Catastrophe Portfolio Management

CARE Seminar 2011

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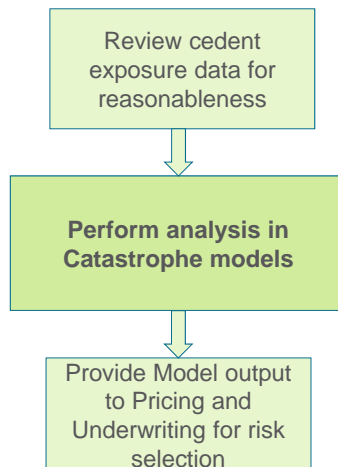
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1	Utilize Model Output for Risk Selection
2	Portfolio Management and Optimization
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Catastrophe Modelling – A Traditional Approach

Review cedent
exposure data for
reasonableness

**Perform analysis in
Catastrophe models**

Provide Model output
to Pricing and
Underwriting for risk
selection

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Catastrophe Modelling – Alternative Approach

**Catastrophe
Modeling**

**Pricing & Underwriting
Evaluation**

**Portfolio
Management**

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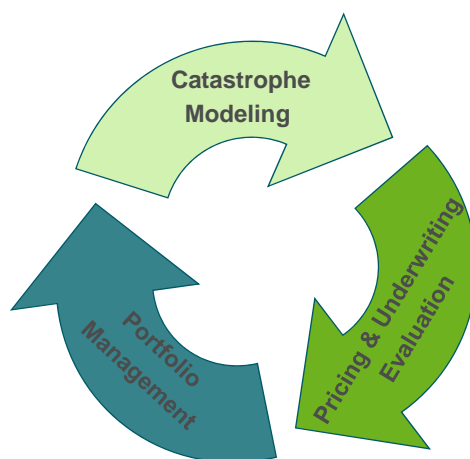
Model Output (1/2)

❑ Event Loss Table (ELT)

- A table of all simulated events, with estimates of loss amounts, descriptive code for the event, and the annual rate of the event recurring.

Event ID	Annual Probability	Loss	Cumulative Probability
Event 1	0.01%	$100	0.01%
Event 2	0.5%	$50	0.51%

These columns are used to draw the EP Curve

❑ Exceedance Probability Curve (EP Curve)

- Curve shows the probability that the loss amount exceeding various loss threshold.

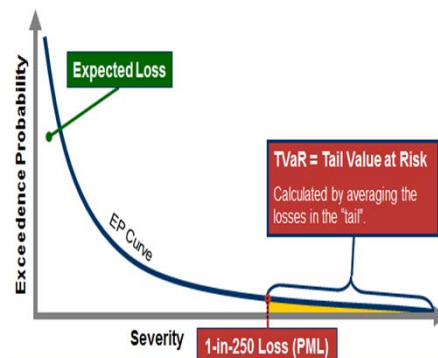The area under the EP curve = the average annualized loss (or pure premium)

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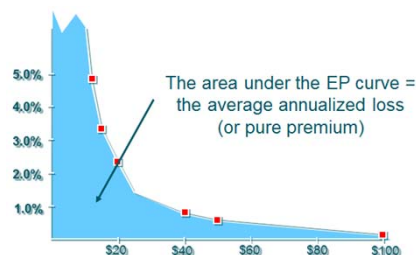
Model Output (2/2)

❑ PML (aka VaR – Value at Risk)

- Indicates the magnitude of a loss this size or higher that has a given probability of occurring.

❑ TVaR – Tail Value at Risk
(aka TCE – Tail Conditional Expectation)

- Average value of loss above a selected EP return period.

Expected Loss

EP Curve

TVaR = Tail Value at Risk
Calculated by averaging the losses in the "tail".

Exceedence Probability

Severity   1-in-250 Loss (PML)

1) PML at 250yr Return Period - Loss likely to be met or exceeded 1 out of every 250 years (0.4% of the time).

