Institute and Faculty of Actuaries

GIRO Conference 2014
23-26 September 2014
Celtic Manor Hotel, Newport

D4: A Survey of Commercial Property Pricing Practices Around the World

And Practitioners Application to the Netherlands

GIRO D4: Commercial Property

Agenda – 25 September, 2014

- **Introduction**
  - John Buchanan
- **Some New Insights into Large Commercial Risks**
  - Enrico Biffis 15 minutes
- **Property Insurance in China and the Far East Region**
  - Xiaoxuan (Sherwin) Li 15 minutes
- **Application to Netherlands**
  - John Buchanan 15 minutes
- **Q&A**

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

D4: A Survey of Commercial Property Pricing Practices Around the World

And Practitioners Application to the Netherlands

Speakers:
John W. Buchanan, Principal, Excess & Reinsurance, Verisk / ISO
Enrico Biffis, Associate Professor of Actuarial Finance, Imperial College London
Xiaoxuan(Sherwin) Li, Assistant General Manager of Actuarial Department, CPCR / China Re P&C

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 various European, US, and Asia-Pacific and other developed and developing country data sources will be discussed.

- Emphasis on ground-up and excess pricing approaches in various global markets
- Imperial College London: presents issues and results of large collaborative multi-year project with various Lloyd's syndicates in the area of large fire and other tail losses around the world
- China Re: show how adapting information from other developed markets to the burgeoning Asia-Pac markets
- Verisk/ISO: show how information from US can be adjusted and adapted via COPE etc. methods to other markets around the world and validated with localized information using the Netherlands in comparison to the US and UK as a practical example

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Some New Insights into Large Commercial Risks

Enrico Biffis

Imperial College London

CAS Seminar on Reinsurance

New York City
May 22, 2014

Extracts from full CARe Presentation

OVERVIEW

A new data source: Imperial-IICI dataset

- Insurance Intellectual Capital Initiative (IICI)
  - Bronek Masojada (Hiscox), James Slaughter (Liberty Mutual), Rob Caton (Hiscox)
  - Lloyd's of London
- Focus on Large Commercial Risks (LCR)
  - Commercial Property, On-shore Energy; non-natural hazards

Implications for reserving and capital modeling (joint work with Davide Benedetti, Erik Chavez [Imperial]; with Andreas Milidonis [Nanyang] for Asia-Pacific region)

- Tail risk estimation
- Benchmarking exercise (market loss curves & scaling factors)

LCR

LCR largely **non-modelled** risks

- Heterogeneity of exposures by type and size
- Complex relation between hazard events and losses
- Paucity of data for model estimation/validation

Implications

- Considerable degree of judgment in pricing/reserving decisions
- Reported claims may not reflect true risk of business
- Pricing variability makes it difficult for corporates to budget for insurance

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DATASET

- Around 3,200 FGU claims and exposures based on brokers' submissions
- Scope: worldwide, 1999-2012
- Granular classification of exposures by three occupancy levels
    - Definitions based on Lloyd's codes & individual syndicates' classification; can be related to ISO/PSOLD classification
- Anonymized claim narratives available
- Example:

Region	Country	Risk Code	Occupancy 1	Occupancy 2	Occupancy 3
NoA	US	P2 (Physical damage for primary layer property; USA; excluding binders)	RE (residential)	R (residential)	51 (Large Hotels)

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OCCUPANCY EXAMPLE - LEVEL 2 LIST

Code	Definition	Code	Definition
A	Miscellaneous	Q	Offices/Banks
B	Manufacturers/Processors	R	Residential
C	Chemicals/Pharmaceuticals	T	Transport
D	Bridges/Dams/Tunnels/Piers	U	Utilities
E	Conglomerates	V	Telecoms and Data Processing
F	Food	W	Woodworkers (Sawmills, Papermills)
G	Grain	X	Onshore Crude
H	General Mercantile/Shops	Y	Onshore GasPlants
J	Mines	Z	Onshore Construction
K	Crops	2	Hospital/Health care centres
L	Auto	4	Semiconductor/Fabs
M	Metals	5	Motor Manufaturers
O	Municipal Property	6	Warehouses
P	Energy (Oil Refineries/Petrochemicals)		

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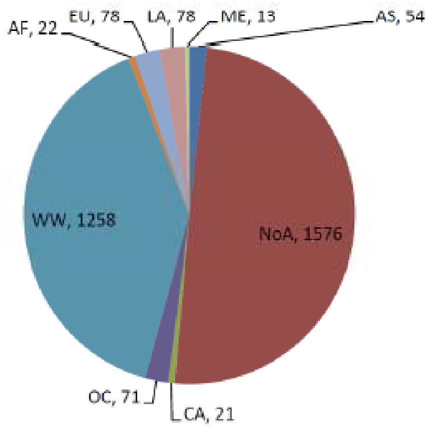
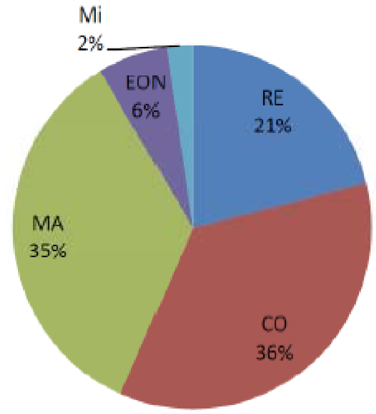
GEOGRAPHICAL/OCCUPANCY SPLIT



AF (Africa), CA (Central Asia), EU (Europe), LA (Latin America), ME (Middle East), AS (Asia-Pacific), NoA (North America), OC (Oceania), WW (Worldwide).



RE (Residential), CO (Commercial), MA (Manufacturing), EON (Energy on-shore), Mi (Miscellaneous).

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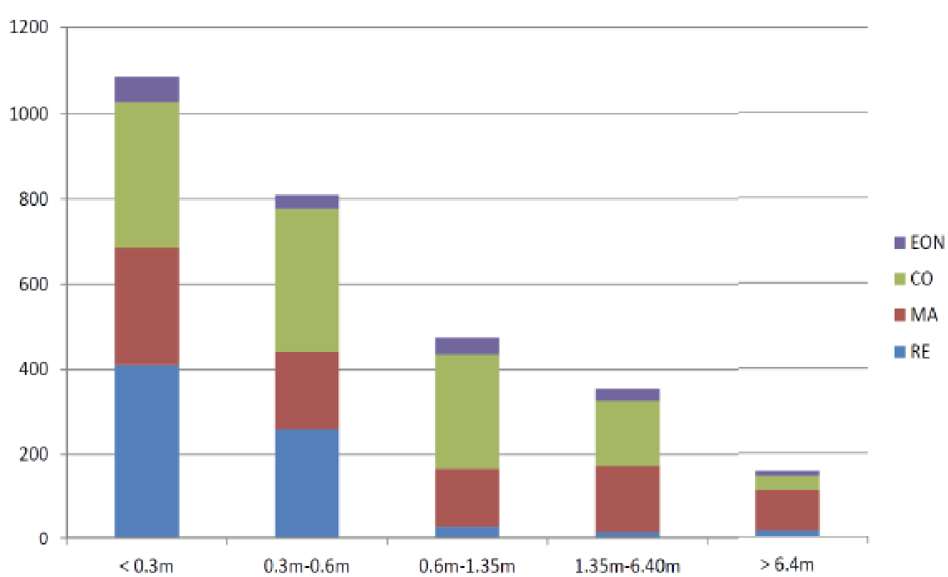
OCCUPANCY SPLIT BY CLAIM SIZE



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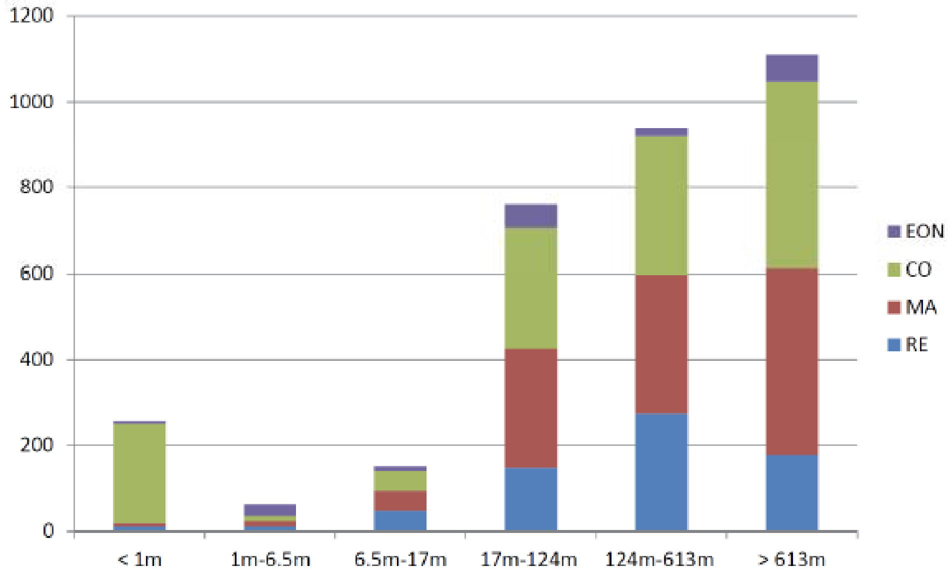
OCCUPANCY SPLIT BY TIV



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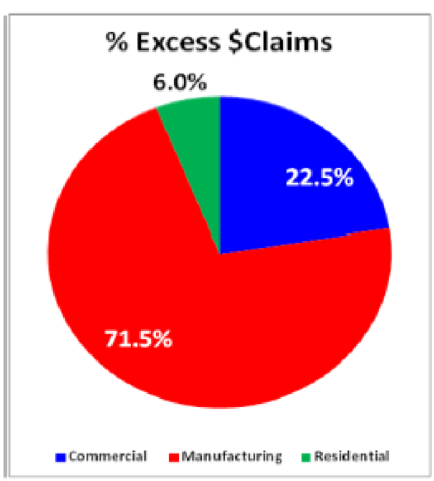
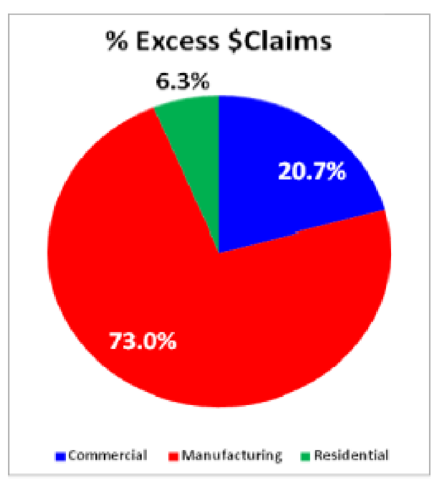
OCCUPANCY SPLIT BY LOCATION



North America

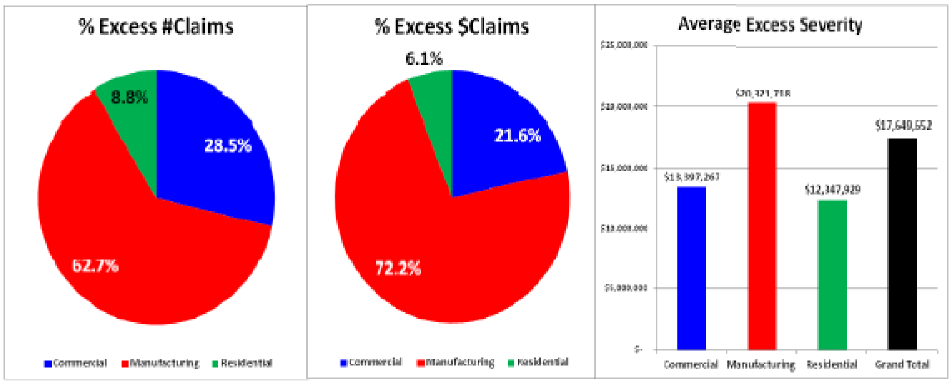


Rest of the World

FGU claims > USD 5m

VALIDATION

- Imperial-IICI data vs. Property Size-of-Loss Database (PSOLD) [John Buchanan (ISO-Verisk)]



FGU claims > USD 5m

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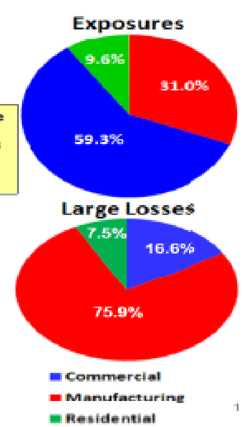
VALIDATION - Cross-occupancy comparison

- Imperial-IICI data vs. Property Size-of-Loss Database (PSOLD) [John Buchanan (ISO-Verisk)]

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 5X5 Threshold 25mm	% XS Threshold
Commercial	2,727.6	33	16.6%	1,903	15.2%
Manufacturing	14,055.3	151	75.9%	10,278	82.3%
Residential	689.0	15	7.5%	314	2.5%
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)



Source: National Fire Protection Association as compiled by ISO Verisk.

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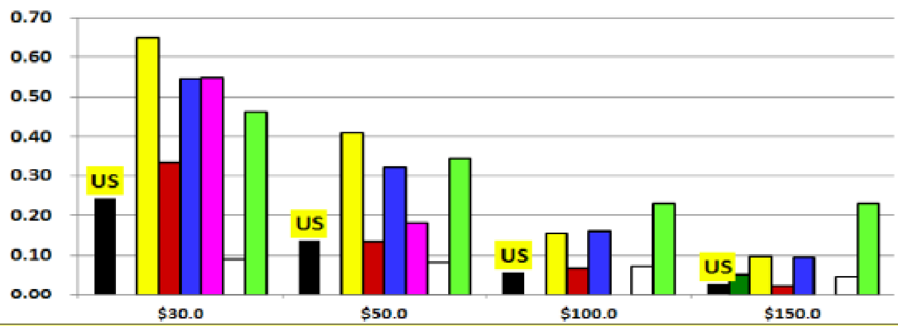
VALIDATION - Cross-country comparison

- Imperial-IICI data vs. Property Size-of-Loss Database (PSOLD) [John Buchanan (ISO-Verisk)]



• 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

Source: ISO Verisk.

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TAIL RISK

Tail index (α) estimation: $\mathbb{P}(Z > z) \sim Cz^{-\alpha}$

- Existence of centered moments (mean, variance, etc.)
  - Mean/Variance finite if and only if $\alpha > 1$ ($\alpha > 2$)
- Extent of diversification benefits for quantile-based risk measures
  - Retain fractions $w_1, \ldots, w_n$ of risks $X_1, \ldots, X_n$
  - Resulting aggregate risk $Z_{(w_1,\ldots,w_n)} = \sum_i w_i X_i$
  - $VaR_p(Z_{(1,0,\ldots,0)}) < VaR_p(Z_{(\frac{1}{n},\ldots,\frac{1}{n})})$ for $\alpha \in (0,1), p \in (0,1/2)$, for stable distributions (e.g., Ibragimov, 2009)

What do we find for LCR?

- Heavy tails & significant heterogeneity across occupancy type

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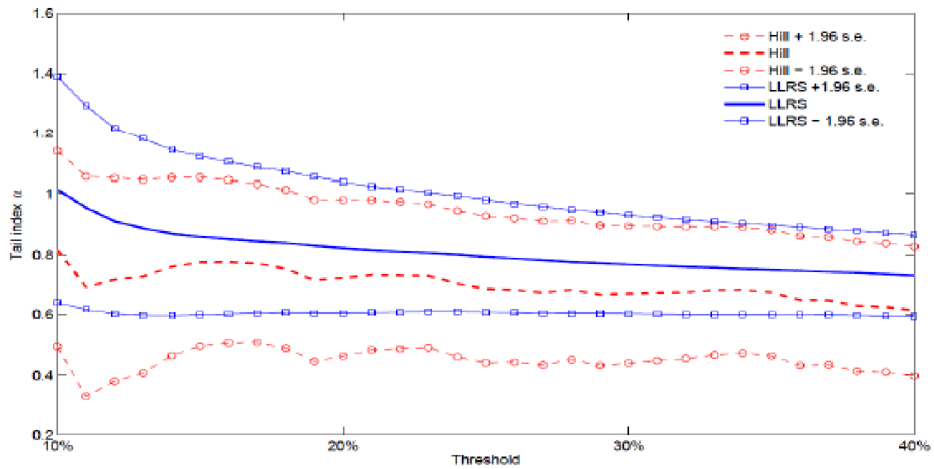
RESIDENTIAL EXAMPLE (ALL TIVs)



Hill (1975) vs. Gabaix-Ibragimov (2011)'s log-log rank-size regression method with optimal ranks shift -1/2 and correct standard errors.

