College of London
Adam Shrubshall, Tokio Millennium Re Zurich

14 October 2015

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B04: GIRO / CARE International Pricing Research Working Party - Property Risk

**Analyzing the Disconnect Between the Reinsurance
Submission and the Global Underwriters Needs**

John Buchanan, ISO/Verisk
Enrico Biffis, Imperial College of London
Adam Shrubshall, Tokio Millennium

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GIRO International Pricing Research Working Party - Agenda

- **Background of Working Party and Steps**
 - Joint Working Party between the IFoA and the CAS
 - Survey results presented at CARE - Phila in June
 - Overview presented at CAE – London in September
- **Overview of Working Party Results**
 - Primary companies including insureds, agents, and brokers
 - Reinsurance companies including reinsurance brokers
 - White paper practitioner reference document
- **Survey Results**
- **Sample White Paper Sections**
- **Audience Polling**
- **Appendix**

Audience Polling Test

- **Why are you at GIRO?**
 - To escape from work
 - To escape from family
 - To earn CPD points
 - Because I love (re)insurance

Impetus for Working Party

- **Focus: Property per risk insurance and reinsurance**
- **Insurance companies provide limited data in reinsurance submissions**
- **Reinsurance actuaries often make more conservative assumptions – price implications**
- **Potential implications on insurance premiums for commercial property insureds**
- **Better data from insured to insurer to reinsurers could benefit all parties to a given transaction**

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Working Party Formation

- **Joint effort between IFoA-GIRO and CAS-CARe**
- **Initially focus on Property Per Risk Reinsurance for 2015**
- **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 information on pricing throughout a number of examples.
 - Create a reference framework for future property primary data collection and reinsurance submissions.

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Working Party Steps

- **Conduct survey to identify an ideal submission vs. most common submission**
 - A survey was prepared and circulated among CAS and IFoA reinsurance practitioners (actuaries and underwriters)
 - Results of the survey were presented at the annual CARE meeting in June 2015 in Philadelphia, USA.
- **Prepared a summary of results for GIRO**
 - Detailing the importance from the initial insured through to the reinsurance company
- **Preparing a white paper with detailed examples showing illustrative price differences driven by lack of data**
 - Will be finalized after GIRO

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White Paper Table of Contents

1. **Introduction, Methodology, and Conclusions**
 1. Main survey findings
 2. Differences – e.g. CAS and IFoA, etc.
 3. Levels of “Goodness” - Acceptable, Good, Preferred
2. **Primary Company Considerations**
 1. Relevance / benefits to primary markets including agents and brokers
 2. Actuaries, underwriters
3. **Reinsurance Company Considerations**
 1. Relevance / benefits to reinsurance markets including reinsurance brokers
 2. Actuaries, underwriters
4. **Types of Submissions**
 1. Individual Exposures
 2. Banded Limit Profiles
 3. Banded Attachment / Limit Profiles (US, some other countries)
5. **Amount of Insurance**
 1. What does it really represent
 2. MPL, PML, MFL, average location, top/largest location, key location...
 3. Business interruption
 4. Shares of excess policies, ventilated layering, valued policies
6. **Historical profiles**
 1. Importance
 2. Adjusting experience for changes in exposure

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White Paper Table of Contents (cont).

7. **Large claim information and link of AOI to Claims**
 1. Common challenges in linking claims and exposures
 2. Necessary for testing / validating size-of-loss scales
 3. Various projects: Lloyd's-IIC, FPA's; other sources
 4. ECO / XPL claims / PML Bust claims
8. **Traditional COPE and Portfolio Extensions**
 1. Traditional Definitions - Construction, Occupancy, Protection, Exposure
 2. Multi-location / policy / country issues
 3. Portfolio enhancements – individual vs. rollup (FARM)
9. **Loss ratio information**
 1. Ground-up – extending individual / banded exposures
 2. Cat / non-cat / types of cat loss ratios
10. **Price monitors**
 1. Renewal
 2. New policies / definition
11. **Using and reconciling property risk submissions with cat submissions**
12. **Various Country Issues**
 1. Emerged markets
 2. Emerging markets – BRICS, CIVETS, etc.

References, Appendices

A-1 Survey Results

A-2 Raw Survey Information (IFoA link)

Overview of Results - Primary Companies

- **Careful collection of relevant property per risk underwriting information**
 - will benefit both the primary actuaries and underwriters in their initial pricing
 - allow better connection between what the primary companies collect and what the reinsurers need in the reinsuring transaction
- **Relevance / benefits to primary markets including agents and brokers**
 - A direct correlation exists between the underwriting information gathered and the ultimate premium paid by the buyer
 - Lacking needed information, reinsurance underwriters must make underwriting assumptions.
 - Underwriting assumptions directly affect reinsurance pricing – usually resulting in higher premiums and translating into increased primary insurance pricing for commercial property insureds.
- **Understanding what information the reinsurer needs benefits all parties involved in the property insurance transaction**
 - from the main street buyer to the agent to the primary insurance carrier.

