

The Actuarial Profession
making financial sense of the future

Momentum conference 2010
Mark Rothwell

Crowds
Aspects of pricing in a crowded marketplace

9 December 2010

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To start....

A question that you won't know the answer to (I hope!):

- Before it started erupting, how high was the Eyjafjallajökull volcano in Iceland?
 - (metres above mean sea level)
- Please write down your:
 - Point estimate
 - 90% confidence interval



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... and if you know a bit about your competitors...

- Confer with one of your nearest neighbours (“competitors”)
- What is their point estimate?
- What is their 90% confidence interval?

- Update your estimate and confidence interval based on knowing what your “competitor” is estimating.

Any lessons from that?

- Did you change your point estimate as a result of the discussion?

- Did you widen or narrow your confidence interval?

... for a small prize

- With the revised point estimate, who was closest?

Answer was: 1,666m

How robust were our confidence intervals?

- How many had the right answer within their first guess confidence interval?
- How many had the right answer within their second guess?
- What conclusions can we draw?

Typical results

- **Wisdom of Crowds**
 - More will tend to have the answer in their second confidence interval than their first...
 - ... Despite narrower confidence intervals
- **Overconfidence**
 - Less than 90% of people will have the answer within their 90% confidence interval.
 - However, overconfidence reduces with competence (Dunning-Kruger Effect)

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Dunning-Kruger Effect

“People reach erroneous conclusions and make unfortunate choices but their incompetence robs them of the metacognitive ability to realize it.”

– Dunning and Kruger, 1999

- The unskilled will rate their ability much higher than it actually is
- The highly skilled underrate their abilities

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Some concepts

- On average, how did we do?
Wisdom of Crowds
- If this were a range of quotes...
Winner's Curse
- How did the winner feel?
Utility of Winning

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Agenda

- **Wisdom of Crowds**
- **Winner's Curse**
- **Psychological Effects**

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Wisdom of the Crowd

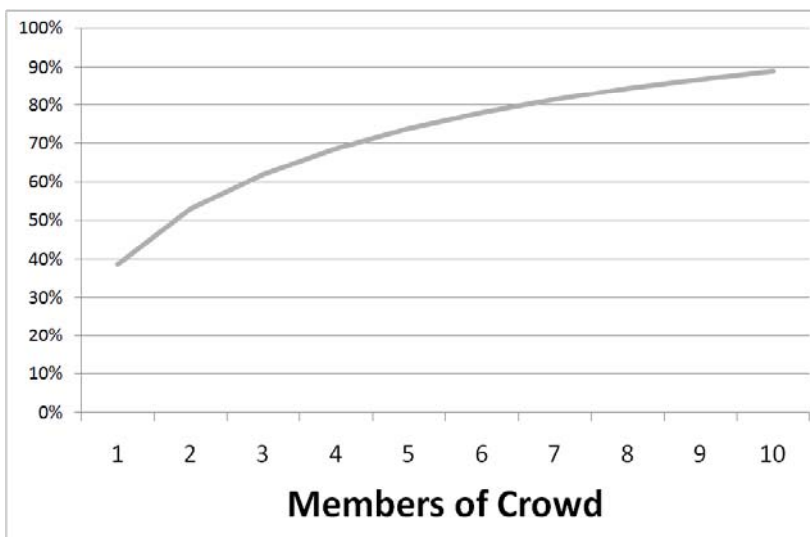
The theory that a larger group of diverse people can make better decisions, and display more intelligence than any smaller collection of experts

Simple Example

- Consider estimates of an amount x .
- And the estimates come from a distribution $N(x,1)$
- Then approx. 38% of estimates are within 0.5 of the mean.

- ... If we take an average of 2 estimates then approx. 53% are within 0.5

... And Bigger Crowds



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Wisdom of Crowds

- Different companies making different assessments
- Average price should usually be better than any individual price
- Does this mean that the market price is a good estimate?
- Where does it fall down?

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The pit falls...

- Market price is not usually the market average
- Example
 - An underwriter complains about the pricing model you've given him.
 - It is "above the market price" 90% of the time.

... well if there are 10 companies in his market...!!

Some more questions...

Who can provide the most accurate price for a risk?

- Claims Manager
- Accountant
- Underwriter
- Actuary
- Broker

.... Or a collaboration of several of the above?

Unwise crowds

Common themes in “unwise” crowds:

- Too homogenous:
 - Similar professional backgrounds
 - Similar types of models
 - Similar source information

A “wise” or “unwise” crowd?