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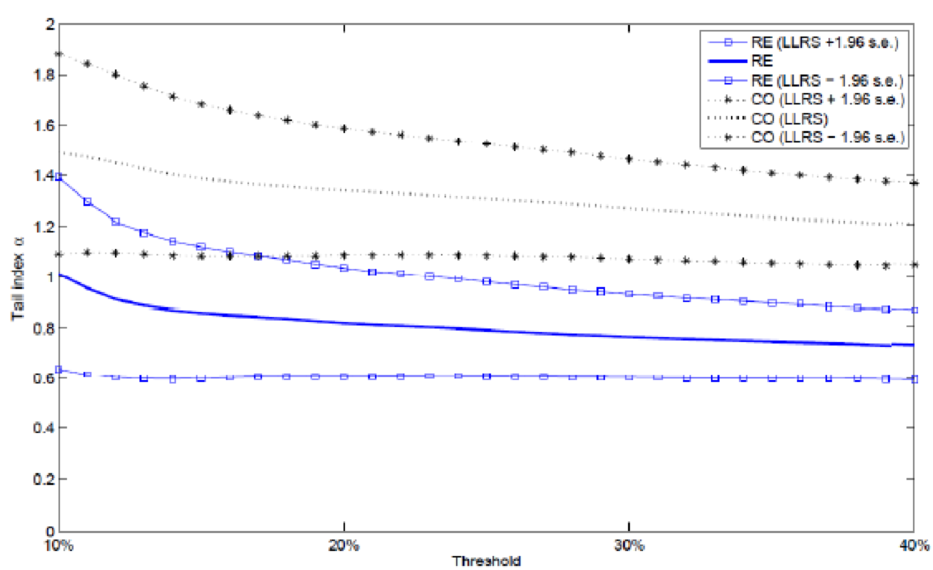
OCCUPANCY LEVEL 1 (ALL TIVs)



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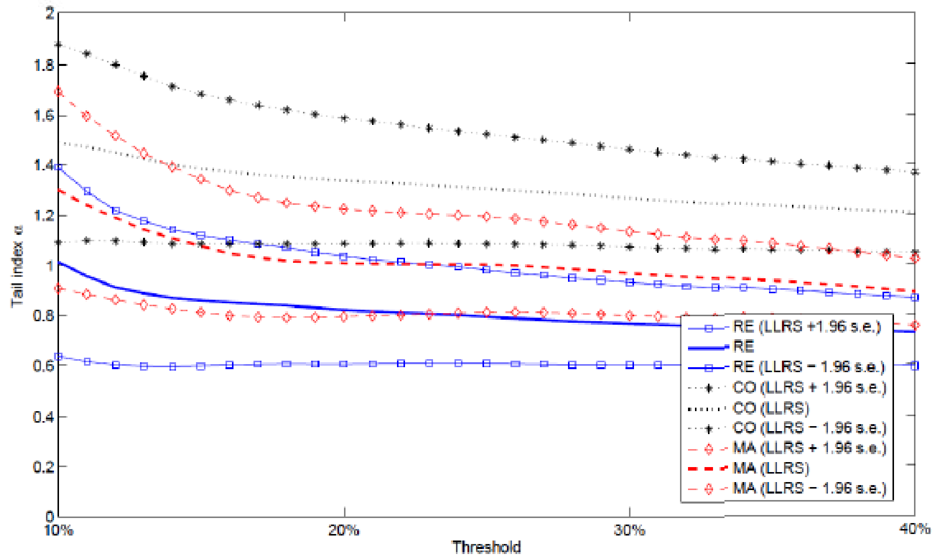
OCCUPANCY LEVEL 1 (ALL TIVs)



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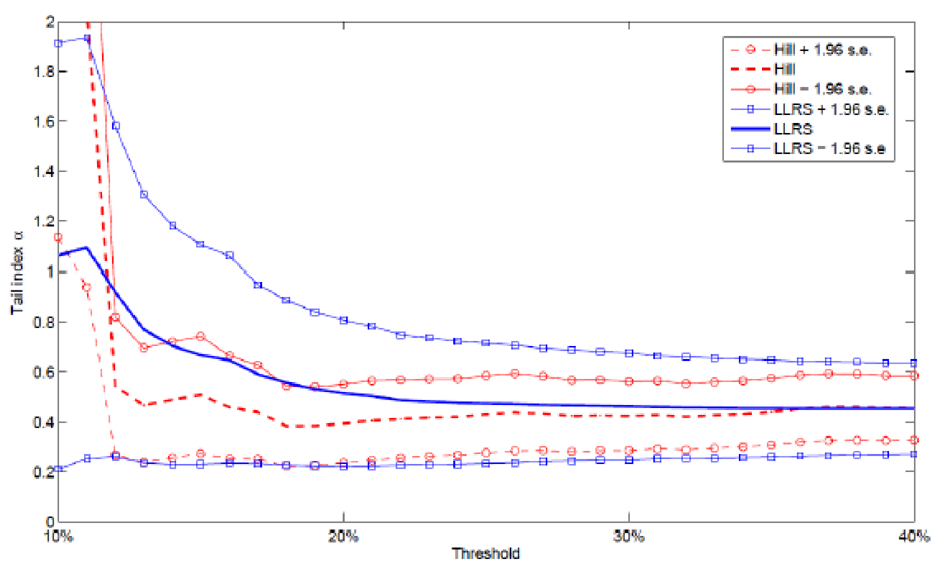
OCCUPANCY LEVEL 3 - Large Hotels



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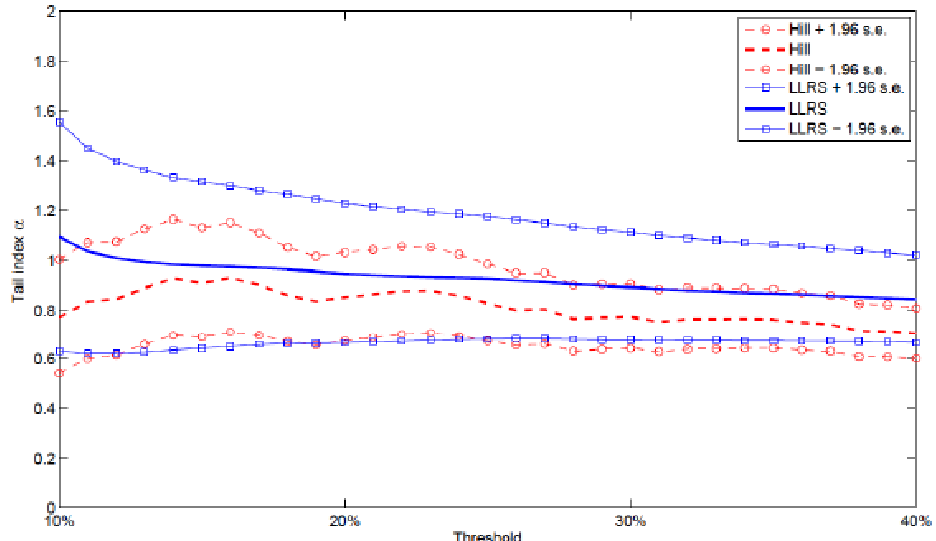
OCCUPANCY LEVEL 3 - Institutional Housing, Condos, Housing Associations



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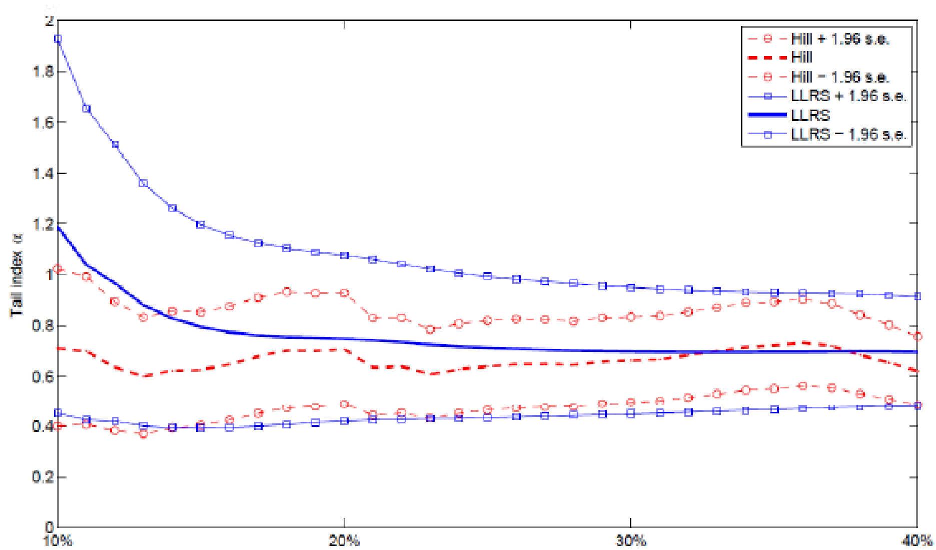
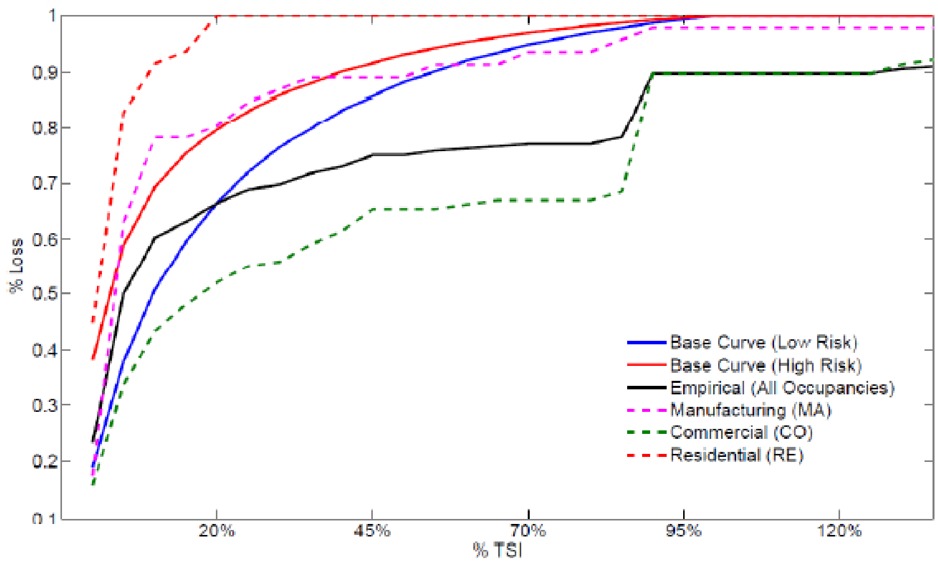
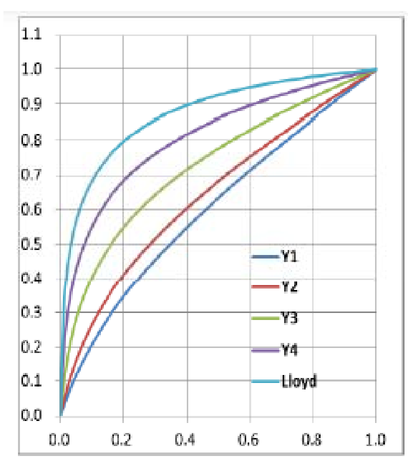
OCCUPANCY LEVEL 2 - Chemicals, Metals, Mines



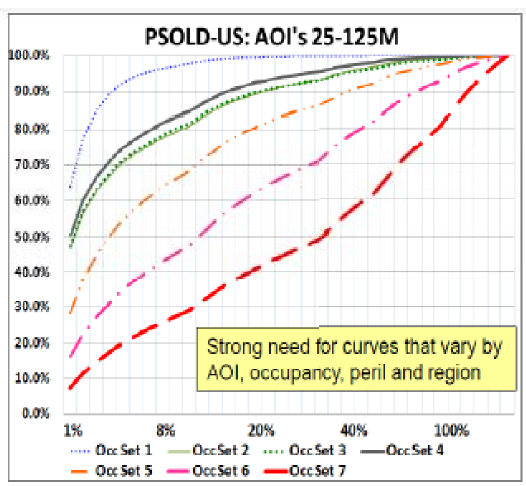
BENCHMARKING EXERCISE - A SPECIFIC TIV BAND



LOSS CURVES HETEROGENEITY



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



PSOLD has over 1 million individual curves for 60 AOI bands, 38 occupancies, 4 sets of perils, 50 states, etc.; some collapse to between 500 and 1,000 curves

Source: John Buchanan (ISO-Verisk).

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NEXT STEPS

New data source for LCR

- Robust estimation of tail risk
- Comparing claim costs across occupancy/TIV bands/location

Lessons from Imperial-IICI data collection, validation, and analysis

- Link between claims and exposures crucial: Systematic storage of claims & exposures information (policy schedules & claims narratives in digital, compatible format) should be a priority
- Macro-validation (e.g., Fire Protection Agencies) & micro-validation (e.g., syndicate level) of data important for *structural* understanding of risk
- Gains from data aggregation HUGE - please contribute!

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WORK IN PROGRESS (ASIA-PACIFIC REGION) & NEXT STEPS

NANYANG TECHNOLOGICAL UNIVERSITY

Insurance Risk & Finance Research Centre
at Nanyang Business School Singapore

www.irfrc.com

SCOR

Verisk Analytics

White Paper

Large Commercial Property Risk Loss Estimation: A Practitioner's Application to the Netherlands

John Buchanan (Verisk/ISO)
Enrico Biffis (Imperial College Business School)
25 Sept 2014

Verisk Insurance Solutions | ISO AIR WORLDWIDE XACTWARE

Large Commercial Property Risk Loss Estimation: A Practitioner's Application to Netherlands

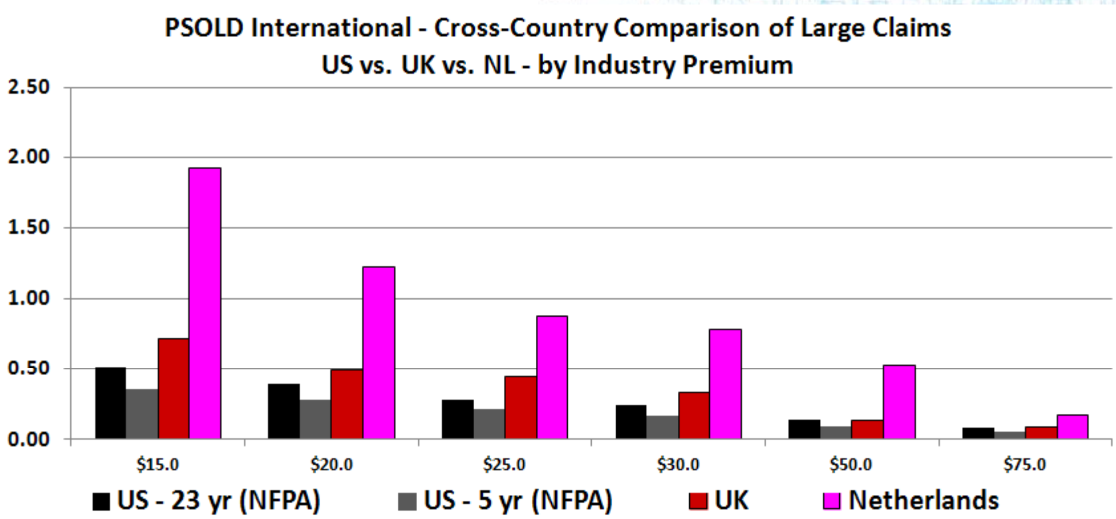
John Buchanan (Verisk / ISO)
Enrico Biffis (Imperial College Business School)
22 September, 2014

Abstract
Reinsurance pricing actuaries and underwriters are confronted with many challenges when attempting to produce credible loss estimates for the layering of large commercial risks globally. Of particular difficulty is amassing, validating, and using various estimations of size-of-loss curves, estimating total ground-up non catastrophe loss estimates, and estimating cat potential losses for these large commercial risks. Using Netherlands as an example of the concepts, in this paper we present methodologies and validation procedures to help utilize information from local and global sources in an attempt to produce plausible property benchmarks and apply them in a real setting reflecting unique country exposing characteristics.

We will also go through a practical application of this information to illustrate striking a balance between the benchmarks that are presented in this paper, and weighed with actual granular level adjustments needed to reflect substantial heterogeneity in the exposing characteristics such as protections, constructions, occupancies, and forces specific to the Netherlands. This paper will illustrate how to credibly use this exposure based information along with illustrative experience results.

Large Commercial Property Risk Loss Estimation: A Practitioner’s Application to the Netherlands

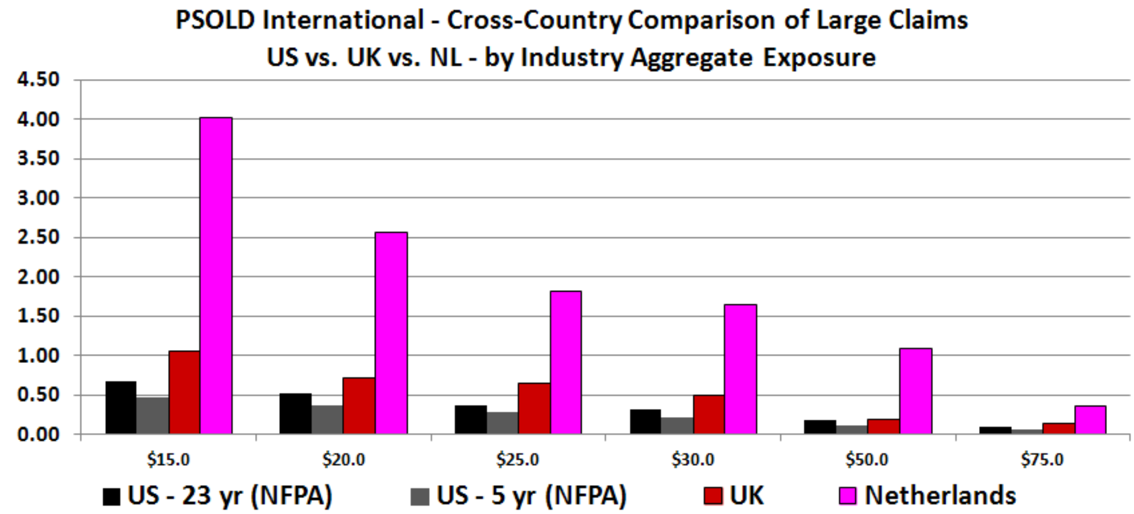
- **Overview**
  - o Netherlands vs. US and UK
  - o Attempting to solve the Puzzle – Non-cat Excess vs. Ground-up
- **A. Non-cat Excess Loss Estimates**
  - o Important link between exposures and losses
  - o US vs. International loss scales – COPE-ARM adjustments
  - o Cross-country validations – macro and micro view
- **B. Non-cat Ground-up Loss Estimates**
  - o Breakdown by perils – Fire, Wind, other causes of loss
  - o Scaling adjustments
- **C. Cat Estimates**
  - o Hazards by country
- **D. Bringing It All Together**
  - o Case Study – 1000 NL Offices and Light Manufacturing



# of Large Claims Per $Bn of Subject Premium (Thresholds in $M)

Source: **US: National Fire Protection Association (1990-2012)**
UK: Fire Protection Association (2000s)
Netherlands: NIVRE/VVV (2010-2013)

Why is NL so much worse for large claims than US or UK?



