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Making the most of a longevity internal model

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Making the most of a longevity internal model

1. How to design a robust longevity model
2. The PRA's quantitative indicators
3. How a good model can add value, and a bad model destroy value





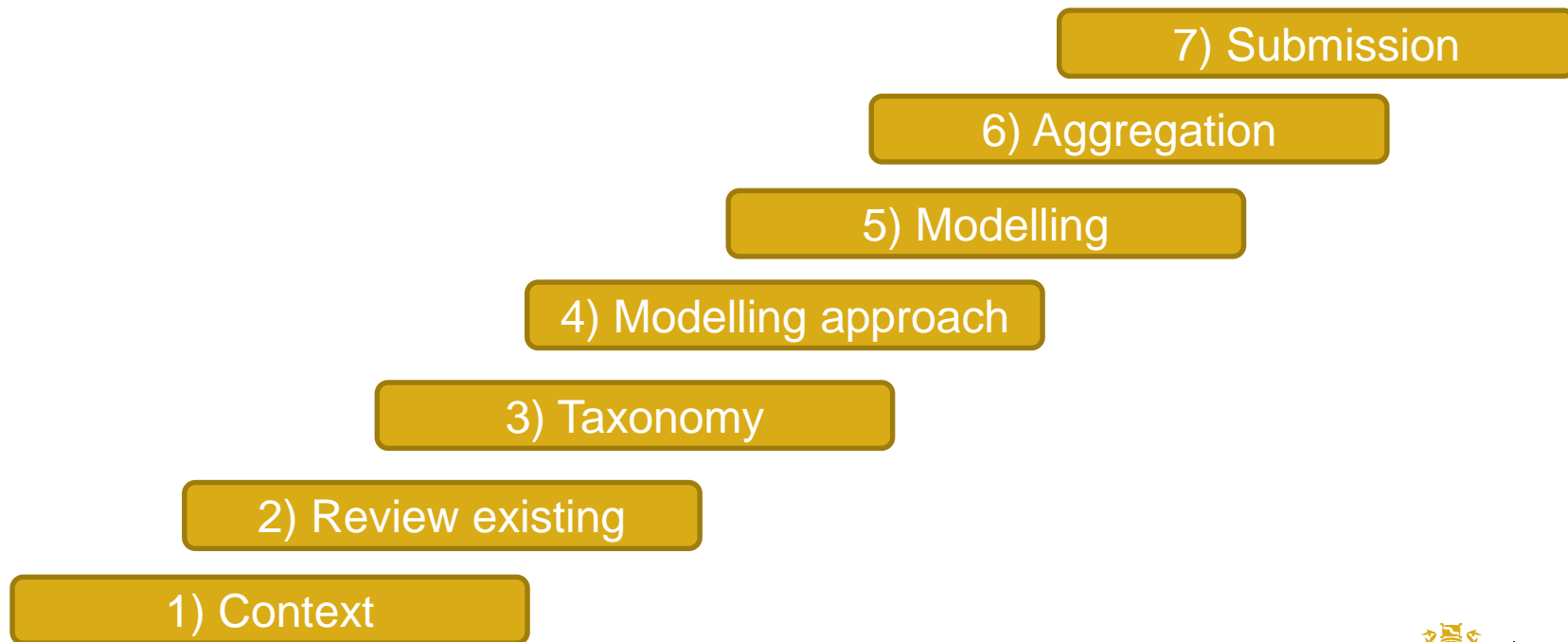
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1) How to design a robust longevity model

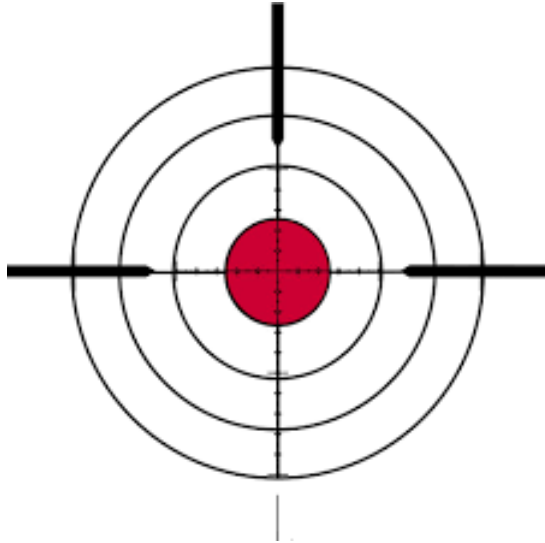
Key risks, modelling decisions and interactions

ertise
ponsorship
Thought leadership
Progress
Community
Sessional Meetings
Education
Working parties
Volunteering
Research
Shaping the future
Networking
Professional support
Enterprise and risk
Learned society
Opportunity
International profile
Journals
Support

Seven steps to success



Context



“The methods used to calculate the probability distribution forecast shall be based on adequate, applicable and relevant actuarial and statistical techniques and shall be **consistent with the methods used to calculate technical provisions.**”

Paragraph 2, Article 121 of SII Directive (our emphasis)



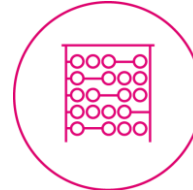
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What risk drivers are in scope?

