Session Agenda

- Warm-up act: Phil Ellis
  - Intentionally provocative title
    - *But who knows, you might even agree in 20 minutes time!*
  - Various angles on the “problem”
    - *Will talk GI and mainly reserving, but can generalise*
- Headliner: Rob Murray
  - A different approach to reserving
  - With a case study
- Debate from the floor
Try 1: A ("the") big actuarial idea

- Projecting the uncertain future is hard
- But actuaries are the boys and girls for the job
- We choose a "basis" then do calculations
- **The result depends on the basis**
- But we use the result for decisions (pension funding rate, GI profit, etc)

- In GI the part of the basis is played by the reserving method plus adjustments
  - and the future new business and financial assumptions where relevant

- Rough analogies(?)
  - Blindfold investigation of an elephant
  - Anamorphic art(!)

"Anamorphic Art" by Ole Martin Lund Bo - 1

(deceptive outward appearance)
“Anamorphic Art” - 2

“Anamorphic Art” - 3
Arguably …

- GI actuaries don’t think about this enough
  - Less so than Pension and Life actuaries
- We might always do the same thing
  - e.g. “Chain Ladder plus Bornhuetter-Ferguson”!? 
  - When different tools may bring better perspectives

- “The reserving cycle” discussion can help prompt thought
- We should better consider previous models’ performance
  - “Validation”, “Back-testing”, “P&L attribution”, …
Try 2: How surprising can the world be?

- Do our models make adequate allowance for surprises?
  - Really?
- Ask Fukushima post the Tohoku earthquake
- Or Arab Governments after the spring uprisings
- Or Christchurch post the second quake
- Or New Orleans post Hurricane Katrina
- Or New York post 9/11
- Or Fred Goodwin post the crash (!)

Consider this example from the Bank of England

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![GDP projection graph](image)

Percentage increases in output on a year earlier

Bank estimates of past growth

Projection

ONS data

Bank estimates of past growth

Projection

ONS Data (Aug'08 vintage)

ONS data (mid 2010 vintage)
Try 3: (Perspectives …) Reserving is:

- Pattern spotting
  - Any mildly intelligent monkey could do it
  - AND
- Intellectually stimulating & demanding
  - Very hard to do as well as is possible

NB: I avoided “get right” since this would need careful definition
Professional Guidance may be unhelpful?!

- Focus: methods/assumptions/replicability
  - Tends towards using fixed, standard machinery

- I’d rather get the right answer
  - Even if methods could be “flaky” (i.e. heavily JUDGEMENT BASED)

- Arguably current standards consider:
  - Only PROCESS
  - Not QUALITY OF RESULT

Huge class differences (especially in EC3)

- The JOY of the GI, especially the London market is variety
  - Heisenberg would have loved it
- Many classes have intrinsic degree of un-knowable-ness
  (unless we collect LOTS more data & do LOTS with it)
- And often we have far from “perfect” data

So:
- Pick the best tools for the job
- Use your considerable & expensive skills and judgement
- And enjoy the ride!
Too Simplistic or Too Complex?

- The Basic Chain Ladder, plus
- Bornhuetter - Ferguson
- Are NOT the only games in town

But excessive complexity can also lead to issues:
- Many subdivisions of data
- Taking away outliers
- "As-iffing" historical data to reflect the current situation
- Building individual scenarios
  - e.g. to assess reinsurance impacts

Some actuaries can miss the wood for the twigs!

Nice smooth models: “Central 3 from 5 factors”

A talk at my only US reserving conference ~ 1995:
- Do development factor models
- At each development stage, pick the central 60% of ratios & discard the rest
- Result is lovely smooth model
- But answers will be biased on the low side(!)
  - Reason: Life is skew “good’s nice but bad’s often awful”
- This is a lovely way to get smooth and pretty models
- But doesn’t help get “the right” level of reserves
  - The problem is just passed into the “biasing adjustment”
What do the best GI actuaries do?

A good GI actuary has a range of tools in their toolbox
Different problems succumb to different approaches
They:
• know their data and the mechanisms that produce it
• have many different ideas & approaches available to them
• use judgement appropriately (so justify humungous salaries)
• understand the uncertainties
• and communicate this to actuarial and other “consumers”
IF you think not all GI actuaries do all this
Then logically you agree with the assertion in my title!