# of Large Claims Per $Tn of Industry Aggregate Exposure Database - AIR (Thresholds in $M)

Source: US: National Fire Protection Association (1990-2012)
UK: Fire Protection Association (2000s)
Netherlands: NIVRE/VVV (2010-2013)

Non-Cat and Cat Perils

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 sources split non-cat and cat losses into three components. Relative size varies significantly by territory / occupancy, etc.

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

International Property
A. Non-Cat Excess Loss Estimates

Sample FPA Data Collection
Netherlands – Original Data

NIVRE

Grote branden eerste kwartaal 2012

Ramingen van branden groter dan 1 miljoen Euro

Datum	Plaats	Soort bedrijf	Bedrag
januari			
1	Velsen	Buurtcentrum	€ 1.500.000,00
2	Nijmegen	Voetbalstadion	€ 2.000.000,00
6	Leek	Handel in bouwmaterialen	€ 1.000.000,00
8	Gorinchem	Bedrijfsverzamelgebouw	€ 2.500.000,00
8	Pijnacker	Bedrijfsverzamelgebouw	€ 2.000.000,00
8	Vriezenveen	Horeca	€ 1.500.000,00
8	Kwintsheul	Supermarkt	€ 2.000.000,00
13	Oirschot	Fabrikant tuin/decomaterialen	€ 1.500.000,00
16	Vianen	Bedrijfspand	€ 3.000.000,00
21	Roermond	Producent verpakkingsmateriaal	€ 4.000.000,00
24	Waalwijk	Diverse bedrijfspanden	€ 1.000.000,00
26	Zutpen	Bakkerij	€ 3.000.000,00
Totaal			**€ 25.000.000,00**
februari			
1	Ravenstein	Woonboerderij	€ 1.000.000,00
3	Tolbert	Partycentrum	€ 4.000.000,00
7	Ter Apel	Fabriekshal aardappelverwerking	€ 8.000.000,00
8	Grijpskerk	Bedrijfsverzamelgebouw	€ 2.000.000,00
11	Giesbeek	Bad en keukenhandel	€ 1.000.000,00
17	Lichtenvoorde	Bedrijfsverzamelgebouw	€ 1.500.000,00
24	Echt	Cosmeticabedrijf	€ 1.500.000,00
24	Enschede	Parketvloerenbedrijf	€ 4.000.000,00
24	Rotterdam	Laboratorium	€ 1.000.000,00
25	Steenwijk	Biomassacentrale / opslaghal	€ 6.000.000,00
Totaal			**€ 30.000.000,00**

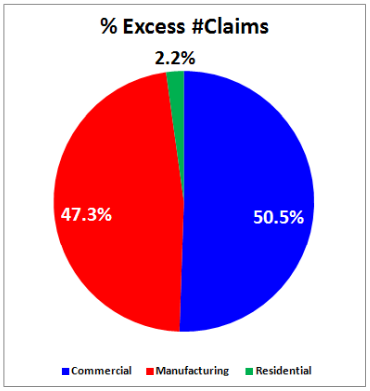
Large Netherlands Claims Validation by Type

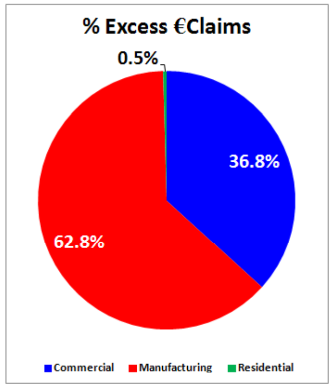
PSOLD - International
Netherlands Cross-Country Data Validation
Source: N/VRE (Fire Protection Association Data)

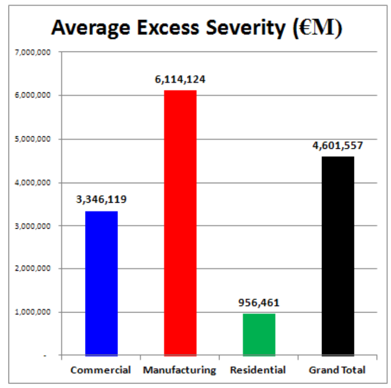
Threshold (All) 2.5 in million Euro

Values

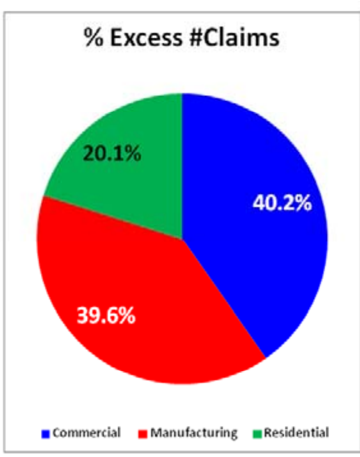
Row Labels	Sum of #Claims > Threshold	Sum of ıClaims > Threshold (M)	Sum of ıClaims Excess of Threshold (M)	Average Loss	Average Excess Loss
Commercial	92	538	308	5,846,119	3,346,119
Manufacturing	86	741	526	8,614,124	6,114,124
Residential	4	14	4	3,456,461	956,461
Grand Total	182	1,292	837	7,101,557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

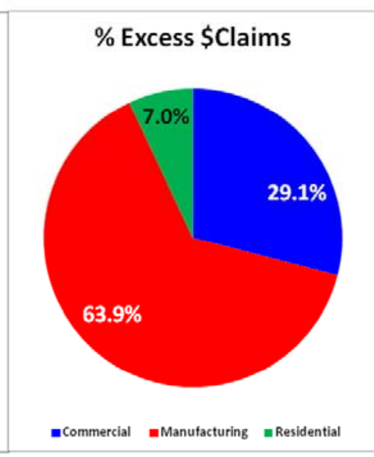


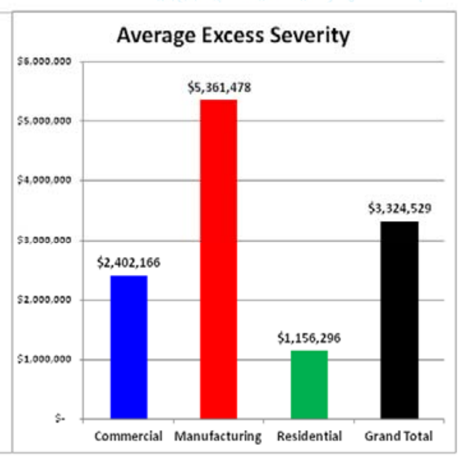




Additional Validation: Imperial-IICI Dataset
Imperial College – IICI Large Commercial Risks (LCR)





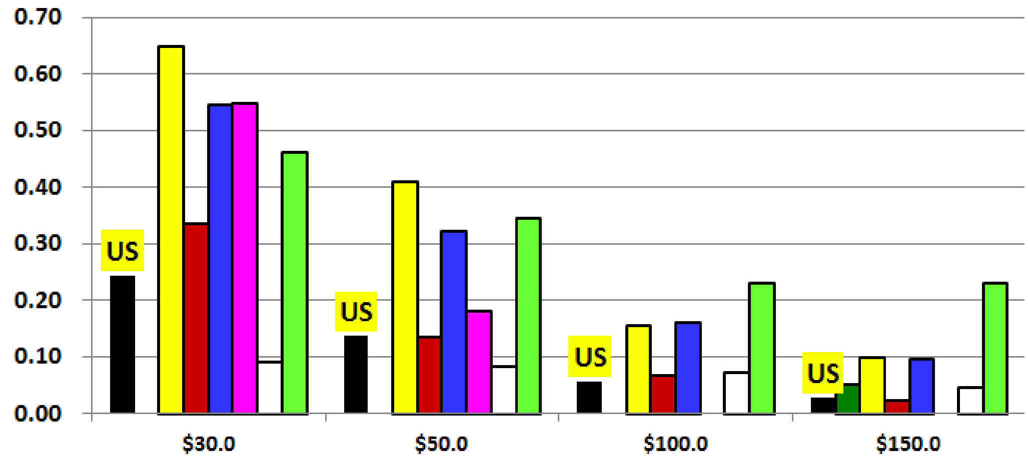


Threshold: All Claims >= $0M
n= 3,080

- 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
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

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

Commercial / Industrial

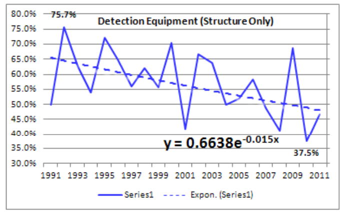
		US	Country A	Country B	Country C	Country D	Country E	Country F	Country G
Construction	C		H	M	L		M	M	M
Occupancy	O		L	H		M		H	L
Protection	P			M	M	M	H	M	H
Exposure (e.g. industrial facilities)	E			M	L	H			L
Amount of Insurance	A		M			M	L	H	M
Replacement Costs	R		M	L	H	L	L	H	M
Miscellaneous	M			M		L		H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

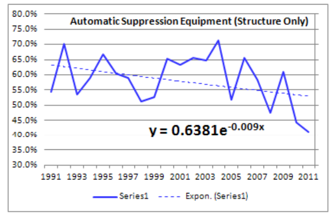
Impact Key *(compared to US)*	
Direction	Worse
	Better
	No difference
Magnitude	H = High
	M = Moderate
	L = Low

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

NFPA US Large Loss Data Collection
Detection / Suppression Trends

NFPA US - Analysis of Fire Protection Equipment - 21 Year





			Loss Type				Detection Equipment (Structure Only)			utomatic Suppression Equipment (Structure Onl		
Threshold (mm	Loss Ye	Total Los	Structu	Outside of Structu	Vehicl	Wildfi	None	Some Typ	Unknow	None	Some Type	Unknown
10	2011	22	17	1	1	3	7	8	2	7	10	0
10	2010	17	15	1	0	1	3	5	7	4	5	6
10	2009	24	19	0	2	3	11	5	3	11	7	1
10	2008	35	31	0	0	4	7	10	14	10	11	10
5	2007	71	59	0	2	10	20	21	18	28	20	11
5	2006	45	38	0	3	4	14	10	14	19	10	9
5	2005	38	37	0	1	0	14	13	10	14	13	10
5	2004	46	41	2	3	0	16	16	9	25	10	6
5	2003	46	41	0	1	4	21	12	8	22	12	7
5	2002	46	41	0	1	4	24	12	5	23	12	6
5	2001	52	49	0	1	2	18	25	6	26	15	8
5	2000	61	55	0	0	6	31	13	11	32	17	6
5	1999	66	56	1	4	5	20	16	20	19	17	20
5	1998	55	50	0	4	1	23	14	13	19	18	13
5	1997	56	50	0	4	2	23	18	9	23	16	11
5	1996	59	52	1	4	2	26	14	12	26	17	9
5	1995	43	42	0	0	1	26	10	6	26	13	3
5	1994	54	43	0	5	6	20	17	6	23	16	4
5	1993	54	45	0	4	5	25	15	5	23	20	2
5	1992	52	44	0	2	6	28	9	7	26	11	7
5	1991	47	39	0	4	4	17	17	5	19	16	4
	Total	989	864	6	46	73	394	280	190	425	286	153
	% Total	N/A	87.4%	0.6%	4.7%	7.4%	58.5%	41.5%	N/A	59.8%	40.2%	N/A

Note: Total losses from 1991-2007 >$5m and >$10m for 2008+

Note: 2001 excludes WTC

Source: ISO analysis of National Fire Protection Association data - Fire Loss in the United States Reports from 1991 to current

International Property
B. Non-Cat Ground-up Losses

Calculating Ground-Up Non-Cat Loss Costs (Illustrative)

- Non-Cat Loss = Base LC x
- Territorial Multiplier x
- Deductible Factor x
- Limit of Insurance Factor x
- (Limit of Insurance / 100) x
- Protection Factor x
- Sprinklered Relativity

Parameter	Building Value	Contents Value
Base loss cost (for specific occupancy/ construction combination)	0.175	0.220
Territorial Multiplier	1.150	1.150
Deductible Factor	0.870	0.730
Limit of Insurance Factor	0.600	0.750
Limit of Insurance	$42.5M	$9M
Subtotal	$44,647	$12,467
Protection Factor	1.00	1.00
Sprinklered Relativity	0.85	0.85
Loss Estimate	$37,950	$10,597
Basic Group 1: Fire et al (building & contents)	**$48,547**	

Portability to Australia (Illustrative) - NonCat Ground-Up Loss Costs and Layering

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

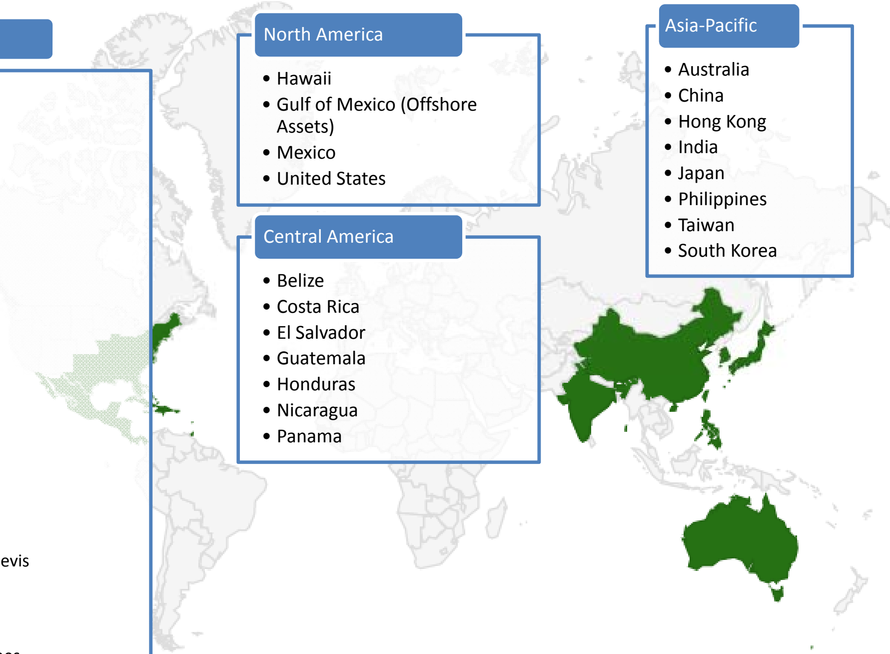
Adjusting Ground-up Loss Costs by Region and Peril Component – NL (Illustrative)

	Proxy State Group		Region Scalar
Netherlands - L	US Low States	00095	0.85
Netherlands - M	US Countrywide	00099	0.95
Netherlands - H	US HIgh States	00097	1.10
Netherlands - S	US Very HIgh States	00098	1.25

	Minimum Loss Cost	US & Intl Peril Scalar
BG1 (Fire, Lightning, Sprnklr Lkg)	0	1.25
BG2 (Wind, WCSHAVERS)	0	0.25
SCL (Water Dmg, Collapse, Theft)	0	0.50

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

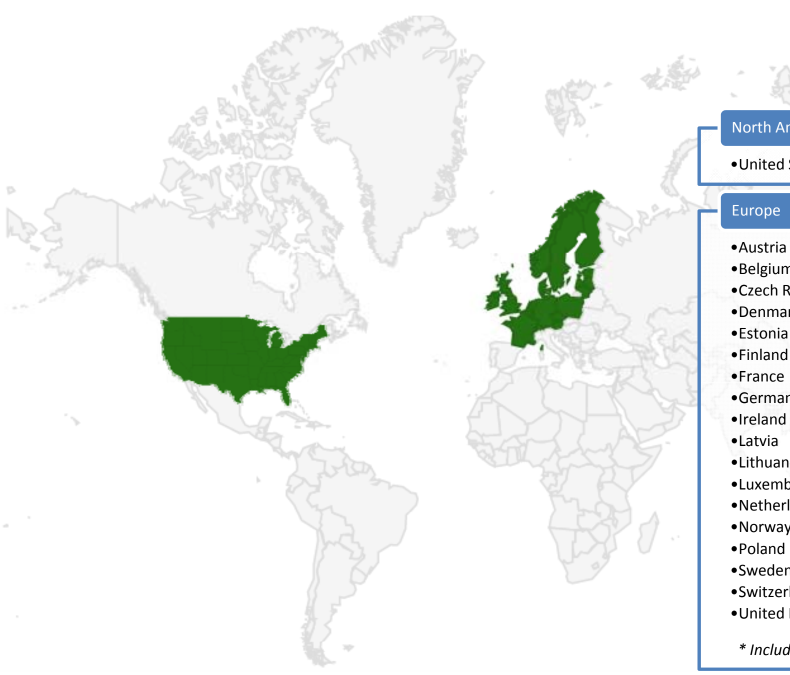
- Belize
- Costa Rica
- El Salvador
- Guatemala
- Honduras
- Nicaragua
- Panama

