



2004 Hurricanes and 2005 Reinsurance Market

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CAS Spring 05 Meeting

Looking Forward From 2004

- **Background**
- Example
- Modeling Basics
- Risk Definition
- Risk Measures
- Modeling Issues
- Modeling Techniques
- Conclusions

- ❖ Impact On The market
- ❖ What Does This Mean To The Insurer?
 - How Do You Measure Risk?
 - How Can You Get Your Arms Around The Problem?
 - Traditional Thinking May Not Work

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The Reinsurance Market

- ❖ Different From Post Andrew
 - After Andrew Cat Market Hardened
- ❖ 911 Had Driven Rates Up
- ❖ 4 Events Did Not Have As Big An Impact On The Reinsurance Market As Originally Thought
 - Market Still Softening
 - Can Get Bells And Whistles
- ❖ Still Not Everything Available
 - But Insurers Can Look Into Creative Solutions

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Traditional Approach to Buying

- ❖ Not As Concerned With Aggregate Events
- ❖ Bought To Protect A Certain Return Period
 - Could Vary Depending on Risk (EQ vs HUR vs TOR)
 - Value at Risk Concept
- ❖ Limited Reinstatements
- ❖ No Protection For Retention

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Purchasing Reinsurance Post 2004

- ❖ In Florida, Some Carriers Consider 2 Events
 - What Happens When Cat Fund (FHCF) Is Used Up
 - Speed of Payment From Cat Fund
 - Gaps Created Due to Second Event And FHCF Depletion
- ❖ How Can The Retention Be Protected?
- ❖ Looking to Better Understand Multiple Event Impact and Use Simulation Tools to Understand the Difference.
- ❖ May Have a Different View of Risk

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A Question For The Audience

- ❖ A Unbiased Coin Is Flipped 10 Times and Each Time a Head Comes Up.
- ❖ You Are Asked To Bet On The Outcome Of The Next Flip.
- ❖ What Do You Choose?
- ❖ OK Same Question But Now Start With 5 Heads In A Row?



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A Question For The Audience

- ❖ The Coin Example Assumed an Unbiased Coin and We Knew The True Underlying Distribution of Results.
- ❖ What Happens When We Look At Something More Volatile...
 - Hurricanes
- ❖ Does Last Year Change Your Expectations for This Year?
 - Are The Commercial Models Memory-less?
 - The People in High Risk Areas Tend To Be Memory-less.
- ❖ Does It Change the Level of Risk You Want To Manage To?
- ❖ NOAA and Colorado State Believe In An Above Average Year of Activity...
 - Do You?

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Push Modeling To Help You!!!

- ❖ Just Can't Run The Cat Model And Look At the Results and Stop.
- ❖ Need to Define Risk:
- ❖ Need to Identify Your Risk Measure and Threshold
- ❖ Need to Run Different Options and Compare Impact On Company
- ❖ Should Consider Timing Issues While Comparing
 - Another Level Of Complexity But Can Be Done With Minimal Effort.