Try 4: Tails of Reserve Ranges

• How likely bootstrap gives the right tails out at extreme levels?
  – Really?!
Issues include:
• What is the incentive to do this “right”?  
• Sensitivity to a few individual ratios
• Always the wrong number of large losses
  – None is not enough, several is probably too many
• Underlying exposures where “lucky” throughout our experience?
• 1 in 200 is around 1 in 8 “actuarial generations”
  – assuming a “leading role” from ages 30 to 55, say
Reserve Ranges: Issues and Approach

• Assessment of reserves is inexact and judgemental science
• Suppose we seek proper best-estimate plus a view of variability
• Idea: interrogate historical triangle to lift out signal and noise
  – Signal allows us to project immature cohorts to ultimate
  – Noise can give an indication of reserving uncertainty
• Bootstrap method aims to do this
  – Methodology identifies observed noise around best-fit model
• In practice:
  – Judgements, especially with dependencies on a few points
  – Arguably history won’t include all that could happen

Potential problems – Reserve Ranges

*Strong signal, limited noise*

In this example:

• Projected ultimates “obvious”
• Uncertainty appears very small
• Modelled 99.5\textsuperscript{th} percentile will be close to the mean
Potential problems – Reserve Ranges

*Weaker signal, much more noise*

For this different class:

- Less certain about the most likely outcome
- Much more aware of the volatility
- Modelled 99.5\textsuperscript{th} percentile far from the mean

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Illustrative Bootstrap output and use

*Signal gives central projection, Noise guides variability*
Illustrative Bootstrap output and use

Specify 1:200 reserve risk?!

Final Thoughts: Nassim Nicholas Taleb, Behavioural Finance, Modesty

- NNT stirred actuaries ~5 years ago
  - Books pretty badly written(!)
  - But some important themes

- Behavioural Finance is getting lots of economists excited
  - eg “Superfreakonomics”

- Hubris is not appealing even for actuaries
- Modesty is more appropriate
Session overview

1. Background
2. Introduce and explain a new (but simple) approach for deriving development models
3. Case study
**Background**

- Traditional chain ladder modelling has some limitations:
  - Requires sufficient past data
  - Assumes ‘one pattern fits all’
  - Fails to recognise changes in the underlying exposures, and processes for reporting and settlement
  - No direct links between various stages of the insurance claims process
    - But in reality payment patterns will depend on reporting patterns which will depend on exposure patterns etc.
  - Expert judgements made at relatively low levels
    - eg the removal of development factors

**A new (but simple) approach**

- Deconstruct the claims process into its component parts
- Build these parts back up into a working model
- Populate the model with assumptions or actual data where available

“The significant problems we face cannot be solved at the same level of thinking with which we created them”

- Albert Einstein
Deconstructing the claims process

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Building the model - summary

Business written

Premium rates

Earnings patterns

Reporting delays

Settlement delays
Building the model: the detail (1)

- Analyse the written premiums:

![Monthly Written Premiums](image)

Building the model: the detail (2)

- Allowing for premium rate changes, gives a written exposure profile:

![Monthly Written Exposure % vs Premium Rate Index](image)
### Building the model: the detail (3)

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### Building the model: the detail (4)

- Spread each month’s written exposure over the policy term using the selected earnings pattern:

#### Monthly Earned Exposure % vs Monthly Incurred Claims %

![Graph showing the relationship between earned exposure and incurred claims across earnings months.](image-url)
Building the model: the detail (5)

- Apply the reporting delay pattern to each month’s earnings:

Building the model: the detail (6)

- Apply the settlement delay pattern to each month’s reported claims:
Real life case study – the problem

- Produce estimates of ultimate claims and expected cash-flows for a new GAP account
- Multi-year policies
- Earnings patterns are distinctly non-uniform
- Forecasts required on an underwriting year basis
  - Business began partway through a financial year
  - and ended partway through the following year

Real life case study: our prediction

Cumulative development of paid claims

<table>
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<tr>
<th>% of Estimated Ultimate</th>
<th>Expected Paid UWY1</th>
<th>Expected Paid UWY2</th>
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Development Month
Real life case study: actual experience

Looking at the business as a whole
Some of the benefits…

- Projections can be made with little or no claims data
- Early warning management tools can be constructed
- Enables management to act or react faster
- Different years do not have to follow the same pattern
- Can allow for changes in exposure/reporting/settlement
- Insights into the business
  - how the business is earned
  - claims reporting and settlement processes
- Easy to produce models on different bases
  - eg underwriting year or accident year

Questions or comments?

Expressions of individual views by members of The Actuarial Profession and its staff are encouraged. The views expressed in this presentation are those of the presenters.

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