Gallagher Re

Reinsurance of Insurance Risk

Ing. Jan Hrevuš, Ph.D., CEO of Gallagher Re, a.s.
Aktuárský Seminář MFF UK
April 25th, 2025

FACULTY
OF MATHEMATICS
AND PHYSICS
Charles University

Gallagher Re

About Gallagher Re

Gallagher and Gallagher Re – Global Leaders, Local Expertise

Founded by Arthur J. Gallagher in Chicago in 1927, Gallagher has grown to be one of the leading insurance brokerage, risk management, and human capital consultant companies in the world. With significant reach internationally, our organization employs over 56,000 people and our global network provides services in more than 130 countries.

Founded in
1927
with headquarters in the U.S

Listed on the NYSE (AJG) [5]
$80+ bn market capitalisation

970+ sales and service offices
globally

Total Adjusted Revenue [1]
$11.3bn

56,000 employees
worldwide [3]

Client service capabilities
in more than 130 countries around the world

One of the
world's top three
insurance brokers [2]

10%
organic growth rate [4]

All figures correct at July, 2024 unless otherwise indicated.
1 Brokerage & Risk Management segment adjusted revenue before reimbursements and annualized acquired revenue for full year 2024
2 According to Business Insurance for Insurance Broking Revenue, July 2024.
3 As of December 31, 2024
4 As of February, 2024
5 As of January 30, 2025

Gallagher Re at a Glance

We are a leading reinsurance broker, with recognized expertise in everything we do

$36bn+
Brokered ceded premiums

2,300+
Reinsurance clients

150+
Countries where clients are represented

10.6%
Organic growth in 2024

Gallagher Re

1,300+
Placed programmes

15%
Estimated market share

3,000+
Colleagues in 32 countries

92%
Average client retention ratio

Client access & relationships | **Proprietary data assets** | **Proven market experts**

Capitalize on Full Value of Gallagher Re by leveraging our proprietary data and market expertise…

A full-service global reinsurance firm revitalizing the industry, redefining innovation, and reimagining what's possible.

Gallagher Re specialists collaborate with you to understand your goals.

Together, we leverage powerful industry-leading data and analytics tools to secure the right reinsurance and advisory solutions that meet your unique needs.

Backed by Gallagher, we're more connected to the places you do business. Whether your operations are global, national or local, we have the talent, market position and trusted relationships to build the best solutions possible.

Explore solutions with Gallagher Re

Practices

Customised Solutions
Program Solutions
Public Sector & Climate Resilience
Insurance Linked Securities
Ceded Facultative

Global Data & Analytics

Actuarial
Catastrophe Analytics
Climate and ESG
InsurTech

Global Strategic Advisory

Business Intelligence
Strategic Advisory
Ratings Agency Advisory

Products


Aviation


Agriculture & Crop


Construction & Engineering


Global Credit & Political Risk


Cyber


Financial & Professional Lines


General Casualty


Life, Accident & Health


Marine & Energy


Mortgage


Property


Property Retro


Political Violence, Terror & War

3000+ Employees worldwide

143+ Offices globally

150+ Countries served

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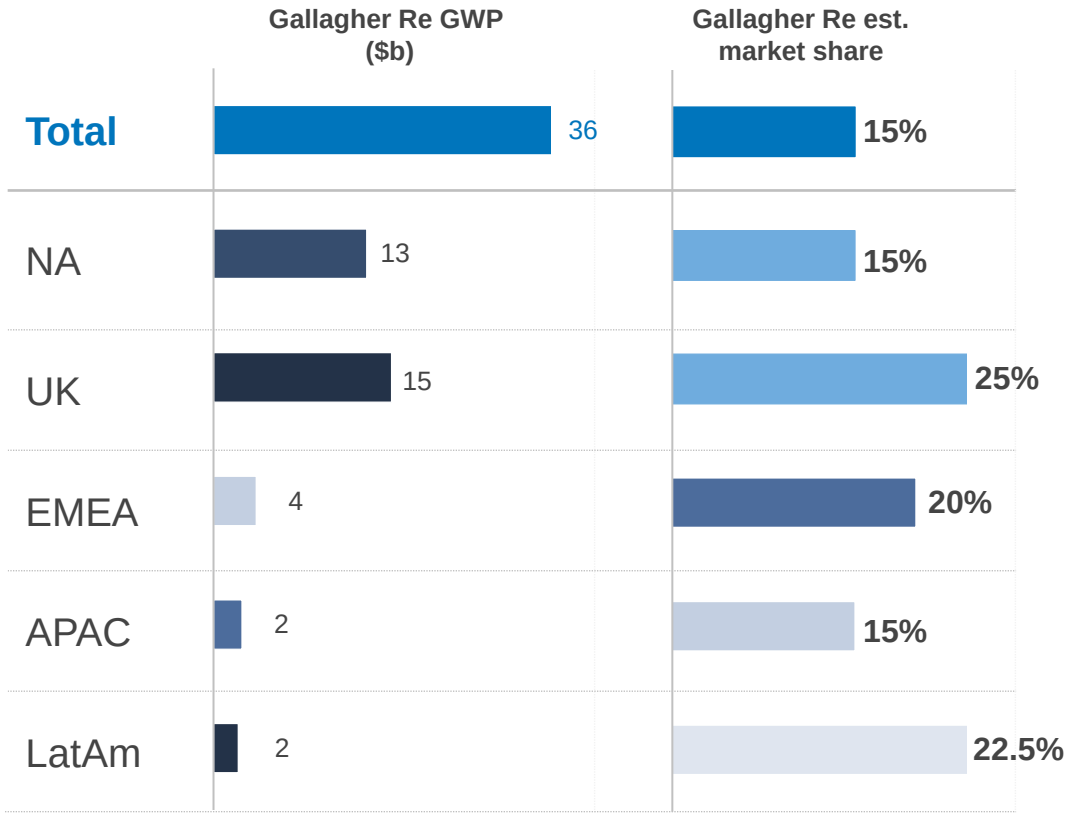
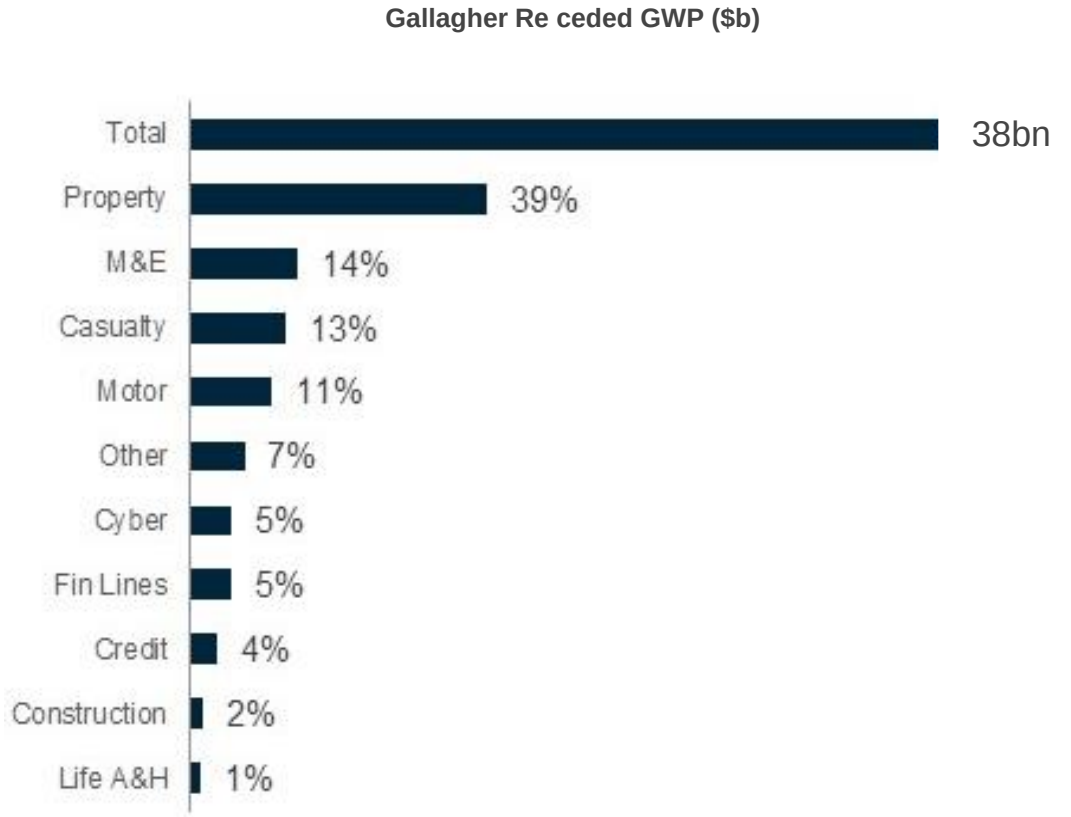
Gallagher Re: Ceded premium

Gallagher Re ceded premium of ~$36bn in 2024 with UK the largest segment and Property largest LOB

UK represents the largest geography for Gallagher Re with ~$15bn of ceded premium. International represents ~$10bn of ceded GWP



Property is the largest line of business for Gallagher Re with 39% share of total ceded GWP, Marine & Energy is the second largest with 14%.



