

# Maximising the Potential of Earthquake Models

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# Use of Catastrophe Models

## ➤ Assessing PMLs

- How much reinsurance cover to purchase / capital to hold?

## ➤ Pricing Risk Transfer

- Modelling Expected Loss and Volatility of Loss to each reinsurance or capital markets contract

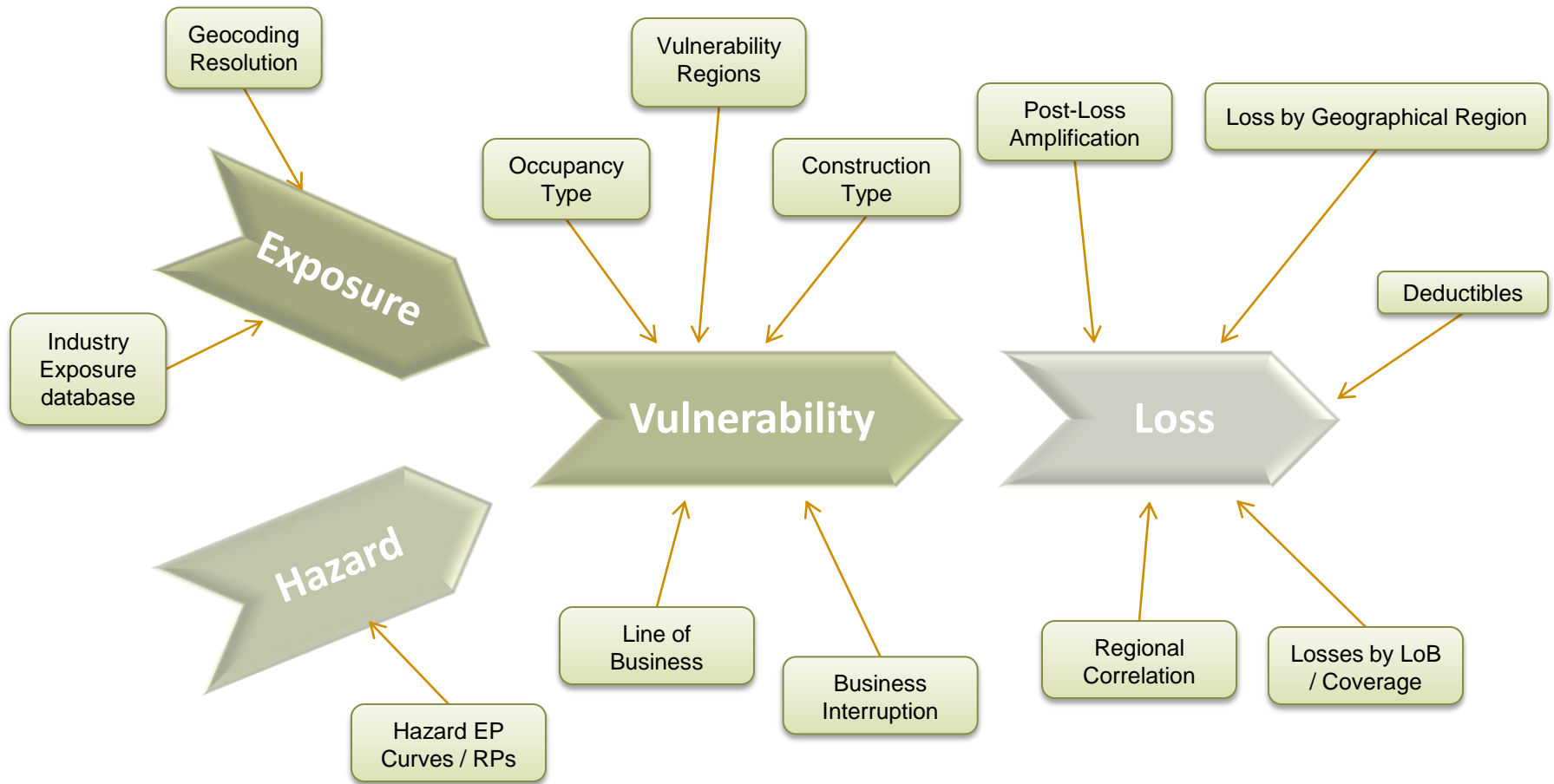
## ➤ Application to original (natural peril) policies

