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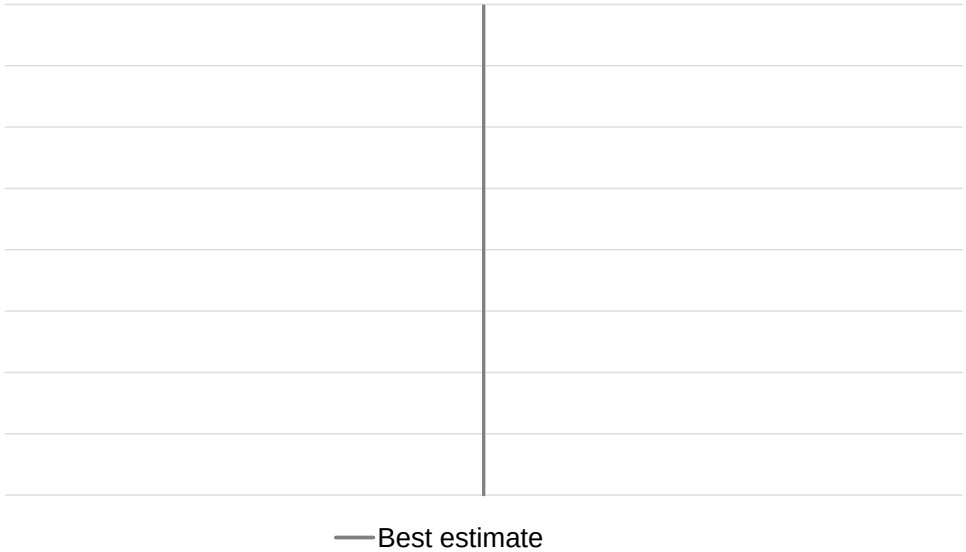
Introduction to stochastic reserving

Richard Lewis
Robert Scarth

26 April 2019

Reserve best estimate



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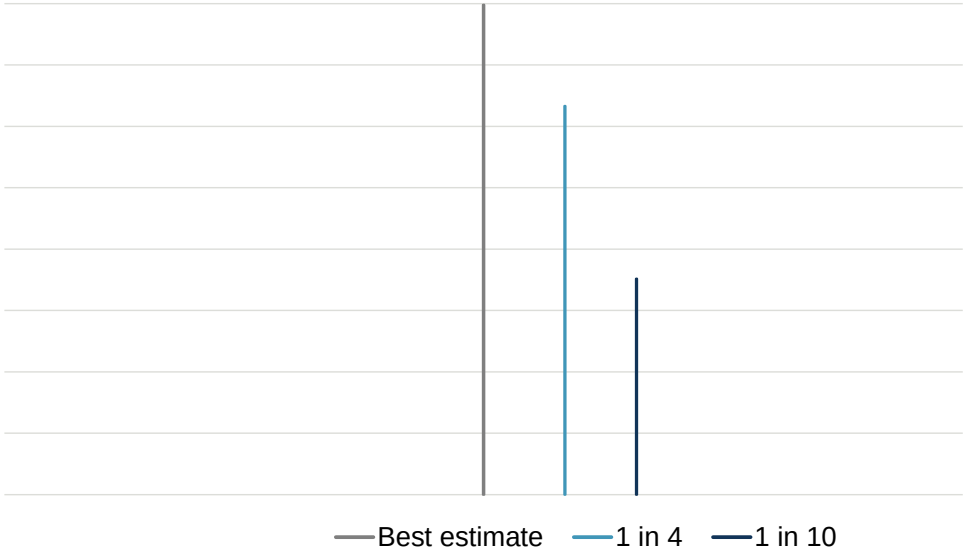
Reserve point estimates



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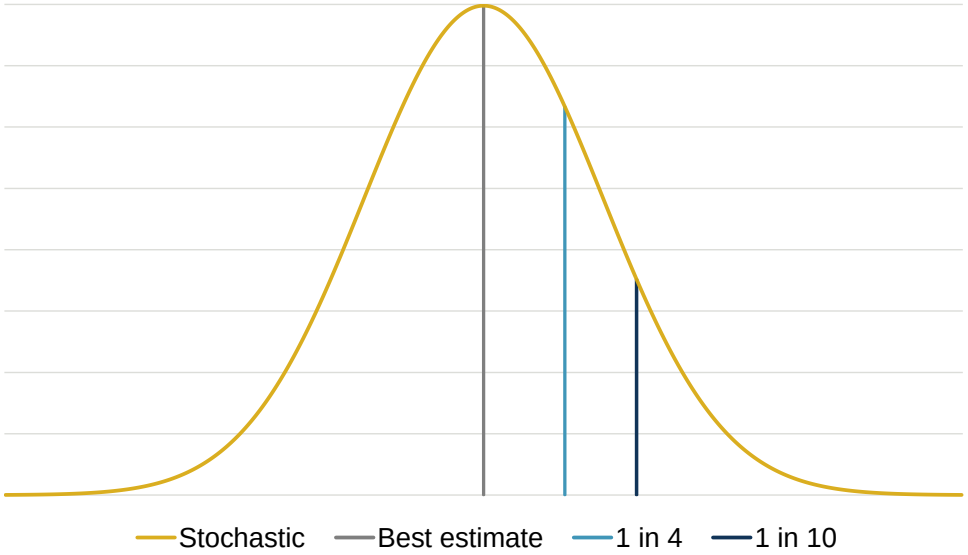
Reserve variability