Longevity



Volatility



Base table mis-estimation



Longevity trends

Demographic



Proportion
married



Age difference



Optionality



Selection



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Being proportionate

Optionality



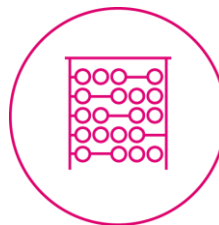
Age
difference

Proportion
married



Selection

Base table
mis-estimation

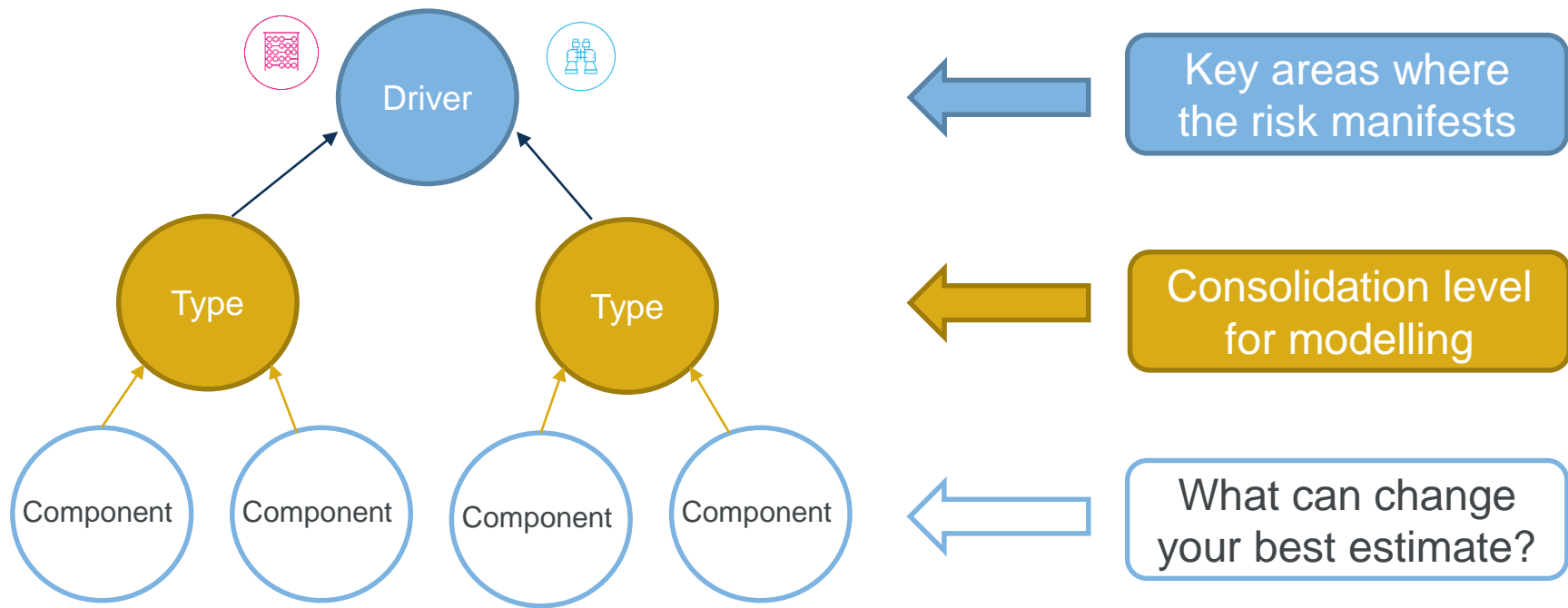


Longevity trends

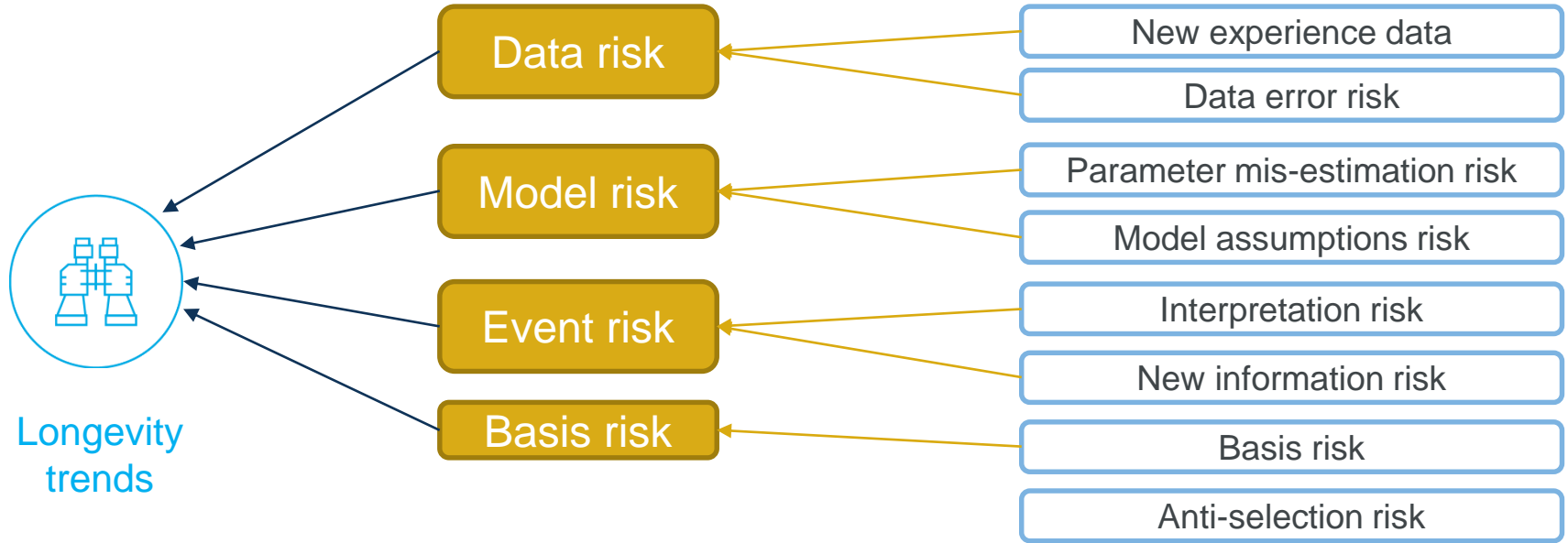


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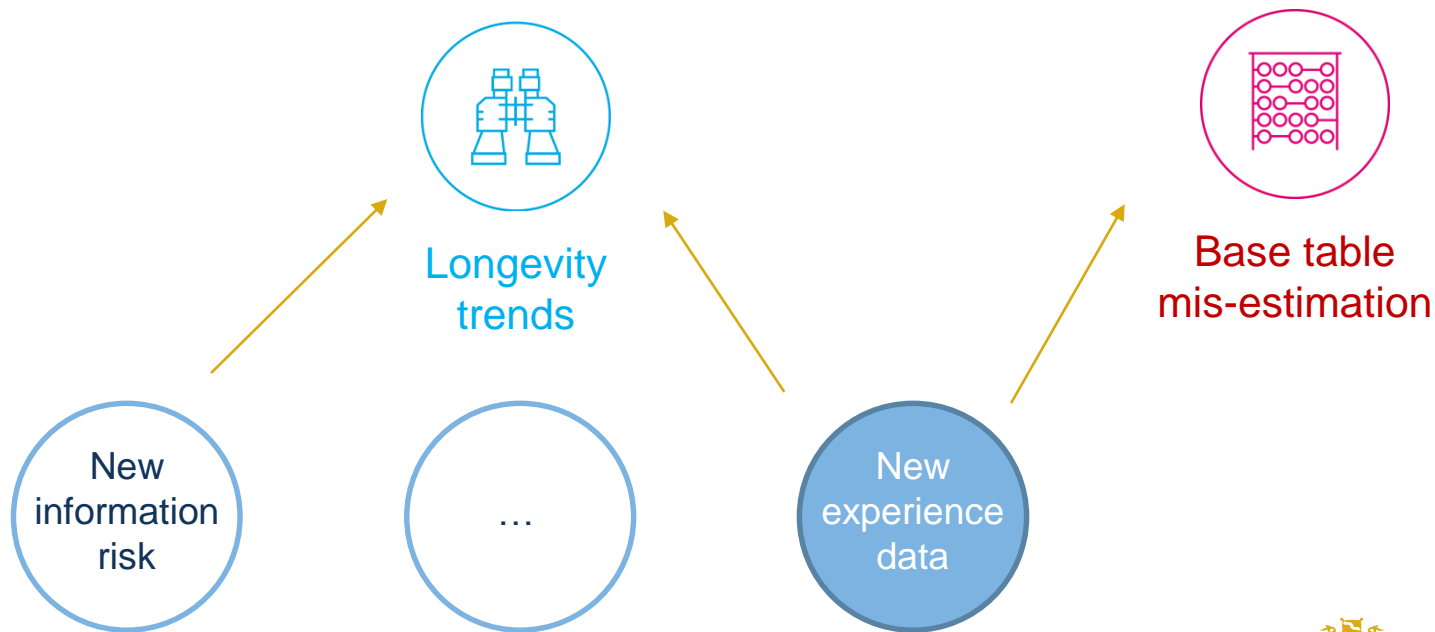
Taxonomy