- Impact of deductibles and peril limits
- Impact of risk factors
  - Geographic location
  - Construction factors

## ➤ Reinsurance Portfolio Management / Optimisation

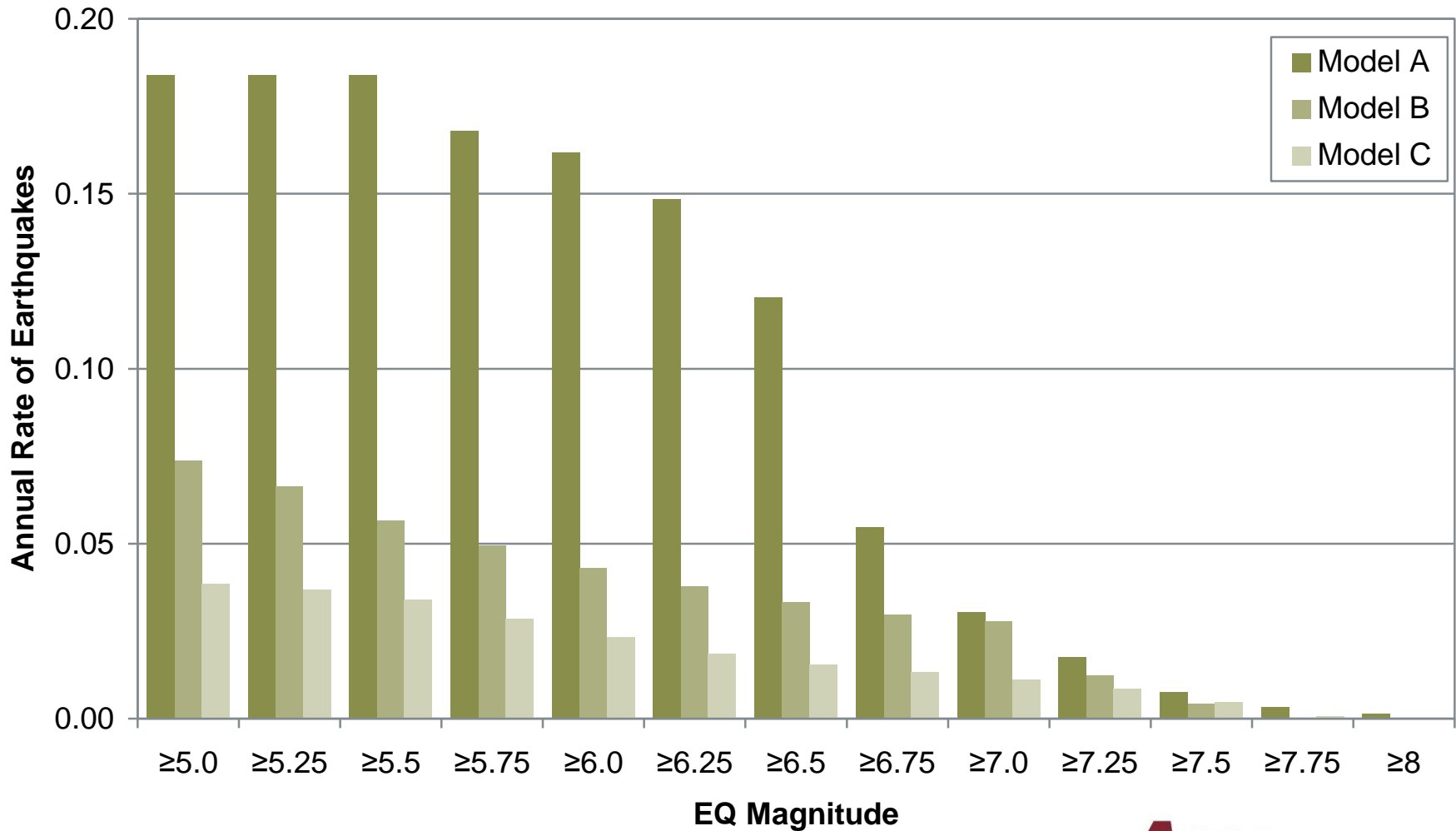
- Monitoring Accumulations.
- Growth / Reduction Strategies