Note: Other contains PVT, Aerospace, Agriculture & Crop, Entertainment, General
Source: Gallagher Re
**Figures accurate as of December 2024*

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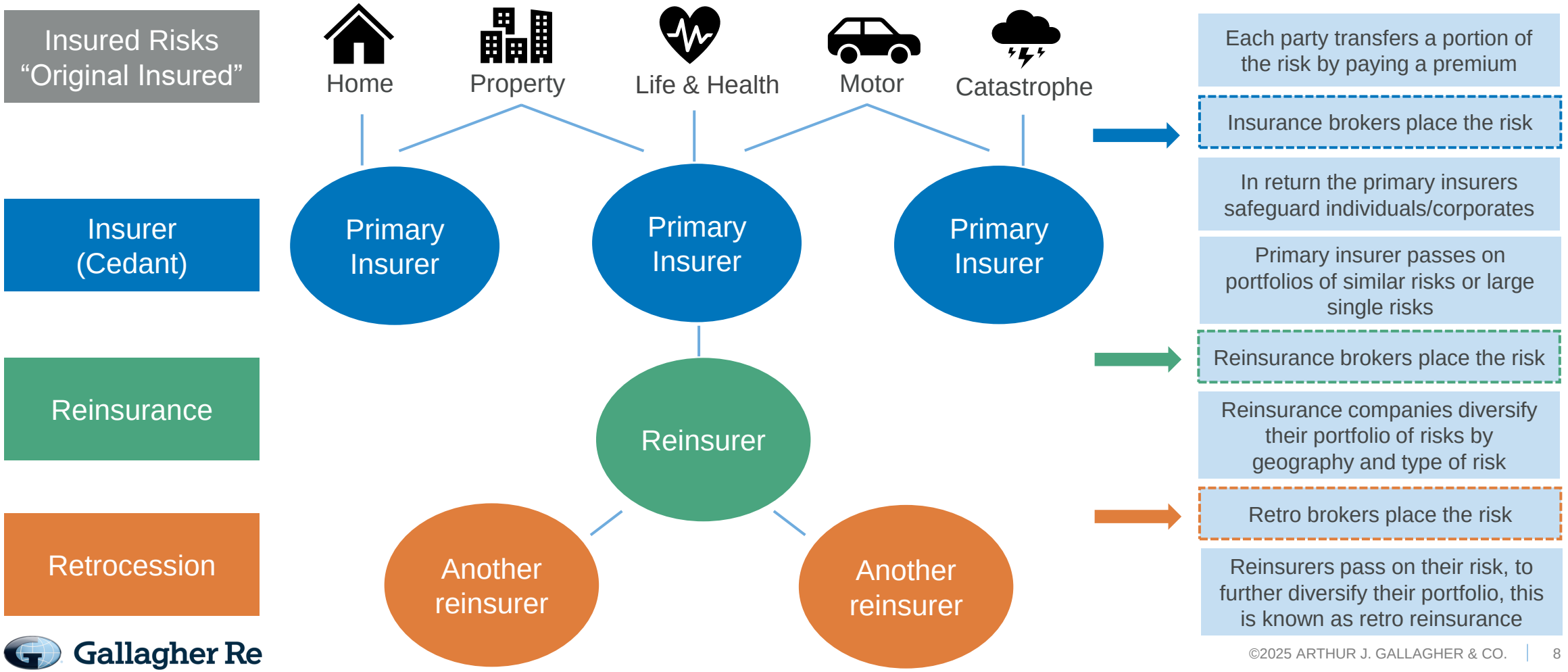
Introdution to Reinsurance

What is reinsurance?

Reinsurance is insurance for insurance companies



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Why do insurers buy reinsurance?

Reinsurance reduces volatility, provides capital relief and can be a source of knowledge and information

Risk transfer

Passing some risks can allow insurers to underwrite large risks limits

Reduces volatility

Stabilise financial results by smoothing the impact of unexpected major losses

Capital relief

Reinsurance is a cost-effective substitute for equity or debt, allowing insurers to take advantage of global diversification

Advisory expertise

Reinsurers assist clients in pricing and managing risk, developing products and expanding global footprint

Cycle management

Smooth out the peaks and troughs of a hard and soft market cycle

Regulatory requirements

Lloyd's RDS, LCM5, Solvency II, A.M Best BCAR

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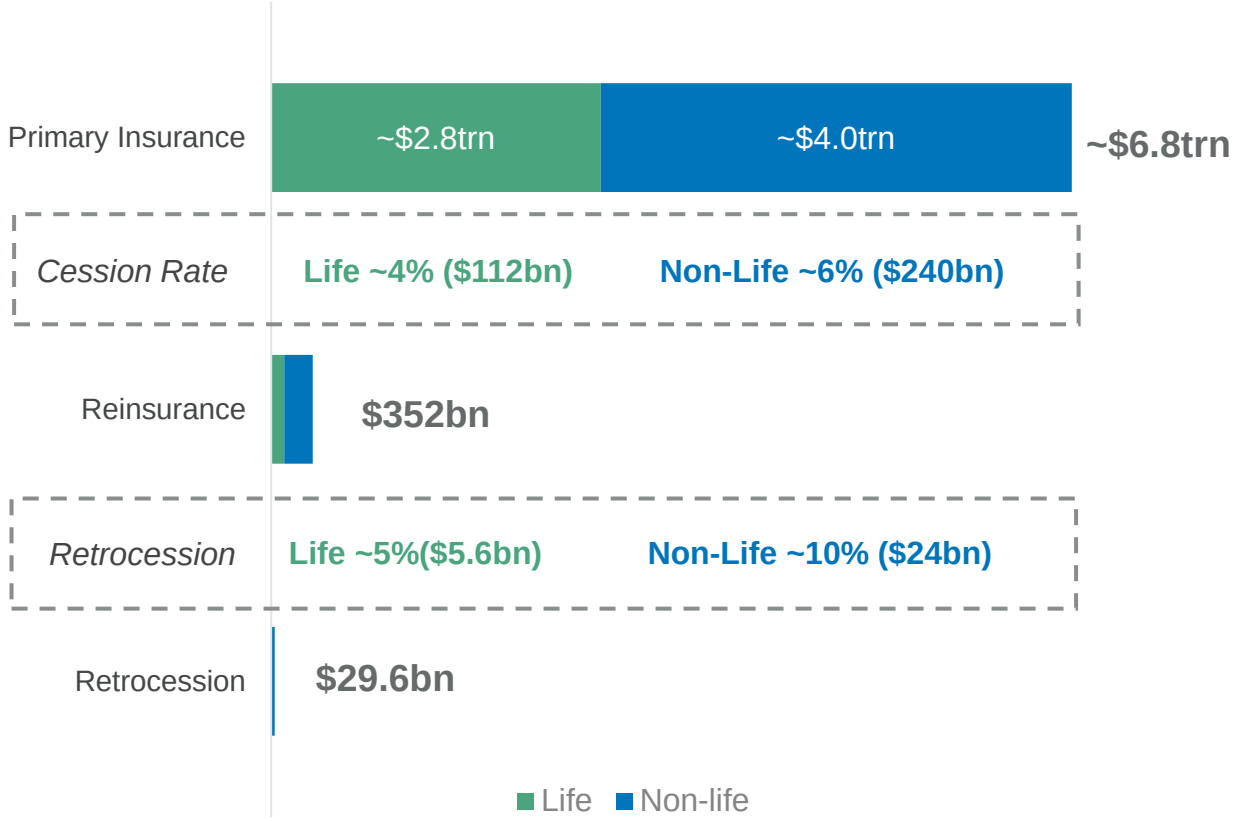
What is the reinsurance market size?

Reinsurance has a share of 5% of the overall insurance market

Market size primary insurance vs reinsurance vs retrocession



Key market players in reinsurance (top 10)

Swiss Re
Munich RE
hannover re®
Arch
everest™
LLOYD'S
BERKSHIRE HATHAWAY INC.
SCOR
PartnerRe
RenaissanceRe

Source: Autonomous New Insurance Primer 2022 Report, Best's Market Segment Report: World's 50 Largest Reinsurers Aug 28th 2024
Note: The market size figures are an estimation

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Role of Broker and Players on the Reinsurance Market

Role of a Broker

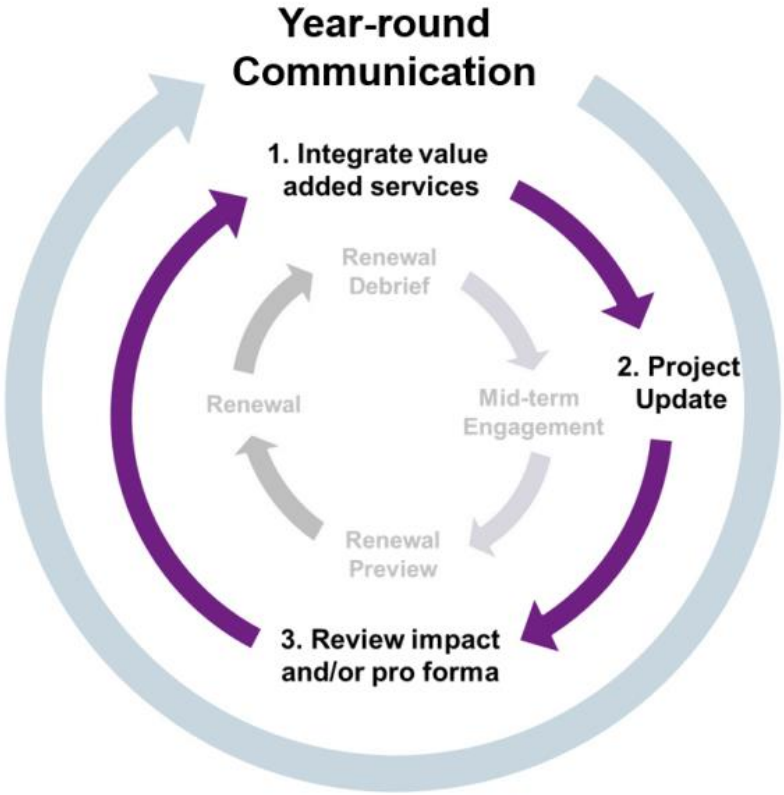
More than a transactional broker

Integrating consultative value-added services

- Goes beyond the transaction and renewal process
- Part of increasing wallet share, strategically growing the account and becoming a trusted advisor

Year-round communication

- Maintains regular contact and builds the relationship; increases the number and relevance of touches throughout the year



The Gallagher Re PlayBook / Annual Client Management Cycle

A flexible framework of touch points that covers any client, product or class of business:

- Keeps us in step with the client at every level of the organization
- Importantly: aligned to but **going beyond the renewal process** throughout the year
- Keeps us **alert to changes, threats or opportunities** within the client's organisation (constant RFP mode to avoid the real thing)
- Ensures replication of best practice consistently across the business and our client base
- Enables us to **retain and grow existing clients** (highest margin growth)

Gallagher Re Analytics

Our analytics team members help clients:

- Optimize the value-cost tradeoff of reinsurance
- Manage retained risk
- Create strategic financial plans
- Understand / address rating agency and shareholder issues

Why do we need Analytics?

