Catastrophe Estimation

Alternative Methods

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September 16, 2013

Catastrophe Estimation
Agenda

- Background
- Catastrophe Estimation Methods
- Frequency x Severity Model
  - Overview
  - Frequency - Day Curves
  - Considerations for Day Curves
  - Considerations for Severity Assumptions
- Summary

Catastrophe Estimation
Background

Traditional actuarial methods don't work well for estimating cat losses:

- Volatility in patterns
- Timing of losses (i.e., early in period or late in period)

		Reported Cat Losses (millions)					
AY	AQ	1	2	3	4	5	6
2011	1	106	135	144	148	152	150
	2	319	405	438	454	470	474
	3	148	195	199	202	203	204
	4	39	44	59	59	58	58
2012	1	62	124	143	155	157	157
	2	55	146	171	176	178	
	3	64	89	93	97		
	4	372	412	414			
2013	1	25	46				
	2	95					
AY	AQ	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7
2011	1	1.272	1.070	1.030	1.025	0.984	1.004
	2	1.272	1.081	1.037	1.035	1.009	1.003
	3	1.323	1.022	1.011	1.008	1.003	0.994
	4	1.137	1.326	1.003	0.985	1.003	1.178
2012	1	2.018	1.150	1.080	1.019	0.998	
	2	2.627	1.173	1.028	1.016		
	3	1.394	1.050	1.045			
	4	1.110	1.003				
2013	1	1.844					

Catastrophe Estimation

Cat Estimation Methods

- Market Share Approach
  - Cost of Event x Company Market Share
- Exposure Based Approach
  - TIV x Damage %
- Frequency x Severity Approach
  - # of Ultimate Claims x Average Claim Value

Catastrophe Estimation
Cat Estimation Methods

Market Share Approach - Example

- Industry Sandy Estimate = $10 billion - $20 billion
- Company Y Market Share = 2%
- Company Y Sandy Estimate = $10 billion - $20 billion x 2%
  = $200 million - $400 million