2) TVaR at 250yr Return Period– Average of worst modeled losses the smallest of which will be met or exceeded only 0.4% of the time.
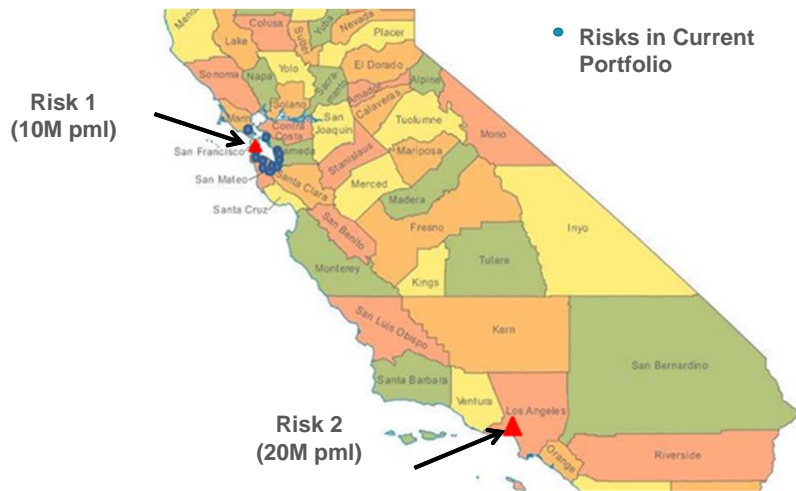
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Utilize Model Output for Risk Selection (1/3)

❑ Example

Model Output	Risk 1	Risk 2
Annualized Loss cost	$1M	$1M
100 yr pml	$10M	$20M

❑ Which risk is riskier to write?

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Utilize Model Output for Risk Selection (2/3)

● **Risks in Current Portfolio**

Risk 1 (10M pml)

Risk 2 (20M pml)

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Utilize Model Output for Risk Selection (3/3)

- ❑ The benefit of diversification is not reflected when PML is measured on a standalone basis
- ❑ PML on marginal basis should be used for both risk selection and risk comparison purposes
- ❑ Marginal contribution can be used for a single risk evaluation (e.g. facultative business) as well as evaluation for a group of risks (e.g. treaty business)
- ❑ Marginal contribution is not limited to PML measure; it can be used for other risk metrics also (e.g. TVaR)
- ❑ Marginal Contribution (treaty) = Risk Metrics (portfolio w/ treaty) – Risk Metrics (portfolio w/o treaty)
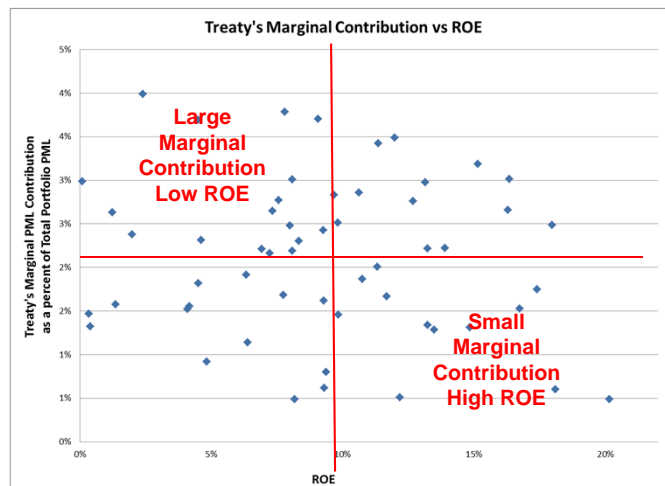
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Portfolio Management

❑ During the renewals, establish a Reference Portfolio at a given time interval

❑ Reference Portfolio needs to be established by region/peril

❑ Marginal contribution of a potential account to the Reference Portfolio can be calculated

❑ Marginal contribution can be useful to track company's overall exposure during renewal period to make sure PML does not exceed the company's risk tolerance limit