How much risk am I exposed to?

What are the latest insights on the topics of concern to my company?

How can I improve my business processes?

How do I interpret differences in the modeled results?

What can I do when no off-the-shelf model is suitable?

What is the trade-off between risk and reward?

What's the best strategy?

What view are outside stakeholders likely to take?

Value-Added Analytics

Key Actuarial Offerings

- Loss Cost Analysis
- Segmentation Analysis
- Predictive Modeling Advisory
- Reinsurance Optimization
- Economic Capital Analysis & Allocation

Key FA Offerings

- Ratings advisory and analysis
- eXAMINE™ benchmarking
- Industry research
- eNVISION™ strategic financial forecasting

Added value for

Key ERM Offerings

- Customized ERM workshops
- Transition to ERM
- “20 Best Practices” assessment
- ORSA support

Key CAT Offerings

- Core catastrophe modeling
- Customized cat analysis
- Rating agency and regulatory cat requirements
- SpatialKey

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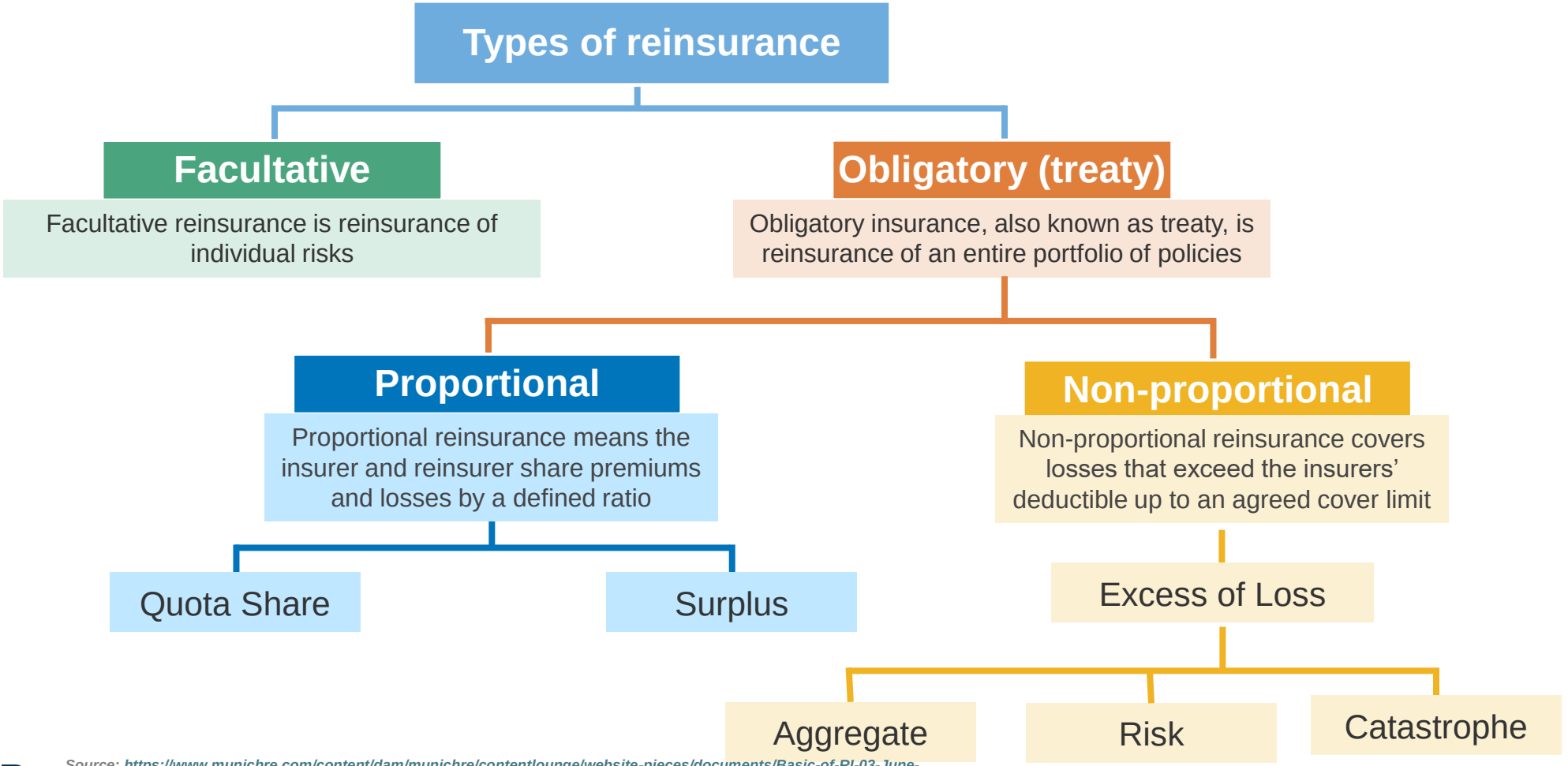
Types of Reinsurance

Types of reinsurance

The most common types of reinsurance are proportional and non-proportional



Source: https://www.munichre.com/content/dam/munichre/contentlounge/website-pieces/documents/Basic-of-RI-03-June-21.pdf/_jcr_content/renditions/original./Basic-of-RI-03-June-21.pdf

Proportional reinsurance – Quota share

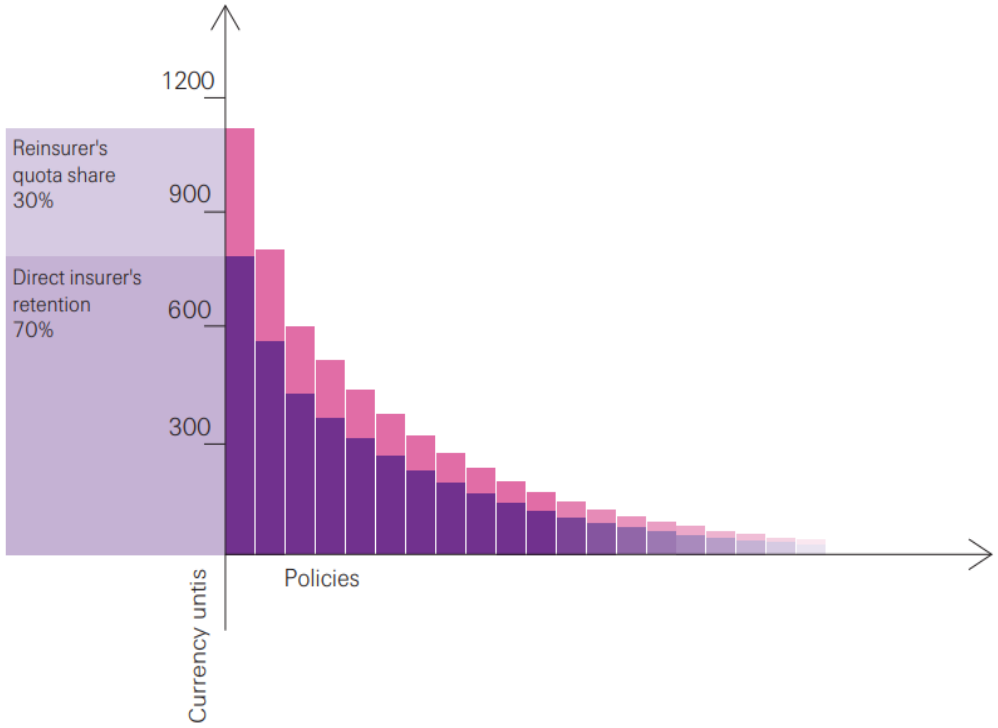
The simplest form of proportional reinsurance is quota share

- Proportional reinsurance means the insurer and reinsurer share premiums and losses by a defined ratio
- The reinsurer compensates the primary insurer for a portion of its acquisition and administration costs by paying a reinsurance commission

Quota Share

- The reinsurer assumes an agreed-upon, fixed quota or percentage of all policies written by the direct insurer within the particular branch or branches defined in the treaty
- The primary insurer retains a fixed percentage of each policy's premiums and cedes the remainder
- The maximum size of the policies that can be ceded is limited by quota share agreements
- Quota share is very capital efficient (major impact on SCR reduction)

Illustration of quota share reinsurance



Source: *The essential guide to reinsurance | Swiss Re*

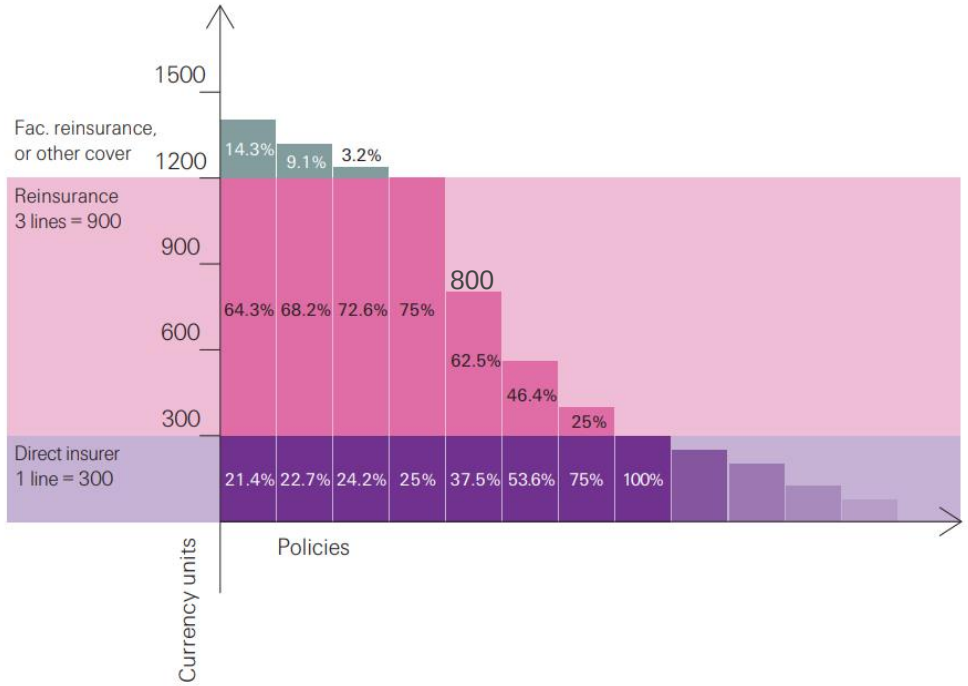
Proportional reinsurance – Surplus

The other common form of proportional reinsurance is surplus

Surplus

- With surplus reinsurance, the reinsurer does not participate in all risks; up to a specific amount, the primary insurer retains all risks for its own account. This is in contrast to quota share reinsurance where the retention is defined as a percentage, starting from the very first dollar of premium.
- Under surplus reinsurance, the reinsurer is obliged to accept the surplus or the amount which exceeds the primary insurer's retention.
- The limit of a surplus agreement is based on the maximum amount of liability a reinsurer is prepared to take on.
- This limit is usually expressed as a multiple of the primary insurer's retention, known as a line.
- For example, a three-line surplus means the reinsurer assumes coverage up to three times the primary insurer's retention.