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

Netherlands Case Study – White Paper
Include Ground-up, Excess and Cat Components

- **Case Study**
  - 1000 Netherlands exposures split between Commercial and Industrial (banded profile)
- **Ground-up Loss Costs**
  - Use NL ground-up loss cost factors that have been adjusted for Fire, Wind, and other cause of loss factors from US or other source
  - Include construction, occupancy, protection (location or region) and other exposure selections – either identified or judgmental
- **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
- **Combined Results**
  - Total ground-up and excess layer cat and noncat results in aggregate and by exposure

Case Study – Netherlands Banded Profile (Illustrative)

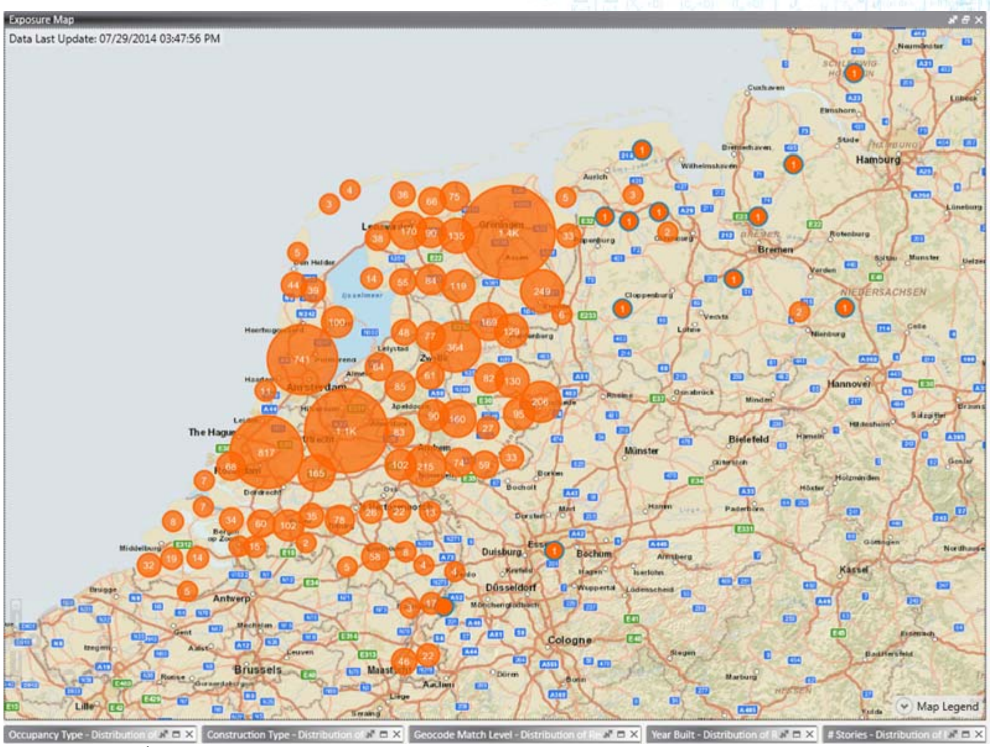
Commercial				
Sum Insured (EUR)		Total Sum Insured	Number	Premium
-	500,000	58,904,000	290	172,642
500,001	1,000,000	75,591,000	108	180,483
1,000,001	2,000,000	174,873,000	122	332,542
2,000,001	5,000,000	287,917,000	92	447,804
5,000,001	7,500,000	150,015,000	24	209,515
7,500,001	10,000,000	103,247,000	12	130,705
10,000,001	12,500,000	168,046,000	15	170,971
12,500,001	15,000,000	273,308,000	20	254,471
15,000,001	20,000,000	449,610,000	26	416,152
20,000,001	25,000,000	287,708,000	13	177,028
25,000,001	50,000,000	818,160,000	24	401,052
50,000,001	100,000,000	265,495,000	4	106,635
Total		3,112,874,000	750	3,000,000
Total Comm'l + Industrial		4,029,168,000	1,000	4,000,000

Industrial				
Sum Insured (EUR)		Total Sum Insured	Number	Premium
-	500,000	15,744,000	82	50,236
500,001	1,000,000	30,373,000	41	79,046
1,000,001	2,000,000	34,853,000	24	69,499
2,000,001	5,000,000	157,877,000	40	208,191
5,000,001	7,500,000	191,957,000	31	218,303
7,500,001	10,000,000	115,248,000	13	125,692
10,000,001	12,500,000	56,236,000	5	60,856
12,500,001	15,000,000	81,742,000	6	65,495
15,000,001	20,000,000	37,532,000	2	24,933
20,000,001	25,000,000	43,364,000	2	25,836
25,000,001	50,000,000	82,110,000	3	43,547
50,000,001	100,000,000	69,258,000	1	28,366
Total		916,294,000	250	1,000,000

Note: Sum insureds are total of Building + Contents + Time Element (Business Interruption) - per policy

Source: compiled from AIR Cede file

Netherlands – Geospatial Exposure



Ground-Up Non-cat Loss Costs – NL (Illustrative)

						Total Premium & Loss Cost Info	
Company	White Paper-NL Case Study	Total Exposure Info					ELR
Program	Offices / Light Mnfg	Total AOI	4,029,168,000		Total	2,405,108	60.1%
Inception Date	1/1/2015	# of Exposures	1,000		Total / AOI	0.060	
Comment	Initial non-cat - before adj. for exper.	Average Exposure	4,029,168				
		Largest Exposure	76,854,000				

PSOLD Country - Region	Description/Record Index	BUILDING Amount of Insurance ($)	CONTENT Amount of Insurance ($)	TIME ELEMENT Amount of Insurance ($)	CSP Class Code	Portfolio GULC Scalar	IRV Class Based Total Loss Costs	ELR (IRV GULC/ Actual Prem)
Netherlands - M	1_C2259-9301	56,924,000	13,300,000	6,630,000	0702	0.95	19,047	59.4%
Netherlands - M	2_C3750-7951	53,983,000	12,610,000	6,290,000	0702	0.95	18,062	59.4%
Netherlands - M	3_C3426-7735	53,256,000	12,440,000	-	0702	0.95	13,981	59.4%
Netherlands - M	4_C7517-3371	44,842,000	-	5,220,000	0702	0.95	12,219	59.4%
Netherlands - M	5_C2293-9402	37,272,000	-	-	0702	0.95	8,963	59.4%
Netherlands - H	6_C518-9501	36,360,000	8,490,000	4,240,000	0702	1.10	16,346	59.4%
Netherlands - M	7_C4040-3771	36,026,000	8,420,000	4,200,000	0702	0.95	12,056	59.4%
Netherlands - L	8_C7463-2964	34,728,000	8,110,000	-	0702	0.85	5,188	59.4%
Netherlands - M	9_C2098-9411	33,477,000	-	3,900,000	0702	0.95	8,475	59.4%
Netherlands - M	10_C934-7822	31,884,000	-	-	0702	0.95	7,299	59.4%
Netherlands - M	11_C382-7971	31,381,000	7,330,000	3,660,000	0702	0.95	10,500	59.4%
Netherlands - L	12_C5748-1601	30,294,000	7,080,000	3,530,000	0702	0.85	5,869	59.4%
Netherlands - M	13_C385-7981	28,272,000	6,610,000	-	0702	0.95	11,300	59.4%
Netherlands - M	14_C389-7991	28,052,000	-	3,270,000	0702	0.95	9,590	59.4%
Netherlands - M	15_C2292-9402	27,945,000	-	-	0702	0.95	8,279	59.4%
Netherlands - M	751_I1277-7951	49,508,000	13,820,000	5,930,000	0520	0.95	17,699	62.4%
Netherlands - M	752_I282-7783	21,753,000	6,070,000	2,600,000	0520	0.95	9,496	62.4%
Netherlands - M	753_I1359-3861	20,161,000	5,630,000	-	0520	0.95	7,244	62.4%
Netherlands - M	754_I1339-3771	19,625,000	-	2,350,000	0520	0.95	5,206	62.4%
Netherlands - M	755_I1124-7902	18,753,000	-	-	0520	0.95	6,530	62.4%

- Individual exposures assigned to LMH region based on postal code; construction/ sprinkler usage was selected based upon building size; occupancies selected: offices and light manufacturing for commercial and industrial – sensitivity testing
- Includes Peril scalars to adjust for expected Fire, Wind, other causes of loss differentials for US vs. Netherlands
- Include additional country/region scalars as needed to balance back to credible actual expected loss ratio (vs. 60.1% indicated LR)

Source: ISO Rapid Valuator –International with ISO-Portal

Ground-Up Non-cat Loss Costs – NL (Illustrative) Results by Peril

			Proportion to PSOLD				Total
			Fire et al BG1	Wind et al BG2	Special COL	TE (BI)	Attritional (non-cat)
		Peril Scalars:	125%	25%	50%	100%	84.7%
1000	$ 3,296,838,000	Total after Peril Scaling:	$ 1,778,864	$ 176,541	$ 259,922	$ 189,781	$ 2,405,108
		Total before Peril Scaling:	$ 1,423,091	$ 706,163	$ 519,815	$ 189,781	$ 2,838,850

Description/ Record Index	Building AOI	State / Region	BG1 Loss Cost	BG2 Loss Cost	SCL Loss Cost	*TE Loss Cost 15% (BG1+BG2)*	Total Loss Cost
1_C2259-9301	56,924,000	Netherlands - M	$ 11,940	$ 1,190	$ 2,753	$ 3,164	$ 19,047
2_C3750-7951	53,983,000	Netherlands - M	$ 11,323	$ 1,129	$ 2,611	$ 3,000	$ 18,062
3_C3426-7735	53,256,000	Netherlands - M	$ 10,719	$ 987	$ 2,275	$ -	$ 13,981
4_C7517-3371	44,842,000	Netherlands - M	$ 7,246	$ 949	$ 2,070	$ 1,954	$ 12,219
5_C2293-9402	37,272,000	Netherlands - M	$ 6,023	$ 932	$ 2,008	$ -	$ 8,963
6_C518-9501	36,360,000	Netherlands - H	$ 9,470	$ 1,399	$ 2,900	$ 2,577	$ 16,346
7_C4040-3771	36,026,000	Netherlands - M	$ 7,557	$ 753	$ 1,742	$ 2,002	$ 12,056
8_C7463-2964	34,728,000	Netherlands - L	$ 3,390	$ 442	$ 1,355	$ -	$ 5,188
9_C2098-9411	33,477,000	Netherlands - M	$ 5,217	$ 580	$ 1,288	$ 1,391	$ 8,475
10_C934-7822	31,884,000	Netherlands - M	$ 5,152	$ 675	$ 1,472	$ -	$ 7,299
11_C382-7971	31,381,000	Netherlands - M	$ 6,582	$ 656	$ 1,518	$ 1,744	$ 10,500
12_C5748-1601	30,294,000	Netherlands - L	$ 3,031	$ 515	$ 1,488	$ 835	$ 5,869

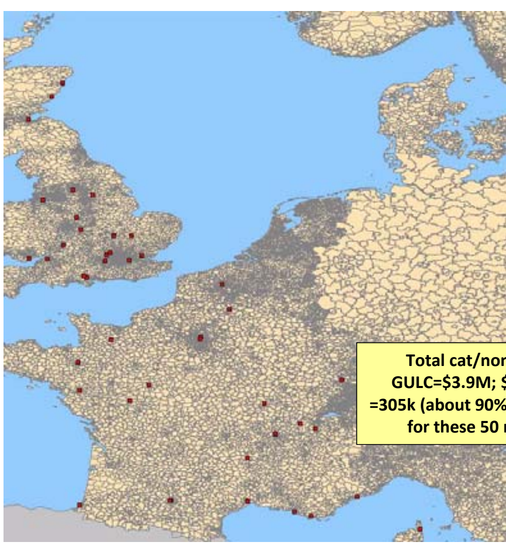
Source: ISO Rapid Valuator –International with ISO-Portal

Ground-up and Excess Layer Distribution – Non-cat

Description/ Record Index	Building AOI	PSOLD Input: PSOLD-Attritional Expected Loss	Base - 500 XS 0 XS Loss	Sub1 - 500 XS 500 XS Loss	Sub2 - 500 XS 1,000 XS Loss	Sub3 - 1,000 XS 1,500 XS Loss	Layer1 - 2,500 XS 2,500 XS Loss	Layer2 - 5,000 XS 5,000 XS Loss	Layer3 - 10,000 XS 10,000 XS Loss	LAyer4 - 180,000 XS 20,000 XS Loss
		Layer %	40.2%	12.6%	7.4%	9.4%	12.2%	9.2%	5.3%	3.7%
		Return Period	1.15	2.30	3.45	5.62	12.88	41.60	150.51	
1000	$ 3,296,838,000	$ 2,405,118	$ 966,170	$ 303,679	$ 177,602	$ 226,231	$ 293,996	$ 220,878	$ 127,096	$ 89,467
			PSOLD Outputs - Attritional							
1_C2259-9301	56,924,000	$ 19,047	$ 1,848	$ 954	$ 720	$ 1,151	$ 2,110	$ 2,771	$ 3,211	$ 6,282
2_C3750-7951	53,983,000	$ 18,062	$ 1,752	$ 905	$ 683	$ 1,092	$ 2,001	$ 2,628	$ 3,045	$ 5,957
3_C3426-7735	53,256,000	$ 13,981	$ 1,356	$ 701	$ 529	$ 845	$ 1,549	$ 2,034	$ 2,357	$ 4,611
4_C7517-3371	44,842,000	$ 12,219	$ 1,622	$ 817	$ 600	$ 920	$ 1,558	$ 1,829	$ 1,917	$ 2,956
5_C2293-9402	37,272,000	$ 8,963	$ 1,417	$ 707	$ 512	$ 767	$ 1,238	$ 1,347	$ 1,305	$ 1,671
6_C518-9501	36,360,000	$ 16,346	$ 2,170	$ 1,093	$ 802	$ 1,231	$ 2,084	$ 2,447	$ 2,565	$ 3,955
7_C4040-3771	36,026,000	$ 12,056	$ 1,600	$ 806	$ 592	$ 908	$ 1,537	$ 1,805	$ 1,892	$ 2,917
8_C7463-2964	34,728,000	$ 5,188	$ 689	$ 347	$ 255	$ 391	$ 662	$ 777	$ 814	$ 1,255
9_C2098-9411	33,477,000	$ 8,475	$ 1,340	$ 668	$ 484	$ 725	$ 1,171	$ 1,273	$ 1,234	$ 1,580
10_C934-7822	31,884,000	$ 7,299	$ 1,154	$ 576	$ 417	$ 624	$ 1,008	$ 1,097	$ 1,063	$ 1,361
100_C6999-2636	9,292,000	$ 2,543	$ 733	$ 340	$ 234	$ 325	$ 447	$ 343	$ 121	$ -
101_C1-3842	162,000	$ 403	$ 403	$ -	$ -	$ -	$ -	$ -	$ -	$ -
102_C2-6221	238,000	$ 550	$ 525	$ 25	$ -	$ -	$ -	$ -	$ -	$ -
103_C3-7941	549,000	$ 954	$ 755	$ 156	$ 43	$ -	$ -	$ -	$ -	$ -
104_C4-7961	1,584,000	$ 1,742	$ 1,112	$ 292	$ 141	$ 150	$ 47	$ -	$ -	$ -
996_I304-7918	302,000	$ 630	$ 567	$ 63	$ -	$ -	$ -	$ -	$ -	$ -
997_I305-7925	90,000	$ 257	$ 257	$ -	$ -	$ -	$ -	$ -	$ -	$ -
998_I306-7926	199,000	$ 429	$ 410	$ 19	$ -	$ -	$ -	$ -	$ -	$ -
999_I307-7941	231,000	$ 363	$ 351	$ 12	$ -	$ -	$ -	$ -	$ -	$ -
1000_I310-8401	65,000	$ 109	$ 109	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Source: ISO PSOLD-International – capping losses at 150% of AOI

Case Study 2: 50 European Locations



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

Loc ID	Cat Expected Losses: Total (GroundUp)	Cat Expected Losses: 5xs5	NonCat Expected Losses: Total (GroundUp)	NonCat Expected Losses: 5xs5	Combined: Total	Combined: 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

