The Changing Regulatory Environment for Catastrophe Models

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Overview

- Background: the historical and current role of catastrophe models in actuarially sound pricing of property insurance
- Florida's development of regulatory infrastructure for CAT models
- The spread of regulatory impulses and the current landscape of initiatives
- Model regulation: How much? What kind? The proper roles of regulators and modeling firms in a competitive information market

Background: CAT Pricing Requires Economic As Well As Technical Considerations

- Actuarially sound ("fair") rates must estimate
  "*the* ***expected*** *value of* ***all*** *future costs associated with an individual risk* ***transfer***"
- Key words in CAT pricing context:
  - Expectations – estimates should be central (and unbiased?)
  - Transfer – invokes economic equilibrium notwithstanding technical costs
  - All costs – rate is only adequate if it is sufficient to fund risk transfer
- Traditionally, CAT fair premiums consider separately
  - CAT Expected Losses – the average annual losses (AAL) funded in one year's premiums
  - Cost of Capital – the cost of the right to access funds up to a given probable maximum loss (PML) – usually many times annual premiums – to pay event claims
- Not an academic problem: in many high-risk areas, CAT expected losses and capital costs consume well over half of property fair premium dollar

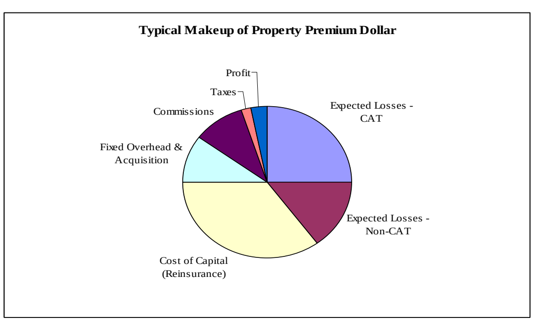
Catastrophe Models Provide Important Information Underpinning Premium Components

- In property lines, catastrophe models substitute for historical data sets in developing provisions in actuarial fair premium
  - Modeled average annual losses – proxy for expected CAT losses
  - PMLs and percentiles – justify amount of capital to be included in cost of capital analysis and indicate its annual probability of consumption

$$P = \frac{E[L_C + L_N] + K + F}{1 - c - t - \pi}$$

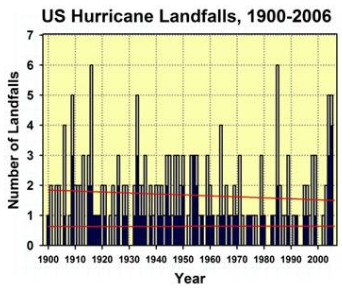
Expected Cat Losses

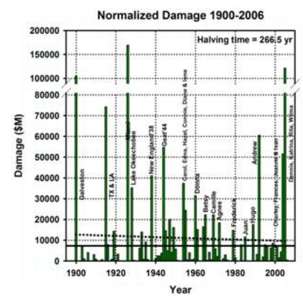
Cost of Capital



But Why Use CAT Models? Because Historical Loss Experience is Not Sufficient for CAT Peril Ratemaking

- Catastrophes, by definition, are
  - Infrequent – insufficient number of events in historical records for needed credibility
  - Severe – generate huge losses and unusual claim settlement conditions
  - Unpredictable – can happen in any year, notwithstanding frequency
- Historical data available is difficult to normalize to today's conditions
  - Incomplete data on number and value of insured properties
  - Rapid changes in recent decades in
    - Population and distribution thereof
    - Replacement values of properties
    - Policy conditions
    - All changes unevenly distributed by rating classes and territories





Proxy Loss Data from Models Ameliorates Most Challenges with Insurance Claim Data...

- Computer simulation of physical events produces estimates of insured losses based on scientific, validated relationships between perils and outcomes
- Simulation provides thousands of years of modeled loss data, essentially eliminating process variance from expected losses
- Simulation approach has other practical advantages for ratemaking
  - Captures current exposures, adjusting for trends in population patterns, building codes, replacement values
  - Provides complete probability distributions of modeled losses, not just a point or interval estimate
  - Provides sensitivity analysis framework - effects of assumptions on losses

...But The Final Accountability for Rates Rests with Insurers and Their Actuaries