Overview of Results – Reinsurance Companies

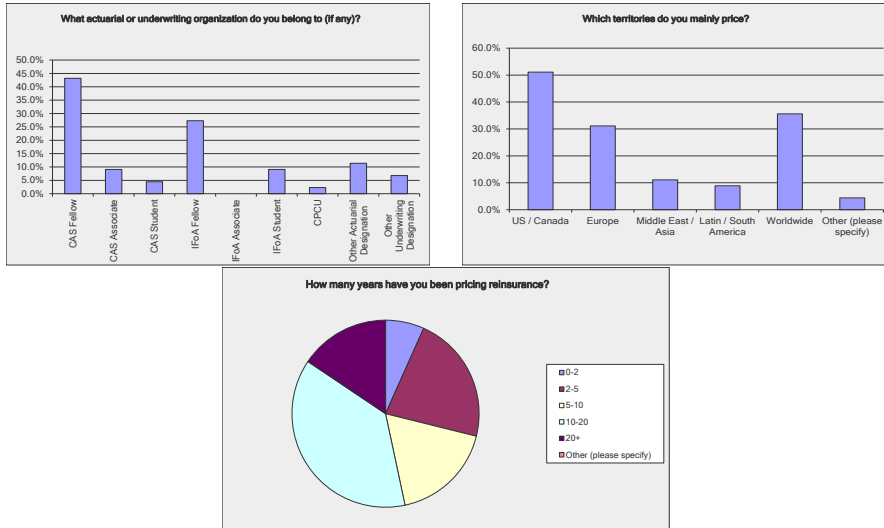
- **Relevance / benefits to excess and reinsurance markets including reinsurance brokers**
- **'Best Price'**
 - No loadings. Most appropriate price for given risk.
- **Offensive vs Defensive strategy to acquiring business**
 - Maximize opportunity vs trying to avoid mistakes
- **'Fair Price' and 'Smooth Price'**
 - Demonstrable that price is directly based on data.
 - Less price movement post loss
- **Above leads to longer term relationships between all parties (Ceding company through broker through reinsurer)**

Survey Results

- **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)
 - Including representation from France, China and NZ.
- **Wide variety of priced territories**
 - Global coverage

Survey Participation

- 44 responses – 86% Actuary, 14% Other (Actuary Turned UW, UW Turned Actuary, CRO)

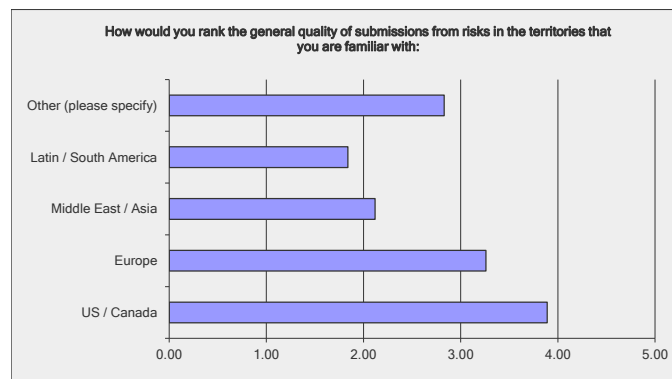


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Submission Quality - by Region



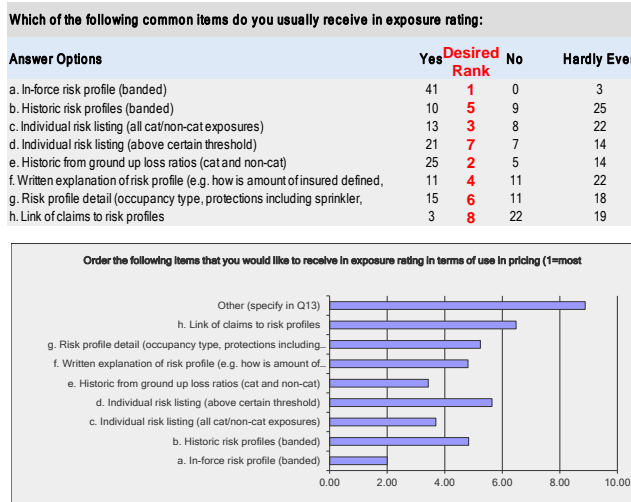
- UK vs Europe?
- Australia?
- Ceding company size?
- Broker sophistication?
- Market cycle – provide only what you have to?

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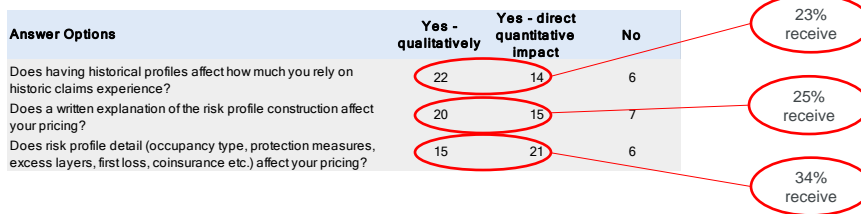
14

Submission Quality - Exposure



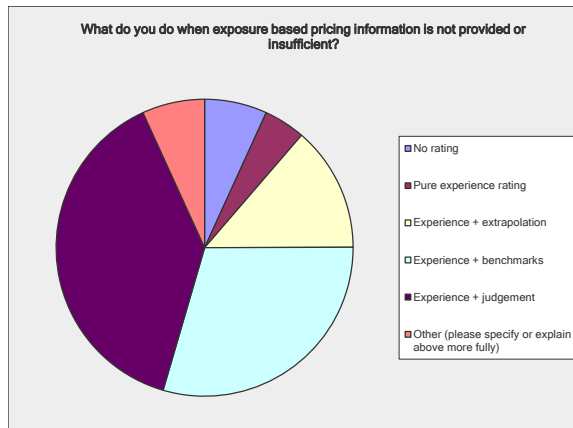
- What about on request?
- How often do you request extra items?
- Other items:
 - Historic prices
 - Inuring RI
 - Lead reinsurers

Exposure Info – More Detail



- 80-90% say these items impact the pricing in some way
- Only 1/3 or less say they normally receive these items
- Do cedants know this?