Appendix

Netherlands - Sample FPA Data Collection Sample Fire Cause Comments

Yr	Mo	Date	Estimated PSOLD12 RG	Validation Occs PSOLD12 Name	Original Dutch Description	Actual Estimated Loss (in EUR mm)	Trended Estimated Loss (in EUR mm)	Translation:	Loss Type:	Estimated Ultimate Loss (Lloyd's, broker,...)	Estimated Exposure (Amount of Insurance)	Claim / exposure comments (cause, detection/suppression, conflagration,...)
2013	September	9/6/2013	30	Heavy		65.00	65.00	plastic company				Caused by technical problem, Fire started at adjacent business (Speck Pompen)
2013	July	7/21/2013	24	Commercial/Industrial		57.00	57.00	Waste disposal company				Caused by a power failure in a turbine to turn heat into electricity
2011	January	1/5/2011	30	Heavy	Chemiepak	50.00	53.05	chemical protection				Caused by hazardous actions that were against company rules and permit regulations. Employee did not activate alarm, powder extinguisher did not work, did not switch off flow of flamable resin.
2013	June	6/4/2013	27	Commercial/Industrial		50.00	50.00	bread factory				Fire started in shock freezer
2012	April	4/4/2012	14	Commercial/Industrial	Telefoniebedrijf	30.00	30.90	Telephone Company - network center 700 towers affected				Fire started in a company in the same building as Vodafone separated by a fire resistant wall instead of a fire resistant separation through the roof.
2013	April	4/3/2013	31	Commercial/Industrial		20.00	20.00	printing company				Fire started in a printing press, employees failed to extinguish the fire
2010	July	7/2/2010	8	Small Business	Recreatiebedrijf	14.79	16.16	Recreation company				Fire started in the attic
2013	April	4/23/2013	17	Small Business		16.00	16.00	chemical company - Gas Station				Fire started after a pump failed
2010	January	1/12/2010	27	Commercial/Industrial	Distributeur in voec	12.70	13.88	Food distributor				Fire started in a furnace. Took a long time for firefighters to come because of traffic due to the smoke
2012	July	7/18/2012	11	Local Authority	Gemeentehuis	12.50	12.88	Town hall				Caused when two cars drove into the building during the night
2011	January	1/21/2011	15	Commercial/Industrial	Parfumgroothandel	7.50	7.96	Perfume wholesaler				Substances containing alcohol quickly went up in flames
2013	March	3/28/2013	6	Commercial/Industrial		7.50	7.50	Hotel/sauna				Started on the roof where construction was taking place
2011	June	6/27/2011	5	Commercial/Industrial	Verzorgingstehuis	7.00	7.43	Nursing home				Started on the roof where renovations are happening. Roofer did not have a fire extinguisher
2011	November	#########	24	Commercial/Industrial	Voormalig Distribut	6.50	6.90	Former distribution center				Suspected arson
2011	January	1/19/2011	28	Heavy		5.00	5.30	Cocoa factory				Started from an explosion in a production line
2011	Juy	7/15/2011	23	Other		5.00	5.30	antenna				Caused by overheated cables . Antenna was undergoing maintenance when fire broke out
2013	June	6/20/2013	30	Heavy		5.00	5.00	lighter factory				Had all permits and met all fire safety requirements
2013	February	2/26/2013	6	Commercial/Industrial		4.00	4.00	hotel				Started in the sauna
2013	August	8/29/2013	8	Small Business		3.50	3.50	stadium				Started in the box that controls the lighting system

Source: NIVRE and Verisk/ISO

US - Sample FPA Data Collection Sample Fire Cause Comments

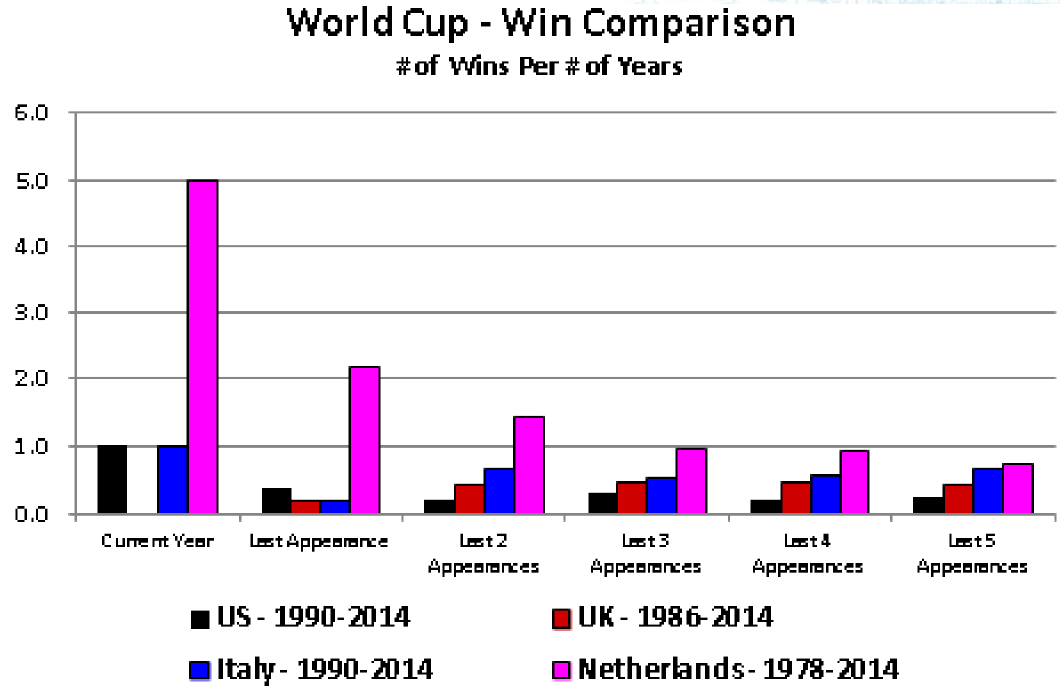
					226	30	234
Date	Type	Actual Estimated Loss (in $US mm	Estimated Ultimate Loss (Lloyd's, broker,...)	Estimated Exposure (Amount of Insurance)	Detection/Supression	Factors Afftecting Fire Department	Claim / exposure comments (cause, detection/suppression, conflagration,...)
1/5/2008	Manufacturing	400					Caused by a gas explosion in a furnace
3/20/2009	Casino	340			Fire alarms. Employee could not find fire extinguisher		Started by welders working on a kitchen duct
2/23/1991	Office	325			Smoke and heat detectors, sprinkler system not in location where the fire started	Inadequate water pressure	Caused by spontaneous ignition of linseed-oil-soaked rags for cleaning wood paneling
2/8/2008	Manufacturing	275			Heat and smoke detectors, sprinkler system was disabled by explosion		Caused by dust explosion
10/21/2010	Mall	110			Smoke alarms. Sprinkler system was shut off by worker for unknown reason, but worked effectively when turned back on, fire doors, fire walls, water curtains	Fire department could not enter immediately because of a bomb scare	Fire was started in a stockroom of a store from lighting toilet paper. Arson
5/1/1991	Manufacturing	105					Fire started near a nitroparaffin compressor and an explosion occurred
4/29/2007	Truck	100					Gasoline ignited after a crash
2/19/2007	Packing Plant	100					Started from an explosion
3/23/2008	Manufacturing	100					Explosion occurred in freezer
1/25/2008	Hotel/Casino	100			Smoke detectors and sprinklers		Workmen on the outside of the building caused the fire

Source: US National Fire Protection Association and Verisk/ISO

UK - Sample FPA Data Collection Sample Fire Cause Comments

Date	Estimated PSOLD12 RG	Type	Actual Estimated Loss (in GBP mm)	Loss Cause:	Estimated Ultimate Loss (Lloyd's, broker,...)	Estimated Exposure (Amount of Insurance)	Detection/Supression	Factors Afftecting Fire Department	Claim / exposure comments (cause, detection/suppression, conflagration,...)
12/11/2005	35	Buncefield oil storage depot in Hemel Hempstead	130	explosion/fire					The protection system which should have shut the supply of petrol to an overflowing tank did not work. Overflowing petrol led to an explosions and fire
1/20/2005	15	Supermarket/warehouse	65	arson					
3/15/2002	29	factory (motot cycle works)	59						Production lines destroyed
4/3/2005	15	Store/food industry - warehouse	38	unknown					Possible arson by an employee after dispute with boss about demotion
6/8/2005	27	Food industry - Sweets factory	26	cooking		100 million pound:	No sprinkler system		Fire began in a popcorn machine. The machine should have been more isolated. Failed supression system that was supposed to discharge carbon dioxide onto smodering popcorn.
9/16/2003	8	Museum	22	unknown		8 million pounds (for bikes)	No sprinkler system		Fire started when a discarded cigarette end ignighted a cardboard box of air conditioner filters.
10/6/2004	13	School	21	electrical					Fire started in boy's bathroom
2/20/2006	12	Church	19	petrol/oil related					Suspected arson
2/7/2006	14	Storage/offices - Textiles	17	unknown					Suspected arson
2/19/2005	29	Manufacturer	17	unknown					
7/27/2004	24	Warehouse - Chemical	16	unknown			No sprinkler system		May have been caused by spontaneous ignition of chemical vapors when coming into contact with air
10/24/2001	13	university	14			2 million pounds (books and			Started by a stray firework
5/21/2001	13	university	13						Royal Sun Alliance Insurance. Fire began in an office
3/21/2001	13	secondary school	13					Firefighters had trouble with water supply and pressure	Most likely cause was work being done on the roof earlier that day

Source: UK Fire Protection Association and Verisk/ISO



Another look at cross-country comparison statistics

John W. Buchanan

Verisk / ISO - Principal, Excess and Reinsurance

John.Buchanan@iso.com

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.

中再产险
CHINA RE P&C

Property Insurance in China and the Far East Region

Xiaoxuan(Sherwin) Li, FIA,FCAA,FCAS

2014 GIRO Conference

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Overview of the Far East Ins Market

Property Line in the Far East Ins Market

Exposure Curves in China

P&C Insurance Market in China

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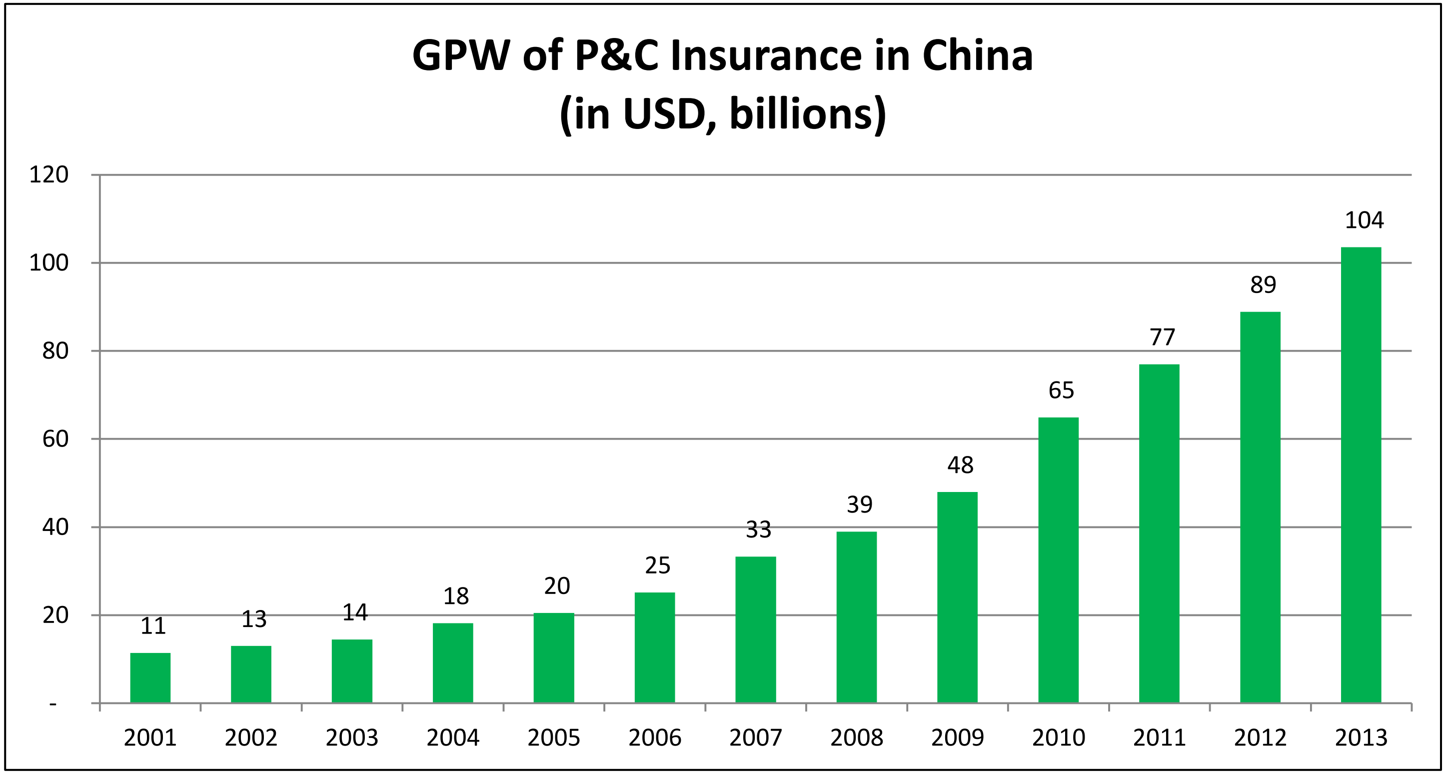
CHINA RE P&C

- China's P&C insurance market was growing rapidly during the past decade, with an average annual growth rate of 22%. It becomes the third largest non-life insurance market in the world by 2013.



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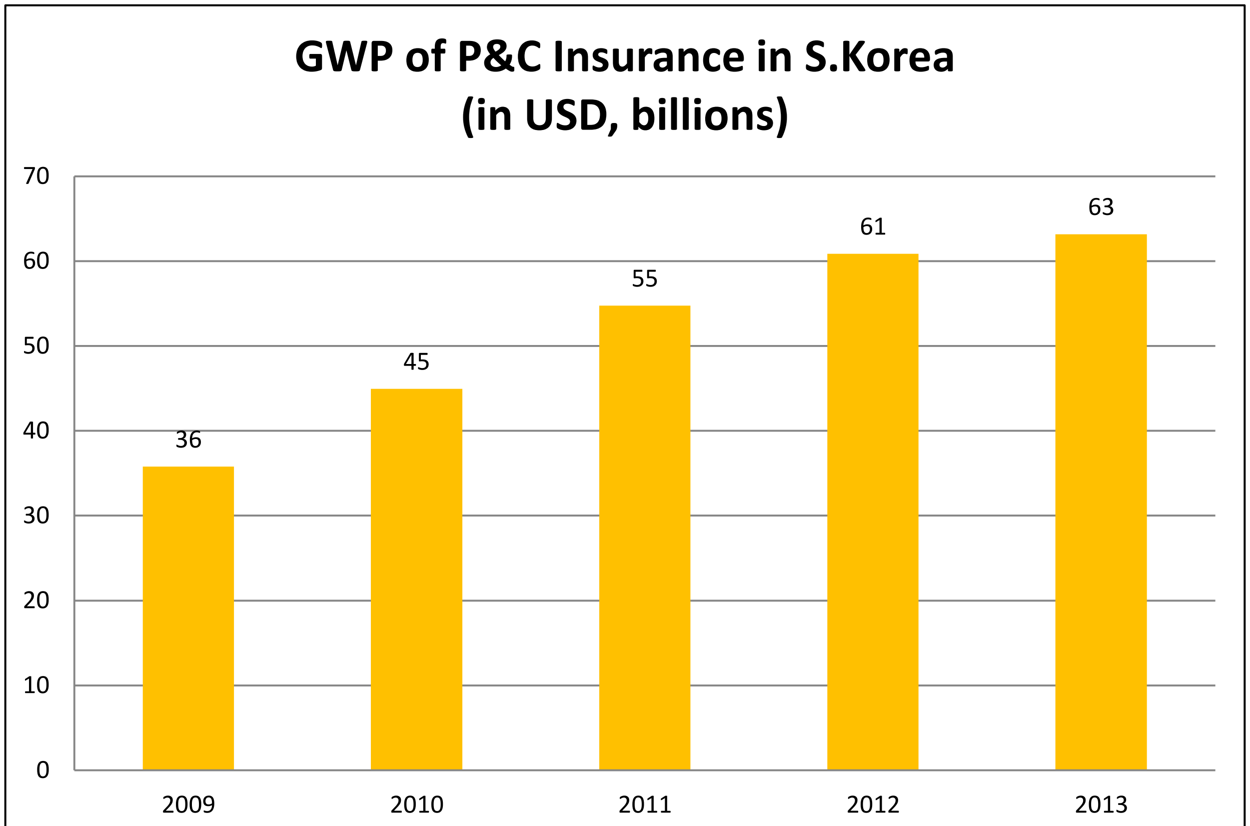
P&C Insurance Market in S.Korea

中再产险 CHINA RE P&C

- Korean P&C insurance market grew rapidly before 2012 with growth rate of over 20%, but slowed down after 2012.



