Time is Money
Are you rich?

Red Arrows and Paper Planes

• Accuracy at speed

OR appropriate level of accuracy?

There can be as much value in the blink of an eye as in months of rational analysis.
What this presentation is not

So what do we spend our time on?

Source: http://www.economist.com/blogs/dailychart/2011/04/time_use
A Traditional Approach to Pricing

1. Start over again?
2. Gather Data → Build GLM(s) → Deploy New Rates
3. Or refine the rates in response to changing sales/market conditions?
4. 4 or more perils
   Frequency/Severity
   Combined models
   4-6 Months?
5. Impact analysis?
   Refresh Optimisation?

A Different Approach to Pricing?

- Actuaries have traditionally focussed on model building
- Is the role of the actuary to provide the most accurate answer that available data and modelling techniques are able to calculate?
  - Or advice and guidance that incrementally improves the bottom line?
- Just because we have the data available to build an accurate model, doesn’t mean it’s worth building…
Money to Burn?

'Agents should allocate time according to cost-benefit tradeoffs. Such tradeoffs should also influence the amount of time that agents allocate to decision-making itself. [...]\n
...agents should allocate **more decision time to choices between options of similar expected utility** than to choices between options of dissimilar expected utility. [...]if an agent’s estimate of the value of the best option is close to her estimate of the next best alternative, then it is optimal to take more time to refine her estimates since this extra time has a good chance of leading her to change her choice. In contrast, if an agent has a noisy estimate of the value of an option but the option almost surely dominates its alternatives, then it is not worth taking the time to refine her estimates, because additional thinking is unlikely to change her choice.'


Is Time Money?

- Yes!
- We love to blame IT for delaying business improvement plans, but...
  - Traditional pricing analyses are very data hungry
  - We seek sufficient data volumes to be ‘confident’ in a decision
- Pricing models: allow 3-6 months development of incurred claims
- Conversion models: allow 15-30 days quote run-off
- AB testing of operational processes: when do we conclude that B is best?
  - If your goal is to get 10,000 responses, how quickly can you get them?
Fictional Example (1)

• I am setting up a sandwich shop in Cobham, Surrey
  – How many staff should I recruit?
  – Do I need the same number every day of the week?
• Two Options:
  – Gather data on lunch time spending habits for, say, 1 month
  – Ask some local experts?

Fictional Example (1): Ask the Audience

Q

■ What will be the average spend per customer?

£3 £4 £5 £6 £7
Fictional Example (1): Ask the Audience

Q

- Which day of the week will be the busiest?

Fictional Example (1): Gather Data
Fictional Example (1): Gather Data

Q

- What will be the average spend per customer?

Week 1
Average Spend £4.25
Fictional Example (1): Gather Data

Week 2
Average Spend £4.22

Week 3
Average Spend £4.02
Fictional Example (1): Gather Data

Week 4
Average Spend £4.33

Fictional Example (1): Gather Data

Week 1
Average Spend £4.25

Week 2
Average Spend £4.22

Week 3
Average Spend £4.02

Week 4
Average Spend £4.33
Fictional Example (1): Gather Data

Week 1
Average Spend £4.25

Week 2
Average Spend £4.22

Week 3
Average Spend £4.33

Week 4
Average Spend £4.35

Total
Average Spend £4.16

Predicted
Average Spend £4.35

Pay Day?
Fictional Example (1): Gather Data

Q

Our survey says

![Bar chart showing daily data]

Fictional Example (1): Conclusions so far

• Our ‘local experts’ were pretty good at predicting the average value of the items surveyed
  – If distribution is important, the data may win out

• Employ an extra member of staff on a Monday based on expert knowledge
  – Gather data before designing ‘last week before pay day’ special offers
Fictional Example (1): Conclusions so far

• Our ‘local experts’ were pretty good at predicting the average value of the items surveyed
  – If distribution is important, the data may win out
• A Third Option?
  – Gather data on lunch time spending habits for, say, 1 month
  – Ask some local experts?
  – Buy some external data?

(Highly) Fictional Example (2): A Motor Portfolio

• You’re asked to care-take a portfolio of 500,000 Motor policies
  – Any profit you make in 2012 is yours to keep
• There’s just you and your actuarial assistant
  – How do you invest YOUR capital?
A Traditional Approach to Pricing

- Gather Data
- Build GLM(s)
- Combine the models
- Deploy New Rates

Impact analysis?
Refresh Optimisation?

4 or more perils
Frequency/Severity

4-6 Months?

(Less) Fictional Example (2): Existing Rating Factor

Terribly Priced Factor 1

- Exposure
- Capped Loss Ratio

<table>
<thead>
<tr>
<th>No</th>
<th>Yes</th>
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<tbody>
<tr>
<td>0.6</td>
<td>0.7</td>
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<tr>
<td>0.7</td>
<td>0.8</td>
</tr>
<tr>
<td>0.8</td>
<td>0.9</td>
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<tr>
<td>0.9</td>
<td>1.0</td>
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(Less) Fictional Example (2): Existing Rating Factor

- You spot this in a one-way loss ratio report on a Friday afternoon
- You have a chance to change your rates on Monday or in four weeks time
- This factor will be included in the GLM your analyst is building
- Do you take action now or wait?