Exposure Info – More Detail



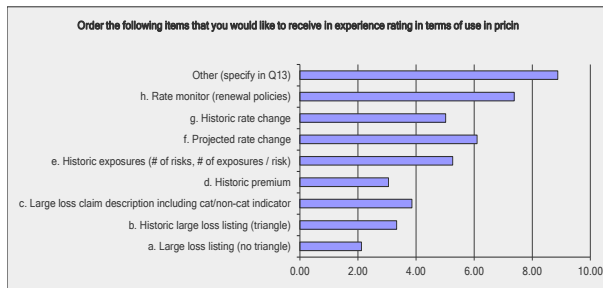
- Comments?
- Is there deliberate caution when no exposure data provided?

Submission Quality - Experience

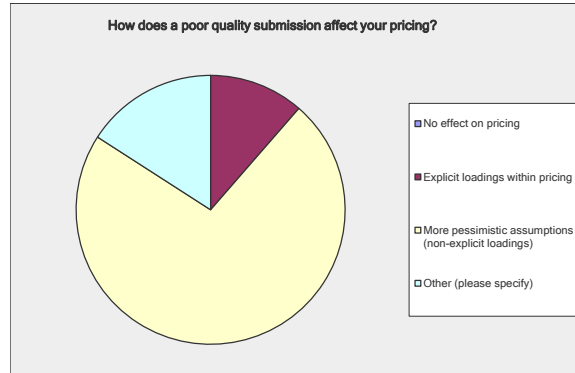
Which of the following common items do you usually receive in experience rating:

Answer Options	Yes	Desired Rank	No	Hardly Ever
a. Large loss listing (no triangle)	44	1	0	0
b. Historic large loss listing (triangle)	13	3	8	23
c. Large loss claim description including cat/non-cat	36	4	1	7
d. Historic premium	41	2	0	3
e. Historic exposures (# of risks, # of exposures / risk)	13	6	9	22
f. Projected rate change	19	7	8	17
g. Historic rate change	26	5	3	15
h. Rate monitor (renewal policies)	8	8	11	25

- What about on request?
- How often do you request extra items?
- Other items:
 - Historic prices
 - Inuring RI
 - Lead reinsurers



Submission Quality – Impact on Price



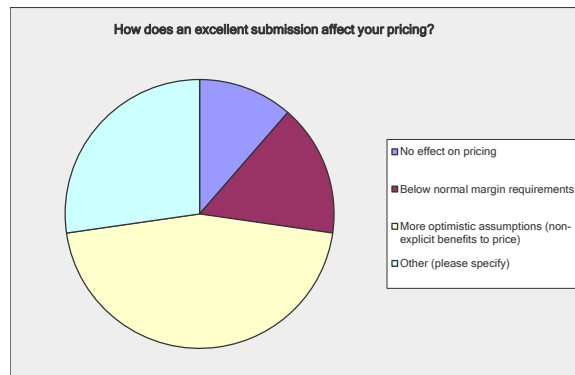
- Other:
 - Mixture of above
 - No pricing performed
 - More uncertainty in communication of pricing

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Submission Quality – Impact on Price



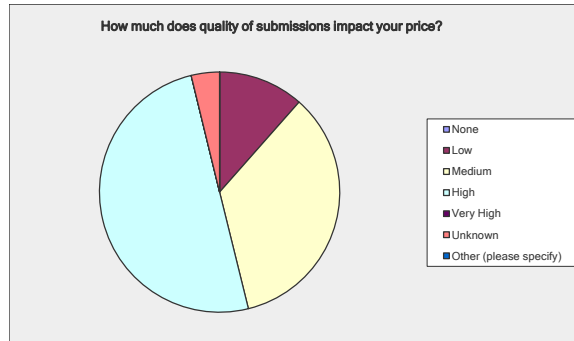
- Other:
 - Tailor to cedant (not benchmarked), might not be more optimistic
 - Adds to cedant credibility
 - Insights for further discussion
 - More confidence in pricing
 - More credit to what cedant believes (trends etc.)

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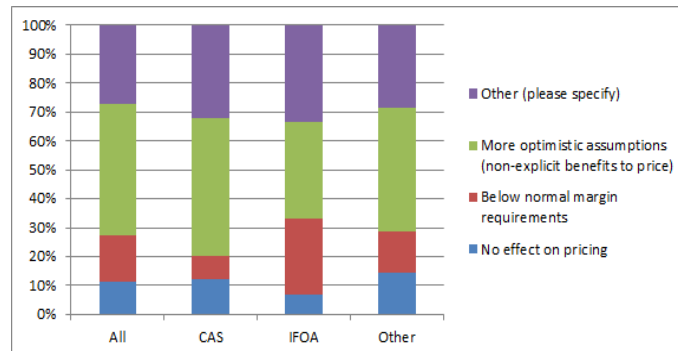
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Submission Quality – Impact on Price

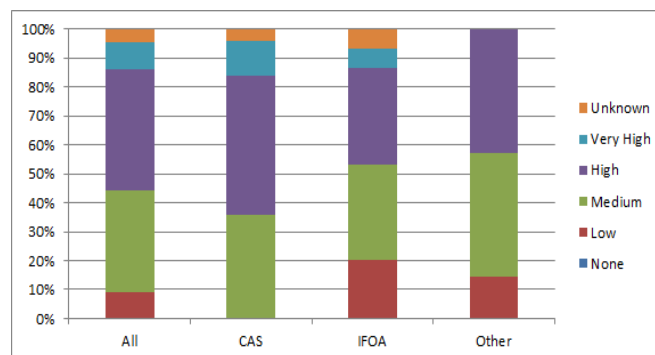


- Is there a relationship between submission quality and price level or does the quality just affect the price but can't say whether higher or lower?

