



# ISFA – CAT Risk

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# Outline: Pricing & Profitability

## Goal: Further details about CAT hazard

- Definition of the CAT risk.
- Modelling of CAT risk.
- Pricing of CAT risk



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# CAT losses

Very extreme events: very low frequency/very high severity process

CAT events for all LoB?

Examples:

1. Property: Windstorm, Earthquake, Flood,...
2. Marine: Windstorm, Tsunami, Hurricane,...
3. Life & Accident: Terrorism, Pandemic, CATNAT?
4. Casualty: Terrorism?, Crashes?, Other?
5. ...



# Reinsurance for CAT risk

- Cat Risk has a huge impact in terms of capital requirement
- ... For a small premium income/average loss
- Generally Excess of Loss reinsurance...
- Or Umbrella covers !?



# Common Catastrophe covers

- Catastrophe Aggregate Excess of Loss
- Second Event Excess Covers
- Reinstatement Premium Protection
- ... Difficult to determine the adequate reinsurance structure ...  
Difficult to model the risk ...



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# CAT losses models

Very rare events imply that there are few data available on the market

Solution:

- Softwares: RMS, Equecat,...
- Mathematical models (reliability?)
- Scenarios

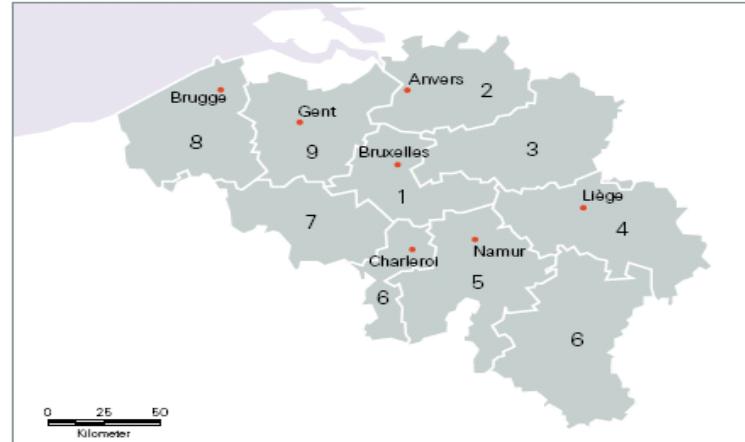
Results: Event Loss Table

Clustering

# Cat Softwares - Inputs

## Accumulation control

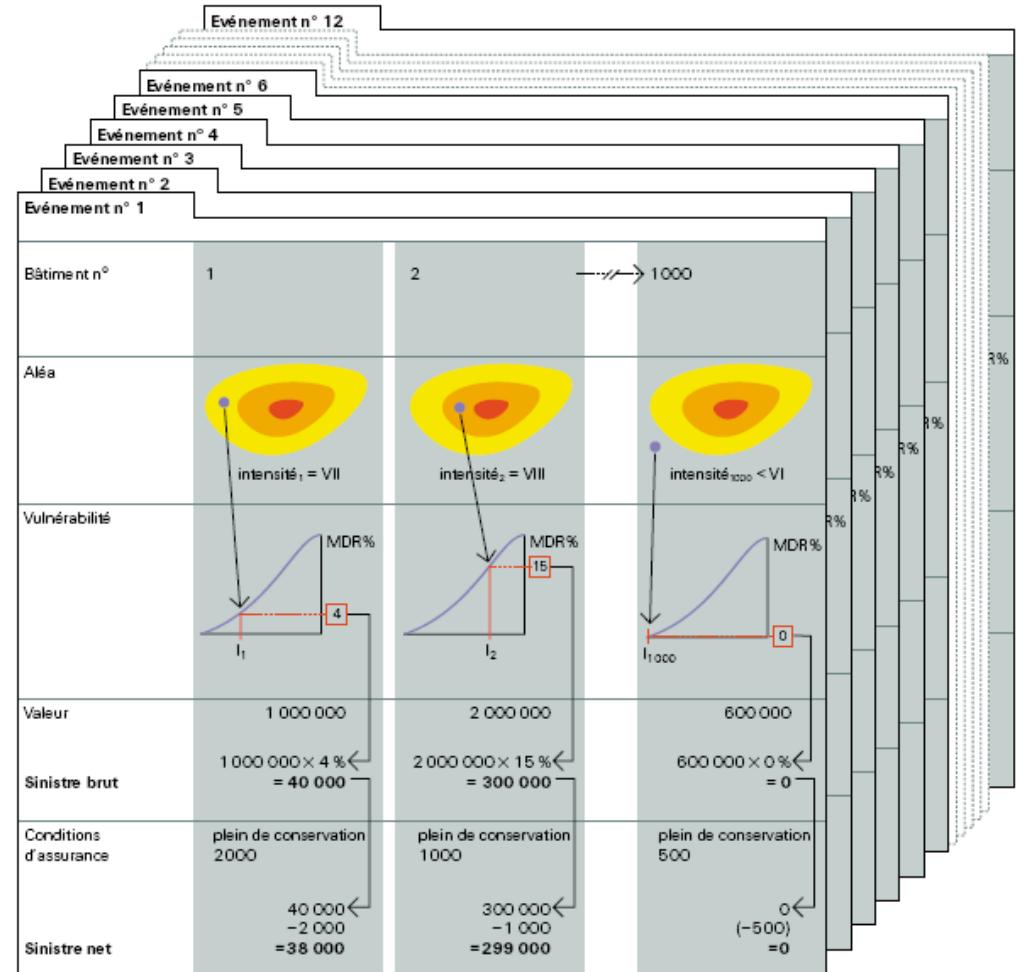
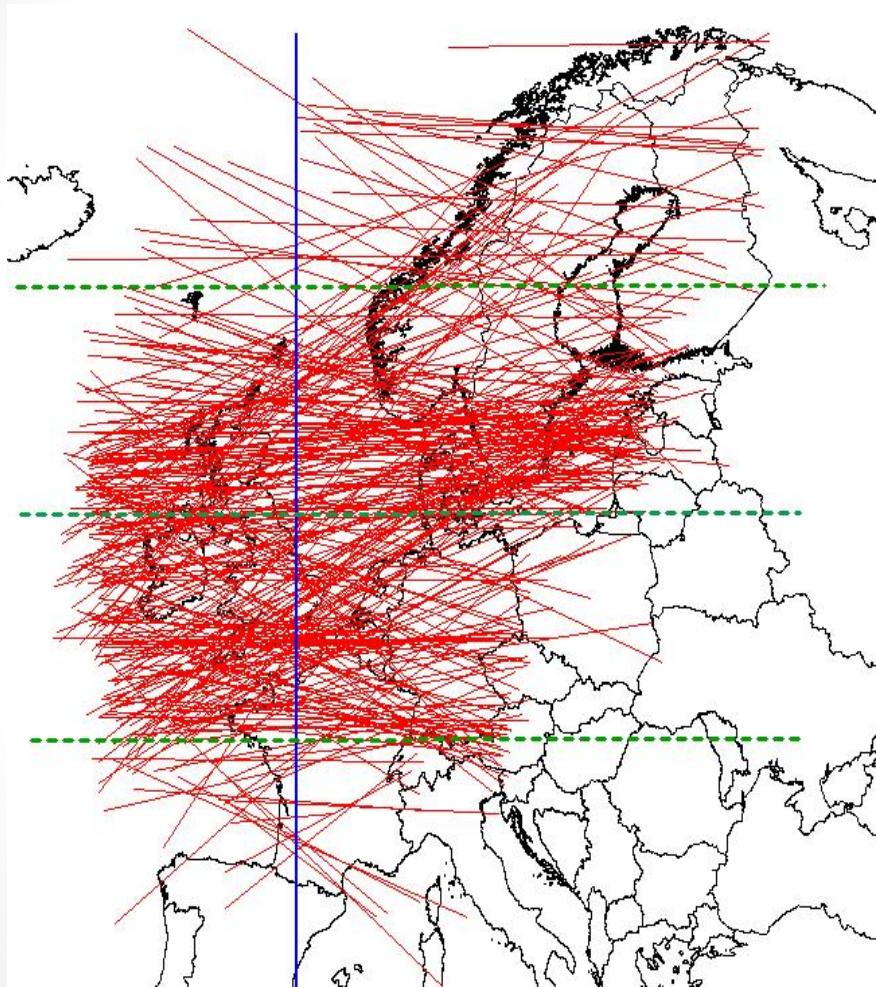
Country: Belgium  
 Natural hazard: Windstorm  
 Geographical breakdown: Aggregated data per CRESTA zone



	Agricultural	Industrial	Commercial	Residential	
CRESTA Zone	Value Building	Value Contents	Value BI*		... Additional fields, eg number of insured objects, limits, deductibles, etc.
1	2304.57	451.88	0.00	.....	
2	456.78	106.23	0.00	.....	
3	396.45	70.80	0.00	.....	
4	299.93	76.91	0.00	.....	
5	1398.45	332.96	0.00	.....	
6	1103.29	204.31	0.00	.....	
7	932.30	198.36	0.00	.....	
8	304.42	63.42	0.00	.....	
9	102.23	23.23	0.00	.....	