- Even for CAT perils, many other considerations influence rates:
  1. Other premium components include expenses, non-cat losses, and LAE
  2. Reinsurance (capital) costs, while somewhat dependent on “technical prices” from CAT models, are volatile and ultimately reflect supply and demand in a free market
  3. Actuarial assumptions used in ratemaking give wide latitude to professional judgment – two actuaries could use the same data and approach and arrive at different rates
  4. Competitive, operational and regulatory factors often influence insurer management to set rates outside actuarial indications
- There are also multiple cat models available, offering a range of results
- Actuarial professional standards require due care in using model results
  - ASOP 38 enumerates five key responsibilities in using models outside actuary’s expertise, and encourages use of multiple models when available
  - ASOP 39 requires identification of CAT perils and allows noninsurance data
- Bottom line: Ratemaking is complex - “The model said so” is <u>not</u> by itself a justification meeting standards of practice

The First Model Regulation was Undertaken by the Florida Commission...

- Actuaries recognized value of model results in ratemaking after Hurricane Andrew; as results became visible in rate filings, political leaders responded
  - First regulatory impulse was simply to ban them
  - Legislature stepped in to create Florida Commission on Hurricane Loss Projection Methodology in 1996
- Commission accepts models as “*accurate and reliable*” and deems results admissible in Florida residential property rate filings - only if they meet all of nearly 40 standards
  - Each modeler must submit updates each year to continue acceptance
  - Volumes of public affirmations, disclosures, and forms (output) provided
  - Confidential audit by Professional Team results in public report on fitness
- This “Underwriters’ Laboratories” approach is the most comprehensive, intense, and public evaluation of cat models now

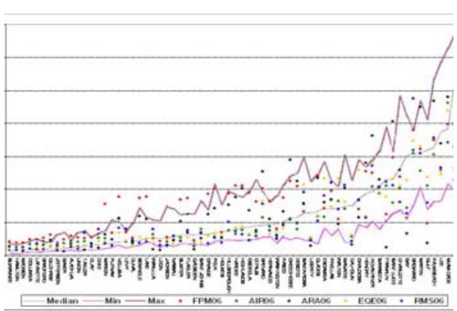
...But The Commission's Work Remains of Limited Practical Effectiveness

- Scope
  - Florida only, residential property only, ratemaking uses only
- Resistance to accepted models from regulators despite Commission nod
  - Claims of lack of "*access to all assumptions and factors*" and ability to disclose in rate hearings – Florida OIR's "51 questions"
  - While the Commission law presumes ability to use accepted models, regulators retain final power over rate filings as a whole
- Reach
  - Commission can only review submitted models, not all models in use in marketplace
  - Standards-based approach may discourage submission of innovative new methods
  - Even "public" model developed and used by regulators since 2005 was not submitted to Commission until 2007
  - Public model is now accepted, but still not readily available to insurers

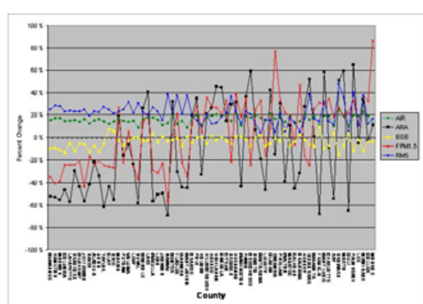
Key New Benefit of Commission Work: Public Comparison of Model Results

- Commission published output range comparisons of all accepted models after its 2007 work cycle; results are enlightening for users
- Both reasonableness (output by county among current models) and stability (changes in same model output over time) were tested

Loss Costs by County – All Models



Change in Loss Cost by County



Regulation Appetite has Spread to Other States along with Property Insurance Market Stresses

Massachusetts: Special Commission (Nov. 2007) recommended creation of "independent public entity" similar to Florida's to study model accuracy and reliability - public hurricane model considered but ultimately not recommended

Maryland: Task Force convened in fall 2007 to develop 2008 property insurance legislation – focus on cat models

Rhode Island: State legislature (mid-2007) requested AIR report on functionality and usage of cat models (with ratemaking emphasis) - some legislators recommended establishing a model review entity

Louisiana: Regulator (early 2007) publicly announced it will only allow cat models accepted by Florida Commission as rate filing support, and prohibit "near-term" models

Mississippi: SB2962 filed (2008) requires insurers to grant Attorney General confidential access to inner workings of models

Hawaii: Long-standing requirement to "file" hurricane models – documentation similar to FL Commission submission

