CAS Ratemaking and Product Management (RPM) Seminar

RR-3: Quantifying Risk Load for Property Catastrophe Exposure

ALLOCATION OF REINSURANCE COSTS/
RISK LOAD TO TERRITORY

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Allocation of Reinsurance Costs/Risk Load to Territory
Background

- Ratemaking done for individual states
- Cost of countrywide aggregate catastrophe reinsurance needs to be allocated to state
- State reinsurance costs/risk loads need to be allocated to territory
- In this presentation, I use hypothetical Cat model output to allocate statewide reinsurance/risk load to territory
- For simplicity, analysis will include three territories
- Same methodology can be used to allocate the net cost of a countrywide or multiple state aggregate catastrophe cover to state

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Allocation of Reinsurance Costs/Risk Load to Territory
Background

- What is the statewide reinsurance/risk load?
- Assume Catastrophe Bond multiples approximate the cost of reinsurance for those layers covered by reinsurance
- Another application
- Use Catastrophe Bond profit multiples to derive statewide reinsurance/risk load

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Slide 3

Allocation of Reinsurance Costs/Risk Load to Territory

Derivation of Statewide Risk Load
Determine Occurrence Probability Layers

Attachment Point	Probability of Attaching	Attachment Point Return Period	Exhaustion Point	Probability of Exhausting	Exhaustion Point Return Period
$0	100.0%	n/a	$8,426,522	20.0%	1 in 5
8,426,522	20.0%	1 in 5	36,006,904	10.0%	1 in 10
36,006,904	10.0%	1 in 10	93,897,520	5.0%	1 in 20
93,897,520	5.0%	1 in 20	232,270,545	2.0%	1 in 50
232,270,545	2.0%	1 in 50	386,063,348	1.0%	1 in 100
386,063,348	1.0%	1 in 100	666,260,955	0.4%	1 in 250
666,260,955	0.4%	1 in 250	Unlimited	0.0%	n/a

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Slide 4

Allocation of Reinsurance Costs/Risk Load to Territory

Derivation of Statewide Risk Load
Determine Statewide Reinsurance/Risk Load

Layer	(1) Expected Loss	(2) Cat Bond Profit Multiple	(3) = (1) x (2) Indicated Risk Load
Up to 1 in 5	$2,269,390	0.00	$0
1 in 5 to 1 in 10	3,788,181	2.05	7,781,615
1 in 10 to 1 in 20	4,081,090	2.15	8,757,558
1 in 20 to 1 in 50	4,346,094	4.28	18,579,867
1 in 50 to 1 in 100	2,214,237	5.53	12,237,904
1 in 100 to 1 in 250	1,833,907	8.08	14,818,109
1 in 250 and Higher	1,467,101	15.70	23,033,662
Total	$20,000,000		$85,208,717

Average Profit Multiple Across All Layers: 4.26

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Slide 5

Allocation of Reinsurance Costs/Risk Load to Territory
Statewide Rate Level Indication

- Hypothetically constructed using the relationships in data from various homeowner rate filings
- Assumptions:
  - Reinsurance/risk load provision is 4.26 times the expected hurricane loss
  - The expected non-hurricane losses are three times the expected hurricane losses
  - Fixed expense provision is $50 and variable expense provision is 20%

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Allocation of Reinsurance Costs/Risk Load to Territory

Hypothetical Statewide Rate Level Indication

Pure Premium Methodology

(1)	Non-Hurricane Loss Provision	247
(2)	Hurricane Loss Provision	82
(3)	Reinsurance Cost/Risk Load	351
(4)	Fixed Expense Provision	50
(5)	Total	731
(6)	Variable Expense Provision	20.0%
(7)	Average Rate	914

(5) = (1) + (2) + (3) + (4)

(7) = (5) / (1 - (6))

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Allocation of Reinsurance Costs/Risk Load to Territory
Selection of Three Territories

	Territory A (Coast)	Territory B (Inland)	Territory C (Far Inland)
Percentage Statewide AIY	0.5%	7.2%	26.6%
Expected Hurricane Loss per AIY	2.47	0.33	0.06
% Statewide Expected Hurricane Loss	4.1%	7.2%	5.2%

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Allocation of Reinsurance Costs/Risk Load to Territory
Methods of Allocating Reinsurance Costs to Territory

- Examined homeowner rate filings
- Four methods:
  - Flat Dollar Amount per Policy
  - Proportional to Premium
  - Proportional to Expected Losses
  - Proportional to Contribution to Statewide Variance

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Allocation of Reinsurance Costs/Risk Load to Territory