P&C Insurance Market in Japan

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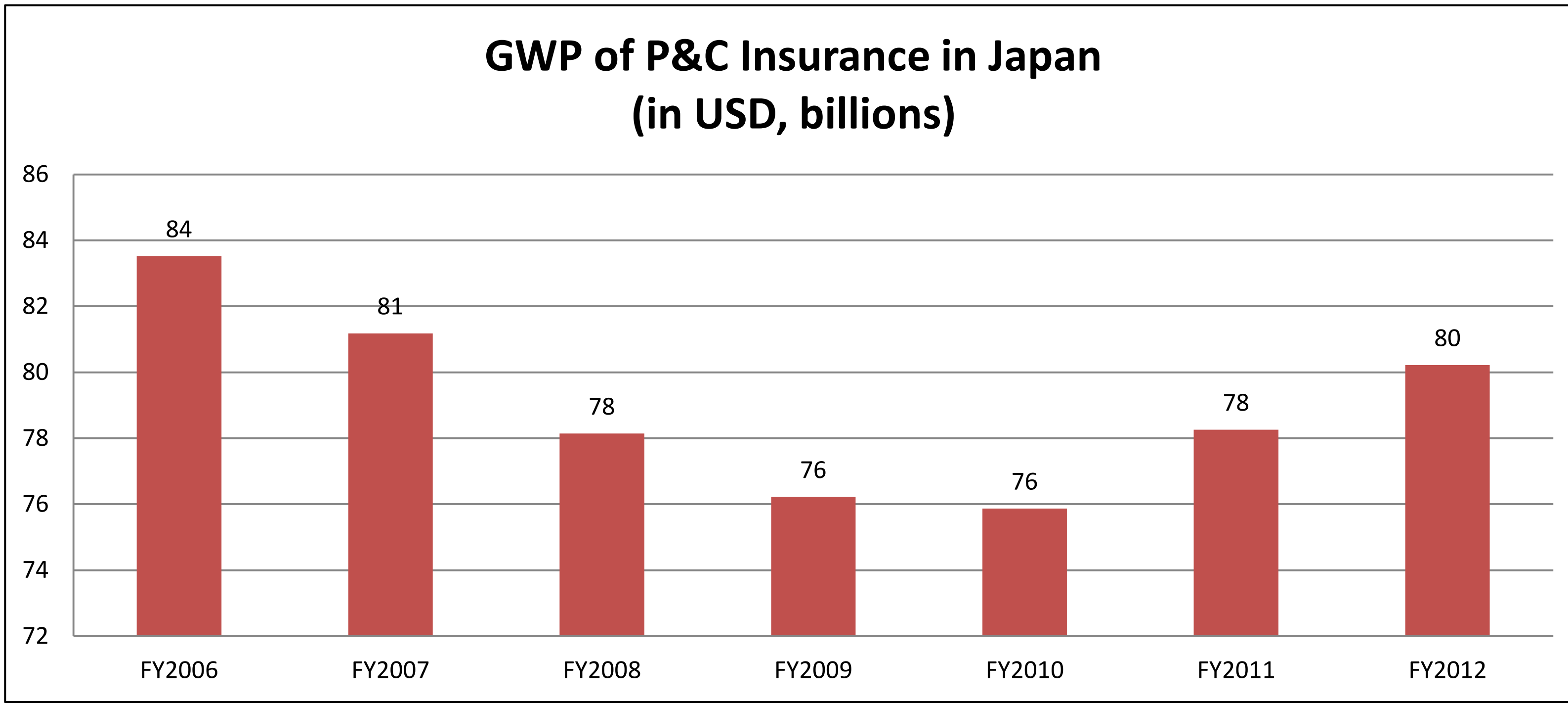
CHINA RE P&C

- The premium volume of Japan's P&C insurance market was decreasing until 2010 and then goes on the rise. It is the fourth largest non-life insurance market in the world.



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P&C Insurance Market in China

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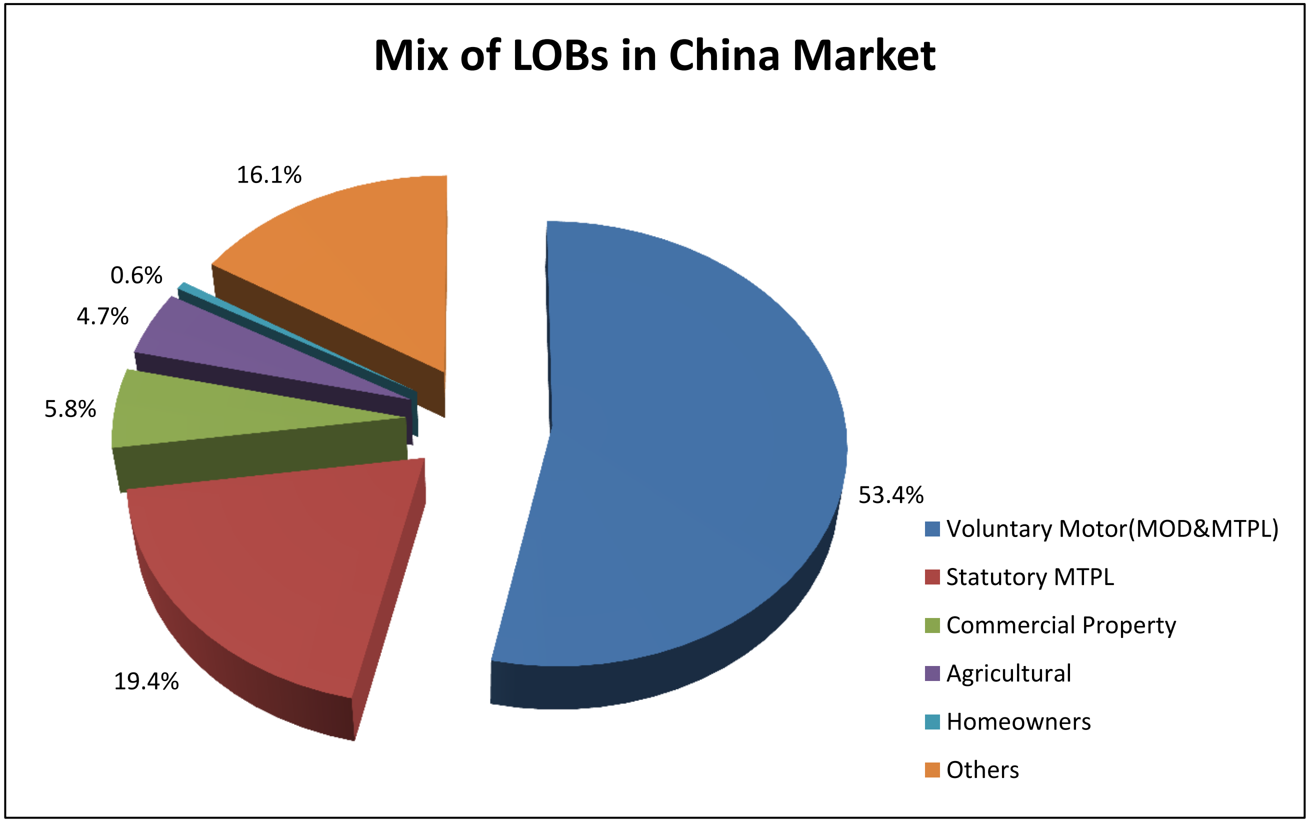
- The commercial property line is the second largest line in China's market, only after motor insurance.
- Homeowners insurance is not a large market in China.



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P&C Insurance Market in S.Korea

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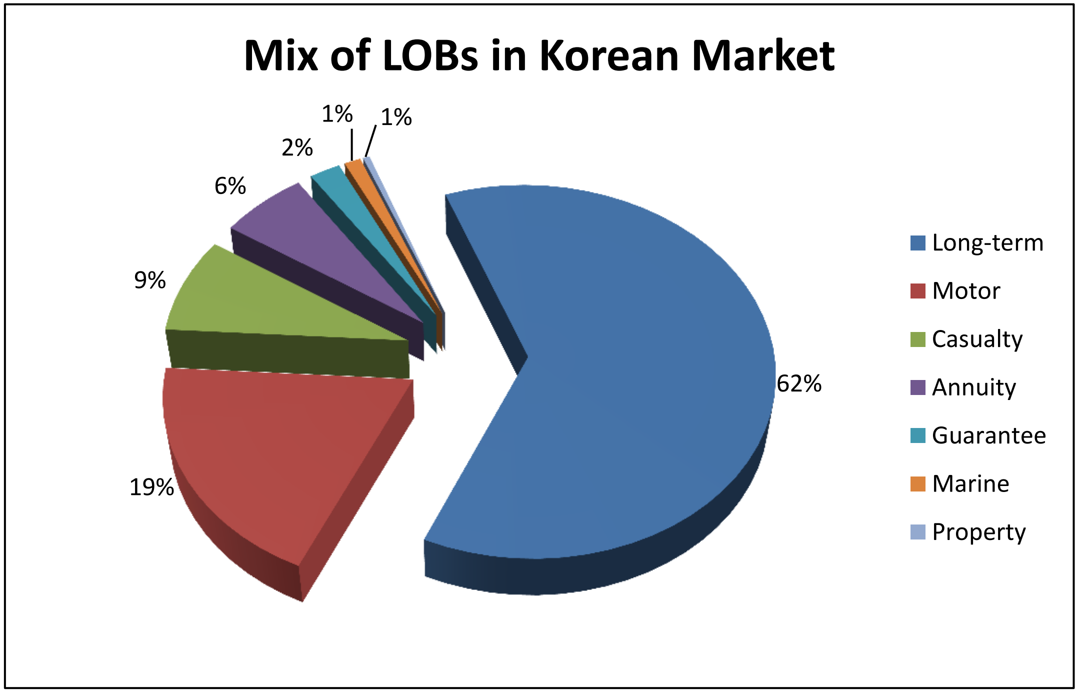
- In Korean P&C market, long-term insurance is the largest line, which is the unique characteristic of Korean market.
- One-year term property insurance only accounts for a very small fraction of the market.



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Long-term Insurance in S.Korea

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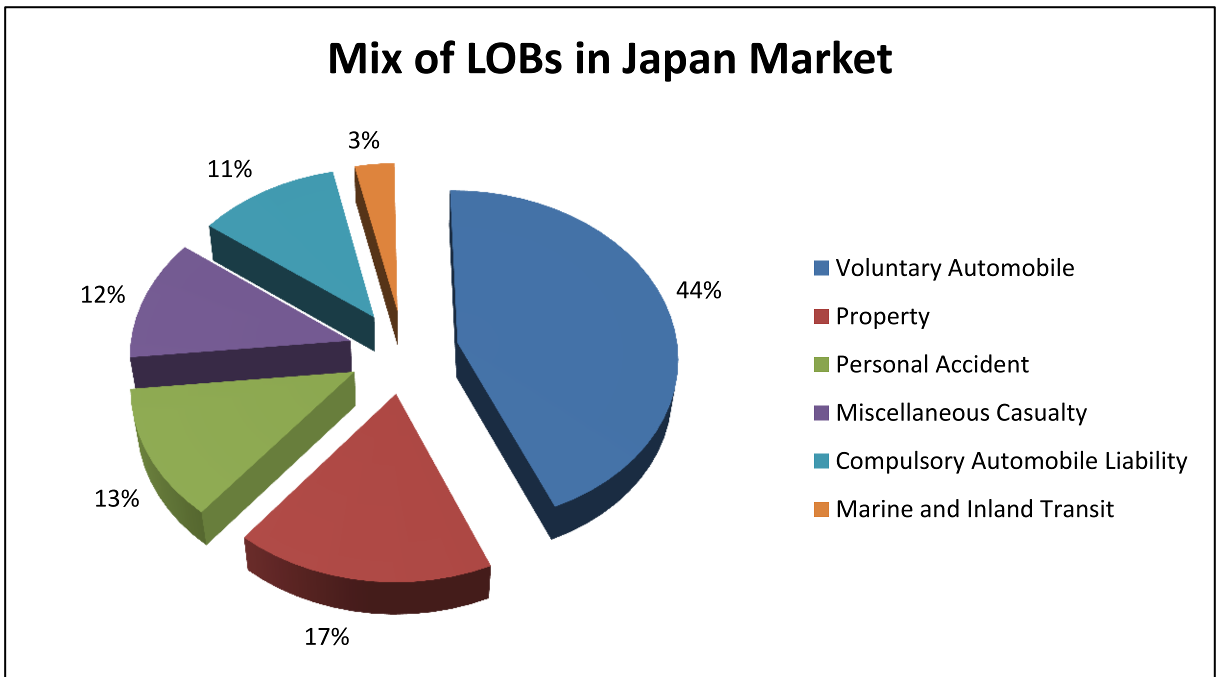
- Long-term insurance is not a line of business in fact, but a type of product form.
  - In fact , it includes long-term motor insurance, long-term property insurance, long-term accident insurance, etc.

- Insurance period is more than 3 years
- Maturity benefit exists.
- Premium can be paid by monthly, quarterly, annually or single lump sum and is divided into risk premium and savings premium.
- Savings premium is operated in separate account, and there is a policy reserve for each policy.

P&C Insurance Market in Japan

- In Japan's P&C market, property insurance is the second largest line.
- There is also a maturity-refund type of insurance product in Japan market covering property, motor, personal accident and miscellaneous casualty. But its market share is very small.



P&C Insurance Market in China

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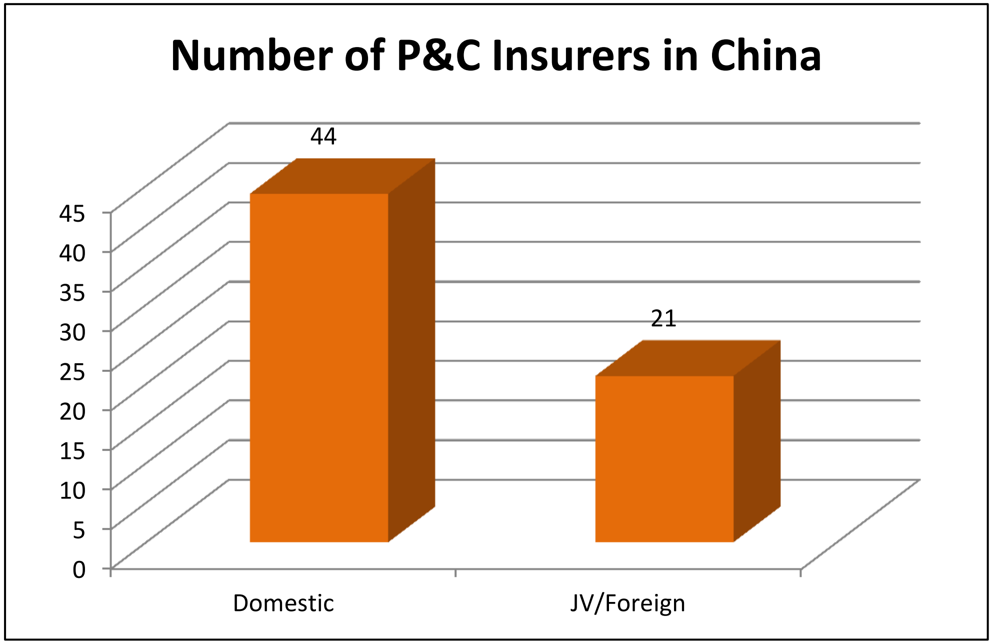
CHINA RE P&C

- There are totally 65 P&C insurance companies in China by the end of 2013.
- However, all the foreign insurers account for only 1.3% of the total premium income in the market.
    - Most of their business are commercial property insurance, with very little motor insurance due to the marketing channel.



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P&C Insurance Market in S.Korea

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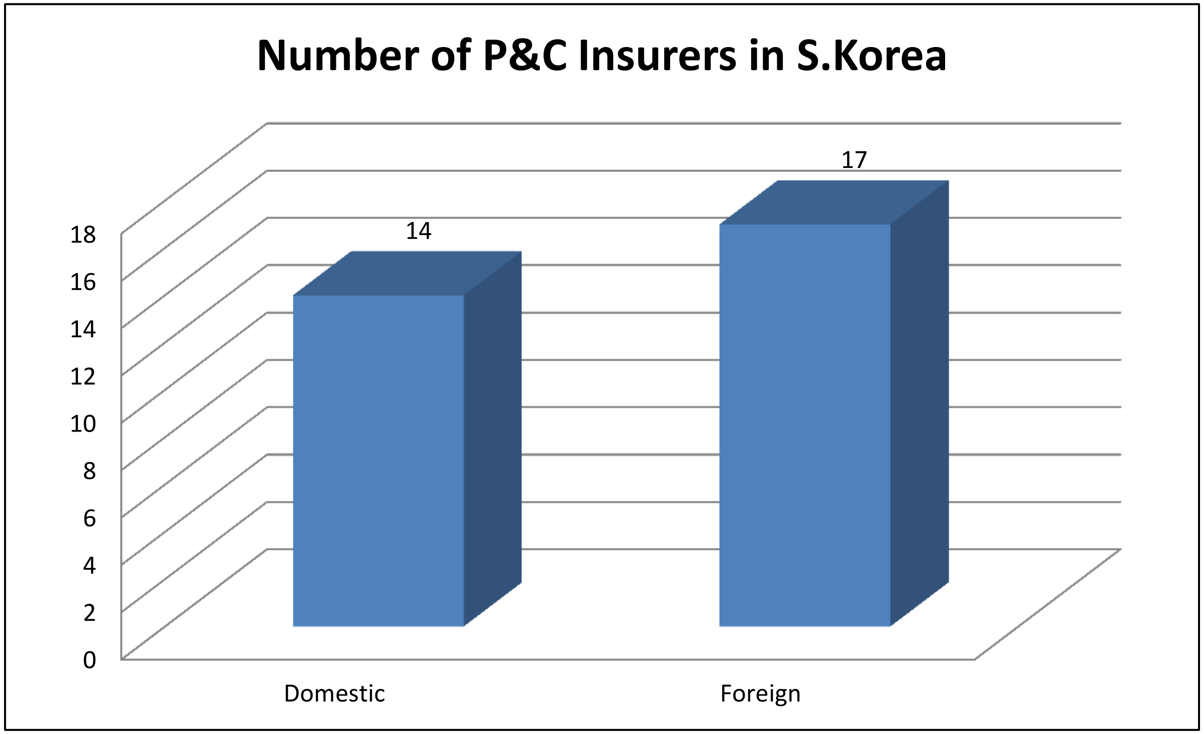
- There are totally 31 P&C insurance companies in S.Korea by the end of 2013.
- Domestic insurers dominate the market and the market share of all the foreign insurers is about 3%.