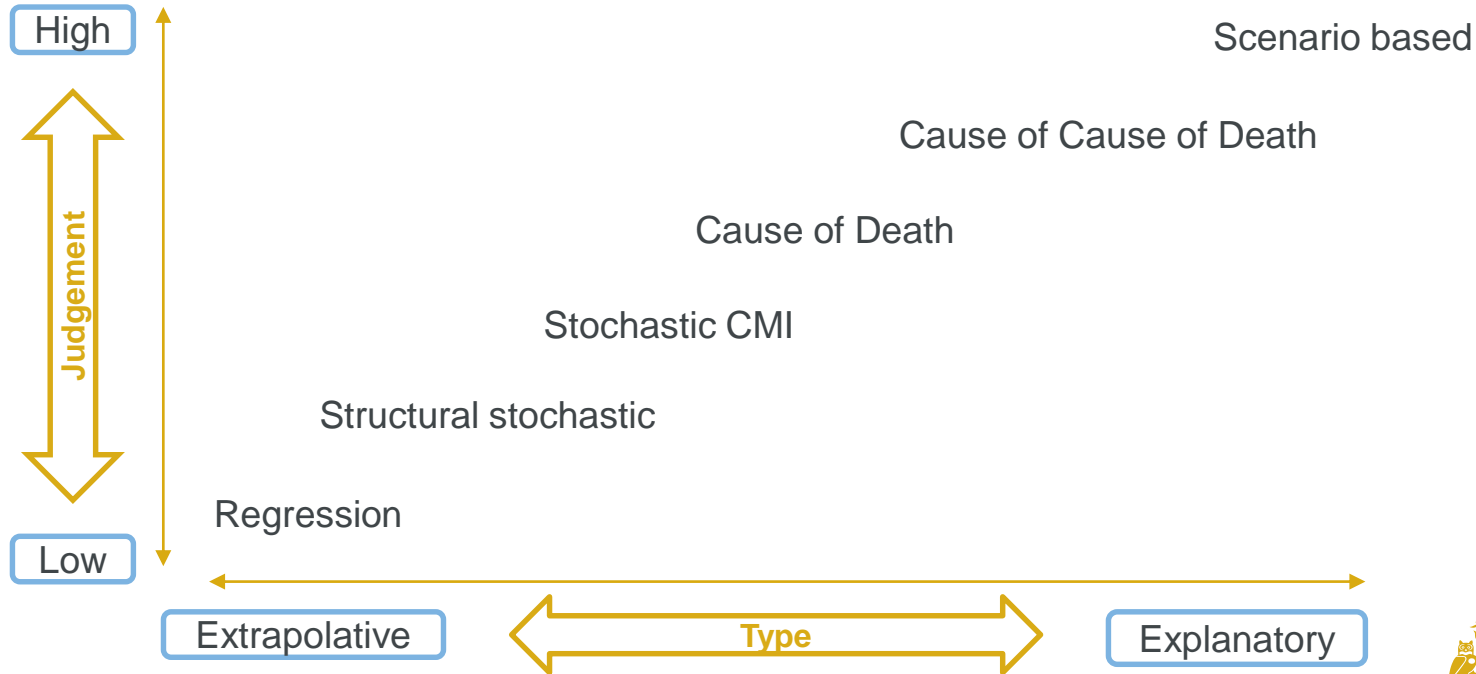
An illustrative taxonomy: Trend risk



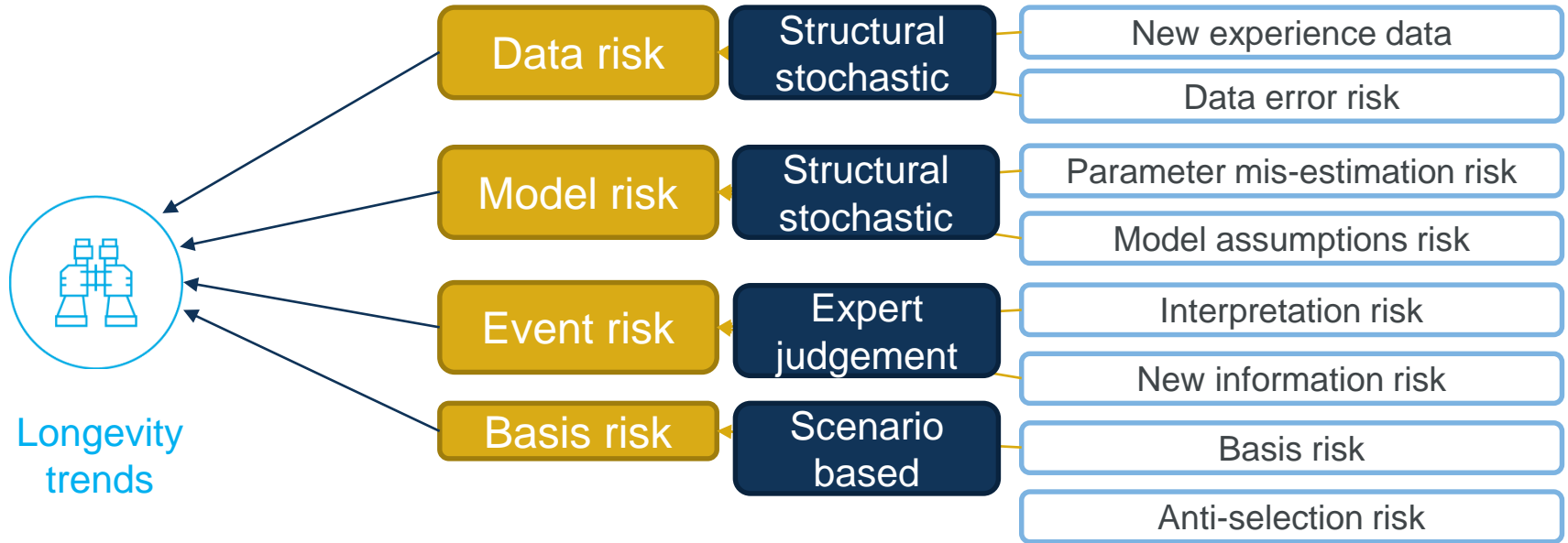
How a taxonomy can add value



Modelling approach: Competing approaches



An illustrative modelling approach: Trend risk