How does an excellent quality submission impact price?



How much does quality of submission impact your price?



Sample White Paper Sections

- Practitioners Reference Document
- Chapter 4: Types of Submissions
- Chapter 5: Amount of Insurance Definition
- Chapter 6: Historical Profiles
- Chapter 7: Large Claim Information and link to AOI
- Chapter 10: Price Monitors

Chapter 4: Types of Submissions

- **In-force risk profile (banded)**
 - normally received by 93%, ranked 1 in exposure rating importance
- **Individual risk listing (all cat / non-cat exposures)**
 - normally received by 30%, ranked 3
- **Individual risk listing (above a threshold)**
 - normally received by 48%, ranked 7

Orig Sort	Country - Region	Description/Record Index	BUILDING ACI	CONTENTS ACI	TOTAL B&C ACI	TIME ELEMENT ACI	Deductible	State/ Country Region	Zip or Postal Code	Occupancy Code (or description)
1	United States	1 - Apartments with Mercantile Occupancies - Over 30 Units	40,500,000	4,050,000	44,550,000	2,000,000		Alabama		0323
2	United States	2 - Residential Condos without Mercantile Operations	38,000,000	3,800,000	41,800,000	2,000,000		Alabama		0331
3	United States	3 - Non-Governmental Offices and Banks	35,500,000	3,550,000	39,050,000			Arizona		0702
4	United States	4 - Non-Governmental Offices and Banks	33,000,000	3,300,000	36,300,000			Arizona		0702
5	United States	5 - Churches and Synagogues	30,500,000	3,050,000	33,550,000			Connecticut		0900
6	United States	6 - Buildings under Construction	28,000,000		28,000,000		50,000	Connecticut	06928	1150
7	United States	7 - Bakeries	25,500,000		25,500,000	1,125,000	25,000	Illinois	62999	2200
8	United States	8 - Multiple Occupancy Mercantile	23,000,000		23,000,000	450,000	5,000	Illinois	62999	0582
9	United States	9 - Waste and Reclaimed Materials, Including Yard	20,500,000	2,050,000	22,550,000	1,215,000		Wisconsin	54990	1400
10	Australia	10 - Motels and Hotels with Restaurant - Up to 10 Units	2,000,000	500,000	2,500,000	100,000		Sydney		0742

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Chapter 5: Amount of Insurance

- **What does it really represent**
 - The term “policy limit” is meant to refer to the maximum loss an insurer is usually obligated to pay in the event of a loss.
 - The amount of information contained in that one single value is extremely limited.
 - Without clear and precise definition, exposure information can be confusing or misleading
- **MPL, PML, MFL, average location, top/largest location, key location...**
- **Business interruption**
- **Shares of excess policies, ventilated layering, valued policies**

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Chapter 6: Historical 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

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Adjusting Experience for Changes in Historical Profile

2005							
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	29%	507,500,000	760,870	667	38.71%	7,460,250
1,000,001	2,000,000	20%	350,000,000	1,583,710	221	20.16%	3,885,000
2,000,001	3,000,000	23%	402,500,000	2,630,719	153	19.63%	3,783,500
3,000,001	4,000,000	18%	315,000,000	3,423,913	92	14.06%	2,709,000
4,000,001	5,000,000	10%	175,000,000	4,487,179	39	7.45%	1,435,000
Total		100%	1,750,000,000		1,172	100.00%	19,272,750
2014							
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

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Adjusting Experience for Changes in Historical Profile

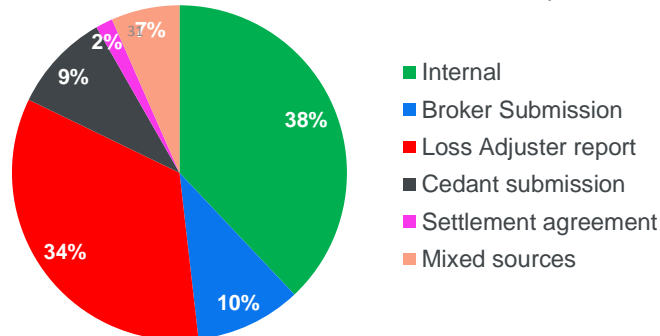
Policy year	On-level premium	Inflation adjusted TIV	Exposure rate using historical profiles	Trended ultimate losses in layer	Burn cost	Exposure adjusted losses			
						With OL Premium	With adjusted TIV	With exposure rate	in layer
2005	14,427,641	1,380,777,657	1.327%	1,015,706	7.040%	1,865,600	1,839,011	1,621,911	0
2006	13,509,518	1,725,835,360	1.327%	0	0.000%	0	0	0	0
2007	16,343,110	1,759,642,147	1.731%	0	0.000%	0	0	0	0
2008	17,100,229	1,801,187,392	1.731%	646,389	3.780%	1,001,700	897,170	791,663	0
2009	18,733,394	1,857,660,264	1.935%	0	0.000%	0	0	0	0
2010	18,592,448	2,049,469,598	1.935%	736,261	3.960%	1,049,400	898,112	806,487	0
2011	21,119,854	2,133,238,221	1.943%	1,926,131	9.120%	2,416,800	2,257,285	2,101,777	0
2012	22,383,158	2,215,147,150	1.943%	957,999	4.280%	1,134,200	1,081,191	1,045,360	0
2013	23,943,359	2,295,225,000	1.943%	0	0.000%	0	0	0	0
2014	25,274,655	2,444,200,000	2.120%	0	0.000%	0	0	0	0
2015 (proj)	26,500,000	2,500,000,000	2.120%			842,513	829,744	774,752	707,466
2015 Projected average loss cost excludes 2014						3.179%	3.131%	2.924%	2.670%