Catastrophe Estimation

Cat Estimation Methods

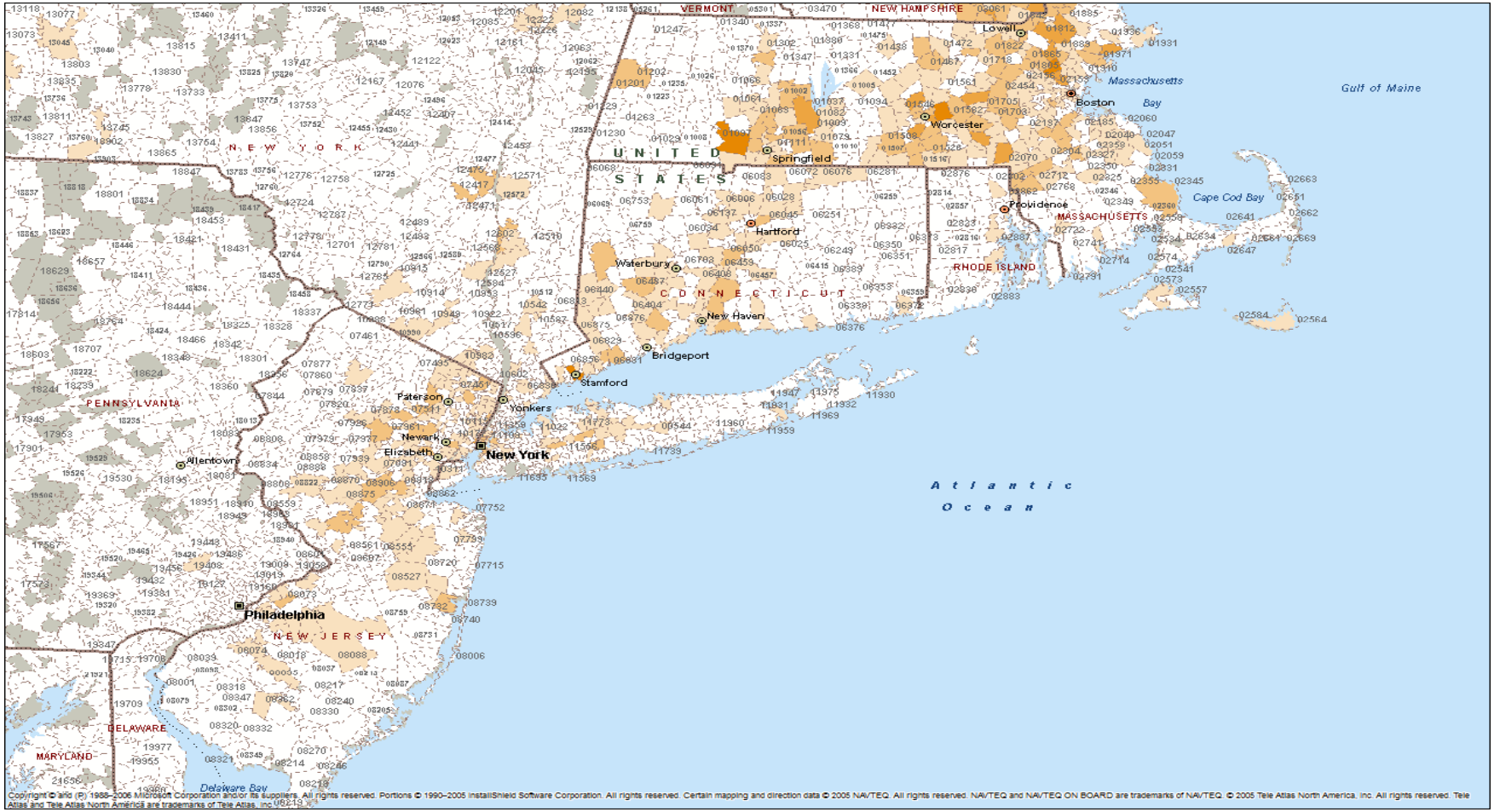
Exposure Based Approach - Example

Zone	TIV	Frequency %	Severity %	Loss
Zone 1	100M	20%	10%	2M
Zone 2	300M	30%	10%	9M
Zone 3	500M	20%	5%	5M
Zone 4	200M	20%	10%	4M
Zone 5	100M	30%	10%	3M
Zone 6	100M	40%	10%	4M
Zone 7	300M	20%	10%	6M
Zone 8	200M	20%	5%	2M
Zone 9	100M	10%	10%	1M
Zone 10	100M	10%	10%	1M
Total	$2B			$37M