Submission: Mind the shape

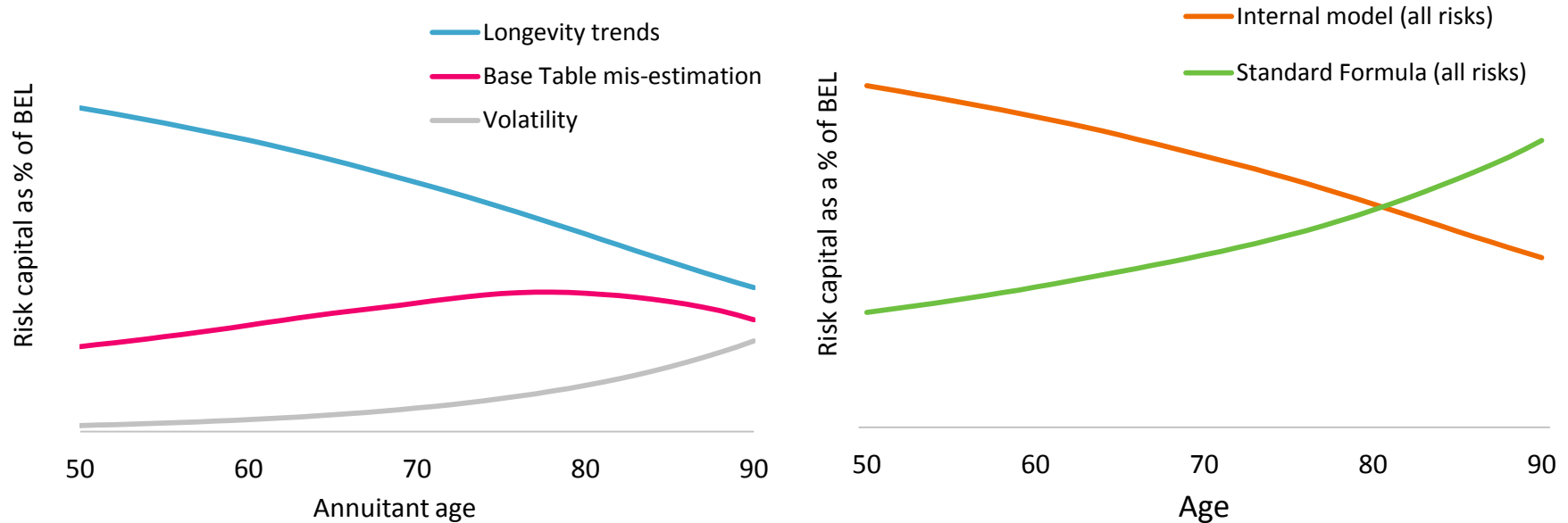


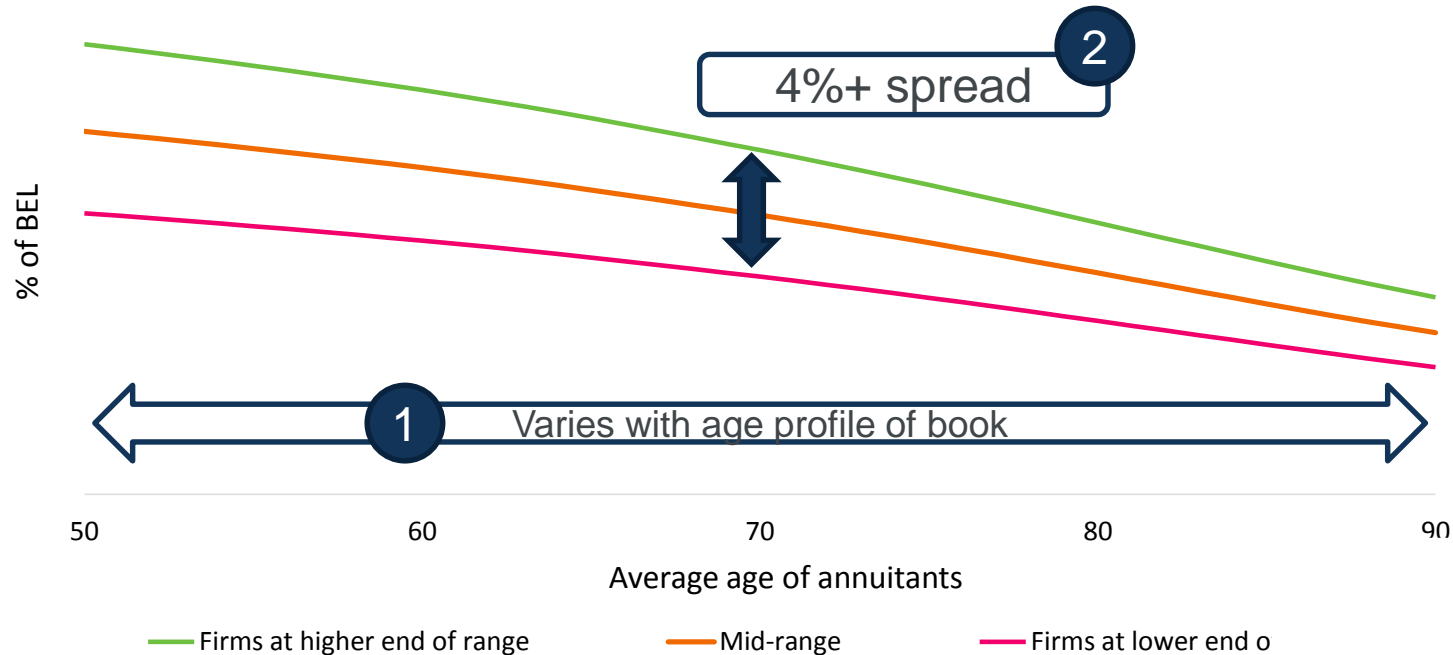
Chart illustrative of shapes of stresses.
Stresses not to scale relative to each other.