Illustration of surplus reinsurance



Source: *The essential guide to reinsurance | Swiss Re*

Non-proportional reinsurance – Excess of loss

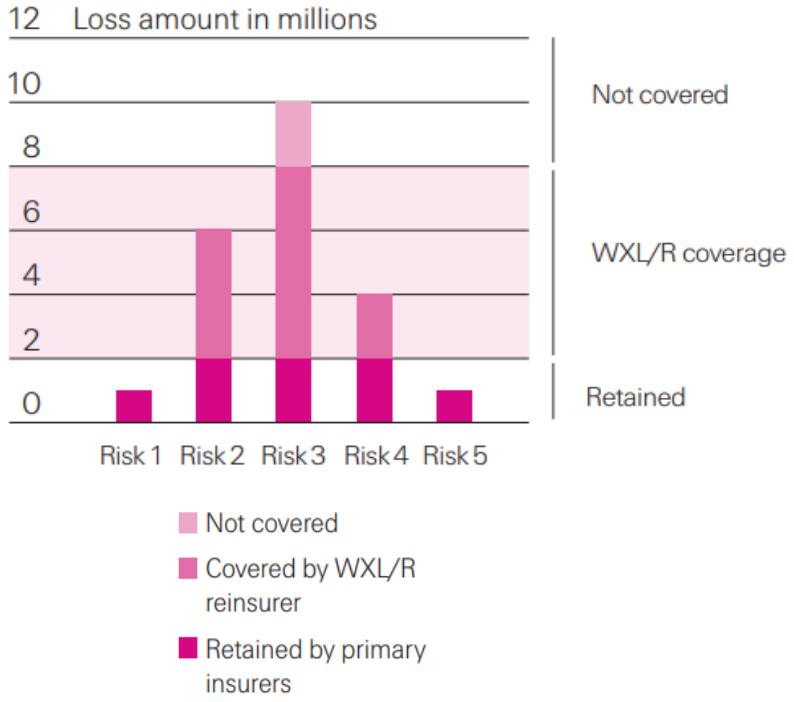
Excess of loss (XOL) reinsurance is the most common form of non-proportional reinsurance

- Under a non-proportional reinsurance contract the reinsurer begins to reimburse the primary insurer for claims once they reach a set monetary level
- Often the contract specifies a maximum limit for claims from the reinsurer, above this limit, the primary insurer is liable to pay claims again

Excess of Loss

- XOL allows insurers to protect themselves above a specific limit for each individual risks and can be used to reduce the insurer's risk when underwriting very large risks
- For example, a contract may be described as "100 xs 50" which means the reinsurer is liable for a maximum of $100mn of claims from the risk once they exceed $50mn
- The primary insurer could purchase another contract (possibly from another reinsurer) to cover higher risk costs (e.g., "200 xs 150" which covers a further $200mn of losses above $150mn).
- Primary insurers can build a comprehensive series of reinsurance contacts to cover against potential large losses, known as a reinsurance programme or a reinsurance tower

Illustration of excess of loss reinsurance



Source: *The essential guide to reinsurance | Swiss Re*

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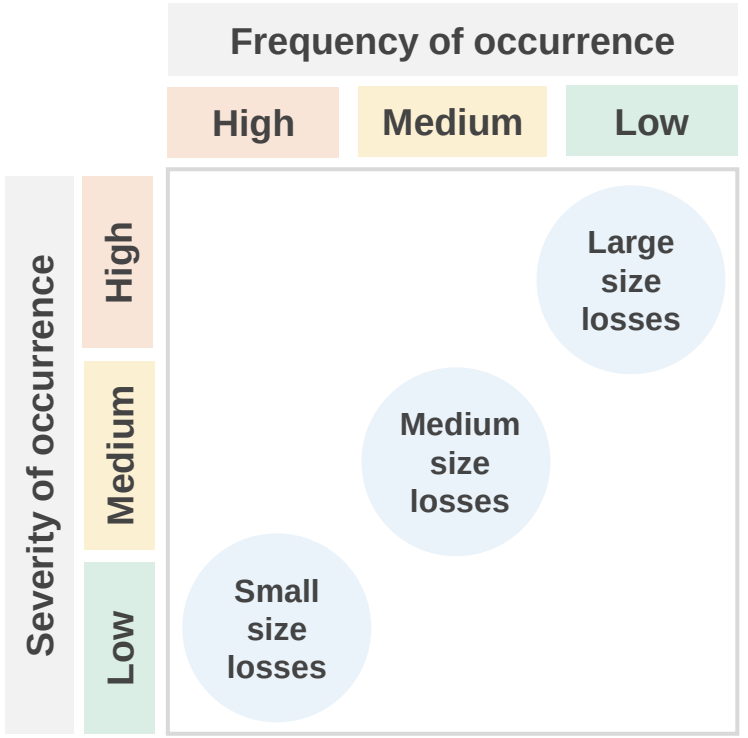
Actuarial Pricing and Modelling Overview

Gross Loss Modelling

Probability and Severity of a Loss – Considerations

	Attritional	Single Risk Losses	Catastrophe Losses
Type of loss	Small and medium sized losses	Large single risk losses	Many risks incur losses in same event
Identifying/ Calculating	▪ 'Normal' or basic losses ▪ Basic losses = Total losses - Large Losses - Catastrophe Losses	▪ Available data (historical losses) ▪ Cash loss limit/claims notification limit ▪ "Rule of thumb" (e.g. 10% treaty premium) ▪ Expected loss + standard deviation	▪ Cash loss/claims notification limit ▪ Catastrophe perils (earthquake, tsunami etc.) ▪ Return period basis ▪ "Rule of thumb" (e.g. 5%-10% treaty premium)
Loss example	Water pipe damage 	Fire at Notre-Dame de Paris, 2019 	Earthquake in Turkey, 2023 



Overview detailed modelling

Gross Loss Modellling

Attritional | **Large** | **Catastrophe**

Aggregate Distribution

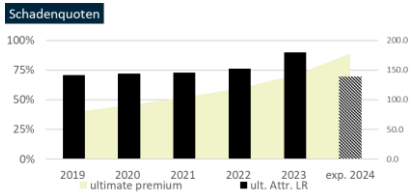
Experience Modellierung: Historical Exposure; Historical Claims; Assumptions - Trends - Inflation - LDFs

Exposure Modelling: Limit Profile; Estimated Loss Ratio; Benchmark Loss Curve

Natural Catastrophe Modelling: Exposure; RMS / Verisk; **ELT**

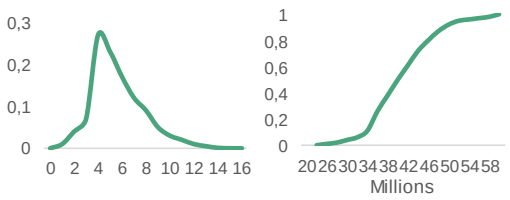
Man-made Catastrophe Modelling: **EIOPA / Large Loss Database**

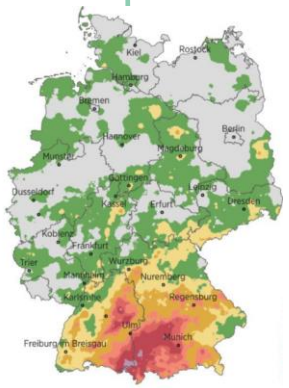
Aufwand	DEV 0	DEV 1	DEV 2	DEV 3	DEV 4	ultimativ
2019	52.7	55.0	55.3	55.6	55.6	55.6
2020	59.1	65.1	65.5	65.7		65.7
2021	70.0	75.2	75.5			75.5
2022	82.2	90.0				90.4
2023	119.0					129.8
LDF	1.08	1.01	1.00	1.00	1.00	

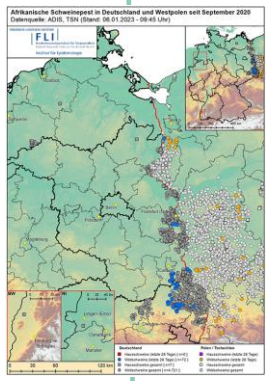


Historical Exposure

Frequency / Severity Distributions







Correlation of UW Result

Gross Loss Model – Stochastically Simulated in iFM

Gross Loss Model (LoB A) | Gross Loss Model (LoB B) | Gross Loss Model (LoB C) | Gross Loss Model (LoB D) | Gross Loss Model (LoB E) | Gross Loss Model (LoB F)