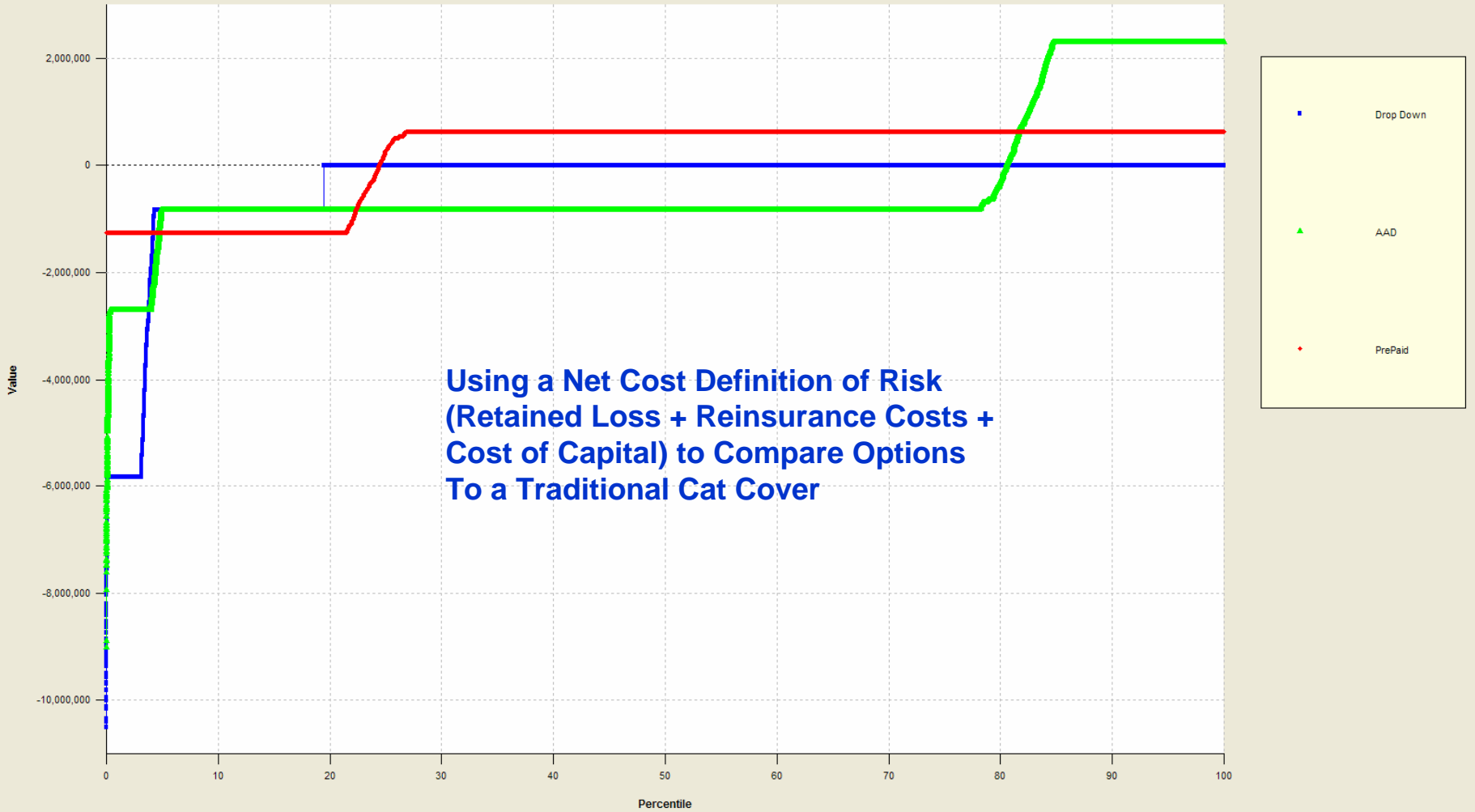
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Defining Risk

- ❖ More To It Than Just Cat Loss
- ❖ Consider The Following:
 - Retained Losses
 - Reinsurance Cost
 - Reinstatements
 - Non Modeled Loss
 - Cost of Capital
 - Could You Have Deployed Your Capital In Higher Returning Investments While You Wait For The Insurance Policy To Close Out
 - Time Value of Money
- ❖ In The Grand Scheme of Things You Would Like to Compare Options by Looking at Risk Adjusted Capital Differences.

Comparing Results

Percentile



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Risk Measures – Coherent

- ❖ Subadditivity – For all random losses X and Y ,

$$\rho(X+Y) \leq \rho(X)+\rho(Y)$$

- ❖ Monotonicity – If $X \leq Y$ for each scenario, then

$$\rho(X) \leq \rho(Y)$$

- ❖ Positive Homogeneity – For all $\lambda \geq 0$ and random losses X

$$\rho(\lambda X) = \lambda\rho(X)$$

- ❖ Translation Invariance – For all random losses X and constants α

$$\rho(X+\alpha) = \rho(X) + \alpha$$

Meyers, “The Role of Risk Metrics in Insurer Financial Management”, CAS 2003 ERM Seminar

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Risk Measures – Coherent Examples

- ❖ Simplest – Maximum loss

$$\rho(X) = \text{Max}(X)$$

- ❖ Next simplest - Tail Value at Risk

$$\rho(X) = \text{Average of top } (1-\alpha)\% \text{ of losses}$$

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Risk Measures – Non Coherent Examples

❖ Standard Deviation

- Violates monotonicity
- Possible for $E[X] + T \times \text{Std}[X] > \text{Max}(X)$