<table>
<thead>
<tr>
<th>Exposure</th>
<th>GEP</th>
<th>Average Premium</th>
<th>Loss Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>150</td>
<td>60,000</td>
<td>400</td>
</tr>
<tr>
<td>Yes</td>
<td>350</td>
<td>143,500</td>
<td>410</td>
</tr>
<tr>
<td>Total</td>
<td>500</td>
<td>203,500</td>
<td>407</td>
</tr>
</tbody>
</table>

- With an 18% expense ratio, each ‘Yes’ policy written is costing you £23
- We’re writing about 1400 policies a day
  - 1000 of which are ‘Yes’
- So we’re losing £23k a day on these policies
  - Over £600k in the next 4 weeks

- You spot this in a one-way loss ratio report on a Friday afternoon (large claims capped and spread)
- You have a chance to change your rates on Monday or in four weeks time
- This factor will be included in the GLM your analyst is building
- Do you take action now or wait?
  - If you use the next 4 weeks to work on your response, will it compensate for the short-term losses?
(Less) Fictional Example (2): New Rating Factor

Gather Data → Build GLM(s) → 8 weeks have passed → Deploy New Rates

- A third party data supplier offers you a new rating factor

1.0

Super Predictive Factor 1

Exposure
One-Way Average
GLM Result

5.5% Discount

1ppt

No
Yes
(Less) Fictional Example (2): New Rating Factor
(with the benefit of hindsight)

1.0

Super Predicitive Factor 1

- You don’t currently rate on this factor, nor do your competitors
- Elasticity is 8 on average
- Offer a 3% cut for ‘No’
  - Attract 24% more ‘No’ business (2.4% overall portfolio increase)
  - For c.0.2pt deterioration in loss ratio
- A marginal benefit, but is this a marginal game?
- Can we only see this with hindsight?
- OR were there simple checks to make to reduce the risk of such a change without waiting for the GLM to be re-run?

One Month Later: Another test of your resolve

- Rated Area:
  - A certain region of the UK is converting at three times your average conversion rate. You only have 10,000 vehicle years experience in those areas but the loss ratio is 50% higher than average. Do you:

  (a) Expand the remit of your GLM project to include a postcode review: compare the results to your current rates then implement any changes as recommended by the model, or

  (b) Assume the market knows something you don’t. Introduce rate increases of 20% immediately and monitor conversion. Look into the poor performance in more detail.
One Month Later: Another test of your resolve

- **Rated Area:**
  - A certain region of the UK is converting at three times your average conversion rate. You only have 10,000 vehicle years experience in those areas but the loss ratio is 50% higher than average.

<table>
<thead>
<tr>
<th>Exposure</th>
<th>GEP</th>
<th>Average Premium</th>
<th>Loss Ratio</th>
<th>Loss Per Policy</th>
<th>Loss Per Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dodgy</td>
<td>10</td>
<td>4,500</td>
<td>450</td>
<td>122%</td>
<td>£178</td>
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<tr>
<td></td>
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<td></td>
<td>£4,888</td>
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<td>Leafy</td>
<td>490</td>
<td>199,920</td>
<td>408</td>
<td>81%</td>
<td>£4</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>£4,910</td>
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</tr>
<tr>
<td>Total</td>
<td>500</td>
<td>204,420</td>
<td>409</td>
<td>82%</td>
<td>£0</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>£41</td>
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</table>

(Less) Fictional Example (2): Conversion

![Fickle Purchaser Factor Diagram]
Following your significant rated area changes, you need to re-build your elasticity models.

- Can you start straight away?
(Highly) Fictional Example (2): A Motor Portfolio
How did you do?

- You’re asked to care-take a portfolio of 500,000 Motor policies
  - Any profit you make in 2012 is yours to keep
- There’s just you and your actuarial assistant
  - How do you invest YOUR capital?

Corrected ‘Terribly Priced Factor’
Introduced ‘Super Predictive Factor’
Made regional area changes
Over-estimated conversion of Fickle Purchasers
Achieved perfect pricing structure

Over-priced for Fickle Purchasers
Selling 27 policies a day in Dodgy Region
Writing 2.5% less business
Losing £22k per day

Began building GLM
Re-fitted models to data including Super Predictive Factor
Commissioned post-code review
Achieved perfect pricing structure
(Highly) Fictional Example (2): A Motor Portfolio
How did you do?

- We end with the same rates
- But can we start reaping the benefits more quickly?

Any learnings from the Sandwich example?

- We’re unlikely to have data (readily) available to support all significant business decisions
- Numerical analysis can undoubtedly enhance the majority of business decisions but what is the cost of the additional time taken to gain additional accuracy?
- Is the role of the actuary always to analyse data and establish the most accurate answer?
Why all this matters

If decisions are all data driven, can these ultimately all be automated?

– Do even the most complex airplanes have an auto-pilot?

Why all this matters

Your time (& brain power) are your capital to invest:

– How will you get the greatest return possible?
– What can you do to forecast the return to help you allocate time effectively?
Is Time Money?

- Yes!

- Get your analytical house in order before blaming IT…