Large Loss Model Approaches – General overview

	Burning Cost	Experience Model	Exposure Model
Input	**Portfolio and Loss data**	**Portfolio and Loss data**	**Risk profile or borderau**
Process	• **Revalue Data:** Adjust past claims to current values to account for inflation and economic changes • **Adjust Due to Exposure Change:** Normalize data to reflect current or projected exposure levels • **Apply RI Structure:** Reflect the actual terms and limits of the reinsurance treaty when estimating expected loss.	• Revalue data • Adjust due to exposure change • Analyse frequency • Analyse severity	• Parameters: loss ratio and exposure curve • Calculate frequency and severity for specific layers
Output	• Average frequency and severity for specific layers	• Frequency and fitted severity distribution for losses • Apply RI structure	• Empirical severity distribution and frequency assumption for losses • Apply RI structure

Rating Variables that Affect Reinsurers' Loss Cost Estimates

Experience analysis

- Rate change
- Loss trend
- Loss development
- Year range & weighting

Exposure analysis

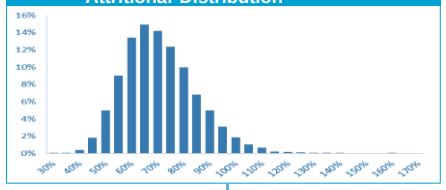
- Loss ratio
- Limit profiles
- Severity distribution (ILFs)

Experience Modelling

Attritional

Aggregate Distribution

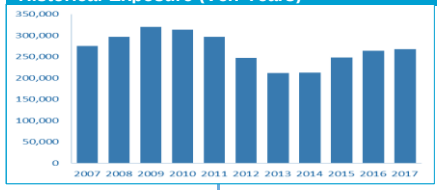
Attritional Distribution



Large

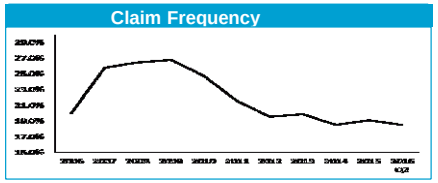
Experience Modelling

Historical Exposure (Veh-Years)

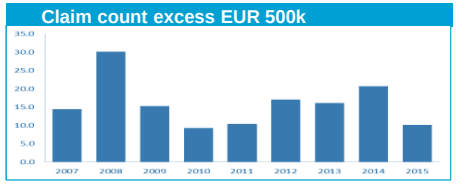


Historical Claims

Claim Frequency

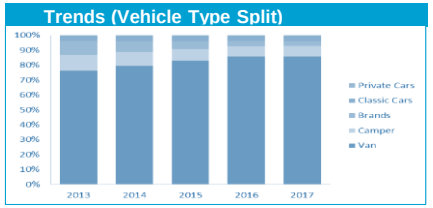


Claim count excess EUR 500k

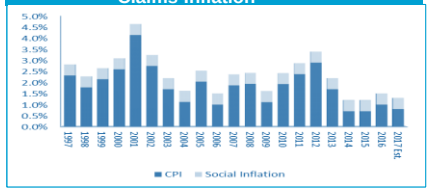


Assumptions

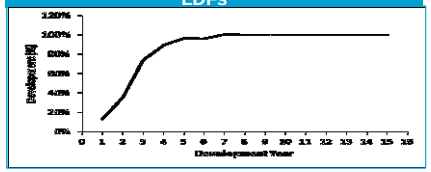
Trends (Vehicle Type Split)



Claims Inflation



LDFs

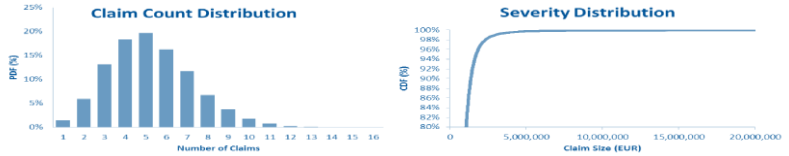


Exposure Modelling

Benchmark Loss Curve

Calibration of Severity

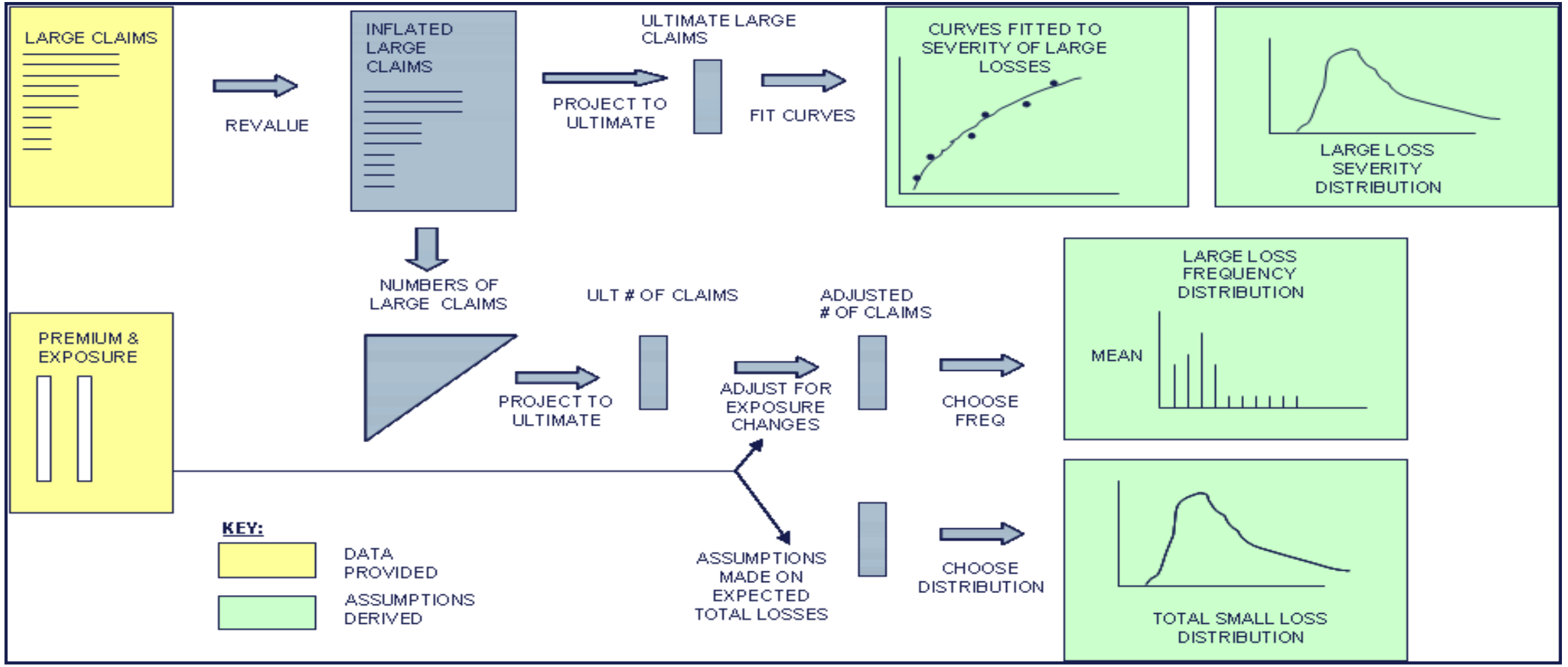
Frequency / Severity Distributions



Expense Loading X%

Gross Loss Model - Stochastically Simulated in iFM

Gross Loss Modelling – Methodology (Frequency & Severity)



Exposure Modelling

Attritional

Large

Aggregate Distribution

Exposure Modelling

Curve Fitting

Risk Profiles

Band Profile

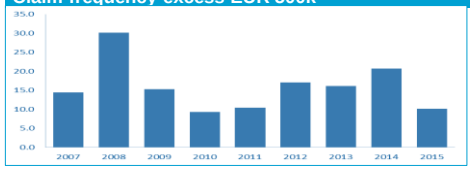
Upper	Lower	No.Ris	Prem	TSI	ASI
0	10,000	12,542	86,214	86,213,708	6,874
10,000	20,000	12,015	148,085	148,084,875	12,325
20,000	30,000	8,541	226,516	226,515,861	26,521
30,000	40,000	2,454	79,792	79,791,810	32,515
40,000	50,000	125	5,707	5,706,500	45,652

Limit Profile

Limit	No.Ris	Prem
10,000,000	12,542	86,213,000
20,000,000	12,015	148,084,000
30,000,000	8,541	226,515,000
40,000,000	2,454	79,791,000
50,000,000	125	5,706,000

Historical Claims

Claim frequency excess EUR 500k



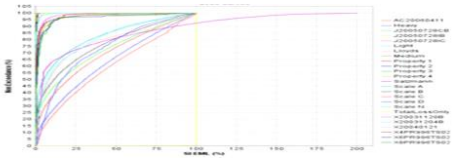
Assumptions

Expected Premium Income

Loss Ratio

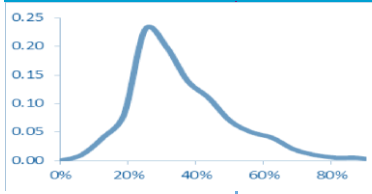
Year	Ult Claims	Premium	LR
2012	17,952	48,707	36.9%
2013	18,049	49,114	36.7%
2014	20,289	52,944	38.3%
2015	24,295	53,321	45.6%
2016	22,449	34,125	65.8%
Average			44.7%

