



Institute  
and Faculty  
of Actuaries

# Wanted: Super-good Surgeon. Must not Kill Patients.

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# Setting the Scene

**A surgeon in a hospital has a mortality rate of 2%.**

- The Chief Administrator in the hospital calls her in for an end-of-year chat.
- Next year the hospital wants her to lower her mortality rate to 1.5%.



# Digressing

## **A room contains 100 actuaries.**

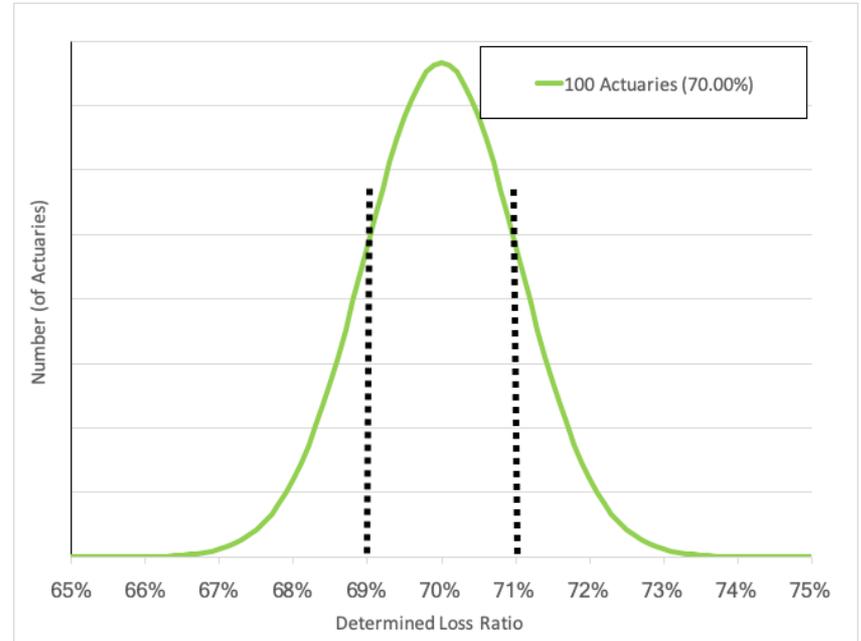
- Each actuary gets identical (but far from complete) data.
- Each actuary must determine a Loss Ratio (LR) pick for a given Class of Business (CoB).
- No conversation is permitted.
- I (alone) know that the 'true' LR is 70%.



# Loss Ratio pick: 100 Actuaries

## Outcome:

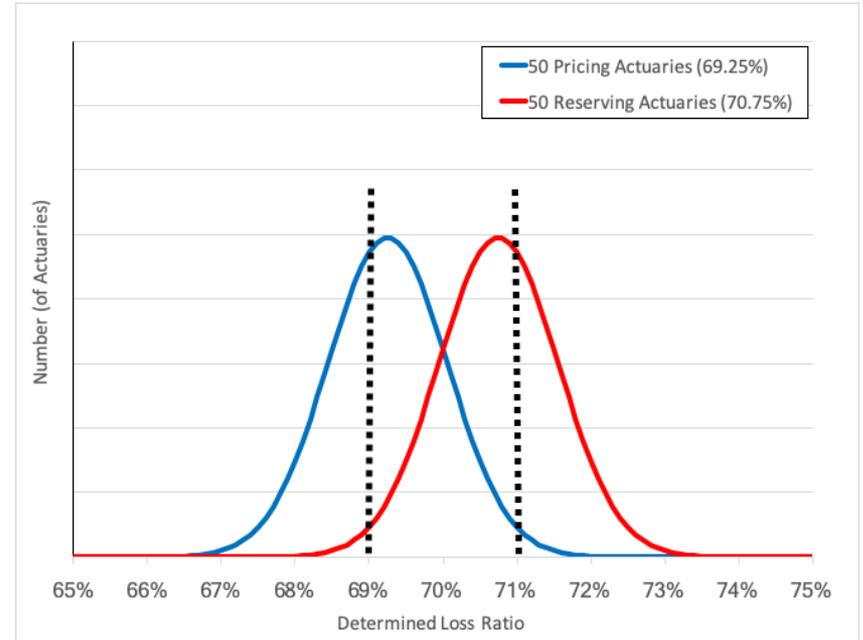
- Many (most) actuaries get fairly close to 70%.
- A few outliers, which is hardly surprising: various actuaries have interpreted things in different ways ('Expert Judgement').
- Each actuary brings their own biases.
- Wait! I've just realised, we actually have (in the room) 50 Pricing Actuaries and 50 Reserving Actuaries.