# Use with confidence? Role of Model Evaluation



# Comparison of Event Rates for EQs affecting Zone 1

➤ Substantial differences – but this is only one aspect of a model



# Models are indispensable but not the whole picture

➤ We must acknowledge the uncertainty in models

- Inherent randomness – how many, which events
- Parameter/Knowledge uncertainty
- Data uncertainty
  - Location of exposure, construction
- Simulation of losses

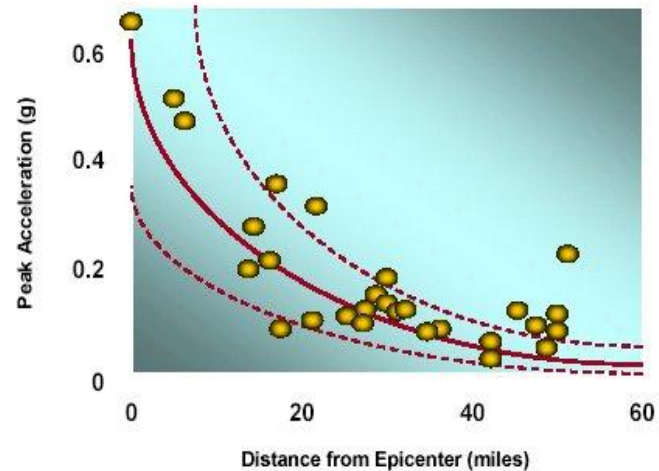
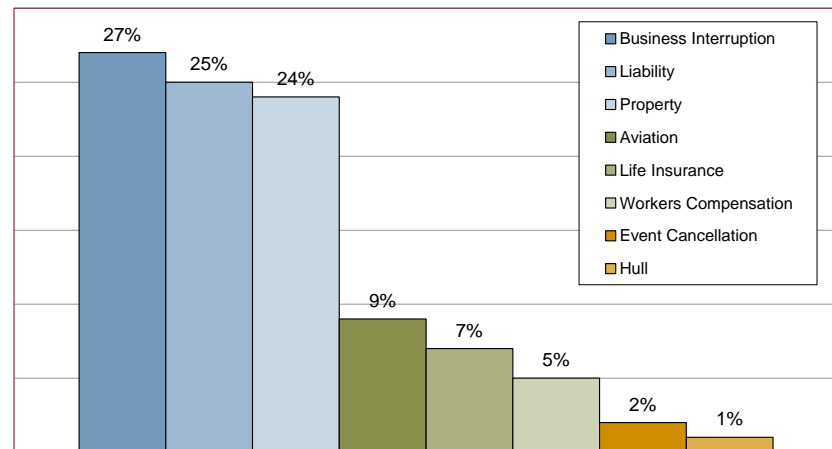


Figure 1. Earthquake Ground Motion Attenuation in the 1989 Loma Prieta Earthquake  
(Source: EERI Earthquake Spectra, May 1990) Courtesy RMS

➤ What does a model cover?