Chapter 7: 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 7: Example: FGU losses

- **(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**



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Chapter 7: Example: Occupancy classification

- **IICl 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.

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Chapter 7: 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 10: Price Monitors (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
- Paper presents detailed examples of how rate changes should be calculated according to Lloyd's Minimum Underwriting Standards



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Audience Polling

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Questions

- **Why do we not have standard submission guidelines in the market?**
 - Different reinsurers request different items
 - Business types are too different to standardize
 - Data systems do not allow all cedants to produce all data
 - Never tried!
 - Other
 - Don't know

Questions

- **Why do you believe submissions are not always perfect?**
 - Lack of understanding as to what is required
 - Too difficult / time consuming for data to be produced
 - No pressure to produce better submissions
 - Conscious filtering of information
 - Other
 - Don't know

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Questions

- **In your experience, do insurance company data systems capture:**
 - Link between claims and exposures (sum insured or PML)?
 - Yes / No / Not Sure
 - Location level sum insured / PML information?
 - Yes / No / Not Sure
 - Historical sum insured / PML for prior policy periods?
 - Yes / No / Not Sure
 - Rate Change in a well-defined and appropriate way?
 - Yes / No / Not Sure

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Questions

- **In your experience, do ceding companies give thought to how the data provided in the reinsurance submission might impact the price.**
 - Yes
 - No

Questions

- **What would you like to see as outcome of the working party?**
 - Wider recognition by brokers and cedants of the importance of submission quality
 - Wider recognition by underwriters of the importance of submission quality
 - Industry-wide improvement in submission quality
 - Industry-wide guidelines for submissions

Questions

- Which line of business should the working party cover next?
 - Property Cat
 - Crop/Hail
 - Energy / supply chain
 - Cyber
 - Autonomous vehicles / drones
 - Motor
 - Liability EL/WC
 - Liability General
 - Liability Professional

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Appendix

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International Pricing Research Working Party - Website

This Joint IFoA GIRO and CAS – CARE working party is exploring the disconnect between the reinsurance submission and the global underwriters needs.

Objectives:-

- Study the disconnect between property reinsurance submissions and the information preferred and needed by both primary carriers and reinsurance underwriters and actuaries.
- Understanding what information the reinsurer needs, benefits all parties involved in an insurance transaction – from the main street buyer to the agent to the primary insurance carrier.

Working towards:-

- The working party started with Property Risk for 2015 utilising a survey amongst actuaries and underwriters, investigating the various levels of what makes a good submission to be included in a forthcoming White Paper.
- For 2016 and beyond, the working party may extend to other property or casualty lines such as e.g. property cat, crop insurance, motor, employers liability, cyber or other emerging issues.

Outputs:-

- GIRO 2015 synopsis
- Analysing the Disconnect Between the Reinsurance Submission and the Global Underwriters Needs (CAE Seminar London, 2015)
- CARE Conference presentation (Philadelphia)
- Survey data and analysis 2015
- The working party will potentially develop a set of suggestions, guidelines and/or a framework including advantages for pricing reinsurance submissions by various methods that can be referred to by interested parties
- A White Paper on the topic would potentially be produced and available for use by any interested parties.

Membership:-

Chair: John Buchanan

Current number of members: 18

<http://www.actuaries.org.uk/practice-areas/pages/international-pricing-research-working-party>

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Chapter 4: Submission Type 1 Individual Exposures - Recommended

Orig Sort	Country - Region	Description/Record Index	BUILDING AOI	CONTENTS AOI	TOTAL B&C AOI	TIME ELEMENT AOI	Deductible	State/ Country Region	Zip or Postal Code	Occupancy Code (or description)
1	United States	1 - Apartments with Mercantile Occupancies - Over 30 Units	40,500,000	4,050,000	44,550,000	2,000,000		Alabama		0323
2	United States	2 - Residential Condos without Mercantile Operations	38,000,000	3,800,000	41,800,000	2,000,000		Alabama		0331
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5	United States	5 - Churches and Synagogues	30,500,000	3,050,000	33,550,000			Connecticut		0900
6	United States	6 - Buildings under Construction	28,000,000		28,000,000		50,000	Connecticut	06928	1450
7	United States	7 - Bakeries	25,500,000		25,500,000	1,125,000	25,000	Illinois	62999	2200
8	United States	8 - Multiple Occupancy Mercantile	23,000,000		23,000,000	450,000	5,000	Illinois	62999	0582
9	United States	9 - Waste and Reclaimed Materials, including Yard	20,500,000	2,050,000	22,550,000	1,215,000		Wisconsin	54990	1400
10	Australia	10 - Motels and Hotels with Restaurant - Up to 10 Units	2,000,000	500,000	2,500,000	100,000		Sydney		0742