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P&C Insurance Market in Japan

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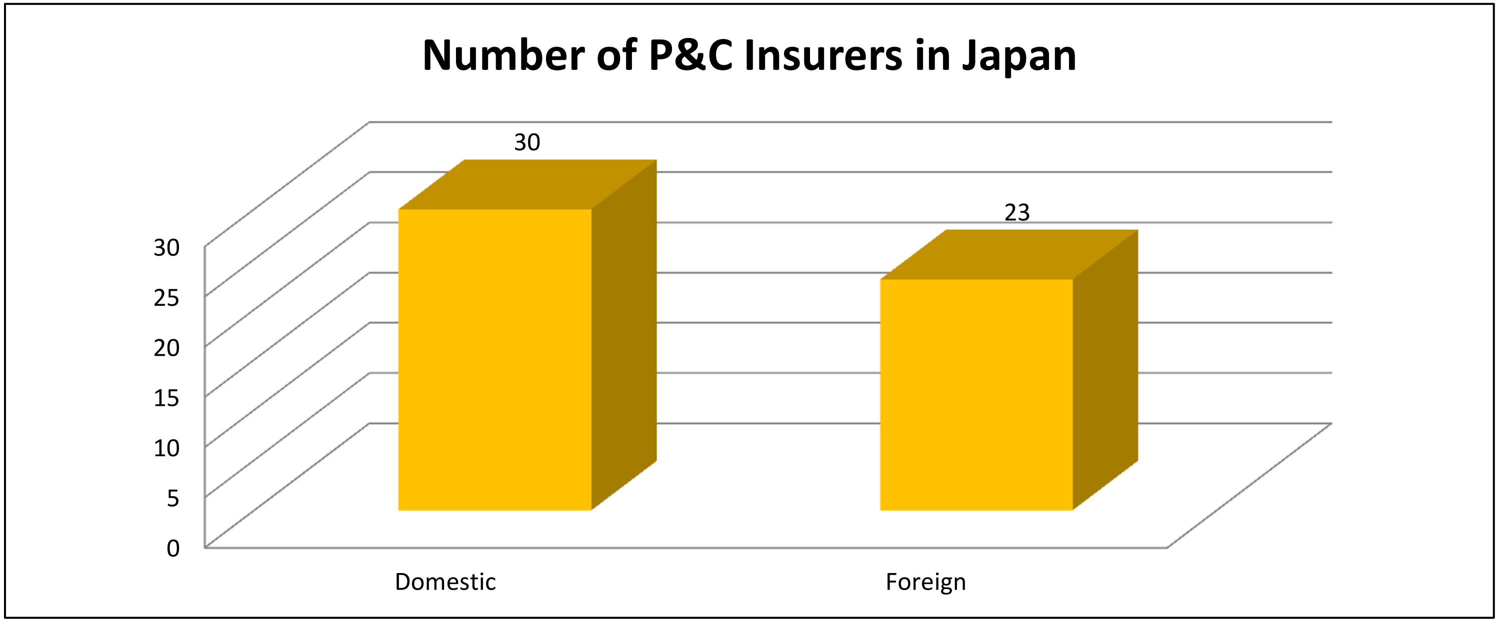
- There are totally 53 P&C insurance companies in Japan by the end of 2013.
- Domestic insurers dominate the market and the market share of all the foreign insurers is about 6%.



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Property Insurance in China

- Before 2012, the growth rate of commercial property insurance in China market was as high as more than 20%.
- Since 2012, however, the commercial property line grew much slowly.

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Property Insurance in S.Korea

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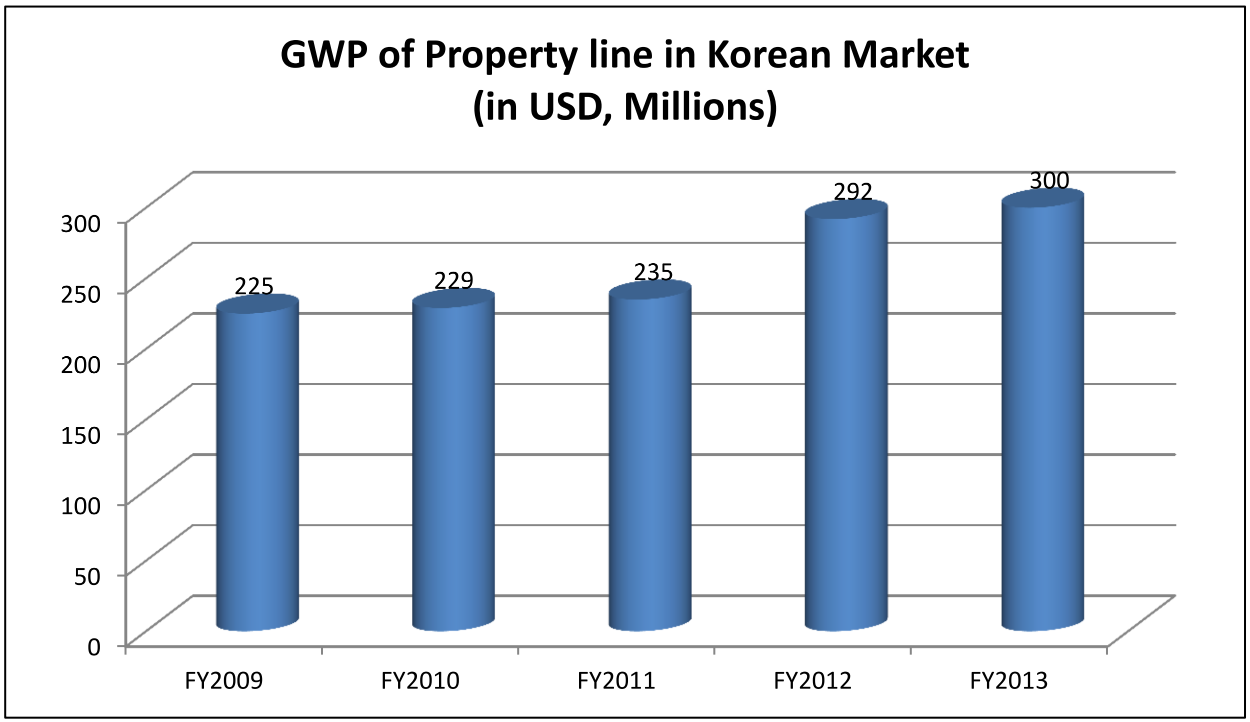
- Except 2012, the growth rate of one-year term property insurance in Korean market was very low.



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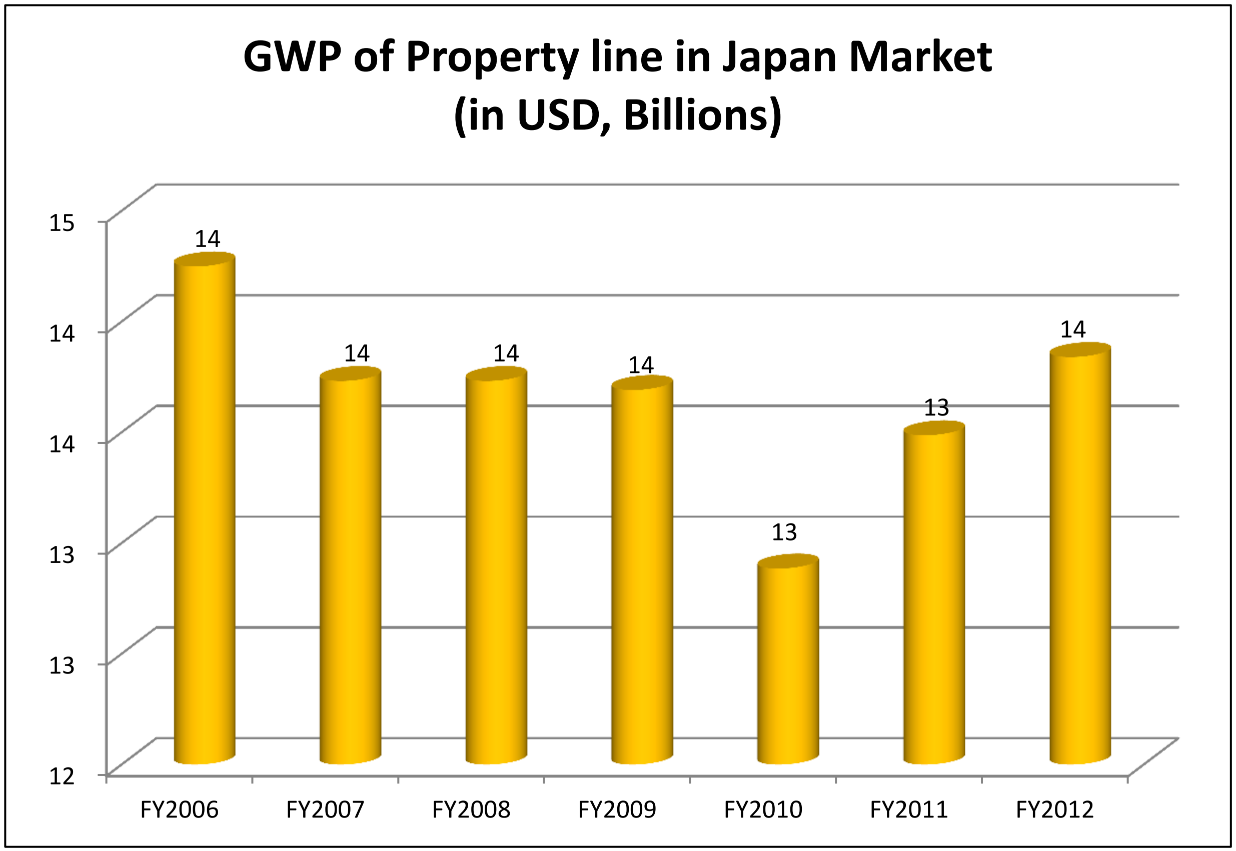
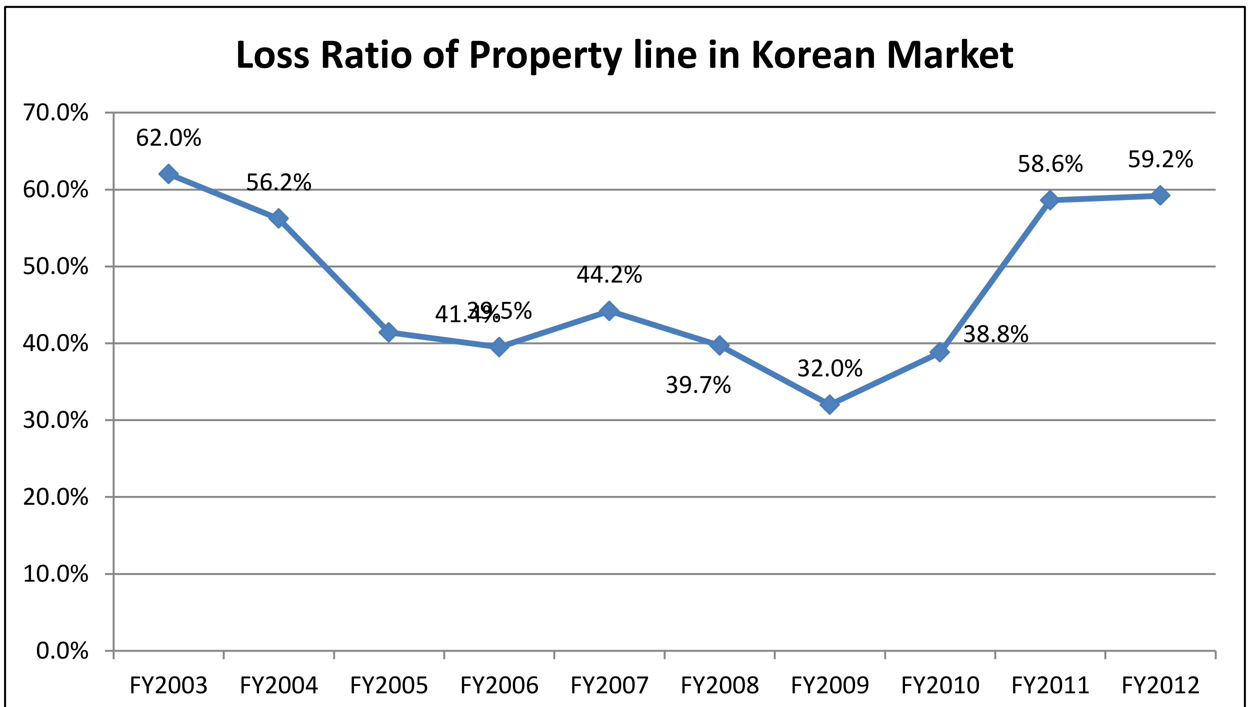
- The premium volume of property line was decreasing until 2010. Then it goes on the rise.



- The loss ratio of commercial property is rising during the past few years.
  - In 2008, there was a heavy snowstorm occurring in South China and an earthquake in Sichuan Province.
  - In 2013, a large claim, Hynix Semiconductor, came up. Its estimated loss could reach USD 1 billion and will perhaps become the largest claim in China by now.

- The loss ratio of one-year term property insurance line in Korea is normally low.



Property Insurance in Japan

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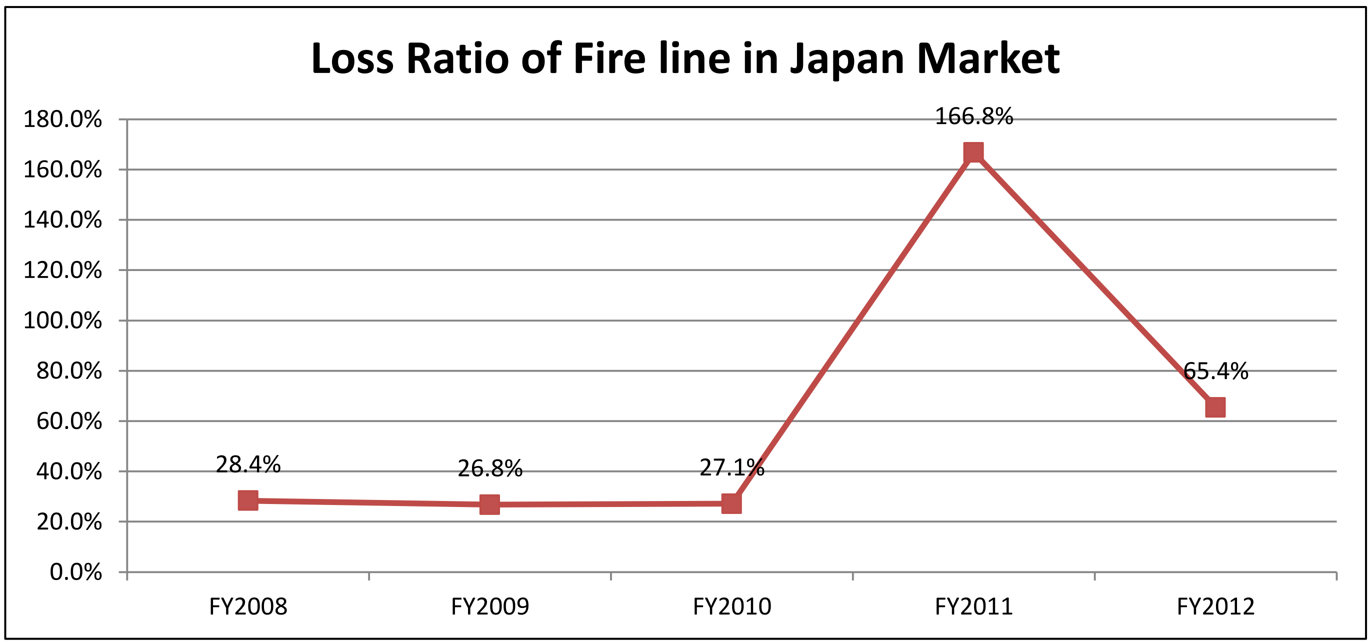
- The loss ratio of property insurance line in Japan very low in normal years but extremely high when catastrophe occurs.



Property Products in China

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➢ The commercial property insurance products include three form in China market.

Basic Form

- Fire, Explosion, Lightening, Falling of objectives

Comprehensive Form

- Besides those of Basic Form, also covers some natural events such as rain, storm, flood, hail etc.

All-risks Form

- Only specifies what are not covered, such as normal wear and tear, destroyed by gov't, war, SRCC, nuclear etc.

Property Ratemaking in China

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- The traditional rating variables for commercial property insurance in China include only a very few factors, such as classification of industry and territory.

- Since 2006 China Insurance Regulatory Commission and Insurance Association of China started to establish the guidelines of Pure Risk Loss Rate Tables, such as for commercial buildings, power plant, metro(subway) etc. But the work has not covered all the insured objects.

- After that, more rating factors were introduced to ratemaking, including types of construction, occupancy, fire protection level.

Property Ratemaking in China

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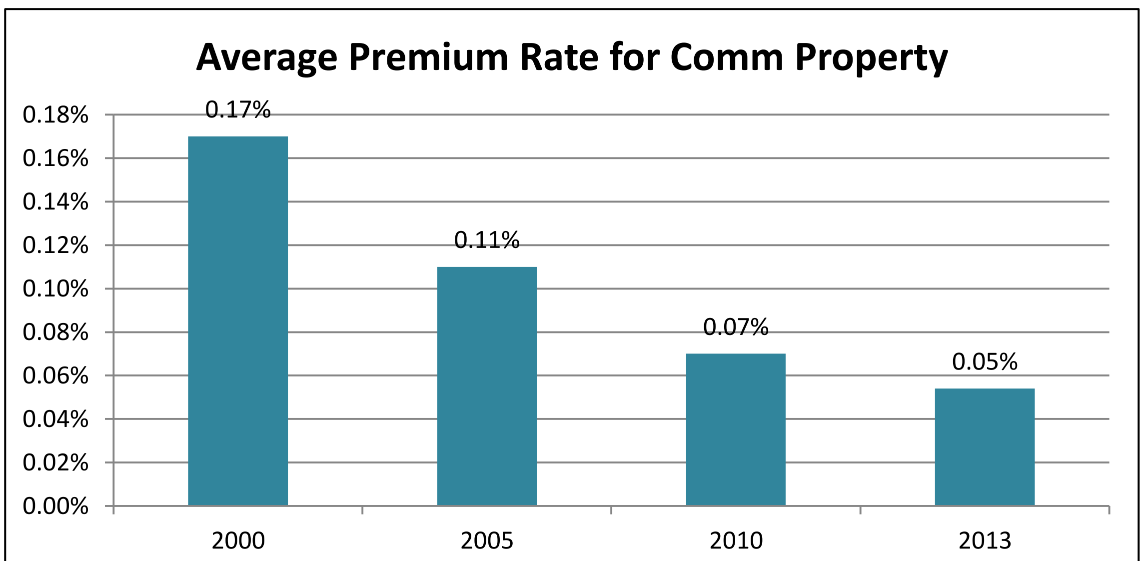
CHINA RE P&C

- Although there are some actuarial rating guidelines, the underwriters still have more authority to adjust the final rates in the market.