❑ Marginal contribution can be used as a benchmark to optimize a portfolio to maximize return on equity

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Portfolio Optimization – An Example

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Rate Comparison after Renewals - ROL

❑ Traditionally, the adequacy of rates for property reinsurance (per occurrence excess covers) is measured by Rate on Line (ROL)

❑ ROL = Reinsurance Premium / Reinsurance Limit (what's charged for the layer / the width of the layer)

❑ For example, a $10 million catastrophe cover with a premium of $2 million would have a ROL of 20 percent

❑ However, if there is a change in reinsurance layer structure, ROL comparison from one renewal period to another provides no meaningful information

$20M	
	Reins. Prem = $2m
$10M	

$30m	
	Reins. Prem = $1m
$20M	
$10M	

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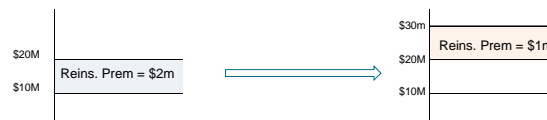
Rate Comparison – ROL with Modification

❏ Plotting ROL by midpoint of each layer can give insight as to how rates "move" by layer for a particular cedent
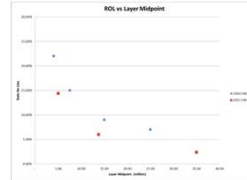

❏ However, what if there is a significant change in underlying CAT exposure?

❏ Ceded PML (on standalone basis) could be a good indication as to how severely their treaties are CAT exposed from one year to another

❏ To normalize the severity of the CAT exposure, a proxy parameter = "midpoint of each layer / ceded PML" could be used

❏ Mapping ROL against this proxy reveals rates by varying level of CAT exposure

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Portfolio Rate Comparison – Example 1

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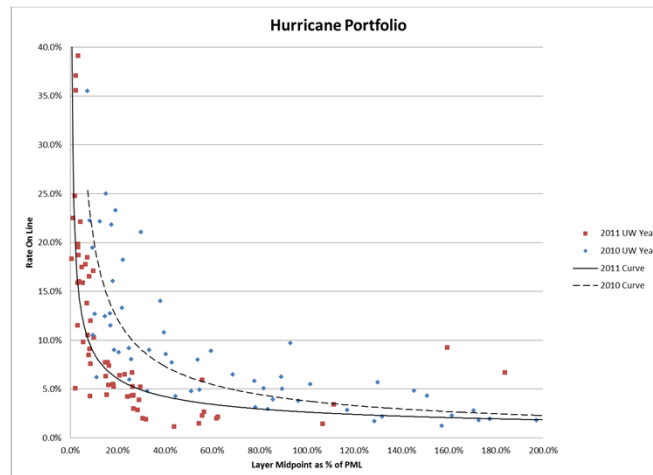
Portfolio Rate Comparison – Example 2

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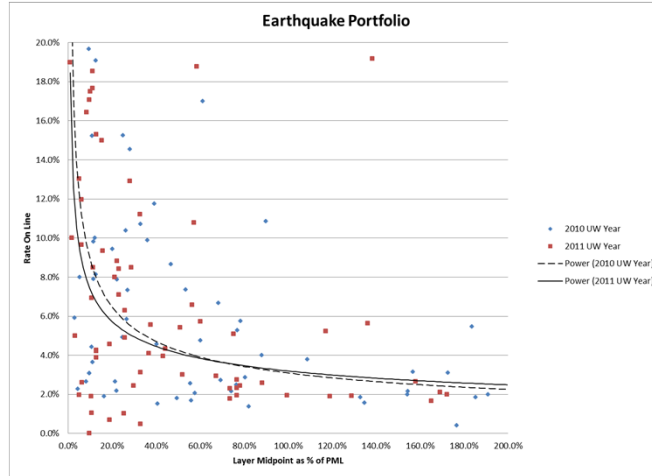
THANK YOU FOR YOUR ATTENTION

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