Catastrophe Estimation

Cat Estimation Methods

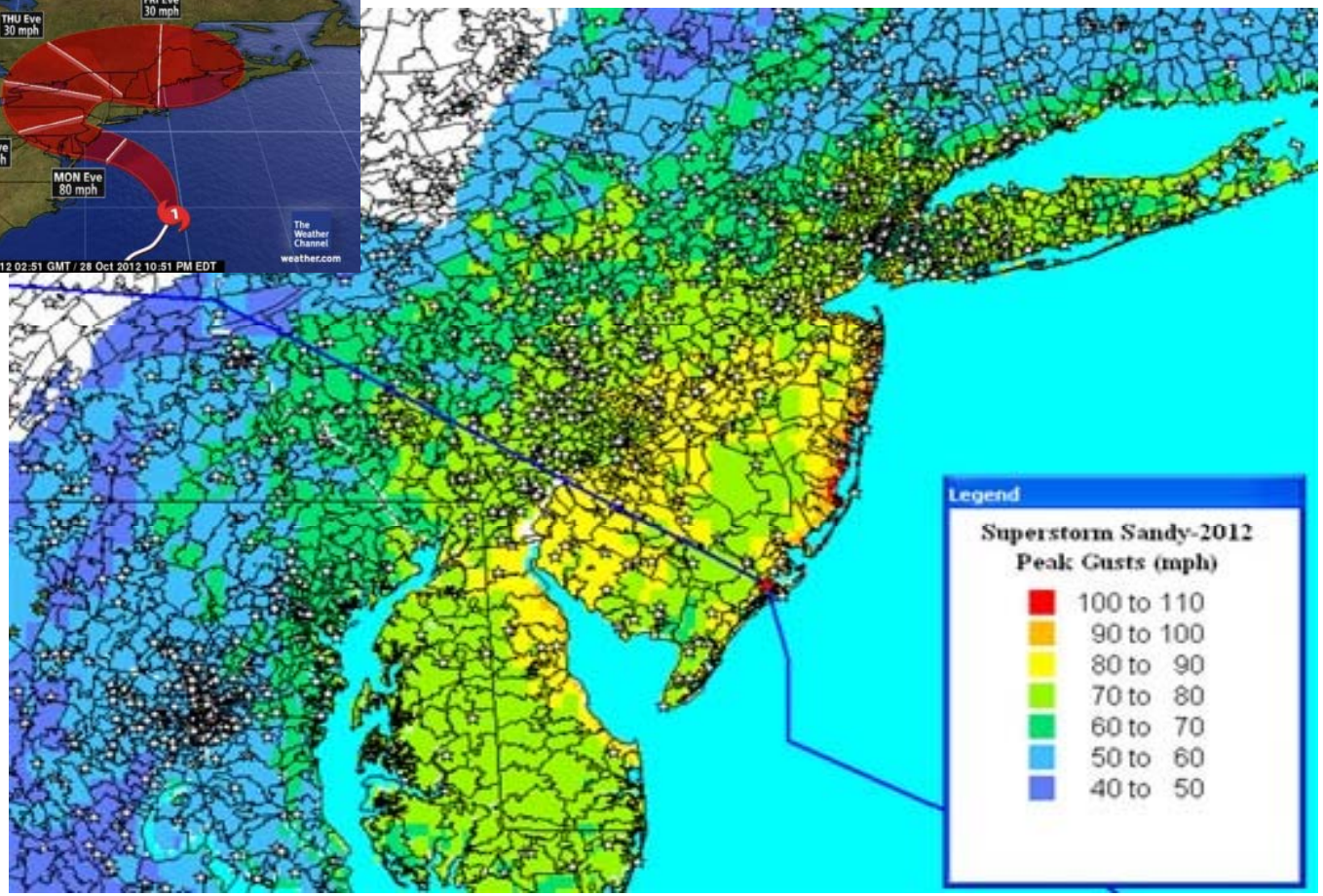
Exposure Based Example
TIV by ZIP Code



Catastrophe Estimation

Cat Estimation Methods

Exposure Based Example
Wind Speed by ZIP Code



Catastrophe Estimation

Cat Estimation Methods

Exposure Based Example
Super Storm Sandy – Breezy Point, NY Fire

Catastrophe Estimation
Cat Estimation Methods

Overview of Frequency Severity Cat Model

- Frequency
  - Estimate ultimate number of claims
  - Derived based on “day curves”
  - Many issues to consider
- Severity
  - Estimate ultimate average value of each claim (limited to 100k)
  - Initial estimates based on prior events
  - Refined estimate as reported losses emerge
- Large Loss
  - Add estimate of large losses using exposure based information
- Ultimate Loss = Frequency x Severity + Large Loss Estimate