# Loss Ratio pick: 50 Pricing Actuaries / 50 Reserving Actuaries

## Outcome:

- It turns out Reserving Actuaries are mildly prudent, and Pricing Actuaries are mildly optimistic.
- Within each group Expert Judgement stills plays a role, but there is an underlying group bias.



# Biases

**Everyone brings their biases to work, every day.**

- Different 'groups' of actuaries have different biases.
- Each individual actuary has their own biases (borne of accumulated experience, or (perhaps) lack thereof).
- Other biases may emerge: anchor biases, when processes are repeated.
- Biases are not inherently a 'bad' thing, but they should be acknowledged (and self-acknowledged) and eliminated as far as possible.



# Underwriter Stretch Goals (Loss Ratios)

## Optimism?

- There's an idea that seems to be quasi-accepted (pervasive?) in the insurance industry that for Business Planning (BP) purposes underwriters should be given an optimistic loss ratio target as a 'stretch' goal. i.e. if the best estimate LR is 70% the underwriter is given a stretch goal of 68%.
- Let's think about this:
  1. what influence (in a good / lower direction) does the underwriter truly have? i.e. it is easy for an underwriter, as an individual, to influence their loss ratio in a bad / higher direction by selecting poor risks, but can he really influence his loss ratio in a good / lower direction by selecting better risks in a competitive marketplace?



# Underwriter Stretch Goals (Loss Ratios)

... continued:

2. If all underwriters are similarly-motivated then obviously they cannot all beat their target (it's possible none of them will, except by chance / luck).
3. How are senior management then to judge (at the end of the year) good underwriters from bad underwriters, and good CoBs from bad CoBs?
4. This approach flies in the face of repeated regulator nudges (e.g. PRA Dear CEO letter 31 May 2018, and Lloyd's Minimum Standards (e.g. UW 1.1 and UW 3.1) ... with action now being required e.g. Decile 10).
5. The Business Plan should be connected to other processes (ORSA, capital setting, reserving) ... can it be, if the loss ratios used are deliberately optimistic?



# Going back to our surgeon

**Next year the hospital wants her to lower her mortality rate.**

- Isn't her job to kill as few patients as possible? No further 'motivation' is needed, and no further 'motivation' will be of any effect.
- So it is with an underwriter: isn't it his job to get as low a Loss Ratio as possible?
- These stretch goals are meaningless (and potentially dangerous if they introduce additional stress to the individuals). Each individual's ability to influence (in a good / lower direction) is essentially zero.
- So why set stretch loss ratio goals? [Aren't you setting yourself up for a fall?]
- Another analogy: Premier League striker.



# Events Not In Data (ENIDs)

## Supervisory Statement SS5/14 (April 2014) of the PRA (my emphasis):

- With respect to Technical Provisions:
  - 2.6 Firms should take ENID into account when calculating technical provisions. [...]
  - 2.7 where outliers are removed from the data as part of the reserving process, this removes events from data. [...]
- With respect to Internal Models:
  - 3.2 [...] Firms should not assume that parameterising the internal model using only historical data will take into account all quantifiable risks, [...]
  - 3.3 [...] data sets covering recent years may not include sufficient examples of liability catastrophes, [...]



# Events Not In Data (ENIDs)

... continued:

- There is a big difference between the *raison d'être* of Technical Provisions (best estimate) and the *raison d'être* of Internal Models (the full range of possible outcomes, and more-specifically: the 1-in-200-year outcome).
- If certain approaches are followed, and certain conditions are present, then ENIDs will already be incorporated into best estimate parameters for Technical Provisions purposes, and no explicit allowance will be required (“tak[ing] ENID into account” <> adding an ENID loading).