Flat Dollar Amount per Policy

		Territory A	Territory B	Territory C
(1)	Non-Hurricane Loss Provision	$247	$247	$247
(2)	Hurricane Loss Provision	$705	$83	$16
(3)	Reinsurance Cost/Risk Load	$351	$351	$351
(4)	Fixed Expense Provision	$50	$50	$50
(5)	Total	$1,353	$732	$664
(6)	Variable Expense Provision	20.0%	20.0%	20.0%
(7)	Average Rate	$1,692	$914	$830

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Allocation of Reinsurance Costs/Risk Load to Territory

Percentage of Premium

		Territory A	Territory B	Territory C
(1)	Non-Hurricane Loss Provision	$247	$247	$247
(2)	Hurricane Loss Provision	$705	$83	$16
(3)	Reinsurance Cost/Risk Load	$927	$352	$290
(4)	Fixed Expense Provision	$50	$50	$50
(5)	Total	$1,929	$732	$603
(6)	Variable Expense Provision	20.0%	20.0%	20.0%
(7)	Average Rate	$2,411	$915	$754

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Allocation of Reinsurance Costs/Risk Load to Territory

Proportion to Expected Hurricane Loss

		Territory A	Territory B	Territory C
(1)	Non-Hurricane Loss Provision	$247	$247	$247
(2)	Hurricane Loss Provision	$705	$83	$16
(3)	Reinsurance Cost/Risk Load	$3,003	$354	$68
(4)	Fixed Expense Provision	$50	$50	$50
(5)	Total	$4,005	$735	$381
(6)	Variable Expense Provision	20.0%	20.0%	20.0%
(7)	Average Rate	$5,006	$918	$477

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Allocation of Reinsurance Costs/Risk Load to Territory

Proportion to Contribution to Statewide Variance

		Territory A	Territory B	Territory C
(1)	Non-Hurricane Loss Provision	$247	$247	$247
(2)	Hurricane Loss Provision	$705	$83	$16
(3)	Reinsurance Cost/Risk Load	$3,587	$366	$57
(4)	Fixed Expense Provision	$50	$50	$50
(5)	Total	$4,589	$747	$370
(6)	Variable Expense Provision	20.0%	20.0%	20.0%
(7)	Average Rate	$5,736	$933	$462

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Allocation of Reinsurance Costs/Risk Load to Territory

Summary of Methods

	Territory A	Territory B	Territory C
Flat Dollar Amount per Policy	$1,692	$914	$830
Proportional to Premium	$2,411	$915	$754
Proportional to Expected Hurricane Loss	$5,006	$918	$477
Proportion to Contribution to Statewide Variance	$5,736	$933	$462
Statewide Average Rate:	$914		

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Allocation of Reinsurance Costs/Risk Load to Territory
Choice of Allocation Method Important

- Significant variation in average rate by territory
- Allocation using expected hurricane losses can understate cost in territories with higher hurricane losses and overstate in those with lower hurricane losses
- Alternative:
  - Use the Catastrophe Bond market profit multiples

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Allocation of Reinsurance Costs/Risk Load to Territory
A New Alternative

- Use profit multiples from Catastrophe Bond market
- AAL available from catastrophe models by territory
- AAL statewide was allocated to layer in earlier slide
- Assume for each event losses in each layer allocated to territory proportional to AAL by territory for all layers
- Apply profit multiples from Catastrophe Bond market to AAL in each layer for each territory
- Sum each territory across the layers to produce an indicated risk load in each territory
- Allocate the statewide reinsurance cost/risk load using the indicated territory risk load

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Allocation of Reinsurance Costs/Risk Load to Territory

Using CAT Bond Multiples

		Territory A	Territory B	Territory C
(1)	Non-Hurricane Loss Provision	$247	$247	$247
(2)	Hurricane Loss Provision	$705	$83	$16
(3)	Reinsurance Cost/Risk Load	$3,357	$367	$61
(4)	Fixed Expense Provision	$50	$50	$50
(5)	Total	$4,359	$747	$374
(6)	Variable Expense Provision	20.0%	20.0%	20.0%
(7)	Average Rate	$5,449	$934	$467

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Allocation of Reinsurance Costs/Risk Load to Territory

Summary of All Methods

	Territory A	Territory B	Territory C
Flat Dollar Amount per Policy	$1,692	$914	$830
Proportional to Premium	$2,411	$915	$754
Proportional to Expected Hurricane Loss	$5,006	$918	$477
Proportion to Contribution to Statewide Variance	$5,736	$933	$462
CAT Bond Multiples	$5,449	$934	$467
Statewide Average Rate:	$914		

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Allocation of Reinsurance Costs/Risk Load to Territory

Questions?

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