\*BI = Business interruption

# Cat Softwares - Running





# CAT Models Outputs

- ELT: *Event Loss Table*  
→ *List of distribution per Event modelled*
- OEP: *Occurrence Exceedance Probability*  
→ *Distribution of the Maximum Event occurring*
- AEP: *Aggregate Exceedance Probability*  
→ *Distribution of the Sum of Events occurring*



# CAT losses models

Example: ELT

EVENTID	Enumeration	RATE	Cat	PerilRegion	PerilTypeID	PERSPVALUE02	EXPVALUE02	STDDEV02
1064679	Secura - NP_Prop	0,000220397473	1	1	1	68583,72037	3519080,24673	130225,25640
1064645	Secura - NP_Prop	0,000415082497	1	1	1	17510,02293	3519080,24673	63408,89933
1057539	Secura - NP_Prop	0,000256904226	1	1	1	8754,51067	169135,65901	10388,71740
1057020	Secura - NP_Prop	0,000639374601	1	1	1	6865,04882	214598,67025	9199,07879
1060465	Secura - NP_Prop	0,003213626333	1	1	1	3910,74034	634283,82857	10848,68826
1057540	Secura - NP_Prop	0,000519740221	1	1	1	3211,32314	168972,77973	4974,12518
1057531	Secura - NP_Prop	0,000276955048	1	1	1	2833,72583	168983,35051	4522,87082
1065818	Secura - NP_Prop	0,000002104170	1	1	1	2756,06244	13548458,94990	24083,81372
1086136	Secura - NP_Prop	0,000056040917	1	1	1	2511,29687	35298,49986	2815,92741
1057021	Secura - NP_Prop	0,001324536279	1	1	1	2419,50302	168790,00412	4322,10729
1057476	Secura - NP_Prop	0,000751060841	1	1	1	1982,14902	214914,61598	3419,21958



# Cat Softwares - Outputs

http://10.10.1.11 - WORLDCAEnterprise - Microsoft Internet Explorer

**File Edit View Search Batch Tools Help**

**Case Treaty Information Probabilistic Analysis Event by Event Downloads**

**Peril:** **Results type:**  Apply demand surge  
**All Perils Combined** **Annual Aggregate Distribution**  Include reinstatement results (except for ROL)  
 Show snapshot of previous results

Return Period (Years)	Non-Exceedance Probability (%)	Ground Up Mean Damage	Cedant Mean Gross Loss	Treaty Mean Gross Loss
1.000	99,9	6.504.293.500	6.162.516.000	1.437.159
500	99,8	5.040.110.500	4.794.932.500	1.437.158
333	99,7	4.356.862.500	4.145.711.250	1.437.158
250	99,6	3.985.750.000	3.748.744.500	1.425.685
200	99,5	3.582.003.500	3.388.093.250	1.320.397
167	99,4	3.328.638.000	3.149.784.750	1.250.457
143	99,3	3.106.950.500	2.933.808.000	1.178.174
125	99,2	2.890.407.000	2.733.831.750	1.118.285
111	99,1	2.729.330.500	2.572.172.000	1.062.951
100	99,0	2.587.083.250	2.433.193.250	1.018.714
50	98,0	1.807.658.000	1.698.831.250	768.585
33	97,0	1.423.423.875	1.329.794.000	718.579
25	96,0	1.172.380.750	1.099.480.375	718.579
20	95,0	996.673.375	929.550.750	718.579
17	94,0	861.683.438	802.549.875	718.579

Portfolio results as of: September 5, 2006 11:24:45 AM CEST (Version 3.8.00)  
Case results as of: July 25, 2006 11:36:25 AM CEST (Version 3.8.00)

**Advanced Options...** **Analyze**

Applet com/eqecat/client/ClientApplet started Internet

start WORLDCATent... http://10.10.1... 100% 17:50



# Cat Modelling – What If?

- Some information may be missing
  - Sum Insured in France for example
  - No deductibles ?
  - No proper split of risks ?
- Peril highly uncertain
  - Software changing drastically from year to year
  - Peril not observed on significant period of time