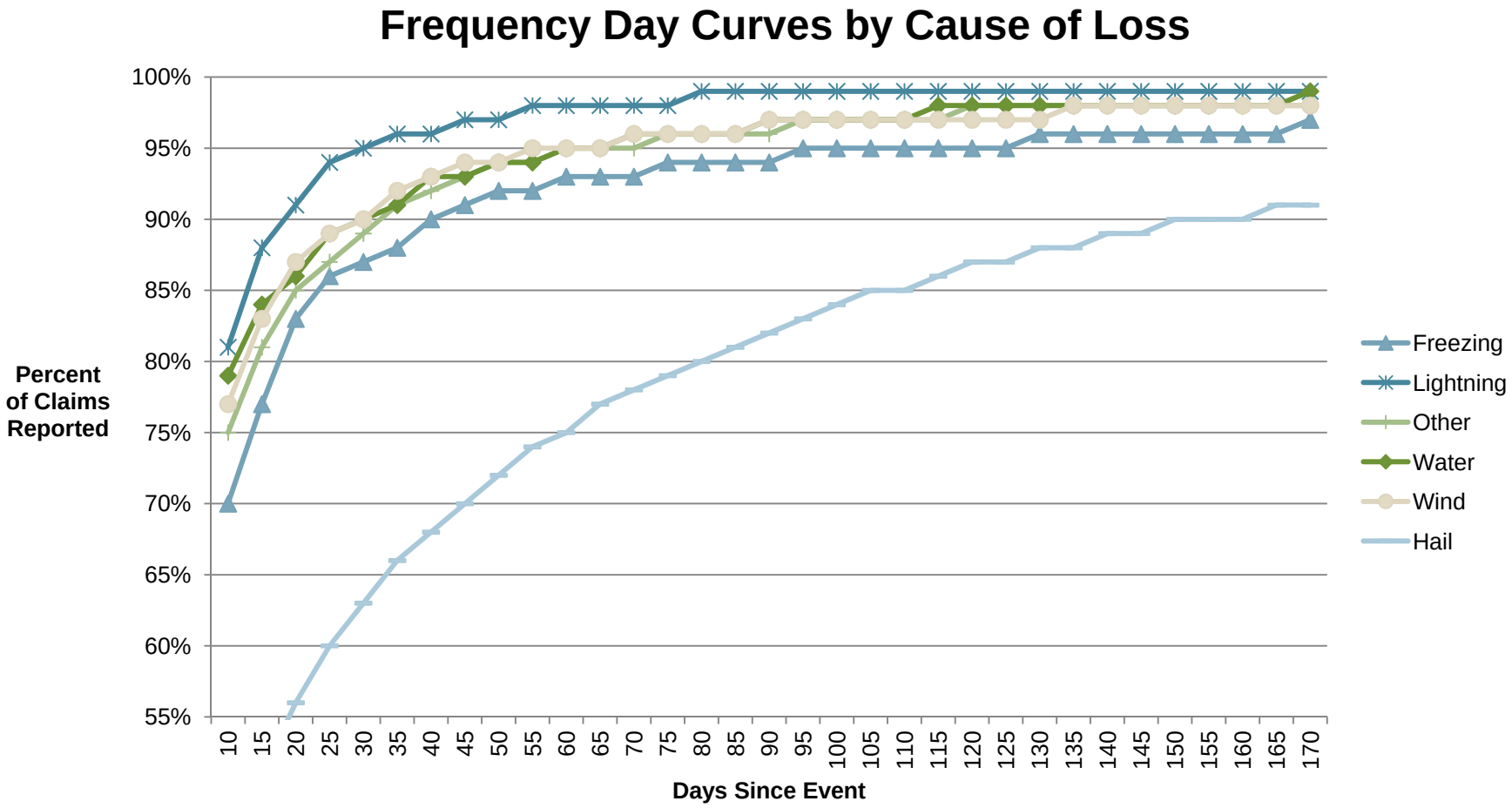
Catastrophe Estimation
Cat Estimation Methods

Estimating Frequency Using Day Curves

- Day Curves
  - Used to estimate ultimate claim count based on reported claim count evaluated at elapsed number of days since cat event
  - Based on historical claim level catastrophe experience
  - Estimate historical lag between accident/event date and reported (or recorded) date
  - Curve based on reported dollars if daily data is available