PPC	Sprinkler?	BG1 Construction	BG2 Symbol	Actual Premium	Account GULC Scalar	PSOLD: Syndication Entry Point	PSOLD: Syndication Exit Point	PSOLD: Syndication % Share
				30,000				
				70,000				
				30,000				
				30,000				
				15,000				
1	Full	MODIFIED FIRE RESIST	SUPERIOR WI	15,000				
5	Full	NON-COMBUSTIBLE	WIND RESIST	12,500				
RI	Part	NON-COMBUSTIBLE	ORDINARY	10,000				
10	Part	JOISTED MASONRY	SEMI WIND R	2,500		2,500,000	10,000,000	50%
	None	FRAME		5,000				

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Chapter 4: Submission Type 2 Banded Limits Profile

		Currency		
		US\$		
		Total Sum Insured	Risks	Gross of Fac
Occupancy Type	Sum Insured range	Total Sum Insured	Exposure Counts	Premium
Commercial	500,000	58,904,000	290	172,642
Commercial	500,001 - 1,000,000	75,591,000	108	180,483
Commercial	1,000,001 - 2,000,000	174,873,000	122	332,542
Commercial	2,000,001 - 5,000,000	287,917,000	92	447,804
Commercial	5,000,001 - 7,500,000	150,015,000	24	209,515
Commercial	7,500,001 - 10,000,000	103,247,000	12	130,705
Commercial	10,000,001 - 12,500,000	168,046,000	15	170,971
Commercial	12,500,001 - 15,000,000	273,308,000	20	254,471
Commercial	15,000,001 - 20,000,000	449,610,000	26	416,152
Commercial	20,000,001 - 25,000,000	287,708,000	13	177,028
Commercial	25,000,001 - 50,000,000	818,160,000	24	401,052
Commercial	50,000,001 - 100,000,000	265,495,000	4	106,635
Manufacturing	-	15,744,000	82	50,236
Manufacturing	500,001 - 1,000,000	30,373,000	41	79,046
Manufacturing	1,000,001 - 2,000,000	34,853,000	24	69,499
Manufacturing	2,000,001 - 5,000,000	157,877,000	40	208,191
Manufacturing	5,000,001 - 7,500,000	191,957,000	31	218,303
Manufacturing	7,500,001 - 10,000,000	115,248,000	13	125,692
Manufacturing	10,000,001 - 12,500,000	56,236,000	5	60,856
Manufacturing	12,500,001 - 15,000,000	81,742,000	6	65,495
Manufacturing	15,000,001 - 20,000,000	37,552,000	2	24,933
Manufacturing	20,000,001 - 25,000,000	43,364,000	2	25,836
Manufacturing	25,000,001 - 50,000,000	82,110,000	3	43,547
Manufacturing	50,000,001 - 100,000,000	69,258,000	1	28,368
Total		4,029,168,000	1,000	4,000,000

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Chapter 4: Submission Type 3 Banded Attachment / Limit Profile (Part 1)

		Limits						Grand Total
		0 - 1,000,000	1,000,001 - 2,000,000	2,000,001 - 3,000,000	3,000,001 - 4,000,000	4,000,001 - 5,000,000	5,000,001 - 7,500,000	
Attachments	0 - 1,000,000	1,000,000	2,000,000	3,000,000	4,000,000	5,000,000	6,000,000	21,000,000
	1,000,001 - 2,000,000	0	500,000	0	0	0	0	500,000
	2,000,001 - 3,000,000	0	500,000	0	0	0	0	500,000
	3,000,001 - 4,000,000	0	0	500,000	0	0	0	500,000
	4,000,001 - 5,000,000	0	0	0	1,000,000	0	0	1,000,000
	5,000,001 - 7,500,000	0	0	0	1,500,000	0	0	1,500,000
	7,500,001 - 10,000,000	0	0	0	0	2,000,000	0	2,000,000
	10,000,001 - 15,000,000	0	0	0	0	1,000,000	0	1,000,000
	15,000,001 - 20,000,000	0	0	0	0	0	400,000	400,000
	20,000,001 - 30,000,000	0	0	0	0	0	200,000	200,000
	30,000,001 - 50,000,000	0	0	0	0	0	100,000	100,000
Grand Total		1,000,000	3,000,000	3,500,000	6,500,000	8,000,000	6,700,000	28,700,000
Attachments	0 - 1,000,000	20	40	60	80	100	120	420
	1,000,001 - 2,000,000	0	10	0	0	0	0	10
	2,000,001 - 3,000,000	0	10	0	0	0	0	10
	3,000,001 - 4,000,000	0	0	10	0	0	0	10
	4,000,001 - 5,000,000	0	0	0	20	0	0	20
	5,000,001 - 7,500,000	0	0	0	30	0	0	30
	7,500,001 - 10,000,000	0	0	0	0	40	0	40
	10,000,001 - 15,000,000	0	0	0	0	20	0	20
	15,000,001 - 20,000,000	0	0	0	0	0	8	8
	20,000,001 - 30,000,000	0	0	0	0	0	4	4
	30,000,001 - 50,000,000	0	0	0	0	0	2	2
Grand Total		20	60	70	130	160	134	574

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Chapter 4: Submission Type 3 Banded Attachment/Limit Profile (Part 2)