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Submission: Different firms, different capital

Undiversified longevity trend stress seen within market





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2) The PRA's Quantitative Indicators

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Data risk...

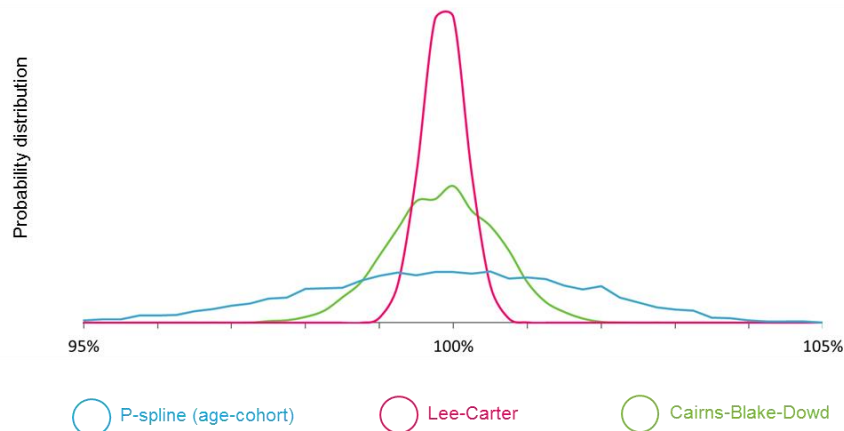
Basic approach:

- Simulate and identify median outcome under run-off
- Simulate one year of extra data, refit model and simulate run-off. Identify change in median. Repeat many times.

PRA QIs:

- Do above for commonly used structural stochastic models
(*P-spline, Lee-Carter, Cairns-Blake-Dowd and Age-Period-Cohort; analysis shown here based on first three*)
- The spread of refitted medians is very different for each model, ranging from 1% to 4%
- The arithmetic average **across the three models is c.2.5% of BEL**

'Best estimate' liabilities under alternative models for future improvement



For ease of illustration only 3 models included above. Jaggedness in distributions arises from modest number of simulations used (5,001).

Analysis shown for a 'typical' annuity business with a mix of IA and BPA and primarily annuities in payment. Actual QI will depend on age profile and mix of your back book.

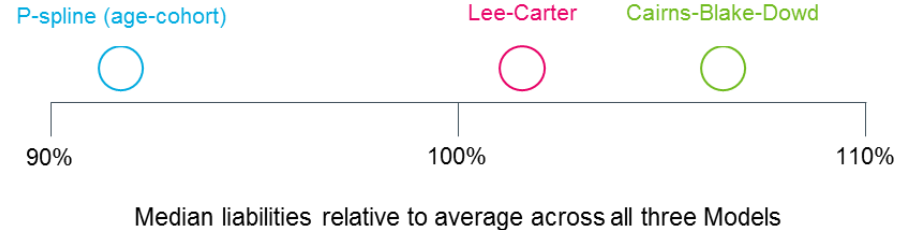


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Event risk...

- Compare the median outcomes under the run-off from the different models
- Potential change in best-estimate owing to event risk taken from the range of views given by the four models
- The chart illustrates different 'best estimate' views under each model
- Each model's best estimate is relative to the mean of best estimate across the models
- Event risk component of PRA's QI is **c.6%** of BEL

'Best estimate' liabilities under alternative models for future improvement



Analysis shown for a 'typical' annuity business with a mix of IA and BPA and primarily annuities in payment. Actual QI will depend on age profile and mix of your back book.



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Example QIs: The importance of correlation



