

# Winner's Curse

GIRO Edinburgh  
8<sup>th</sup> October 2009

Mark Rothwell, Graham Fulcher  
& The Winner's Curse Working Party

## Agenda

- The Working Party
- Winner's Curse - Theory
- Winner's Curse in Insurance
  - Personal and Commercial Lines
  - Our own aggregator
  - A theoretical model
  - Modelling of the bidding process
- Winner's Curse and Actuaries

## Working Party

### Members:

Cherry Chan  
Yves Colomb  
Catherine Farnworth  
Graham Fulcher  
Michael Garner  
Andrew Goldby  
Visesh Gosrani  
Malcolm Jewell  
Tony Jordan  
James Kelsall  
Sylvie Le Delliou-Viel  
Rob Lowe  
Roberto Malattia  
**Mark Rothwell (Chair)**  
Andrew Smith  
Matthew Spedding

### Additional Thanks:

Tina Aidoo  
David Brown  
Carmen Burraston  
David Drury  
Tim Grant  
Paula Iencean  
Daniel Kendrick  
Steven Loyens  
Elena Papadopolou  
Andrew Wallace

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## Winner's Curse - Theory

- Capen, Clapp, and Campbell (1971)  
"Competitive Bidding in High-Risk Situations"
- Each bidder making best guess at uncertain cashflows using
  - Own knowledge of similar risks
  - Expert information
  - Developing pricing techniques and expertise
- Variation in bids much greater than variation in true value to different bidders
- Highest bid wins



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## Winner's Curse & Insurance

- "Competitive Bidding in High-Risk Situations"
- Each bidder making best guess at uncertain cashflows using
  - Own knowledge of similar risks
  - Expert information
  - Developing pricing techniques and expertise
- Variation in bids much greater than variation in true value to different bidders
- Lowest bid wins



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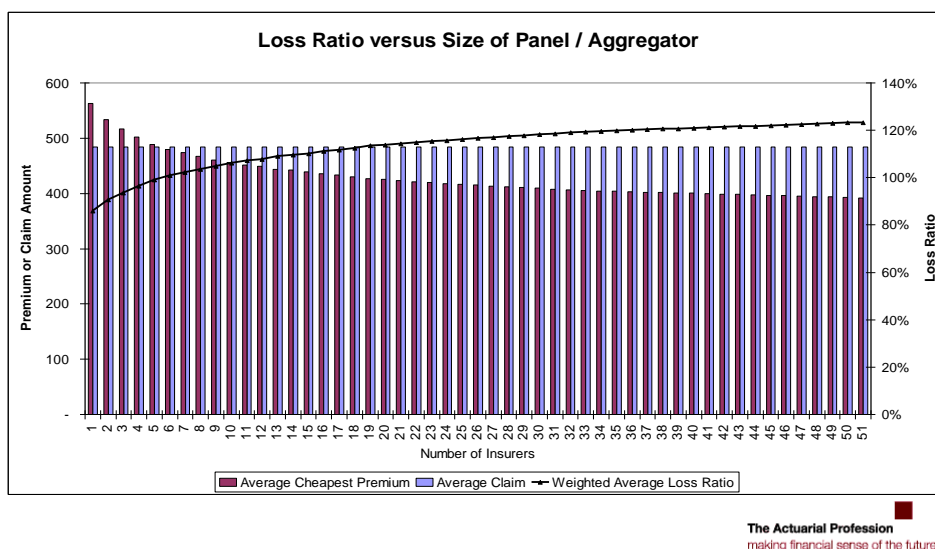
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## Personal Lines and Commercial Lines

	Personal Lines	Balance of risk	Large commercial
Uncertainty	Value of policy can be estimated to high degree of comfort		Value of policy subject to high degree of uncertainty
Nature of bidding	Buyer not concerned if bid out of line with market		Broker often focused only on lowest price in short term but subscription market mitigates
"Common value"	Cost-base & target segment differs for insurers		Cost-base & target segment differs for insurers
Price-focus	High degree of standardisation Aggregators drive price focus Brand important to some		Terms and conditions vary Service levels & claims handling important to insured Financial rating of insurer matters
Competition	Aggregators drive extremely high level of competition		Fewer players with broker driving competition

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## Our Own Aggregator



## Mathematical modelling

Actual ultimate losses  $U$  have mean  $\mu(U)$ , standard deviation  $\sigma(U)$

Assume  $N$  identical insurers

- Estimating of cost  $X_i$  with mean  $\mu(X)$  and standard deviation  $\sigma(X)$

-  $X_i$  multivariate normal with correlation between pairs  $\rho(x)$

- Quoting a premium equal to  $\alpha + \beta X_i$

Correlation between each  $X_i$  and  $U$  is  $\rho(U)$

Aggregate effect of winners curse on profit:  $\xi(N) * \beta * \sigma(X) * \sqrt{1 - \rho(X)}$

Where  $\xi(N)$  is the expected value of the maximum of  $N$  i.i.d.

$N(0,1)$ :  $\xi(2) = 0.564$  and  $\xi(5) = 1.163$

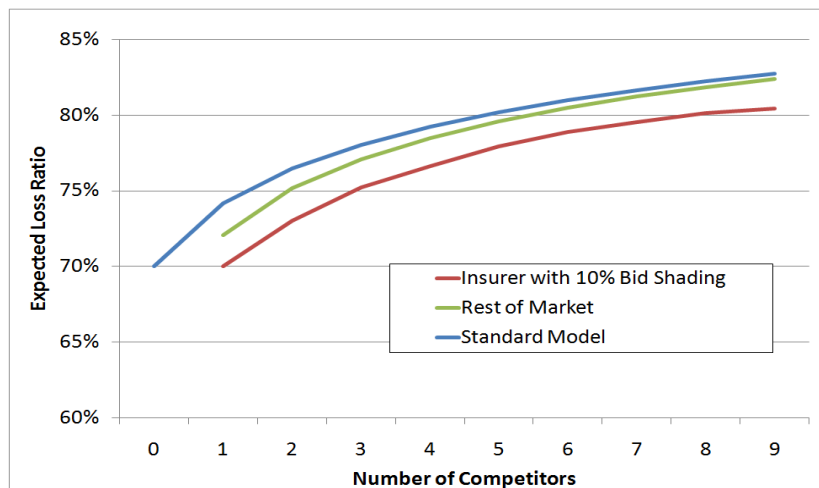
Independent of: Mean estimate; Mean and standard deviation of claims;

Correlation between claims and estimates

Depends only on: profit loading; number of insurers; volatility of estimates;

correlation between estimates

## Theoretical Modelling – rate changes



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## Winner's Curse & actuaries

- Winner's Curse needs to be as familiar a concept to actuaries as reserving cycles
- Competition can be modelled in a variety of ways
  - Build-your-own-aggregators
  - Mathematical and game theory approaches
  - Theoretical London market models
  - Bayesian posterior approach to pricing and rate monitoring
- The "holy grail" of pricing model loss ratios feeding capital modelling means and reserving priors is flawed without consideration of Winner's Curse
- Winner's Curse interacts with the underwriting and reserving cycle

**Please join us in Workshop D3 (after the coffee break)**

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