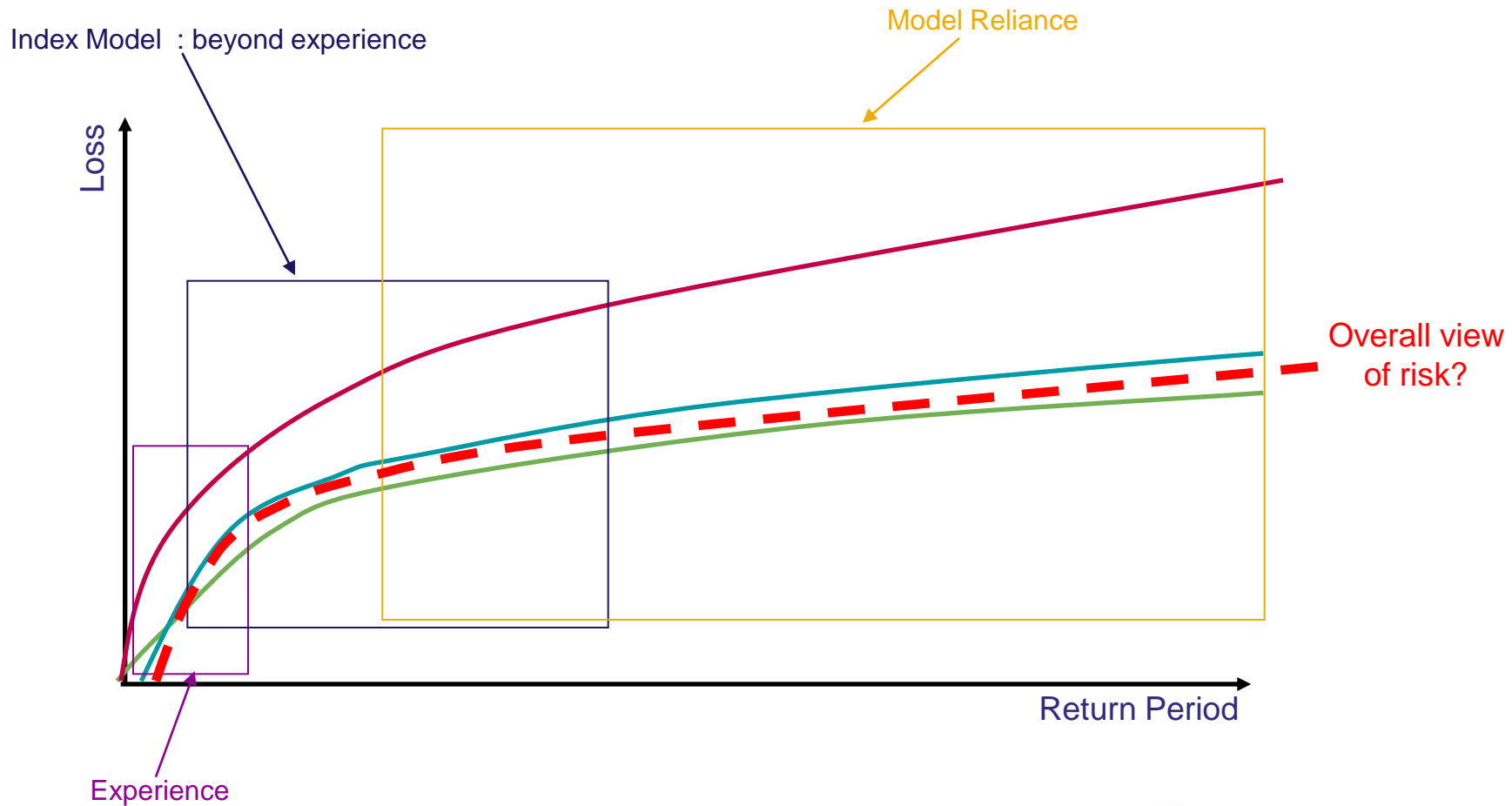
- What exposure data are we modelling?
- Clash of loss across classes?

Breakdown of Insurance Losses by LOB for WTC Disaster



# Evaluate and Decide

## Combining results, experience, knowledge



# Assessing PMLs

## ➤ How much cover to buy and risk capital to hold

- Companies need to understand their risk tolerance level
- Need to have appropriate risk measures – to define solvency and security ratings
- Views of regulators (e.g. Solvency II 99.5% VAR) and Rating Agencies (e.g. 1 in 250-year PML)

## ➤ Insurance markets have often standardised around a percentage of main zone exposure (e.g. 6% of Zones 1&3)

- Based on key risk accumulations and scenarios
- Does not reflect all risk (other zones)
- Does not reflect risk characteristics