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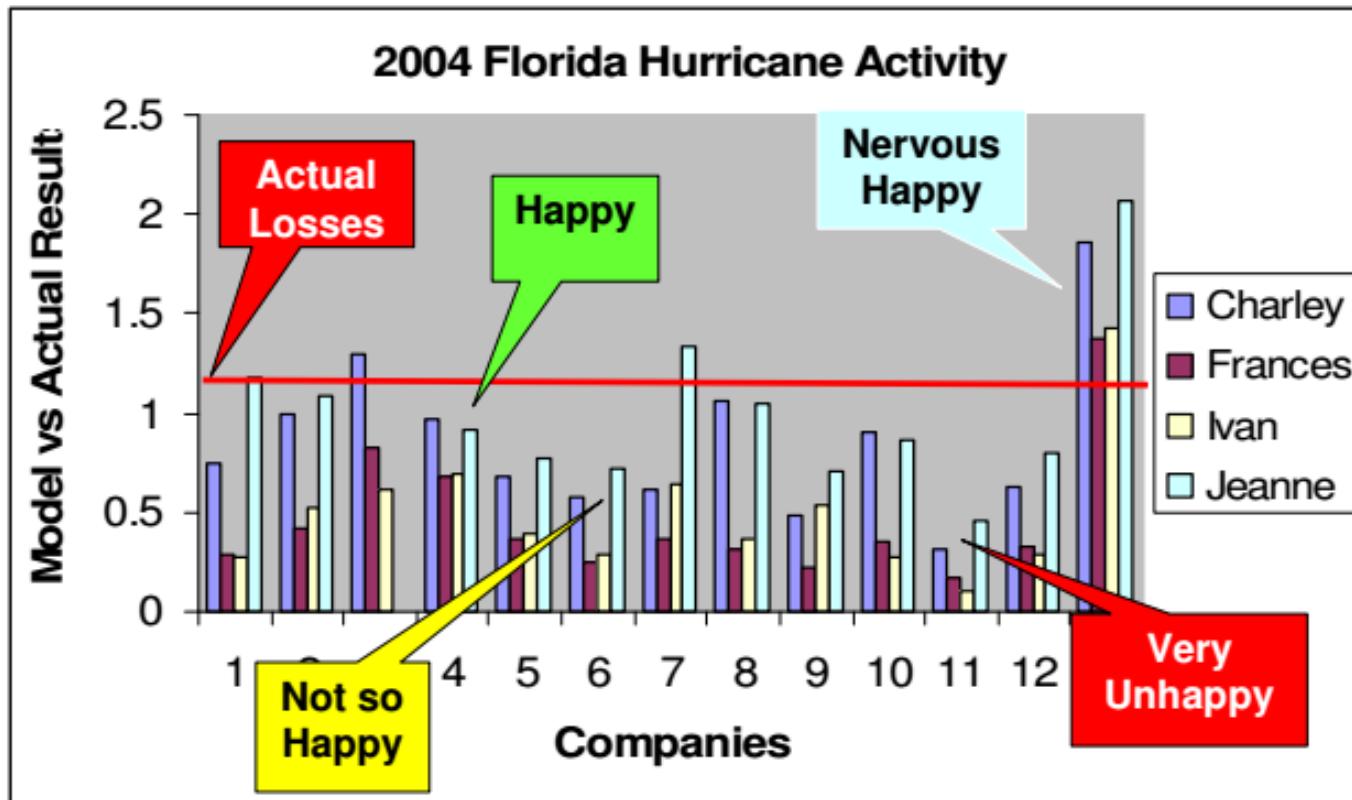
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# Pricing of CAT treaties

- Many problems exist when trying to price:
  - Lack of data
  - Relevance of data available
  - What is the actual risk ?
- Market pressure also to be taken into account...
- Cat Model may not be available/relevant
- If CAT models are available... Outputs heavily influenced by:
  - Quality of the source of data
  - Model methodology
  - Model application

# Reliability of Cat Models





# How to price then ?

- What model to use ?
- How do we use the model(s) if any ?
- How to reach consistency and be in line with market consensus ?
  - ➔ Calibration based methods
  - ➔ Use of scenarios to adjust loss distribution
  - ➔ If no data, then let's remain simple



# How to price then... For You ?

- You'll be given an ELT table ....
- You'll receive a list of Independent Events:
  - Each of them have a probability of Occurrence
  - If it occurs, you have:
    - The average loss cost
    - The Standard deviation
    - The Maximum Value
  - ➔ We ask you to use a **Lognormal distribution**, adjust the parameters accordingly !
- Then using simulations, you can have whatever you need.

# How to price then... For You ?

## (2)

- You'll be given an ELT table .... This is for the « Natural Catastrophies events »
- You will also need to add something for the « conflagration risk » (potential for Big claim hitting 2 (or more) different risks alongside).

➔ You will have to determine one (or more) scenarios with a frequency and a severity, based on judgment, documentation, information of your portfolio, and justify it in your report

(Amount of Loss and Frequency/Return Period)

# Questions ?