Total Insured Value		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	12,000,000	48,000,000	108,000,000	192,000,000	300,000,000	432,000,000	1,092,000,000
	1,000,001 - 2,000,000	0	3,000,000	0	0	0	0	3,000,000
	2,000,001 - 3,000,000	0	3,000,000	0	0	0	0	3,000,000
	3,000,001 - 4,000,001	0	0	3,000,000	0	0	0	3,000,000
	4,000,001 - 5,000,001	0	0	0	12,000,000	0	0	12,000,000
	5,000,001 - 7,500,000	0	0	0	27,000,000	0	0	27,000,000
	7,500,001 - 10,000,000	0	0	0	0	48,000,000	0	48,000,000
	10,000,001 - 15,000,000	0	0	0	0	12,000,000	0	12,000,000
	15,000,001 - 20,000,000	0	0	0	0	0	1,920,000	1,920,000
	20,000,001 - 30,000,000	0	0	0	0	0	480,000	480,000
	30,000,001 - 50,000,000	0	0	0	0	0	120,000	120,000
	Grand Total	12,000,000	54,000,000	111,000,000	231,000,000	360,000,000	434,520,000	1,202,520,000

Share Percentage (or PML Percentage)								
Attachments	0 - 1,000,000	100%	100%	100%	100%	100%	100%	
	1,000,001 - 2,000,000	100%	100%	100%	100%	100%	100%	
	2,000,001 - 3,000,000	100%	100%	100%	100%	100%	100%	
	3,000,001 - 4,000,001	100%	100%	100%	100%	100%	100%	
	4,000,001 - 5,000,001	100%	100%	100%	100%	100%	100%	
	5,000,001 - 7,500,000	100%	100%	100%	100%	100%	100%	
	7,500,001 - 10,000,000	100%	100%	100%	100%	100%	100%	
	10,000,001 - 15,000,000	100%	100%	100%	100%	100%	100%	
	15,000,001 - 20,000,000	100%	100%	100%	100%	100%	100%	
	20,000,001 - 30,000,000	100%	100%	100%	100%	100%	100%	
	30,000,001 - 50,000,000	100%	100%	100%	100%	100%	100%	
	Grand Total							

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Chapter 5: Multi-Location Policies What is a Risk?

What is a risk? This is not self-evident since industrial fire policies typically cover multiple locations. There are mainly three different types of profiles:

- **Policy profile: Each policy is understood as one risk.** The risk profile contains the cumulated sum insured of all locations and the total premium of the policy.
- **Top location profile: Each policy is understood as one risk.** But the risk profile contains the sum insured of the largest location and the total premium of the policy.
- **Location profile: Each location covered by a policy.** Is understood as a risk and is contained in the profile with a separate sum insured and the part of the gross premium which is allocated to the location.

Policy profiles are not very useful for exposure rating since a fire will not (*generally*) affect more than one location of a policy, i.e. the loss amount per event is limited by the sum insured of the largest location. Top location profiles are much better since the reported sum insured corresponds to the largest possible loss amount. From an underwriter's perspective, location profiles offer the best information because they contain more details than top location profiles.

(NB: Conflagration potentials would need to be added to per location profile results. Any policy level deductibles could be applied to the top location, or to the combined losses expected from the individual locations or risks associated with the multi-location policy)

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



Chapter 7: 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		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

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Chapter 10: 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 necessarily consistently followed

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Chapter 10: Rate change example

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

Expiring premium	£100,000
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 10: Rate monitoring at Lloyd's (Underwriting Minimum Standards)

- Property insurance limit is the same as TIV (exposure)
- Excess policies difficult to split change due to layering and change due to TIV
- Need individual locations to measure exposure in layer

Chapter 10: Change in layer and in exposure base (relevant loss costs)

		Policy Layer	
		2014	2015
TIV Profile	2014	Loss cost from 2014 pricing (A) ✓	Loss cost for new layer/old profile (B)
	2015	Loss cost for old layer/new profile (C)	Loss cost from 2015 pricing (D) ✓

- 1) D/A = Change in risk exposure (layer and TIV)
- 2) D/B = Change in TIV exposure in layer (B may not be practically possible to calculate)
- 3) D/C = Change due to layer

Chapter 10: RARC Example

2014

- Layer \$25m xs \$75m
- 3 locations: \$55m, \$85m, \$125m
- No flood coverage
- Net premium charged \$200k

2015

- Layer \$50m xs \$50m
- 5 locations: \$55m, \$85m, \$125m, \$65m, \$45m
- Flood coverage included (loss cost 10% of non-flood)
- Net premium charged \$665k

Chapter 10: Expected loss cost

Limit 25,000,000
Attachment 75,000,000
Loss cost rate on TIV 3%

Limit 50,000,000
Attachment 50,000,000
Loss cost rate on TIV 3%

CHANGE IN LAYER STRUCTURE

2014 Profile/2014 Layer				2014 Profile/2015 Layer			
Building ID	TIV	% loss in layer	Loss cost in layer	Building ID	TIV	% loss in layer	Loss cost in layer
1	55,000,000	0.00%	0	1	55,000,000	0.83%	13,686
2	85,000,000	1.03%	26,371	2	85,000,000	5.41%	138,034
3	125,000,000	3.15%	118,109	3	125,000,000	8.39%	314,483
Total	265,000,000		144,480	Total	265,000,000		466,203

2015 Profile/2014 Layer				2015 Profile/2015 Layer (incl Flood)			
Building ID	TIV	% loss in layer	Loss cost in layer	Building ID	TIV	% loss in layer	Loss cost in layer
1	55,000,000	0.00%	0	1	55,000,000	0.83%	15,054
2	85,000,000	1.03%	26,371	2	85,000,000	5.41%	151,838
3	125,000,000	3.15%	118,109	3	125,000,000	8.39%	345,932
4	65,000,000	0.00%	0	4	65,000,000	2.45%	52,594
5	45,000,000	0.00%	0	5	45,000,000	0.00%	0
Total	375,000,000		144,480	Total	375,000,000		565,417

