

## CAS RBC Dependency and Calibration Working Party (DCWP)

DCWP STATUS

November 12, 2014

Presenting today:  
Allan Kaufman, Chair

CAS RBC DCWP - 11/12/14

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## Key Findings

- |                                   |  |
|-----------------------------------|--|
| <b>1. Size (LOB-size) matters</b> | Not surprising... but it's not just "law of large numbers" |
| <b>2. Type of company matters</b> | Especially significant for specialty lines                 |
| <b>3. Diversification metrics</b> | Little difference between simple and complex metrics       |
| <b>4. Diversification effect</b>  | Bottom up (100+ parameters) vs. top down (2 parameters)    |
| <b>5. Time scale matters</b>      | Need enough years of data to work with                     |
| <b>6. Reinsurance matters</b>     | More reinsurance = higher risk charge                      |

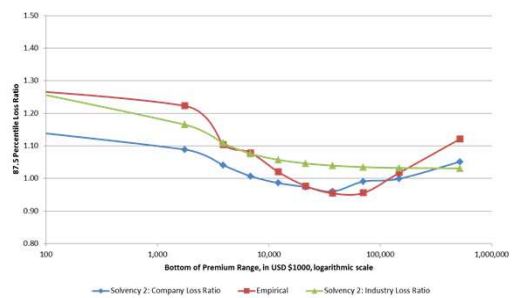
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## 1. Size Matters

- Indicated risk charge (87.5<sup>th</sup> percentile) varies with size
- Pattern appears to depend on factors in addition to size
- Standard formulas generally choose risk charge that does not vary with size, e.g.
  - Median
  - Based on "large enough" companies

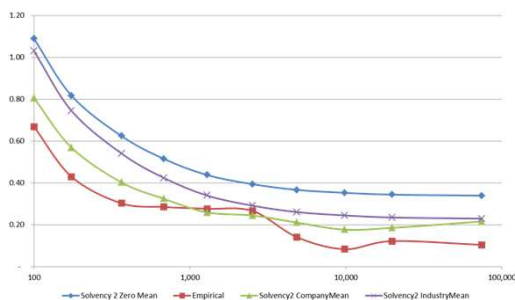
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## Size Matters: PRF for WCA



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## Size Matters: RRF for PPA



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## 2. Type of Company Matters

- Risk charge varies by type of company
  - Reinsurer, standard lines insurer, PL specialist, etc.
- Calibrating on data points that exclude "minor lines" removes much (but not all) of the effect
  - "Minor line" = LOB as % of total company less than some threshold (e.g., 5%)

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## Type matters: Reinsurers

Exhibit 3.1: PRFs - All Reinsurers

Line of Business (LOB)	Reins vs. Non-Reinsurer Larger difference before minor line filter					
	(1) Including Minor Lines			(2) Excluding Minor Lines		
	Specialists	Non-Specialists	Difference	Specialists	Non-Specialists	Difference
A Homeowners/Farmowners	0.908	0.966	0.057	0.874	0.956	-0.082
B Priv. Passenger Auto Liability	1.079	0.982	0.097	0.998	0.973	0.025
C Commercial Auto Liability	1.122	0.984	0.139	0.979	0.982	-0.003
D Workers' Compensation	1.202	1.053	0.149	1.067	1.04	0.027
E Commercial Multi peril	1.041	0.922	0.118	1.002	0.881	0.122
F1 Medical Mal - Occurrence	1.599	1.667	-0.068	N/A	1.458	N/A
F2 Medical Mal - Claims made	1.308	1.2	0.108	0.96*	1.14**	0.201**
H Other Liability	1.194	1.011	0.183	1.07	1.016	0.053
J Auto Physical Damage	0.925	0.862	0.064	0.806	0.842	-0.036
N&P Reinsurance A & C	1.331	1.621	-0.291	1.288	1.303	-0.015
O Reinsurance B	1.329	1.652	-0.323	1.306	1.343	-0.037

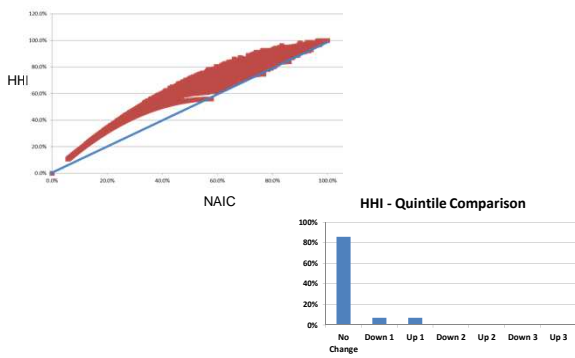
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## 3. Diversification Metrics