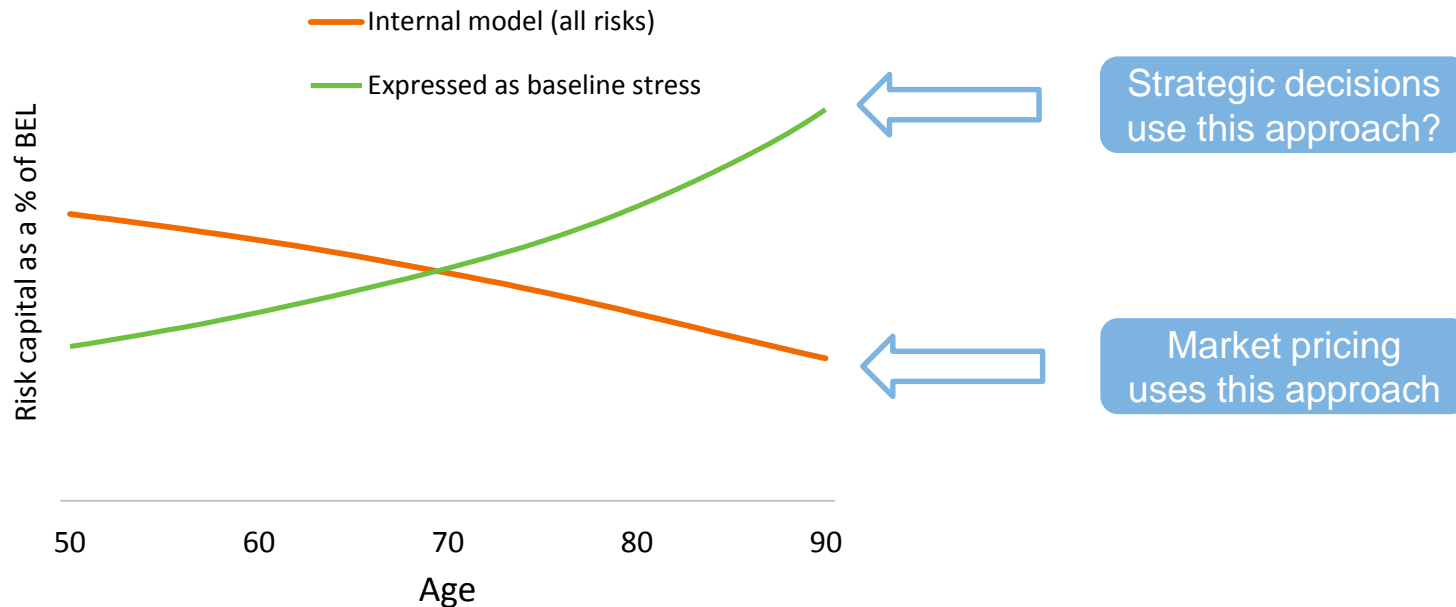


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3) Adding and destroying value

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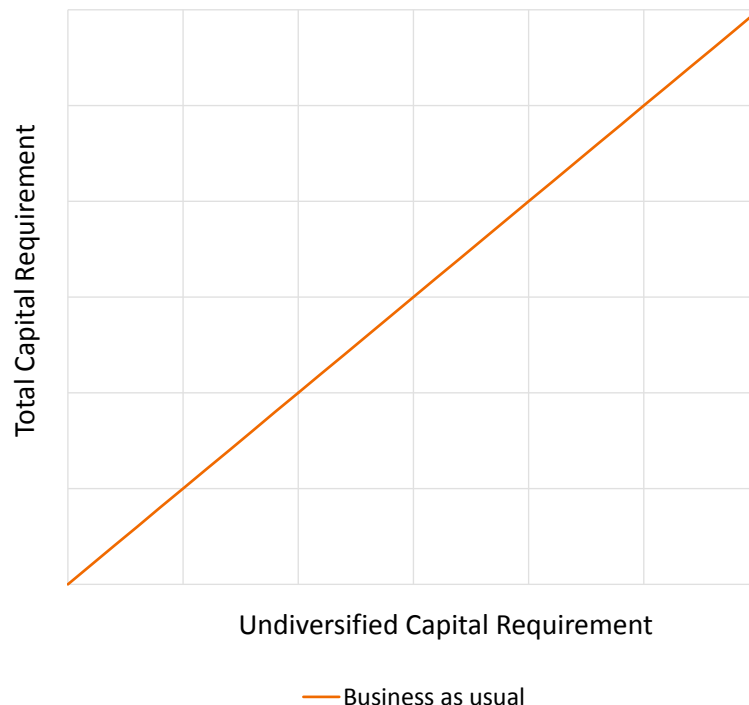
A bad model can destroy value...



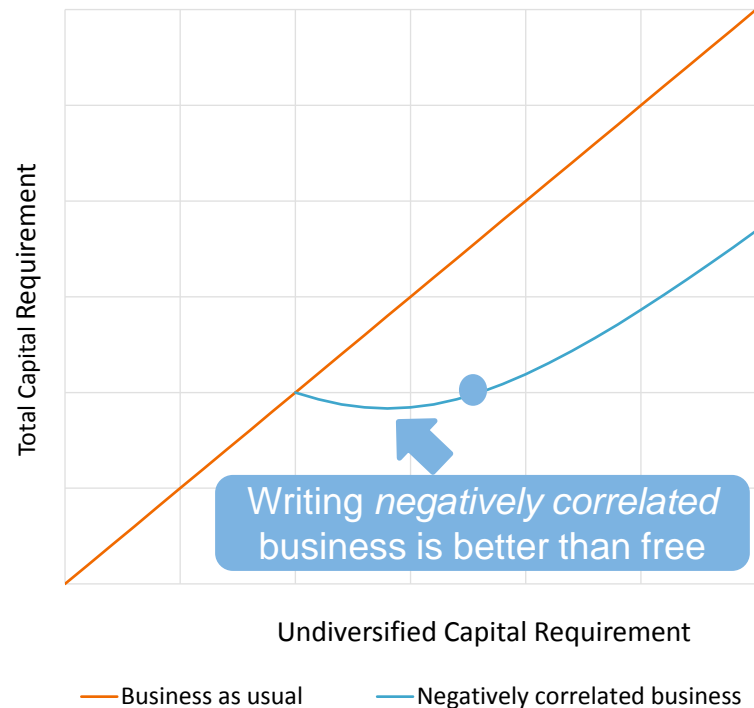
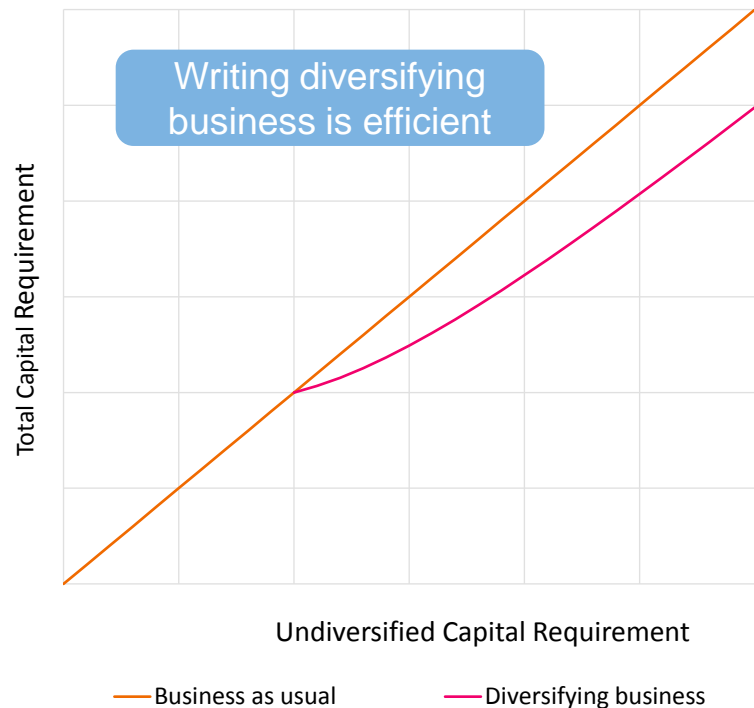
And a good model can add value...