## ➤ Emphasis now on addressing probability of loss and maximum credible loss

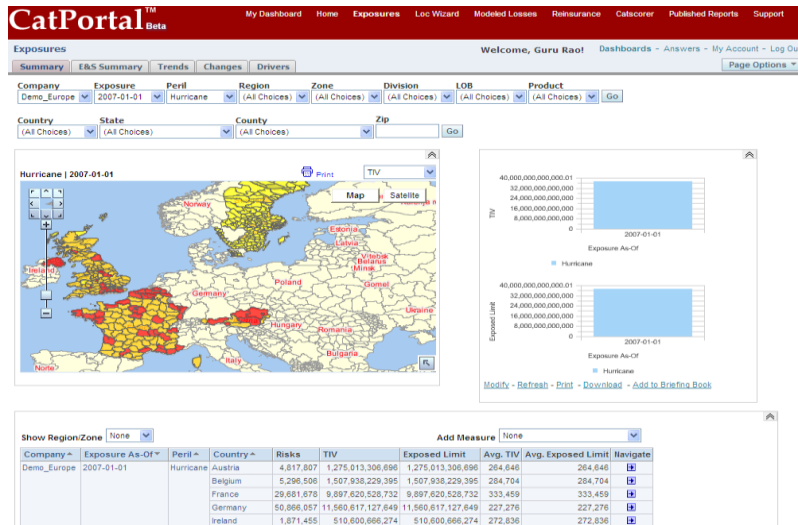
# Pricing Risk Transfer

- Simulate results (in DFA software eg ReMetrica) using cat model output
- Calculate Expected Losses, Volatility, Loss Probability, Margins and Loadings for each layer
- Provides very useful metrics for benchmarking catastrophe pricing

	Premium and ROL %		Expected recovery	Reinsurer margin	Standard Deviation of recoveries	Reinsurer margin to Std. Dev.	Premium multiple	Probability of Attach / Exhaust	
	Initial	Total						1st Limit	2nd Limit
<b>Over the Program</b>			0.07		2.10			0.55%	
<b>€20m xs €10m</b> 1@100%, 100% placed	0.50 2.50%	0.51 2.55%	0.22 1.10%	0.29 1.45%	2.10	13.8%	2.32	2.25% 0.60%	0.60% 0.00%
<b>€5m xs €5m</b> 1@100%, 100% placed	0.29 5.80%	0.32 6.30%	0.18 3.60%	0.14 2.70%	0.85	15.9%	1.75	4.00% 2.30%	2.30% 0.02%
<b>€3m xs €2m</b> 1@100%, 100% placed	0.30 10.00%	0.33 11.11%	0.21 7.00%	0.12 4.11%	0.65	19.0%	1.59	10.00% 4.50%	4.50% 0.10%
<b>Retention</b>			0.29		0.55				
<b>Gross Ceded Net</b>	1.09	1.16	1.07 0.61 0.46	0.55	5.90 3.70 0.14	14.8%	1.90		



# Monitoring Reinsurance Portfolio Accumulation



➤ Tools are available to view and query exposure and loss data

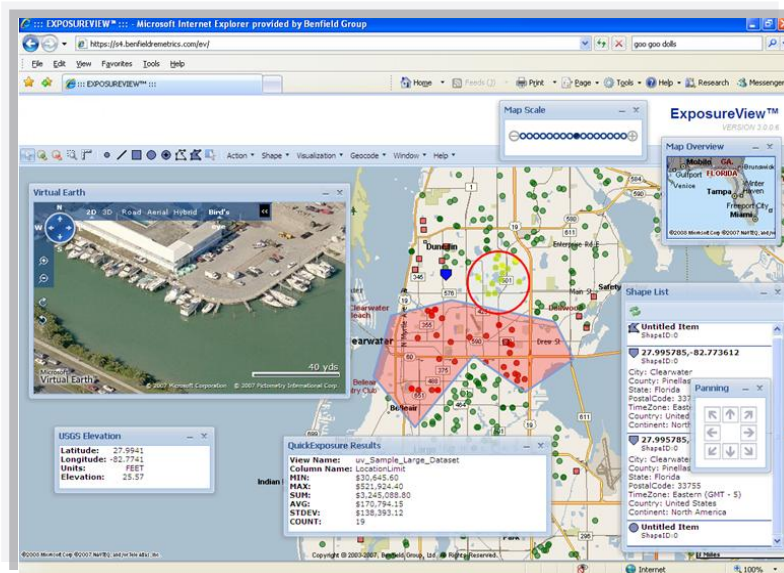
➤ May be online 24-7 access or offline reports

➤ Identify risks potentially affected by a catastrophe before, during and after the event