Common themes in “unwise” crowds:

- Too homogenous
- Too centralised
 - Decisions taken by hierarchical bureaucracy

Question

How often do you collaborate with competitors on your pricing?

I hope it's not very often – that would be anti-competitive!!!

A “wise” or “unwise” crowd?

Common themes in “unwise” crowds:

- Too homogenous
- Too centralised
- Too divided
 - Information not shared between members of the crowd

A Mozart Question

.... And the answer is...

1756



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A “wise” or “unwise” crowd?

Common themes in “unwise” crowds:

- Too homogenous
- Too centralised
- Too divided
- Too imitative
 - Where members of the crowd are making decisions in sequence and can be tempted to copy

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Question

Who thinks Actuaries are better looking than Accountants?

A “wise” or “unwise” crowd?

Common themes in “unwise” crowds:

- Too homogenous
- Too centralised
- Too divided
- Too imitative
- Too emotional
 - Peer Pressure
 - Herd Instinct
 - Collective Hysteria

Challenges for Pricing

- We are a fairly homogenous group
- We sit in separate silos
- We may be fed the same data
- Our underwriters may be imitative
- Peer pressure often exists
- Market prices often follow a herd instinct

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Dilemma

Pricing

- Pricing below market average
- Pricing close to market average
- Pricing above market average

Implications

- Inadequate pricing
- Adequate price, but low conversion rate
- Over priced

... and we start to revisit the “Winner’s Curse” issues discussed at last year’s Momentum

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Agenda

- Wisdom of Crowds
- Winner's Curse..... a recap!
- Psychological Effects

A definition...

Winner's Curse

- The tendency for a **Common Value Auction** to be won by a bidder who has over-estimated the value.

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



Image source: thesharegallery.co.uk, Wiki commons

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



Image source: Wiki commons

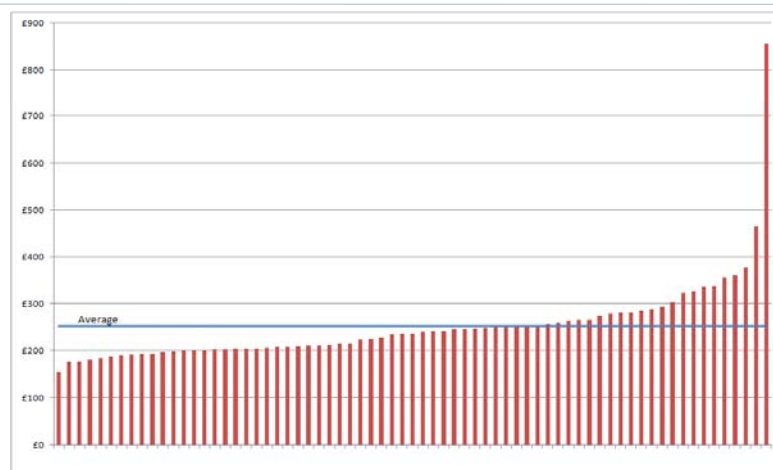
GoSwitchTheBewilderedMongooseSupermarket.com

1	£154.88
2	£175.96
3	£176.60
4	£180.24
5	£184.10
...	...
69	£856.00
Mean	£252.87
Median	£237.38

- What's the right price for the risk?







Prices quoted are for a 37-year-old male member of the working party with an 11-year-old Mazda 323 and maximum NCD. Comprehensive cover and £500 excess were requested on the website of a well-known price comparison website. Prices were taken on the 26th September 2009.

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- What's the right price for the risk?
- What influences the purchase decision?
 - Price?
 - Brand?
 - Other?