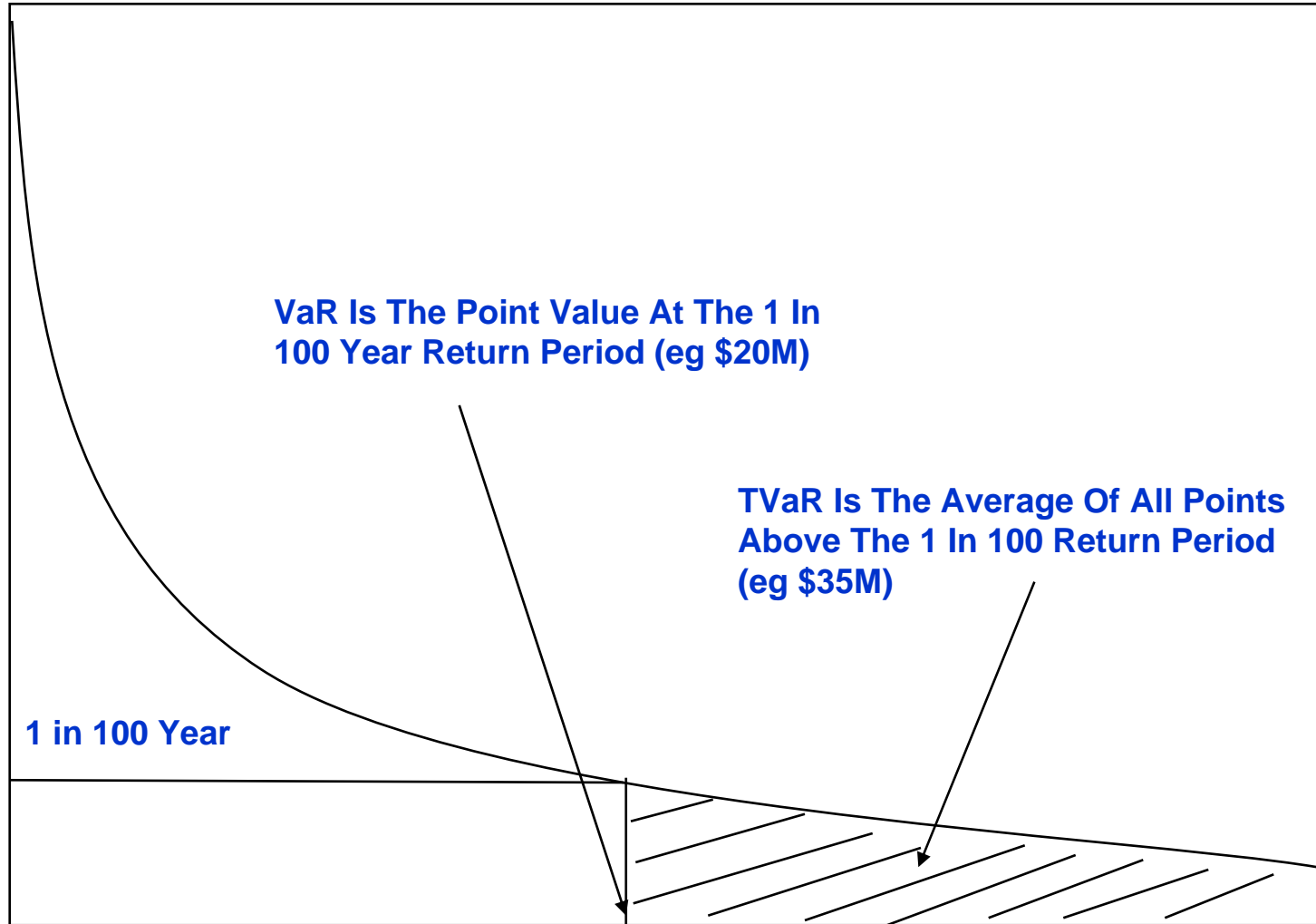
❖ Value at Risk (Return Periods) /Probability of Ruin

- Not subadditive
- Large X above threshold
- Large Y above threshold
- $X+Y$ not above threshold

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VaR vs TVaR

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Return Period	Aggregate Losses		Individual Losses	
	VaR	TVaR	VaR	TVaR
10,000	121,281,689	152,542,795	96,194,396	130,296,854
1,000	55,747,807	81,967,705	43,838,236	66,715,233
500	42,347,870	64,977,005	32,690,272	52,003,038
250	31,607,113	50,600,937	23,905,286	39,776,794
200	28,586,853	46,489,039	21,323,595	36,336,787
100	20,301,777	35,207,303	13,815,685	26,697,967
50	12,668,260	25,600,597	6,719,598	18,216,877
25	5,973,451	17,104,825	3,208,979	11,411,166
10	1,777,695	8,880,509	634,026	5,455,726

2005 Reinsurance

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VaR vs TVaR Implications

- ❖ Company May Not Understand Its True Risk Above The Targeted Return Period

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Other Modeling Issues

- ❖ Combining Results From Different Vendors
- ❖ Dependencies Between Risks or Regions
 - Frequency vs Severity
- ❖ Non Modeled Risks
- ❖ Parameter Risk Is Provided Around Severity But Not Frequency
 - Don't Be Afraid to Stress Test
- ❖ Testing Different Reinsurance Structures Across Groups of Companies
 - Don't Lose Track of The Event
 - Insure Consistency

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Combining Results From Different Vendors

- ❖ Not a Good Idea to Just Average Across Return Periods and Models
 - May Have Different Underlying Event Sets
- ❖ While Looking At An Individual Occurrence PML Across Models May Be OK, But Consider The Impact On An Aggregate Review.
 - For Example: 1 in 250 from Vendor A Was Comprised of 3 Storms and only 1 Storm From Vendor B.
 - Cost of Reinstatements Alone Could Cause A Difference