Modeling Firms Also Provide Significant, Ongoing Regulatory Support to Clients

- AIR has completed regulatory interrogatories and filing requests in over a dozen states in addition to states with "model filing" requirements

Alabama	**Alaska**	**Arkansas**	**California**
Connecticut	**Florida**	**Hawaii**	**Kentucky**
Louisiana	**Massachusetts**	**Missouri**	**New York**
North Carolina	**Oregon**	**South Carolina**	**Tennessee**
Texas	**Washington**		

- Aggregate state-specific legislative and regulatory burden on modeling firms is significant and growing rapidly

Meanwhile, the NAIC Has Been Prodded by Consumer Advocates to Regulate Models

- Consumer Federation of America and Center for Economic Justice responded to cat modeling firms' introduction of alternative catalogs (spring 2006) by calling for
  - Rejection of alternative catalogs reflecting near-term ocean temperatures
  - Regulation of modeling firms due to their products' "*significant impact on rates and availability*"
- Call was repeated in spring 2007
  - This time urging regulation of modeling firms as "advisory organizations"
  - Despite the fact that modeling firms do not enjoy antitrust exemptions and do not have authority to make filings on behalf of a membership
- NAIC held a hearing on the matter (Sept. 28, 2007)
  - Insurer trade groups expressed need for model flexibility and choice to accommodate a range of capital structures and business models
  - Modeling firms said the advisory organization framework is inappropriate for consultants providing same independent information to all parties

Wind Loss Mitigation Mandates Directly Depend on Modeling Issues

- Tables of premium credits for wind mitigation depend more directly on model results than do other rates and rating factors, even for CAT perils
- Florida passed legislation in 2001 requiring premium discounts for property-level construction features mitigating windstorm losses
  - Part of a new statewide Building Code
  - Prescriptive approach: 2002 state-funded study (by ARA) and ISO/AIR studies offered alternative systems of discounts
  - Regulator has now required use of ARA discounts
    - Update to state-funded ARA study including 2004-05 hurricane data underway
- Other states have adopted mitigation legislation similar to Florida's but with a less prescriptive approach
  - Louisiana: new law requires premium discounts for wind loss mitigation features, regulator requires implementation by 1/1/2009
  - South Carolina: HB3820 requires new mitigation discounts, regulatory bulletin allows insurers to design systems individually meeting guidelines

Wind Mitigation Rating Entails Detailed, Nonlinear Systems of Credits for Model Secondary Modifiers