Catastrophe Estimation

Cat Estimation Methods



Catastrophe Estimation

Cat Estimation Methods

Frequency Day Curves by Cause of Loss

% Reported	Lightning	Water	Wind	Freezing	Hail <40	Hail >40	Other
75.0%	12	10	10	12	31	102	12
80.0%	15	12	12	**15**	44	125	16
85.0%	20	15	17	19	65	153	22
90.0%	29	22	24	27	96	207	33
92.5%	37	30	32	33	122	257	46
95.0%	48	**46**	46	48	165	326	68
96.0%	56	56	56	58	193	348	83
97.0%	65	72	75	74	244	362	103
98.0%	79	94	106	100	299	389	139
99.0%	109	148	174	145	367	500	245
99.5%	186	201	265	204	420	594	418

80% of freezing cat claims are reported within 15 days of event
95% of water cat claims are reported within 46 days of event

Catastrophe Estimation

Cat Estimation Methods

Frequency Severity Model - Example

- Severe snowstorm occurs in late December
- Day 15 : 1,200 claims have been reported
- “Freezing” day curve suggests 80% of claims are reported 15 days post-event
- Ultimate claim count = 1,200 * (1 / .80) = 1,500 ultimate claims
- Assume ultimate limited severity = $10,000 per claim
- Ultimate limited loss = 1,500 * $10,000 = $15 million
- Large loss estimate from Claims Department = $3 million
- Ultimate total loss = $15 million + $3 million = $18 million

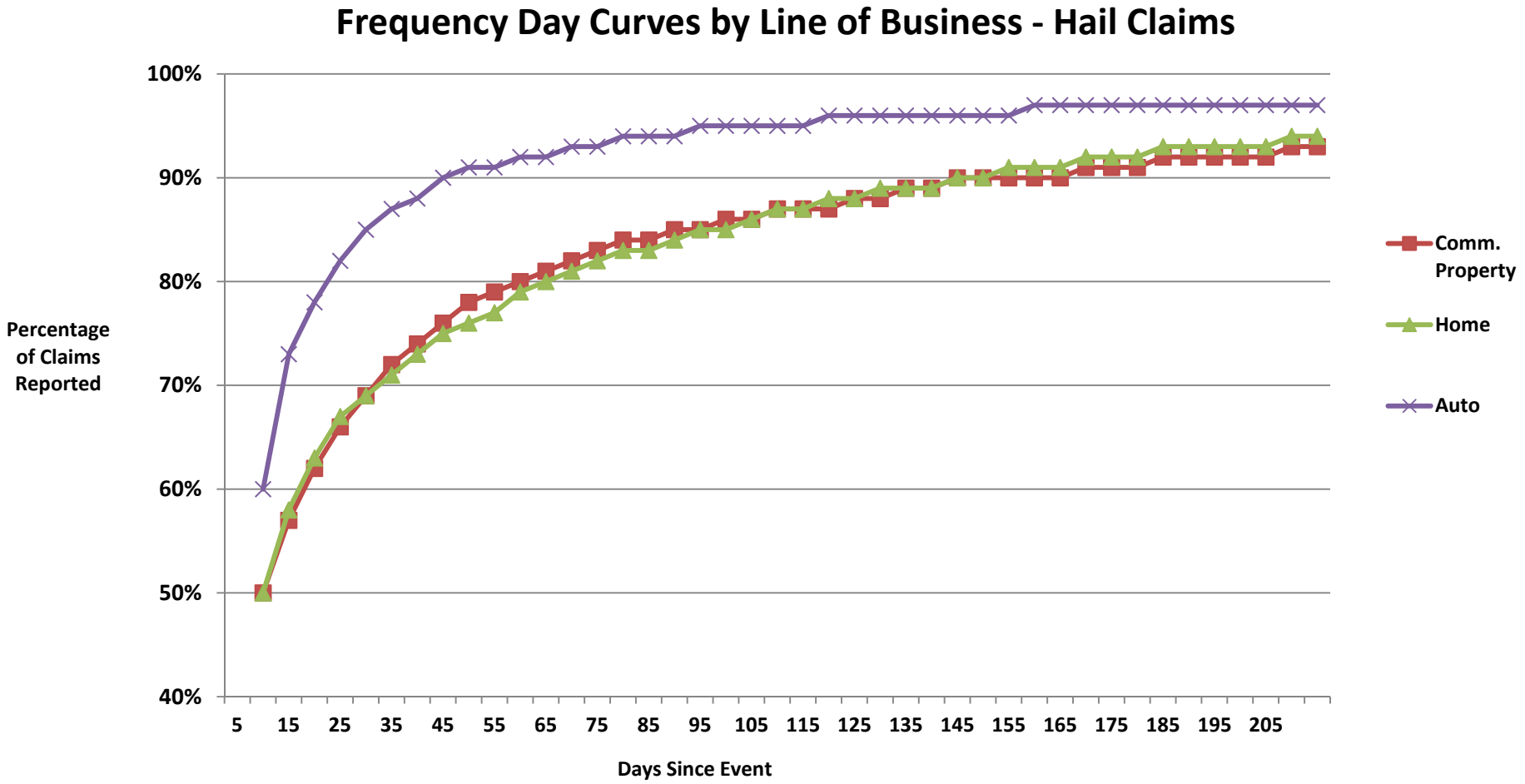
Catastrophe Estimation
Cat Estimation Methods

