



Herding Cats
- Practical and Effective Methods for Estimating Catastrophes




Ken Kasner FCAS, MAAA
2019 Casualty Loss Reserve Seminar

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Know your event




- States, dates, perils, durations
- Characteristics by geo-location:
 - wind speeds bands
 - fire footprints
 - hail sizes
 - rainfall amounts
 - flood depths
- Terrain
- Field reports of damages and severities
- Infrastructure impairments
- Evacuations
- Similarities to other past events
- Any regulatory issues




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Know your exposure




- Geo-locations of your exposures
- Limits
- Coverages and exclusions
- Construction




Pol XYZ
 Lat: 41.51302
 Long: -73.9726
 Ring: \$25K
 Crd: \$125K
 Liv Exp: \$50K
 Oth: \$25K

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Know your data




- How you define a Cat
- How your claims are Cat coded
- How quickly they're coded
- Who handles your Cat claims
- How case reserved
- Large losses



CL	CLM	CD	COV	LOSS	ST	POLICE STATE	CHI	DP	CAUSE	FAID	INC STATUS	
1814	604929	PL	Prop	1/31/19	Intervals	MI	MO	48647	Wind	5,000	5,000	closed
1811	504948	PL	Prop	1/18/18	500va00	CO	PRISQD77	48756	Rain	5,000	5,000	open
1854	539793	CL	Auto	10/25/16	quostatu	MI	UTDHEID	51595	Wind	5,000	5,000	open
1824	280663	PL	Prop	1/8/16	20over1	IN	ROGER	48154	Flooding	5,000	5,000	0"
1534	181321	PL	Prop	1/17/15	320va07	MN	EDNA	55436	Lightning	5,000	5,000	12"
1813	871719	CL	Prop	1/11/18	700va01	MI	ROMALAC	48796		11,250	11,250	1"
1916	490327	PL	Auto	3/31/19	sat0va01	OH	GENIVA	45006	Hail	5,000	5,000	
1914	280246	PL	Prop	4/20/19	0u0va2v	CA	GRASS LAKE	49240	W0000"			

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Types of Cat Estimates





- ❖ Pre-Event
- ❖ Post-Event

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Pre-Event Estimates




- For events you know are coming – e.g. hurricanes and tropical storms
- For:
 - rough orders of magnitude
 - claim volumes for handler deployments
 - loss amount for preliminary financial impacts
- Often ranges, often off-cycle
- Frequency x Severity approach

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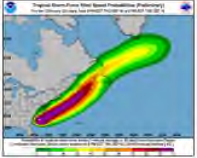
Pre-Event Method



- Hurricane and Tropical Storm paths and winds speed bands from third party vendors
- Exposures mapped to wind speed bands
- Claim frequencies by bands from similar historical events (sometimes judgment)
- Severities also either from other similar past events or judgment
- Just do the math
- Estimated ultimate claim counts and loss dollars
- Often will want to produce ranges
- Likely frequent updates as event unfolds

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Pre-Event – Hurricane Example

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Estimate	Property	Wind	Claim Freq	Est ULI Claims	Est ULI Sev	Est ULI Loss	Est ULI	Est ULI	Est ULI	Est ULI
\$100,000,000	\$100,000,000	100	0.01	1,000	\$1,000	\$1,000,000	1,000	1,000	1,000	\$1,000,000
\$50,000,000	\$50,000,000	50	0.01	500	\$500	\$500,000	500	500	500	\$500,000
\$25,000,000	\$25,000,000	25	0.01	250	\$250	\$250,000	250	250	250	\$250,000
\$12,500,000	\$12,500,000	12,500	0.01	125	\$12,500	\$1,562,500	125	125	125	\$1,562,500
\$6,250,000	\$6,250,000	6,250	0.01	62.5	\$6,250	\$781,250	62.5	62.5	62.5	\$781,250
\$3,125,000	\$3,125,000	3,125	0.01	31.25	\$3,125	\$390,625	31.25	31.25	31.25	\$390,625
\$1,562,500	\$1,562,500	1,562,500	0.01	15.625	\$1,562,500	\$195,312,500	15.625	15.625	15.625	\$195,312,500
\$781,250	\$781,250	781,250	0.01	7.8125	\$781,250	\$97,656,250	7.8125	7.8125	7.8125	\$97,656,250
\$390,625	\$390,625	390,625	0.01	3.90625	\$390,625	\$48,828,125	3.90625	3.90625	3.90625	\$48,828,125
\$195,312,500	\$195,312,500	195,312,500	0.01	1,953,125	\$195,312,500	\$244,140,625,000	1,953,125	1,953,125	1,953,125	\$244,140,625,000
\$100,000,000	\$100,000,000	100	0.01	1,000	\$1,000	\$1,000,000	1,000	1,000	1,000	\$1,000,000
Total						\$3,398,125,000				\$3,398,125,000





- > Buildings and exposed limits by wind speed bands
- > Estimate ultimate claims, apply estimated ultimate severities, generate estimated ultimate losses
- > Homeowners separately from CL Property. Auto separately from Property
- > Enhance perhaps by incorporating rainfall and flooding

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Post-Event Estimates 

For Cats with little to no forewarning:


- o Wind & Thunderstorm
- o Hail Storms
- o Tornadoes
- o Wildfires
- o Winter Storms
- o Earthquakes