- The market is very competitive and the premium rate for commercial property line was diving down during the past decades.



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Exposure Curves in China Market

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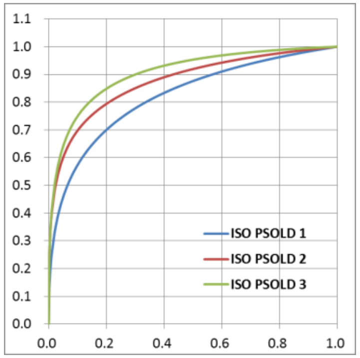
➢ Some exposure curves for property insurance are used in China market.

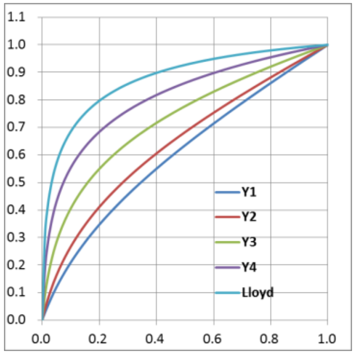
Empirical Curves

- Lloyds Curves
- Reinsurer’s Curves（Swiss Re, Munich Re, etc）
- Salzmann Curve (1960 INA Homeowners data)
- Ludwig Curve (1984-1988 Homeowners and Small Commercial data)
- ISO’s PSOLD & PSOLD+



Parametric Curves

- Log-log
- MBBEFD



Exposure Curves in China Market

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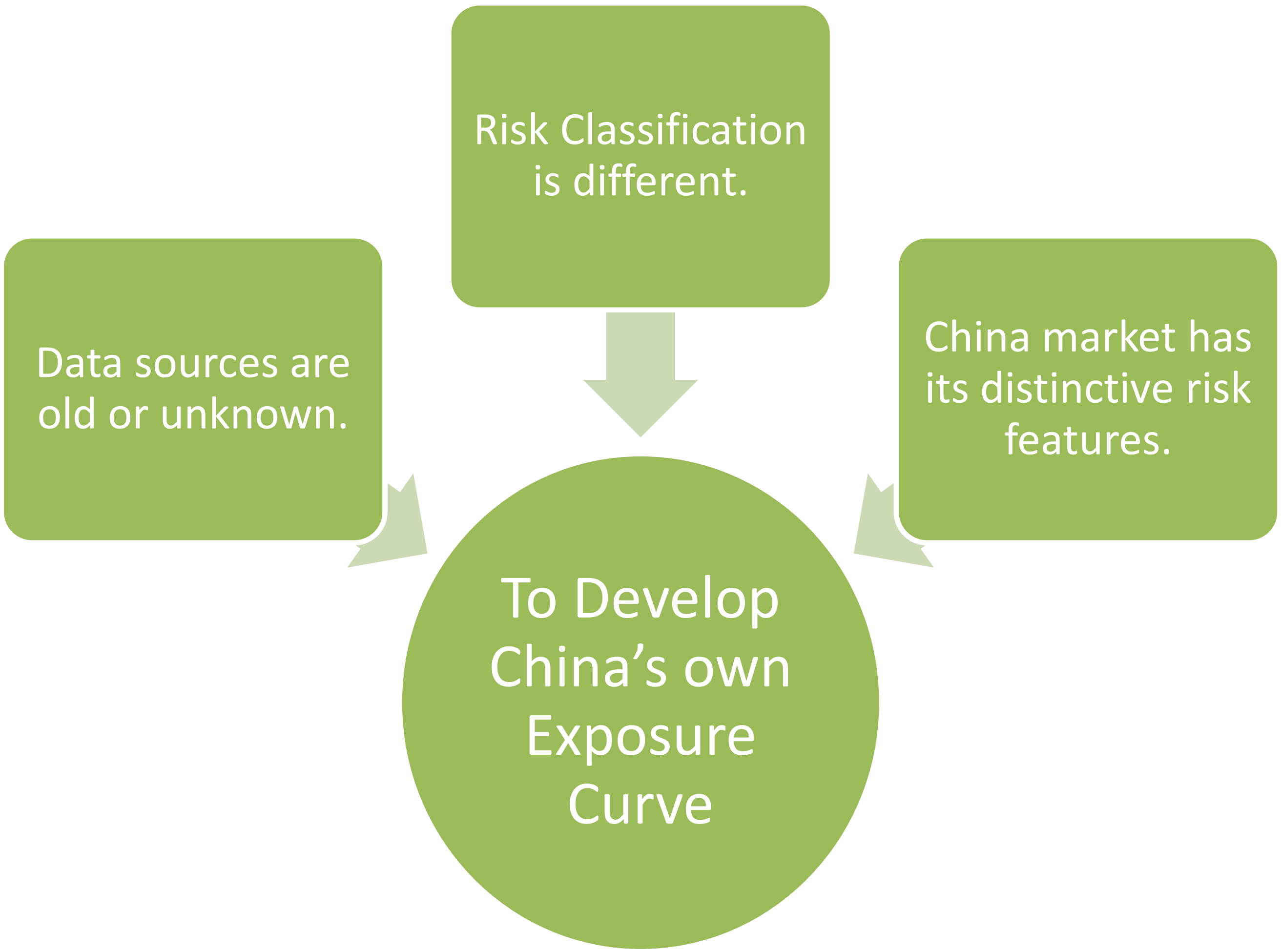
- But it is in doubt whether these exposure curves are suitable for China market.



China Re Exposure Curves

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- China Re Exposure Curves for commercial property was developed by China Re P&C Insurance Experience Research Center and was released to the market in September 2013.

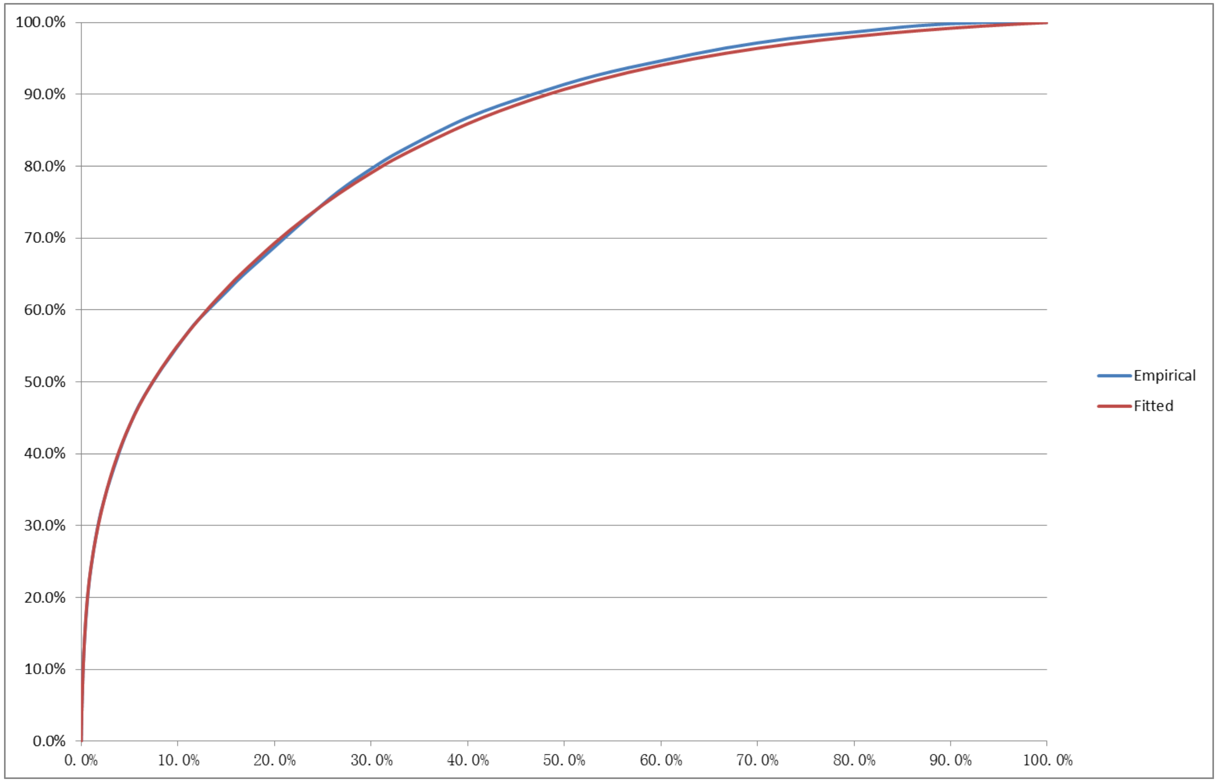
- The curves are based on nearly 500,000 policy-level data collected by China Re P&C.

Categories

- General commercial property
- Warehouse
- Industrial property of low risk
- Industrial property of high risk

China Re Exposure Curves

- Mixed exponential curve fitting technique was used.



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China Re Exposure Curves

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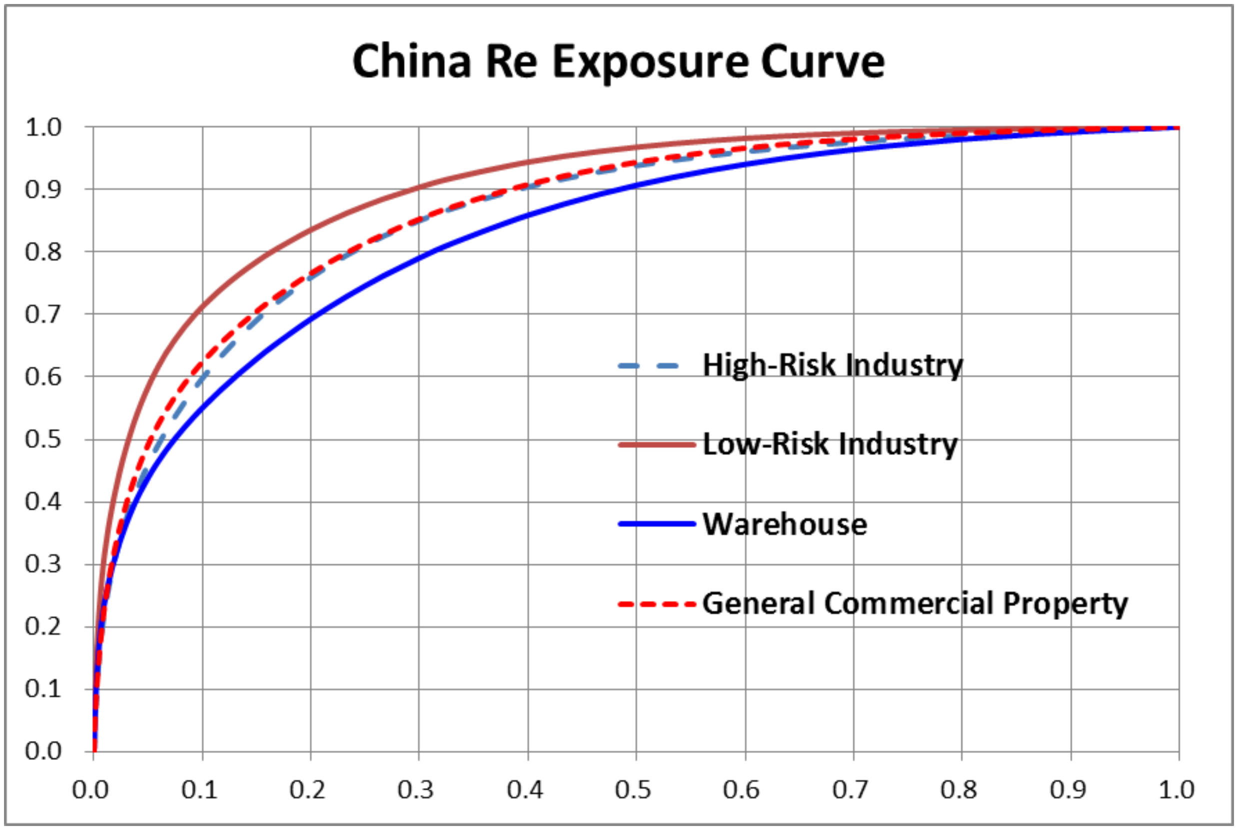
- The graph of China Re Exposure Curves for commercial property suggests that warehouse (storage property) is the most risky class and faces the highest probability of suffering a high-severity loss.



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China Re Exposure Curves

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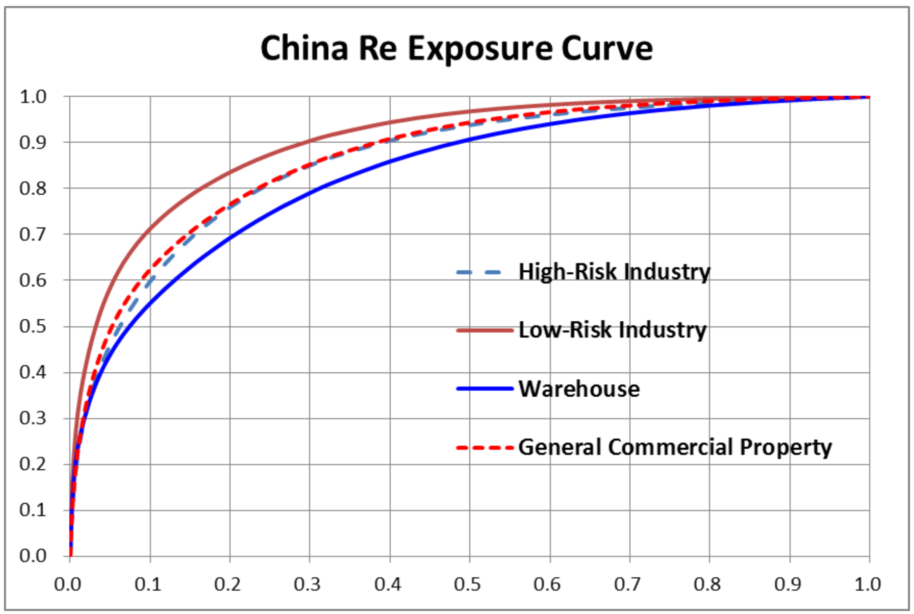
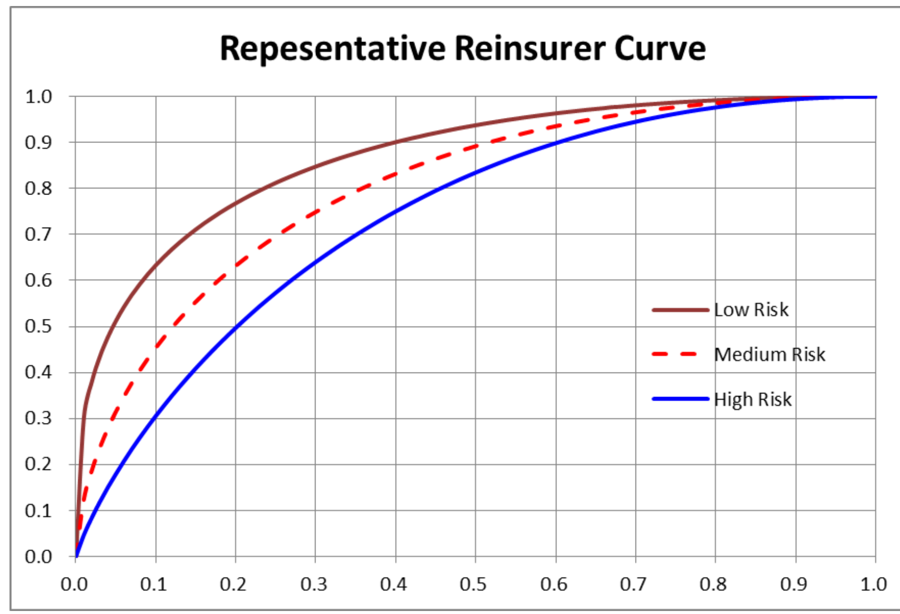
- Compared with the typical international exposure curves, China Re Exposure Curves are closer to the top left corner as a whole, which implies that:
  - The probability of total loss reflected by China Re Exposure Curves is lower.
  - More losses on China Re Exposure Curves are medium/small rather than total loss.





Thank You for Your Listening!

INTRODUCTION OF THE SPEAKER

Mr. Xiaoxuan(Sherwin) Li, has nearly ten years of experience in the insurance industry and is currently the Head of Actuarial Department in China Re P&C. Before being transferred to the Actuarial Department, he worked in Treaty Reinsurance Department and Facultative Department for five years within China Re P&C.

He holds the Fellow of the Institute and Faculty of Actuaries(FIA), the Fellow of China Association of Actuaries(FCAA), and the Fellow of Casualty Actuarial Society(FCAS). He is also an Associate of Reinsurance Administration(ARA) and a Microsoft Certified Systems Engineer(MCSE). He graduated with a Master's degree of Actuarial Science from Nankai University in China.

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