- A mono-line protection business is considering expanding into the life market
- Currently has no diversification benefits

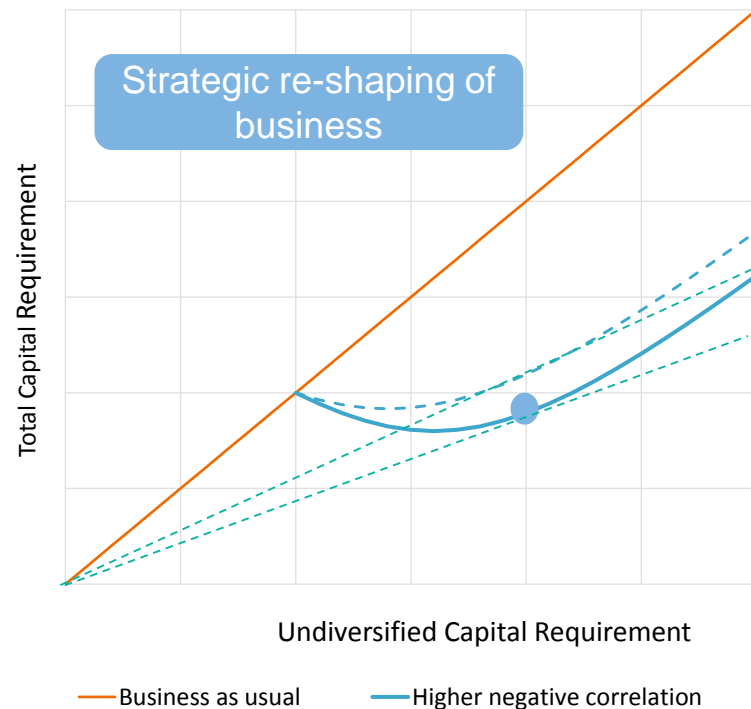
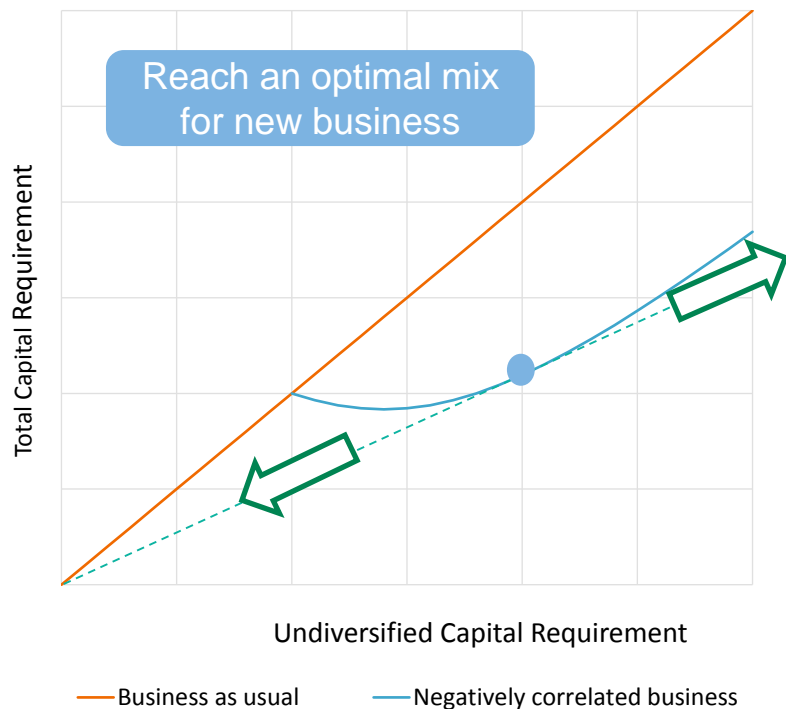
Note: This example is purely for illustration – we appreciate it is unlikely that the mono-line would immediately seek a full internal model for longevity



And a good model can add value...



And a good model can add value...



To conclude...

Your longevity internal model is worth investing in..

...it can pay strategic dividends



Questions

Comments

Expressions of individual views by members of the Institute and Faculty of Actuaries and its staff are encouraged.

The views expressed in this presentation are those of the presenter.



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