Benchmark Loss Curve / ILF curve

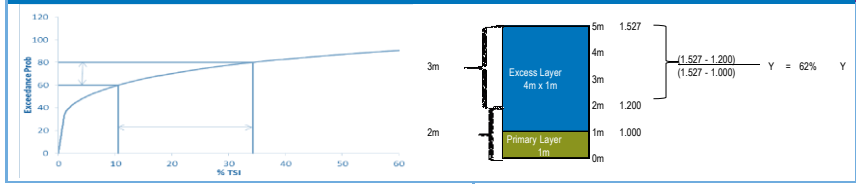


Risk profile Fitting Tool

Attritional Distribution



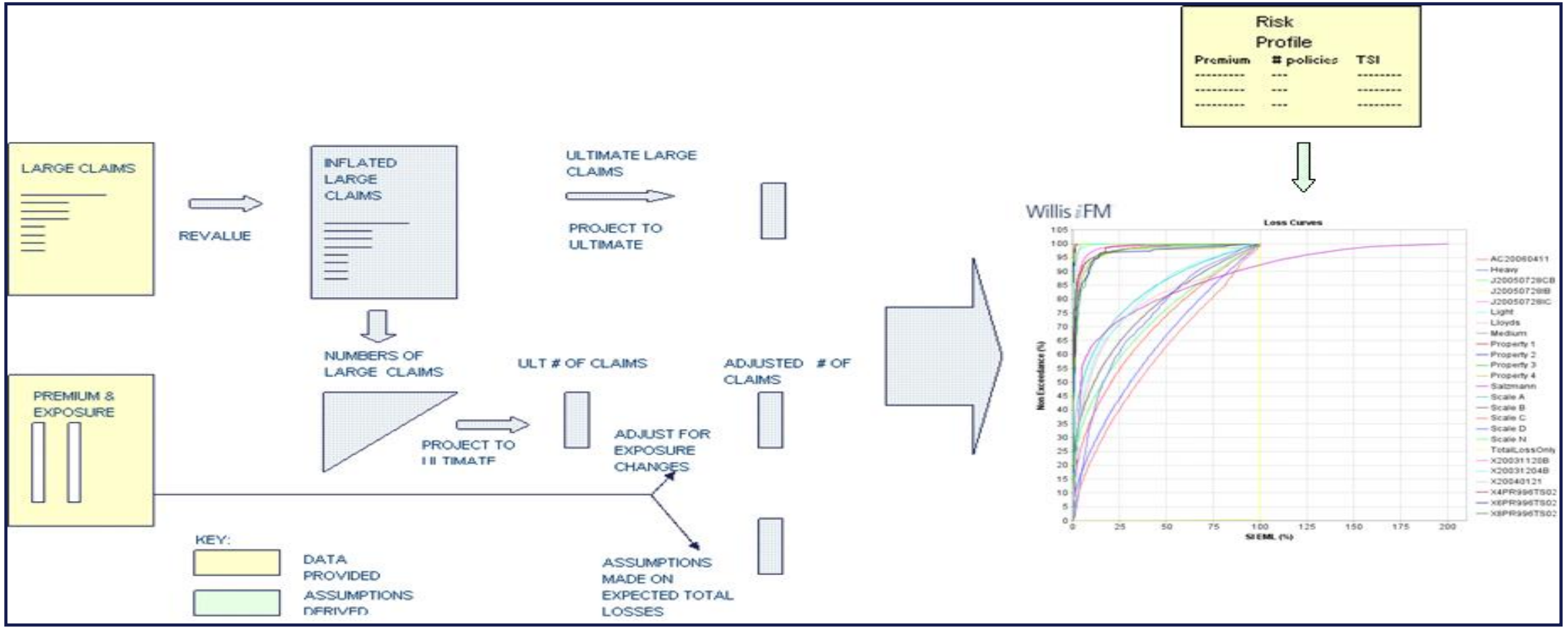
Band calculation



Expense Loading X%

Gross Loss Model - Stochastically Simulated in iFM

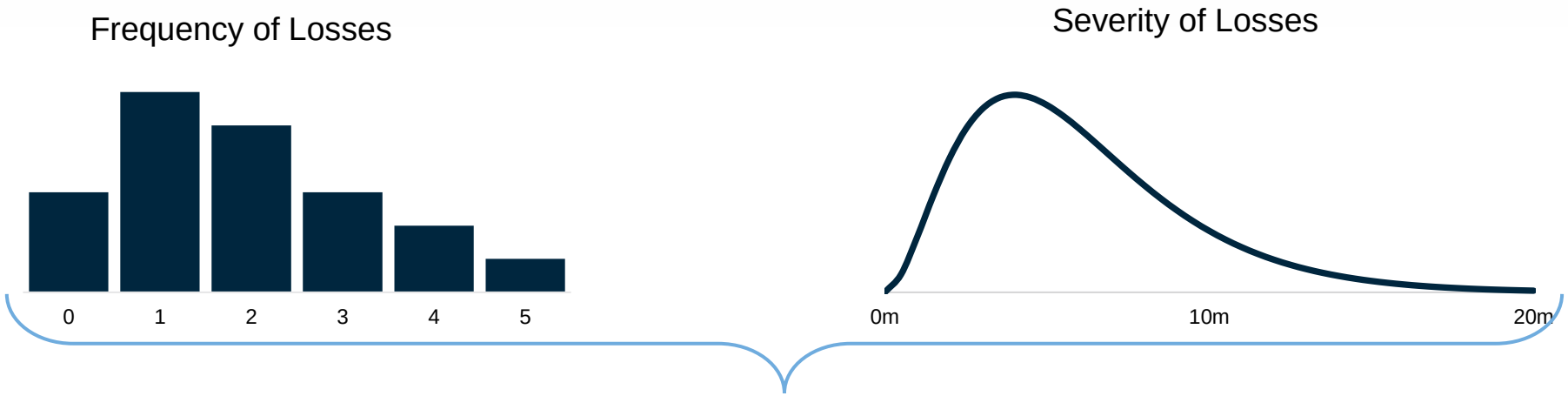
Gross Loss Modelling – Methodology (Risk Profile & Loss Curve)

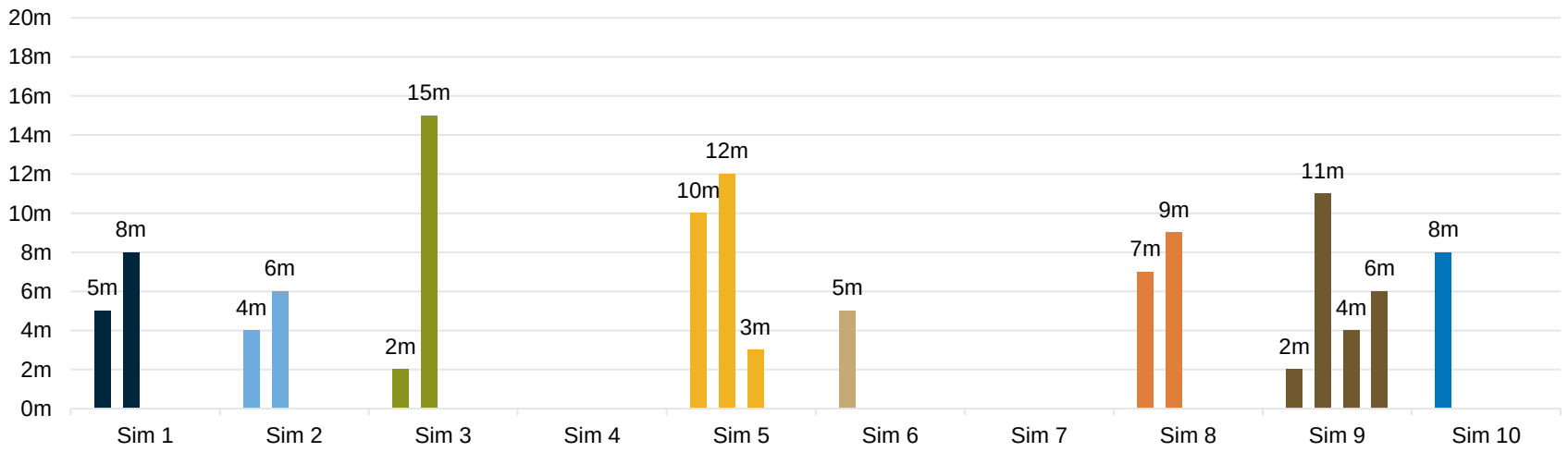


Stochastic Modelling

- Form of financial modelling for estimating probability distribution of potential outcome by allowing for random variation in one or more inputs
- iFM simulates losses for a given number of years / simulations to apply a reinsurance structure
- The output is a distribution of outcomes summarised in key metrics
  - Pricing and reinsurance optimisation

Inside the Black Box





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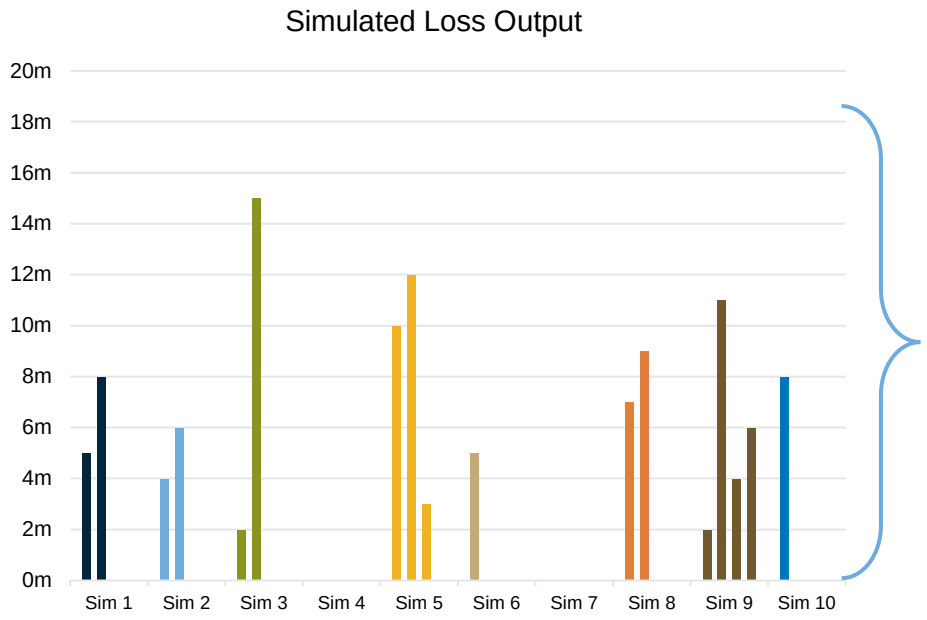