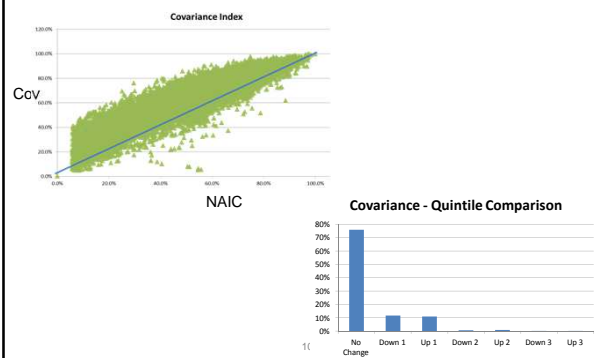
- NAIC RBC diversification measure
  - $(\text{Max LOB Premium})/(\text{All LOB premium})$
- Alternative diversification measures
  - HHI index (sum of squares of percentages by LOB)
  - Covariance matrix
- Company diversification rankings similar, *regardless* of diversification measure

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## HHI vs. NAIC



## Covariance vs. NAIC



## 4. Diversification Effect

- Divide companies by size and diversification
  - 5 size bands
  - 6 diversification bands, incl. monoline (0 diversification)
  - Total of 30 cells
- Calculate 87.5<sup>th</sup> percentile all-LOB PRF for each cell
  - If no diversification effect, PRFs constant down columns
  - Decreasing PRF measures diversification benefit

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## Diversification Effect: Actual vs. Model

Actual						Current and Alternative						
Div Band	Indicated - NAIC Diversification					Indicated	NAIC 70% Rule					Indicated
	A	B	C	D	E		A	B	C	D	E	
0	45%	25%	24%	26%	35%	21.8%	32%	32%	32%	31%	27%	
1	47%	20%	26%	22%	40%		25%	27%	27%	32%	24%	
2	42%	21%	16%	18%	15%		24%	24%	24%	24%	23%	
3	44%	21%	20%	19%	19%		23%	23%	23%	24%	20%	
4	35%	14%	20%	20%	18%		22%	22%	21%	22%	20%	
5	52%	24%	15%	18%	17%		21%	21%	20%	21%	20%	
Data						17.8%						17.9%

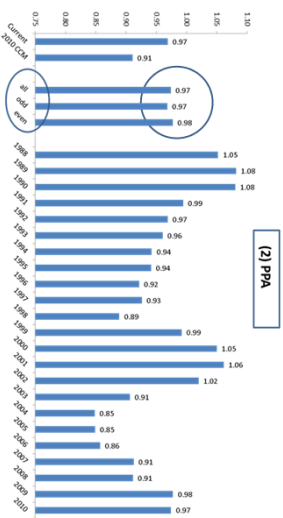
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### 5. Time Scale Matters

- PRF and RRF by AY show UW cycle effects
- Even/Odd test over 24 AYs appears reasonably stable
  - Also tested every 4<sup>th</sup> year for stability

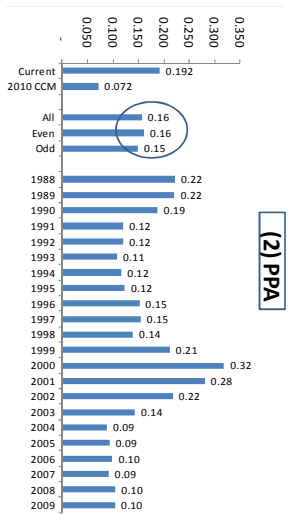
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### Premium Risk Charge by AY



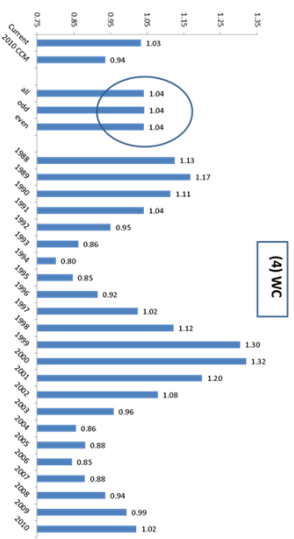
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### Reserve Risk Charge by AY



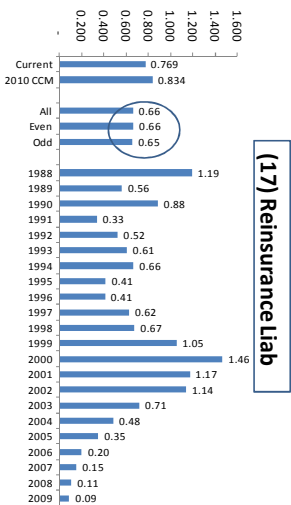
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### Premium Risk Charge by AY



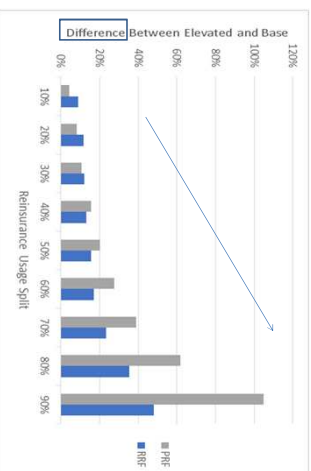
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### Reserve Risk Charge by AY



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Higher Ceded Re =  
Higher Risk Charges



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