WINDSTORM LOSS REDUCTION CREDITS
SECTION 627.0629(1), F.S.
WIND PREMIUM CREDITS FOR EXISTING CONSTRUCTION

				TERRAIN B - 2% DEDUCTIBLE				TERRAIN C - 2% DEDUCTIBLE			
				FRAME, MASONRY, OR REINFORCED MASONRY							
				ROOF SHAPE				ROOF SHAPE			
				OTHER		HIP		OTHER		HIP	
ROOF COVER	ROOF DECK ATTACHMENT	ROOF-WALL CONNECTION	OPENING PROTECTION	NO SWR	SWR	NO SWR	SWR	NO SWR	SWR	NO SWR	SWR
			None	0.00	0.06	0.47	0.50	0.00	0.07	0.28	0.32
		TOE NAILS	Basic - Windows or All	0.35	0.42	0.62	0.65	0.29	0.38	0.56	0.62
			Hurricane - Windows or All	0.44	0.51	0.66	0.70	0.39	0.48	0.64	0.72
			None	0.35	0.42	0.62	0.66	0.18	0.26	0.44	0.51
		CLIPS	Basic - Windows or All	0.47	0.54	0.68	0.73	0.38	0.48	0.64	0.72
NON - FBC	A		Hurricane - Windows or All	0.50	0.57	0.70	0.74	0.44	0.54	0.68	0.76
EQUIVALENT	(6d @ 6" / 12")		None	0.35	0.43	0.62	0.67	0.20	0.28	0.45	0.51
		SINGLE WRAPS	Basic - Windows or All	0.47	0.55	0.68	0.73	0.39	0.49	0.64	0.72
			Hurricane - Windows or All	0.50	0.58	0.70	0.74	0.44	0.54	0.68	0.76
			None	0.35	0.43	0.62	0.66	0.21	0.28	0.45	0.51
		DOUBLE WRAPS	Basic - Windows or All	0.47	0.55	0.68	0.73	0.39	0.49	0.64	0.72
			Hurricane - Windows or All	0.50	0.58	0.70	0.74	0.44	0.54	0.68	0.76
			None	0.09	0.14	0.49	0.52	0.09	0.14	0.29	0.33
		TOE NAILS	Basic - Windows or All	0.46	0.51	0.63	0.66	0.44	0.50	0.59	0.64
			Hurricane - Windows or All	0.56	0.61	0.68	0.71	0.55	0.61	0.69	0.74
			None	0.58	0.65	0.68	0.73	0.38	0.44	0.57	0.65
		CLIPS	Basic - Windows or All	0.65	0.70	0.73	0.76	0.63	0.71	0.73	0.79
NON - FBC	B		Hurricane - Windows or All	0.66	0.72	0.73	0.77	0.69	0.78	0.76	0.83
EQUIVALENT	(8d @ 6" / 12")		None	0.60	0.68	0.68	0.73	0.48	0.58	0.60	0.71
		SINGLE WRAPS	Basic - Windows or All	0.67	0.73	0.73	0.77	0.67	0.76	0.74	0.81
			Hurricane - Windows or All	0.68	0.73	0.73	0.77	0.70	0.80	0.76	0.83
			None	0.60	0.68	0.68	0.73	0.51	0.63	0.61	0.72
		DOUBLE WRAPS	Basic - Windows or All	0.67	0.73	0.73	0.77	0.68	0.79	0.74	0.82
			Hurricane - Windows or All	0.68	0.74	0.73	0.77	0.71	0.81	0.76	0.83
			None	0.09	0.14	0.49	0.51	0.09	0.14	0.29	0.33
	C	TOE NAILS	Basic - Windows or All	0.46	0.51	0.63	0.66	0.45	0.51	0.59	0.64
	(8d @ 6" / 6")		Hurricane - Windows or All	0.57	0.61	0.68	0.71	0.56	0.61	0.69	0.74
			None	0.59	0.65	0.68	0.73	0.39	0.45	0.57	0.65
	AND	CLIPS	Basic - Windows or All	0.65	0.70	0.73	0.76	0.64	0.71	0.73	0.79
NON - FBC			Hurricane - Windows or All	0.67	0.72	0.73	0.77	0.71	0.79	0.76	0.83
EQUIVALENT	D		None	0.62	0.69	0.68	0.73	0.49	0.60	0.61	0.73
	(8d @ 6" / 6")	SINGLE WRAPS	Basic - Windows or All	0.68	0.73	0.73	0.77	0.69	0.78	0.75	0.82
	DIMENSIONAL		Hurricane - Windows or All	0.68	0.74	0.73	0.77	0.73	0.81	0.76	0.83
	LUMBER		None	0.62	0.70	0.68	0.73	0.55	0.71	0.61	0.74
	DECK	DOUBLE WRAPS	Basic - Windows or All	0.68	0.74	0.73	0.77	0.72	0.81	0.76	0.83
			Hurricane - Windows or All	0.69	0.74	0.73	0.77	0.74	0.83	0.77	0.84
			None	0.11	0.14	0.55	0.56	0.07	0.10	0.33	0.36
		TOE NAILS	Basic - Windows or All	0.47	0.49	0.70	0.71	0.39	0.42	0.63	0.65
			Hurricane - Windows or All	0.57	0.58	0.75	0.76	0.49	0.52	0.73	0.75
			None	0.49	0.50	0.72	0.73	0.28	0.30	0.53	0.54
		CLIPS	Basic - Windows or All	0.60	0.62	0.78	0.78	0.50	0.53	0.73	0.76
FBC	A		Hurricane - Windows or All	0.63	0.65	0.79	0.80	0.56	0.58	0.78	0.80
EQUIVALENT	(6d @ 6" / 12")		None	0.49	0.50	0.72	0.73	0.30	0.32	0.53	0.55
		SINGLE WRAPS	Basic - Windows or All	0.60	0.62	0.78	0.78	0.51	0.54	0.73	0.76
			Hurricane - Windows or All	0.63	0.65	0.79	0.80	0.56	0.59	0.78	0.80