Simulation Details

Sim Year	Loss Size
1	5m
1	8m
2	4m
2	6m
3	2m
3	15m
5	10m
5	12m
5	3m
6	5m
8	7m
8	9m
9	2m
9	11m
9	4m
9	6m
10	8m

Results per Simulated Year

Sim Year	Annual Losses (AEP)	Max Loss (OEP)	Number of Losses (Frequency)
1	13m	8m	2
2	10m	6m	2
3	17m	15m	2
4	0m	0m	0
5	25m	12m	3
6	5m	5m	1
7	0m	0m	0
8	16m	9m	2
9	23m	11m	4
10	8m	8m	1

Occurrence Exceedance Probability (OEP)

- Maximum individual loss within each simulation

Aggregate Exceedance Probability (AEP)

- Total (aggregate) loss within each simulation

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Inside the Black Box

Simulation Details

Sim Year	Loss Size
1	5m
1	8m
2	4m
2	6m
3	2m
3	15m
5	10m
5	12m
5	3m
6	5m
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6	5m	5m	1
7	0m	0m	0
8	16m	9m	2
9	23m	11m	4
10	8m	8m	1

Percentile Summary

Percentile	Annual Losses (AEP)	Max Loss (OEP)	Number of Losses (Frequency)
10%	0m	0m	0
20%	0m	0m	0
30%	5m	5m	1
40%	8m	6m	1
50%	10m	8m	2
60%	13m	8m	2
70%	16m	9m	2
80%	17m	11m	2
90%	23m	12m	3
99.9%	25m	15m	4

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Return Period vs Percentiles

- Output from stochastic models are distributions
- To summarise these, certain points along the distribution are shown, typically **emphasizing downside risk**
- Return periods and Percentiles are ways of expressing points in the distribution
  - 1 in 10 years = 10% probability
  - 1 in 100 years = 1% probability
  - 1 in 200 years = 0.5% probability

Return Period Translator

Return Period	Percentile	Probability
999 in 1000	0.1%	99.9%
499 in 500	0.2%	99.8%
199 in 200	0.5%	99.5%
99 in 100	1%	99%
49 in 50	2%	98%
19 in 20	5%	95%
9 in 10	10%	90%
4 in 5	20%	80%
3 in 4	25%	75%
1 in 2	50%	50%
1 in 4	75%	25%
1 in 5	80%	20%
1 in 10	90%	10%
1 in 20	95%	5%
1 in 50	98%	2%
1 in 100	99%	1%
1 in 200	99.5%	0.5%
1 in 500	99.8%	0.2%
1 in 1000	99.9%	0.1%

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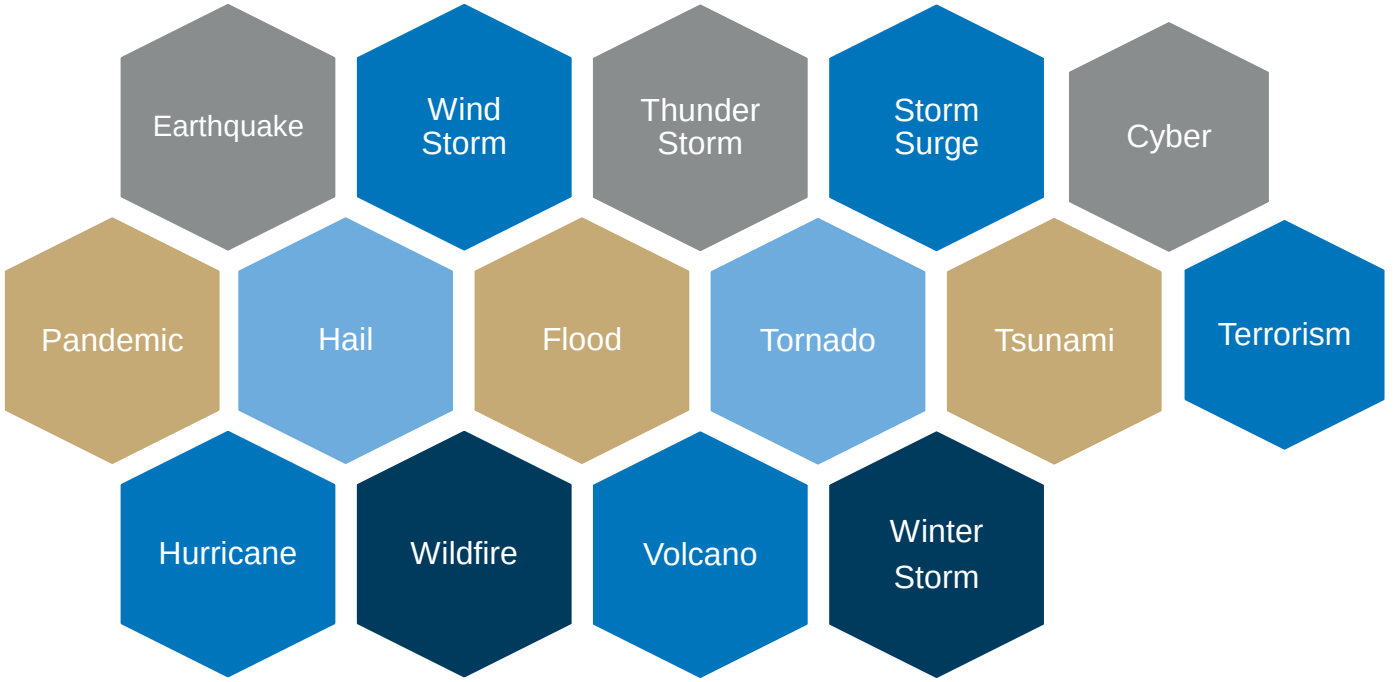
Introduction to Catastrophe Modelling

What is Catastrophe Modelling?

> A process assisting **insurers, reinsurers** and **governments** to **identify, quantify** and **manage risk** from **catastrophic events** (natural and manmade).



Catastrophe Modelling in Context

Why do we need catastrophe modelling in the (re)insurance industry?

Catastrophic events (including natural disasters) can cause huge economic losses

They are often unpredictable

If events could be predicted with complete certainty, there would be no need for (re)insurance.

Catastrophe Modelling allows (re)insurance industry to quantify potential losses

Utilises scientific knowledge & insured details in order to generate loss estimates

Statistics/Probability
Physical Sciences
Engineering/Tech
Actuarial Science

How Cat Analytics is used to improve financial strength

Different parties within re/insurance will have different needs when it comes to catastrophe analytics

Underwriting

- Screen large risks to improve loss ratio, avoiding adverse risk selection
- Ensuring cat risk is appropriately priced

Exposure Management

- Assessing top drivers that are influential on a loss basis
- Identifying risk concentrations and accumulations

Reinsurance

- Ensure risk transfer structure reflects latest risk and growth potential
- Ensure reinsurance is aligned to strategic objectives

Capital and Governance

- Justifying model choice
- Understanding capital adequacy and demonstrating this to regulators

Modelling Process

Using the models to calculate modelled losses forms a small part of the overall process once we receive the data information from the client

Client sends data to Analysts

- Exposure data is provided in Excel or database format
- This contains the exposure location, primary modifier, sums insured and financial term information needed for modelling

Analyst prepares data to import into model

- Analysts manipulate the data to get it into a model ready format
- Create input files that contain the fields and mappings the models can digest

Peril and Settings Selection

- Choose the peril and modelling settings to be applied
- For example:
  - *Loss amplification*
  - *Sub-perils*
  - *Level of loss information*

Model Calculates the losses

- The model takes the exposure data, applies the designated settings and generates modelled losses

Analysts sends losses to client

- Analysts ensure losses are sensible and movements can explained
- Sent back to the client and onto reinsurers

Data Quality has an impact at each stage of the process

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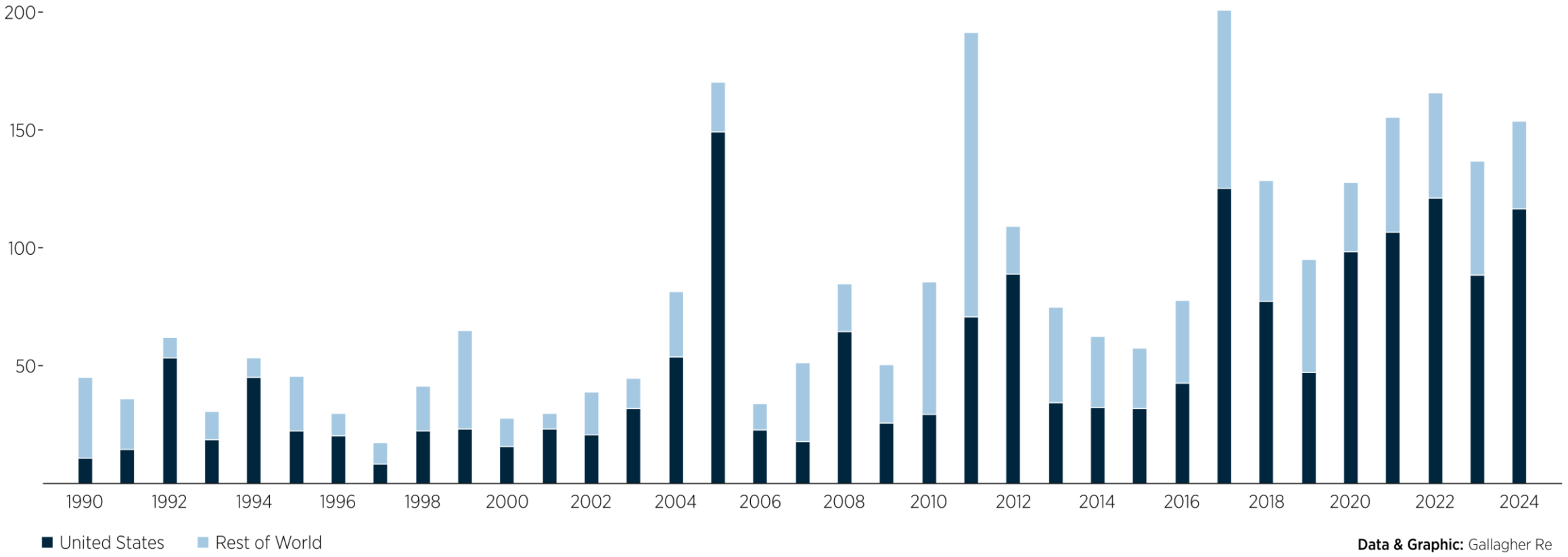
Market Catastrophe Losses