Total change in risk exposure = $565,417/144,480 = 391.35\%$

Change due to L/D/A = $466,203/144,480 = 322.68\%$

Change due to coverage = 110% (flood)

Change due to TIV (other) = $565,417/(110\% \times 466,203) = 110.26\%$

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Chapter 10: Risk Adjusted Rate Change

Expiring premium	£200,000
Change due to L/D/A	322.68%
Change due to coverage	110.00%
Change due to other factors (TIV Change in layer)	110.26%
Risk Adjusted Expiring premium	$£200,000 \times 3.2268 \times 1.10 \times 1.1026 =$ £782,695
RARC = (Renewal Premium / RA Expiring Premium)	$£665,000/£782,695 =$ 84.96% (15.04% rate reduction)
Renewal premium	£665,000

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Initial Survey Questions

5. How would you rank the general quality of submissions from risks in the territories that you are familiar with:

	1=Poor	2=Below Average	3=Average	4=Good	5=Excellent
US / Canada	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Europe	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Middle East / Asia	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Latin / South America	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (please specify)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (specify from above)

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Initial Survey Questions

9. Which of the following common items do you usually receive in exposure rating:

	Yes	No	Hardly Ever
a. In-force risk profile (banded)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Historic risk profiles (banded)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Individual risk listing (all cat/non-cat exposures)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Individual risk listing (above certain threshold)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Historic from ground up loss ratios (cat and non-cat)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Written explanation of risk profile (e.g. how is amount of insured defined, what is meant by a risk, usage of fac, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Risk profile detail (occupancy type, protections including sprinkler, shares/syndication layering, coinsurance, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. Link of claims to risk profiles	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

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Initial Survey Questions

10. Order the following items **that you would like to receive** in exposure rating in terms of use in pricing (1=most important, 9=least):

<input type="checkbox"/>	a. In-force risk profile (banded)
<input type="checkbox"/>	b. Historic risk profiles (banded)
<input type="checkbox"/>	c. Individual risk listing (all cat/non-cat exposures)
<input type="checkbox"/>	d. Individual risk listing (above certain threshold)
<input type="checkbox"/>	e. Historic from ground up loss ratios (cat and non-cat)
<input type="checkbox"/>	f. Written explanation of risk profile (e.g. how is amount of insured defined, what is meant by a risk, usage of fac, etc.)
<input type="checkbox"/>	g. Risk profile detail (occupancy type, protections including sprinkler, shares/syndication layering, coinsurance, etc.)
<input type="checkbox"/>	h. Link of claims to risk profiles
<input type="checkbox"/>	Other (specify in Q13)

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Initial Survey Questions

11. Which of the following common items do you usually receive inexperience rating:

	Yes	No	Occasionally
a. Large loss listing (no triangle)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Historic large loss listing (triangle)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Large loss claim description including cat/non-cat indicator	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Historic premium	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Historic exposures (# of risks, # of exposures / risk)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Projected rate change	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Historic rate change	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. Rate monitor (renewal policies)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (please specify)	<input type="text"/>		

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Initial Survey Questions

12. Order the following items that you would like to receive in experience rating in terms of use in pricing (1=most, 9=least):

<input type="checkbox"/>	a. Large loss listing (no triangle)
<input type="checkbox"/>	b. Historic large loss listing (triangle)
<input type="checkbox"/>	c. Large loss claim description including cat/non-cat indicator
<input type="checkbox"/>	d. Historic premium
<input type="checkbox"/>	e. Historic exposures (# of risks, # of exposures / risk)
<input type="checkbox"/>	f. Projected rate change
<input type="checkbox"/>	g. Historic rate change
<input type="checkbox"/>	h. Rate monitor (renewal policies)
<input type="checkbox"/>	Other (specify in Q13)

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Initial Survey Questions

14. What do you do when exposure based pricing information is not provided or insufficient?

- No rating
- Pure experience rating
- Experience + extrapolation
- Experience + benchmarks
- Experience + judgement
- Other (please specify)

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Existing Literature (*Partial*)

- **Most works focus on methodology (experience vs. exposure rating, or integration of the two approaches, in the face of limited data available)**
 - Clark (2014). **Basics of Reinsurance Pricing**. *CAS Actuarial Study Note Revised*
 - Desmedt *et al.* (2012). **Experience and exposure rating for property per risk excess of loss reinsurance revisited**. *ASTIN Bulletin*
 - Buchanan and Angelina (2007). **The Hybrid Reinsurance Pricing Method: A Practitioner's Guide**. *CARe-London*
 - Mata and Verheyen (2005 Spring) **An Improved Method for Experience Rating Reinsurance Treaties using Exposure Rating Techniques**. *CAS Forum*
- **Some works emphasize importance of exposure info in specific lines**
 - Riegel (2010). **On fire exposure rating and the impact of the risk profile type**. *ASTIN Bulletin*
 - Michaelides *et al.* (1997). **The premium rating of commercial risks**. Working Party on Premium Rating of Commercial Risks, General Insurance Convention, Blackpool
- **Recent work linking claims and exposures to understand tail risk in large commercial risks**
 - Biffis and Chavez (2014). **Tail risk in commercial property risk**. *Risks*



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