			None	0.49	0.51	0.72	0.73	0.30	0.33	0.53	0.55
		DOUBLE WRAPS	Basic - Windows or All	0.61	0.62	0.78	0.78	0.51	0.54	0.73	0.76
			Hurricane - Windows or All	0.63	0.65	0.79	0.80	0.56	0.59	0.78	0.80
			None	0.18	0.20	0.57	0.57	0.15	0.18	0.35	0.37
		TOE NAILS	Basic - Windows or All	0.55	0.57	0.71	0.72	0.51	0.53	0.66	0.67
			Hurricane - Windows or All	0.66	0.67	0.76	0.77	0.63	0.64	0.76	0.78
			None	0.70	0.71	0.78	0.79	0.46	0.48	0.66	0.68
		CLIPS	Basic - Windows or All	0.75	0.76	0.81	0.82	0.71	0.74	0.81	0.83
FBC	B		Hurricane - Windows or All	0.77	0.78	0.82	0.83	0.78	0.81	0.84	0.86
EQUIVALENT	(8d @ 6" / 12")		None	0.73	0.74	0.78	0.79	0.58	0.61	0.71	0.74
		SINGLE WRAPS	Basic - Windows or All	0.78	0.79	0.82	0.83	0.76	0.79	0.83	0.85
			Hurricane - Windows or All	0.78	0.80	0.82	0.83	0.80	0.83	0.84	0.86
			None	0.73	0.75	0.78	0.79	0.63	0.67	0.72	0.76
		DOUBLE WRAPS	Basic - Windows or All	0.78	0.80	0.82	0.83	0.78	0.82	0.83	0.86
			Hurricane - Windows or All	0.78	0.80	0.82	0.83	0.80	0.84	0.84	0.86
			None	0.18	0.20	0.57	0.57	0.15	0.18	0.35	0.37
	C	TOE NAILS	Basic - Windows or All	0.56	0.57	0.71	0.72	0.51	0.54	0.66	0.67
	(8d @ 6" / 6")		Hurricane - Windows or All	0.66	0.68	0.76	0.77	0.63	0.65	0.76	0.78
			None	0.70	0.72	0.78	0.79	0.46	0.48	0.66	0.69
	AND	CLIPS	Basic - Windows or All	0.76	0.77	0.81	0.82	0.73	0.74	0.81	0.83
FBC			Hurricane - Windows or All	0.78	0.78	0.82	0.83	0.80	0.82	0.84	0.86
EQUIVALENT	D		None	0.74	0.76	0.78	0.79	0.60	0.63	0.72	0.76
	(8d @ 6" / 6")	SINGLE WRAPS	Basic - Windows or All	0.78	0.80	0.82	0.83	0.78	0.81	0.83	0.86
	DIMENSIONAL		Hurricane - Windows or All	0.79	0.80	0.82	0.83	0.82	0.84	0.84	0.86
	LUMBER		None	0.74	0.76	0.78	0.79	0.68	0.74	0.73	0.78
	DECK	DOUBLE WRAPS	Basic - Windows or All	0.79	0.81	0.82	0.83	0.81	0.84	0.84	0.86
			Hurricane - Windows or All	0.79	0.81	0.82	0.83	0.83	0.86	0.84	0.87
			None				0.82				0.80
REINFORCED CONCRETE ROOF DECK			Basic - Windows or All				0.84				0.88
			Hurricane - Windows or All				0.84				0.88

- Roof shape
- Roof covering
- Roof deck type
- Roof anchorage
- Roof water barrier
- Storm shutters and doors
- Internal pressure design
- Geographic location and applicable building code items

What is the Proper Role for Regulation in the Catastrophe Modeling Ecosystem?

- In an ideal world, all risk information would be unregulated
  - Limited or asymmetric information about costs always distorts economic signals
  - Overly prescriptive approach to standards may stifle innovation
  - Unrecoverable frictional costs associated with compliance in multiple jurisdictions a powerful incentive to withdraw from regulatory processes
  - Regulatory gauntlet can create artificial barriers to entry for new models
- In the end, insurers are accountable for regulated rates anyway
- Given perceived benefits in excess of economic and social costs, regulation of models should follow potential guiding principles, such as
  - Efficient: minimization of compliance costs and delays
  - Effective: acceptance which confers the right to unfettered use of model results
  - Equitable: a process which is transparent and does not inherently favor any firm
- Questions for Discussion:
  - How does the current Florida process score on each criteria?
  - Is an NAIC-led standardized approach workable?
  - How are actuaries and modeling firms working together to facilitate compliance with both regulations and ASOPs?

Thank You!

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