Nat Cat Losses

Total Global Insured Loss: USD154 billion (International / Non-US Portion: USD37 billion)



2024 Nat Cat Takeaways

- Private insurance market covered USD135 billion; public insurance entities covered USD19 billion
- 30 individual billion-dollar insured loss events; 22 occurred in the United States
- Record 22 multi-billion-dollar (>USD2 billion) events; 15 occurred in the United States
- Costliest individual insured events: Hurricane Helene (USD20 billion) and Hurricane Milton (USD20 billion)
- Severe Convective Storms accounted for 41% (USD64 billion) of global insured losses; USD56 billion from the United States

International Takeaways

- Several significant industry loss events in non-traditional insurance markets for major catastrophe events
  - Eastern Spain Floods (DANA): USD3.7 billion
  - Arabian Gulf Flash Floods: USD2.8 billion
  - Brazil Floods (Rio Grande do Sul): USD1.5 billion
  - Hualien Earthquake (Taiwan): USD1.0 billion
  - Typhoon Yagi (China / Vietnam): USD1.0 billion

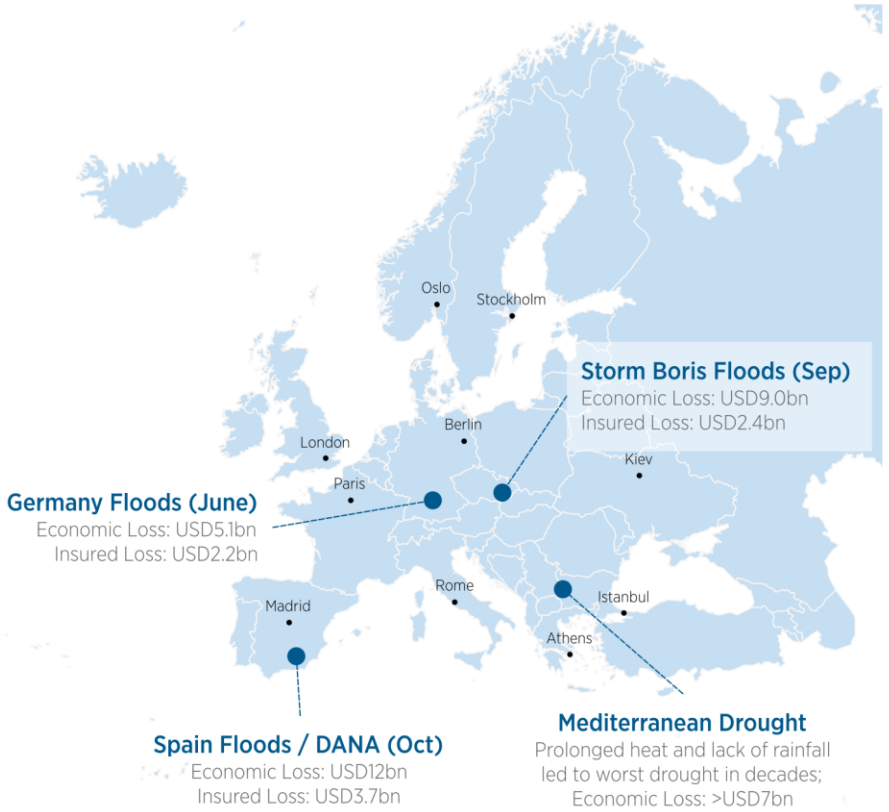
Nat Cat Events: Canada / LAC

Canada: USD6.2 billion insured loss; costliest year for the industry on record

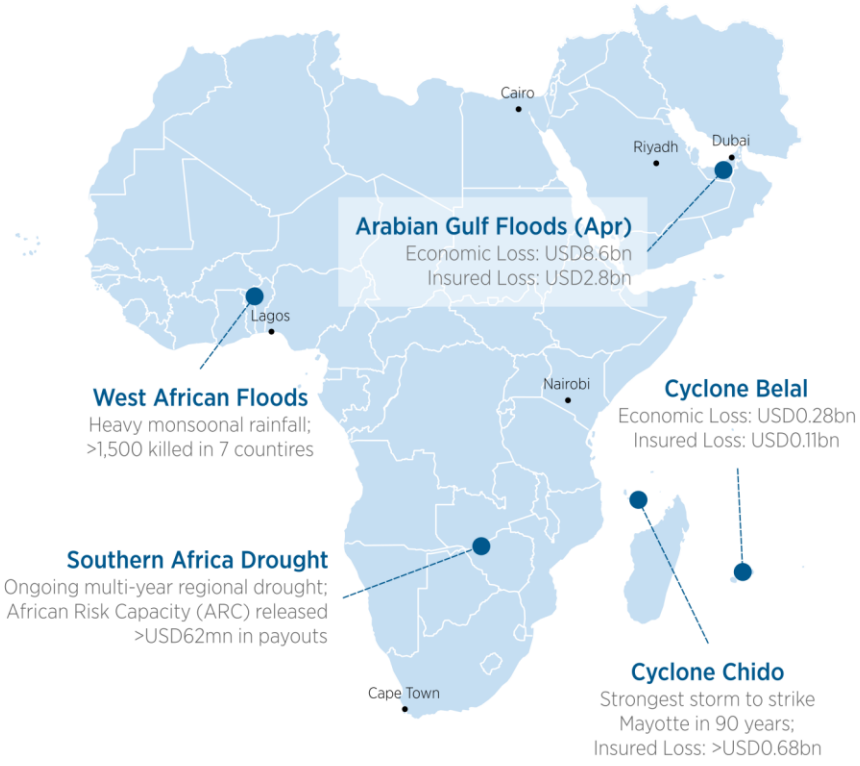
Nat Cat Events: EMEA

Flood and drought events dominated EMEA loss totals in 2024

Europe

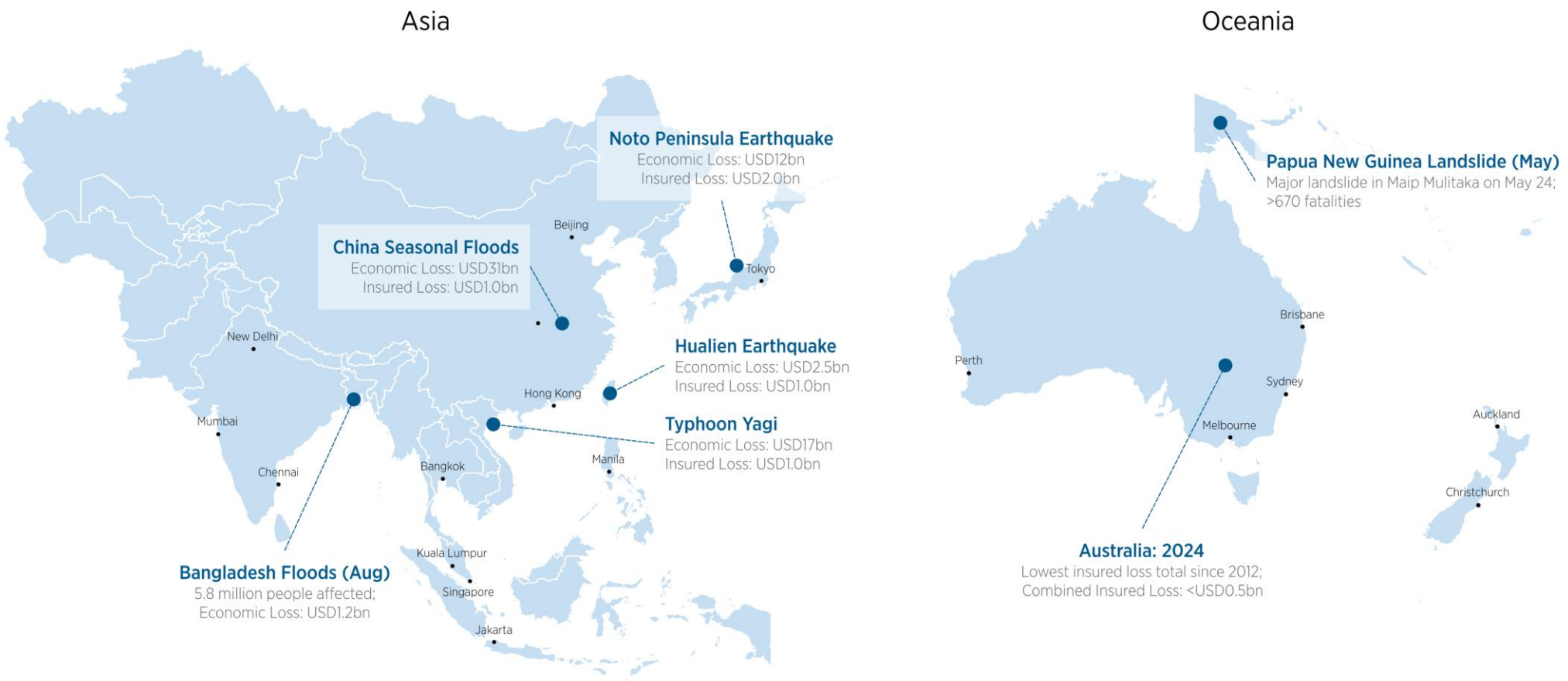


Africa / Middle East



Nat Cat Events: APAC

Below average year for Asia-Pacific; Typhoon Yagi the most consequential regional event



Contact us

Get in touch to let us know how we can help.

Jan Hrevuš

Chief Executive Officer of Gallagher Re, a.s.

jan_hrevus@GallagherRe.com

It’s the way we do it.

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