Timing – 3 phases:

1. Early
2. Transition
3. Mature


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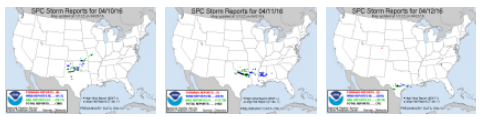
Post-Event Early 

- First few days after event occurs
- No claim or loss information
- Do exposure-based Frequency x Severity method, just like Pre-Event approach



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Post-Event Early - Hail Example 

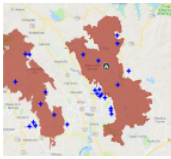


Cat YrX	Hail Event			13/4/18		13/4/18	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Hail Size	Exposures	Avg Bldg Val	Claim Freq	Est Ult Claim	Est Ult Sev	Est Ult Loss	Est Ult Loss
< 1"	15,000	\$250,000	0.02	300	\$ 2,000	\$ 600,000	
1" - 2"	4,000	\$300,000	0.04	160	\$ 6,000	\$ 360,000	
2" - 3"	800	\$275,000	0.20	160	\$ 15,000	\$ 2,400,000	
3" +	200	\$275,000	0.50	100	\$ 35,000	\$ 3,500,000	
Total	20,000	\$250,250	0.04	720	\$ 50,360	\$ 7,460,000	

- Hail size bands and locations from third party vendors
- Buildings and exposed limits mapped to Hail size bands
- Apply estimated ultimate claim frequencies and severities
 - o Consider day of week and time of day for event
- Use NOAA storm maps to help understand extent of event
- Enhance perhaps by reflecting hailstone hardness and duration of storm

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Post-Event Early - Wildfire Example



Cat YrXx	Wildfire Event						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Distance to Fire Footprint	Exposures	Avg Bldg Val	Claim Freq	Est Ulf	Est Ulf Sev	Est Ulf Loss	
0-0.25 mile	200	\$650,000	1.00	30	5	\$1,030,000	\$119,000,000
0.25-0.50 mile	300	\$400,000	0.30	30	5	25,000	\$750,000
0.50-1.00 mile	600	\$275,000	0.16	30	5	15,000	\$450,000
>1.00 mile	900	\$300,000	0.02	30	5	3,000	\$9,000
Total	2,000	\$1,625,000	0.07	140	5	\$123,249,500	

- Wildfire footprints from government entities – USGS
- Buildings and exposed limits within footprint and by proximity to the fire
- Apply estimated frequencies and severities
- Be mindful of Contents, Living Expense, additional limits, endorsements, etc. when selecting severities, especially with total losses.

Post-Event Mature


- Generally around 2-3 weeks after start of event
- Have reliable claim and loss information
- Use traditional claim and loss development approaches using claims and losses to date, and development factors (CDFs and LDFs) based on development patterns from past similar events.
- Reflect actual day-age of event (interpolate if necessary)
- Here too, just do the math
- Use LDF percentiles to generate ranges of possibilities.

Cat Loss Development Factors

Year	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Auto	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Home	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Commercial	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Manufacturing	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Transportation	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Health	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Auto	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Home	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Commercial	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Manufacturing	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Transportation	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Health	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Auto	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Home	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Commercial	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Manufacturing	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Transportation	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Health	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

- Essential:**
 - PL separately from CL
 - Property separately from Auto
 - By type of Cat
 - By smallest credible time interval
- Optional:**
 - By strength category for Hurricanes
 - By percent of Hail for Wind & Thunderstorm events
 - By size of event (small, mid-sized, large)
 - Percentiles

Claim Development Factors – do similarly




Post-Event Mature - Wind & Thunderstorm Example

Cat YYYY		Wind & Thunderstorm Event										
Losses		LDM					CFR					Implied UCL
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
Current	Post	3	4	3.2	Estimate UCL Losses	Current	3	4	3.2	Estimate UCL Claims	Implied UCL Severity	
\$10,000,000	250k	1,400k	1,800k	1,800k	\$13,800,000	1,800	1,000	1,000k	1,000k	1,800k	\$ 7,400	
	500k	1,500k	1,400k	1,400k	\$14,800,000			1,000k	1,000k	1,050k	\$ 7,785	
	750k	1,400k	1,500k	1,400k	\$16,800,000			1,000k	1,000k	1,075k	\$ 8,450	

- > Straightforward development approach
- > Generally will want to interpolate factors to reflect actual age of event
- > Be mindful of large losses in or not in your data
- > Confirm implied ultimate claim severities for reasonableness


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Post-Event Transition Phase

- > From ~ 2 weeks post event to ~ 6 weeks
- > Do both Frequency x Severity and Loss Development Methods

Start of event - 2 Weeks post event - 6 Weeks post event




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Additional Considerations

- Estimate Cats individually – no two Cats are exactly alike
- Homeowners separately from CL Property
- Auto – PL separately from CL – your call
- Stratification often helpful:
 - large vs small claims
 - by coverage - Bldg vs Cnts vs Other etc.
 - generally only for large events
- Know as much as you can about your large losses
- Confirm implied ultimate average claim severities
- Post-mortem your estimates
- Be careful with Hail – protracted reporting, especially in CL



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Questions?

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