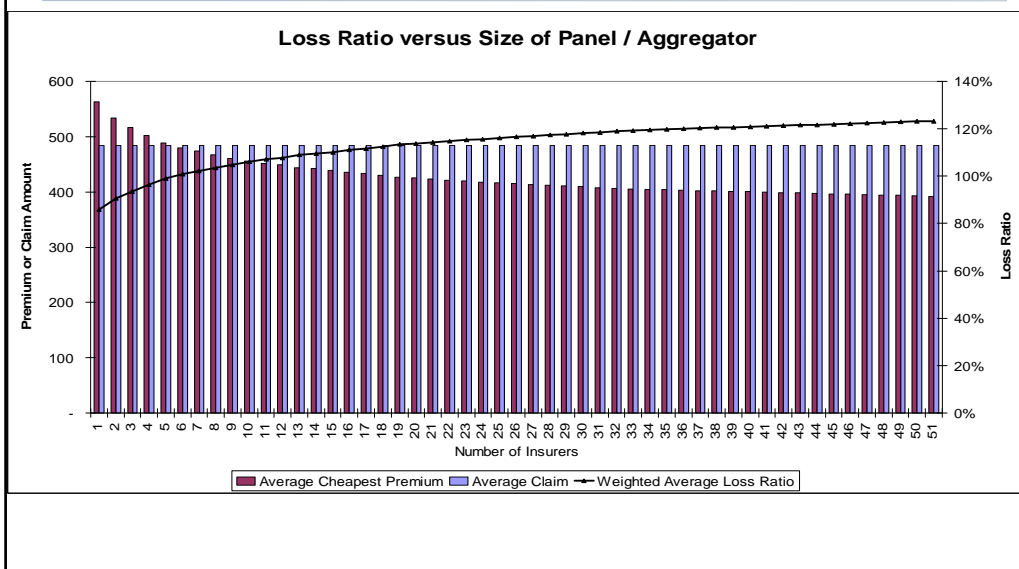
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GoSwitchTheBewilderedMongooseSupermarket.com

Provider	Annual Premium	Monthly Premium	Total Excess	Legal Cover	Courtesy Car	Breakdown Cover	Personal Accident Cover	Windscreen Cover	Customer Reviews
	£154.88	£13.51 @ 10 months £30.98 deposit Total: £166.08	Compulsory £150.00 Voluntary £350.00 Total: £500.00	£19.99 extra	✓	£29.99 extra	✓	✓	★★★★★ 1 review(s)
	£175.96	£16.00 @ 10 months £33.56 deposit Total: £193.56	Compulsory £0.00 Voluntary £500.00 Total: £500.00	£24.99 extra	£17.99 extra	£34.99 extra	✓	✓	★★★★☆ 186 review(s)
	£176.60 Save with MultiCar	✓	Compulsory £0.00 Voluntary £500.00 Total: £500.00	✓	✓	✗	✓	✓	★★★★☆ 102 review(s)
	£180.24	£15.27 @ 11 months £36.05 deposit Total: £204.02	Compulsory £150.00 Voluntary £250.00 Total: £400.00	£19.37 extra	✓	£44.95 extra	✓	✓	★★★★☆ 8 review(s)
	£184.10 SALE NOW ON	£17.00 @ 11 months £15.33 deposit Total: £202.33	Compulsory £150.00 Voluntary £500.00 Total: £650.00	£26.99 extra	✓	£39.99 extra	✓	✓	★★★★☆ 88 review(s)

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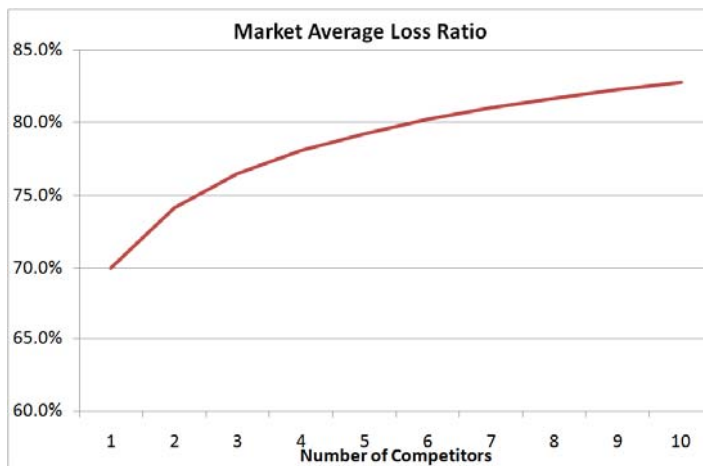
Our Own Aggregator



A Simple Model

- Normally distributed prices
- Up to 10 individual insurers with identically distributed prices
- Co-Efficient of Variation 10%
- Target loss ratio 70%