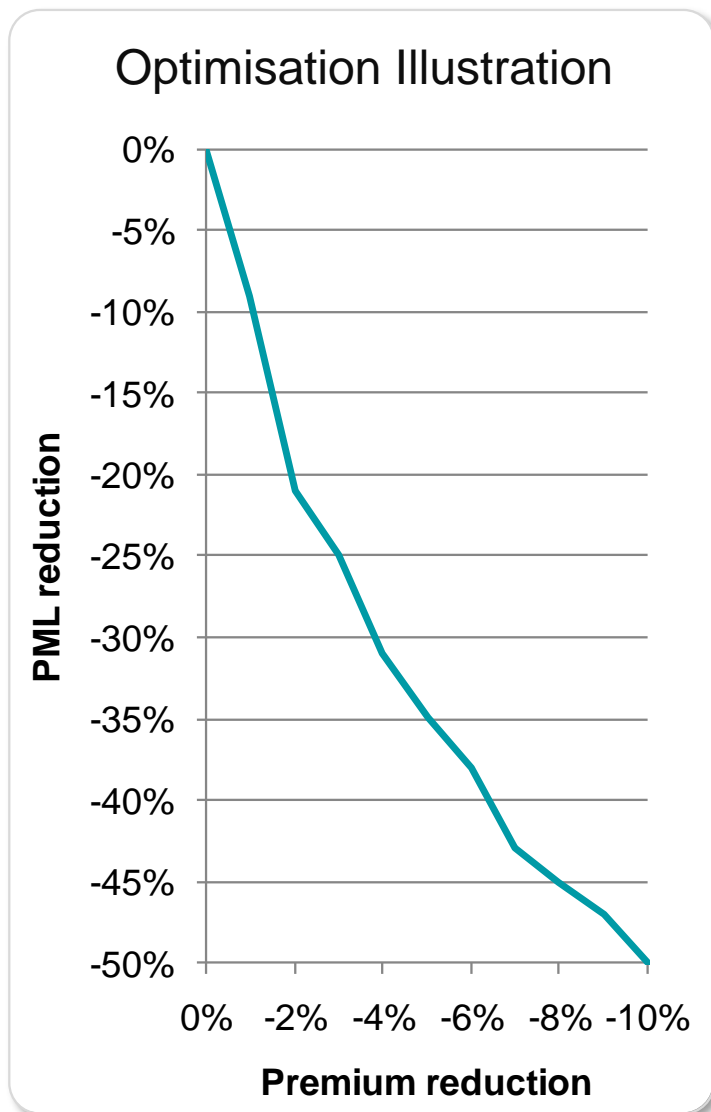
➤ Tables, charts and maps to visualise data

➤ Monitor developments over time

- Changes in geographic mix
- Changes in risk factors



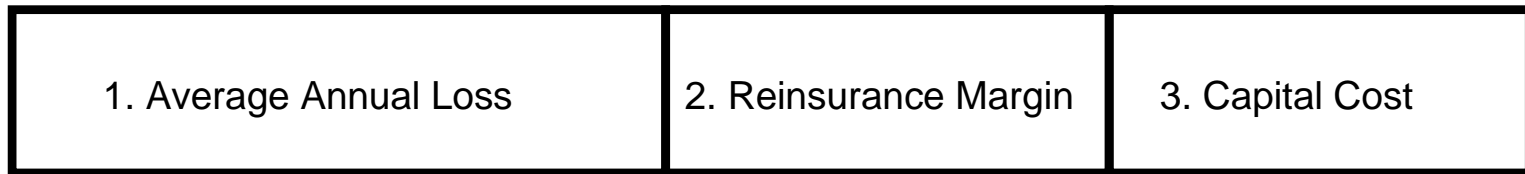
# Reinsurance Portfolio Optimisation



- Identifies policies which have highest PML to premium ratio (for user specified return periods)
- Used to identify areas for growth or develop a non-renewal strategy to reduce the amount of reinsurance needed
- Used to identify efficient use of facultative reinsurance to remove large contributors to the portfolio results
- Used to control:
  - PML
  - Concentration of risk
  - Reinsurance costs
  - Exposure to cat loss

# Pricing the Original Risks

➤ Use models to capture the cost of underwriting Cat risk



Models help to quantify the pricing components

➤ Average Annual Loss

- Long run average expected losses based on all events

➤ Reinsurance Margin

- The expected reinsurance premium in excess of the expected loss

➤ Cost of Net Capital

- Cost of capital required to support the retained catastrophe risk

Thank you for your attention