# Events Not In Data (ENIDs)

## ... continued: Central Limit Theorem.

- If the true distribution of a random variable is  $\mu$  and  $\sigma$ , then the distribution of the average of  $n$  observations of that random variable (i.i.d.) will be  $\mu$  and  $\sigma/\sqrt{n}$ , tending to a Normal distribution.
- Example: determining an Initial Expected Loss Ratio (IELR) for Technical Provisions purposes. On-levelled loss ratios for the last 5 years are 56%, 67%, 55%, 75%, 61%, an average of 62.8%.
- Your underwriter now insists that the 75% was quite unusual and should only be weighted 50%. You comply; the adjusted average becomes 61.4%.



# Events Not In Data (ENIDs)

... continued:

- The very act of making an adjustment (Expert Judgement?) has now caused an ENID to be needed!
- That is, for Technical Provisions purposes ENIDs may only become necessary when the Reserving Actuary fails to resist fiddling with observed data. Where observed data is unadjusted no ENID is necessary (“tak[ing] ENID into account” <> adding an ENID loading).



# Should BPLRs \* and IELRs be identical?

(\* Business Plan Loss Ratios)

## The Challenge.

- Like the old saying “Nobody gets fired for buying IBM” so it is that no Reserving Actuary has ever been fired for over-reserving, but some have been fired when their reserves turn out to be inadequate. Reserving Actuaries have a natural (and I would argue ‘reasonable’) bias.
- Pricing Actuaries have various challenges. Often their reporting line is through the underwriting side of the business. In many CoBs there’s a big difference between a mean result and a median result. Absence of, and allowance for, large (especially catastrophe) losses is important. Often management, especially senior management, *want* to believe they have the best underwriters and next year will be better. Pricing Actuaries have a natural (and I would argue ‘reasonable’) bias.



# Should BPLRs \* and IELRs be identical?

(\* Business Plan Loss Ratios)

**Short Answer: Yes.**

- Long Answer: Yes.
- However, hoping that they will be identical, if Pricing Actuaries control the BPLR process and Reserving Actuaries control the IELR process, is foolish.
- We need to develop or derive some mechanism by which all biases are driven from the processes (or at least minimised).
- It is very important that the goal of  $BPLR = IELR$  be chased ... otherwise how are senior management to judge (at the end of the year) good underwriters from bad underwriters, and good CoBs from bad CoBs, making the needed changes to the overall business?



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## Actual Quote from a Senior Manager

**“I know BPLRs are skinny, and I know IELRs are fat, but for a given Class of Business I don’t know just how skinny or how fat they are (and they’re all different) ... so how can I work out which classes of business to grow and which to shrink?”**



# Actuarial Control Cycle

## One (possible) solution:

- These biases are killing the ability of senior management to properly run an insurance business. We (collectively) need to do something.
- I start from the presumption that (proposed) BPLRs < true unbiased LR < (proposed) IELRs. We need to (somehow) 'discover' where in the BPLR-IELR spectrum that true unbiased LR sits, CoB-by-CoB.
- Empanel an equal group of Pricing Actuaries and Reserving Actuaries (say 3-5 of each). Everyone is aware of the (proposed) BPLR and (proposed) IELR for each CoB. It may be helpful if short summaries could be supplied for each CoB as to how / why each LR was derived.
- Adding other 'experts' to the panel is also possible.



# Actuarial Control Cycle

## ... continued:

- Each panel member, independently, orders (proposed) BPLRs in order of ‘reasonableness’ and (proposed) IELRs in order of ‘reasonableness’.
- Weight these ‘reasonableness’ findings to the (proposed) BPLR and the (proposed) IELR, to determine the to-be-jointly-used *derived* BPLR / IELR (identical) which will proxy the true unbiased LR for each CoB.
- On average the *derived* BPLR / IELR will probably be about ‘in the middle’ of the (proposed) BPLR and the (proposed) IELR, but this process allows extreme-biasedness to be eradicated.



# Conclusions

- Biases exist. Biases are natural. Biases are often defensible. But biases are never helpful.
- Running an insurance business, properly, is very difficult if all parties are not working off the identical single-source-of-the-truth with respect to expected Loss Ratios.
- ENIDs: “tak[ing] ENID into account” <> adding an ENID loading.
- Stretch Goals (Loss Ratios): let’s stop this nonsense, please.
- I proposed one method of bridging BPLRs / IELRs, but many other alternatives exist. The aim, though, is to get to the identical single-source-of-the-truth with respect to expected Loss Ratios.

# Questions

# Comments

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