Impact of Competition

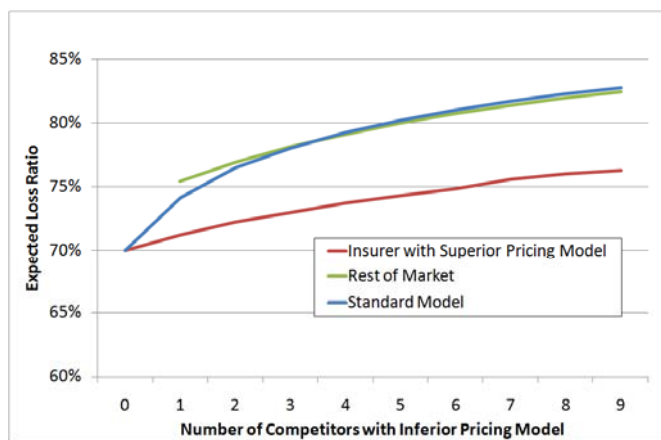


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A more accurate model than your competitors

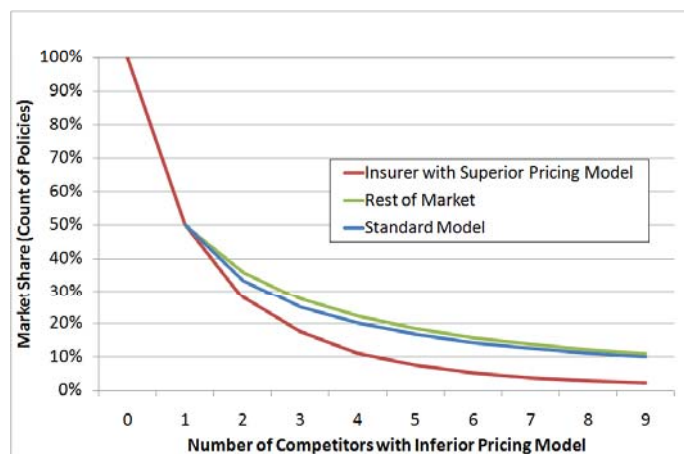
- One insurer has a co-efficient of variation of 5%



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... But less business



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So....

Becomes an optimisation problem

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Pricing Implications

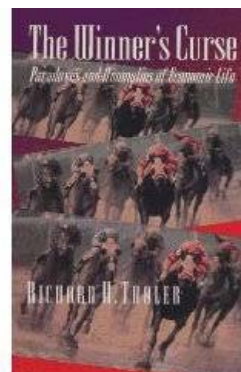
- Importance of good quality data & pricing sophistication
- Danger of panels/aggregators
- Opportunities in product differentiation and niches
- Importance of Cross Selling
- Importance of Cost Efficiency
- Value of strong brand
- Good reason to “talk up” the market
- Subscription markets/Best Terms/Vertical Pricing
- Danger of chasing market share as competition increases
- New broker opportunities (e.g. Reverse auctions)

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For more information on Winner's Curse

- 2009 Working Party Paper
- 2009 GIRO presentations (plenary and workshop)
- 2009 Momentum presentation
- Extensive reading list included in the paper



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Agenda

- Wisdom of Crowds
- Winner's Curse
- Psychological Effects

“Win”

- Synonyms
 - accomplish, achieve, attain, gain, success, triumph
- Antonyms
 - fail, forfeit, lose, miss, relinquish, suffer defeat

Utility of Winning

- Winning feels good
- Psychological benefit from winning
- Risk of wrong reaction to competition

.... Related to other psychological effects

Biases

- Anchoring
 - Over-reliance on one piece of information
- Status Quo
 - Bias towards existing price
- Recency
 - Placing more importance on recent events

Some interesting thoughts on “Cognitive Bias” in David Drury's 2007 CArE presentation.

Conclusions

Think about your pricing in the context of your competitors' actions and reactions

- Game Theory

Beware of the psychological influences on your decisions

- Cognitive Bias

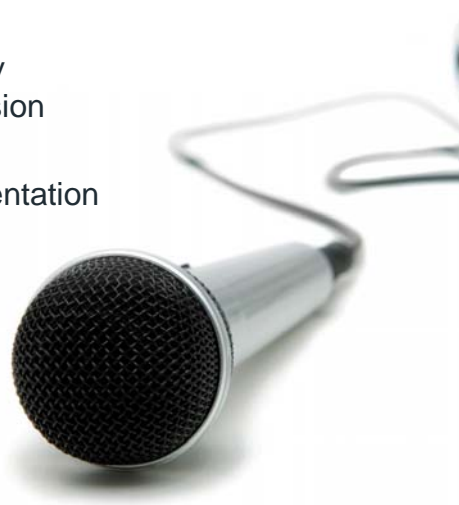
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Questions or comments?

Expressions of individual views by members of The Actuarial Profession and its staff are encouraged.

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