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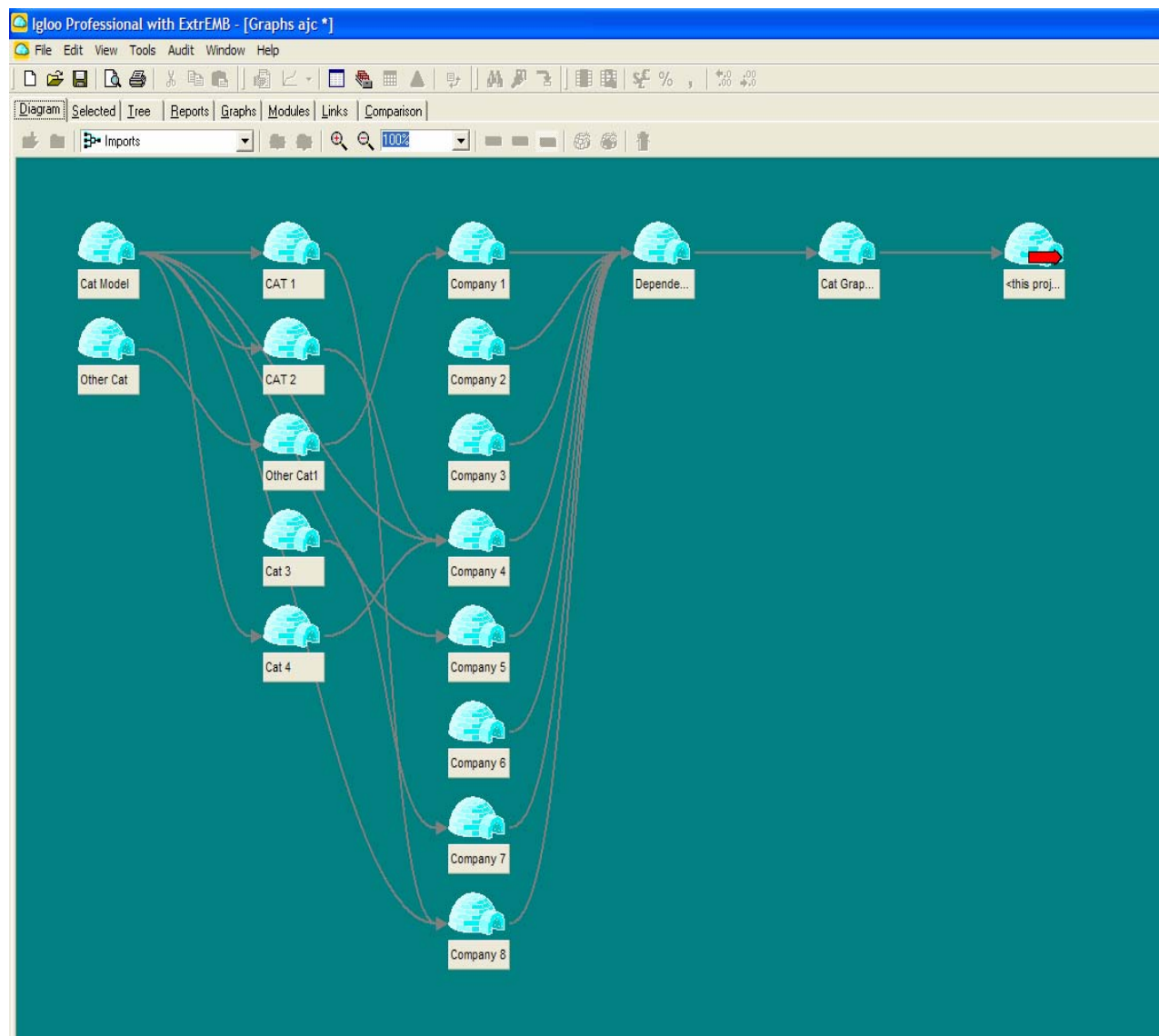
❖ A Solution:

- Assign Probabilities To Each Cat Model
- Simulate Which Cat Model You Will Use
- Simulate The Number of Events and Frequencies Based Upon The Cat Model Chosen
- Repeat

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Across Multiple Companies



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Testing Different Structures

❖ Other Companies Are Using:

- Cat Models
 - Cumbersome and Time Intensive
 - Cannot Combine Results Across Different Vendors Effectively
- Excel Spreadsheets
 - Very Time Consuming
 - Difficult to Build Complicated Structures
- MatLab
- DFA Tools
 - More Efficient Simulation
 - Complex Structures
 - Can Be Integrated With Other Risks

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Conclusions

- ❖ Use The Different Cat Model Outputs
- ❖ Understand Your Options
- ❖ Stress The Output From The Cat Model
- ❖ Understand Your Risk Measure And Its Final Impact On Your Decision



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