Considerations for Day Curves

- Cat Type: Hurricane vs. Winter Storm vs. Tornado
- Cause of Loss: Wind vs. Hail vs. Flooding
- Line of Business: Personal vs. Commercial
- Geography: Regional Differences
- Timing: Calendar Days vs. Business Days
- Trends: Improved/Accelerated Reporting?

Catastrophe Estimation

Cat Estimation Methods



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Cat Estimation Methods

Frequency Day Curves by Line of Business - Hail Claims

	Commercial Property	Home	Auto
50.0%	7	5	3
60.0%	13	11	5
75.0%	36	36	11
80.0%	52	54	16
90.0%	140	125	36
95.0%	283	202	72
97.0%	376	297	111
99.0%	513	412	216
99.5%	625	489	300
99.9%	795	713	378

Catastrophe Estimation

Cat Estimation Methods

Frequency Severity Model Severity
Limited Severity ($100k) by Catastrophe

Cat	Cat Type/Perils	Commercial Auto	Commercial Property	Home	Marine	Personal Auto
A	Hurricane	20,500	9,100	3,300	23,600	8,400
B	Hurricane	4,600	6,300	3,300	19,700	3,900
C	Winter Storm	3,900	4,600	1,600	3,700	2,400
D	Winter Storm	2,000	14,900	5,000	35,100	2,600
E	Winter Storm	3,100	8,800	2,600	14,000	2,500
F	Tornadoes, Hail, Flooding	6,300	8,300	5,000	17,000	3,100
G	Tornadoes, Hail	4,300	20,100	6,100	30,800	2,900

Catastrophe Estimation

Cat Estimation Methods

Frequency Severity Model - Example

Range of Estimates on Day 15

Scenario	Day 17 Curve	Day 15 Curve	Day 13 Curve
Low Severity	$14.5 M	$16.5 M	$18.5 M
Base Severity	$16.0 M	$18.0 M	$20.0 M
High Severity	$17.5 M	$19.5 M	$21.5 M

Catastrophe Estimation
Summary

- Market Share Approach
  - Primitive
  - Used mainly by external parties

  Exposure Based Approach
  - Useful pre-event and short term post-event
  - Simplistic approach vs. sophisticated models
- Frequency x Severity Approach
  - Most reliable post-event
  - Need to understand your data and claims process
  - Need to understand catastrophe characteristics
  - Need to monitor frequently

Catastrophe Estimation