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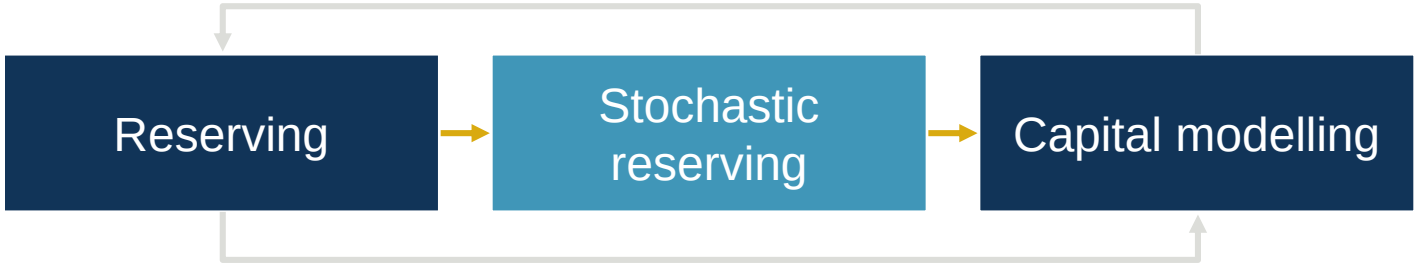

“If you don’t have time to do it right, when will you have time to do it over?”

John Wooden

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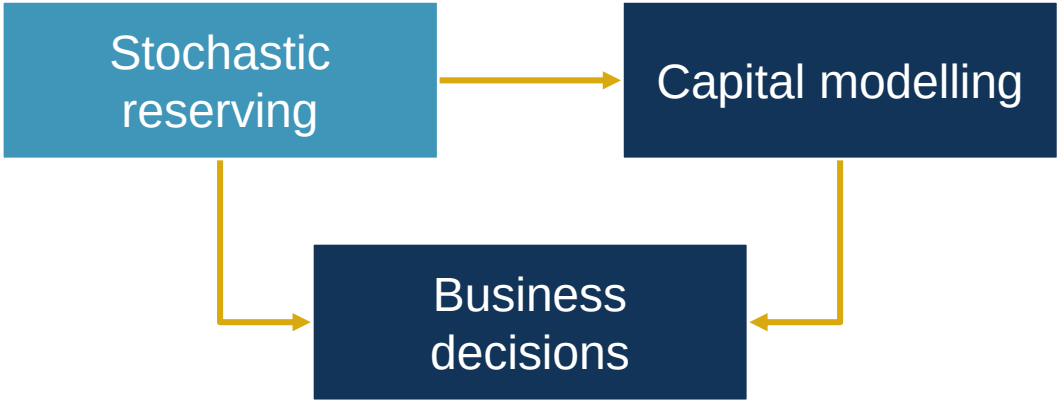
Stochastic reserving
Capital modelling
Business decisions

Process error

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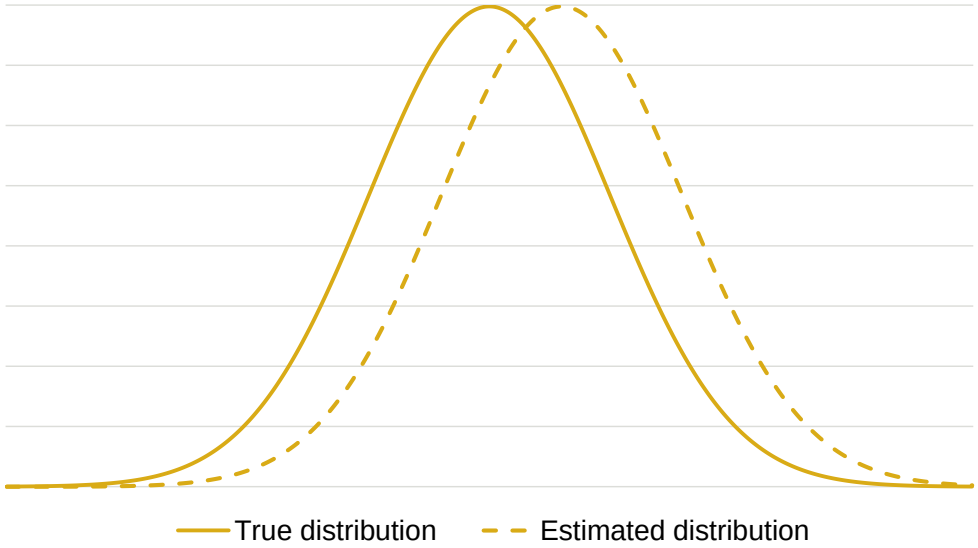
Parameter error



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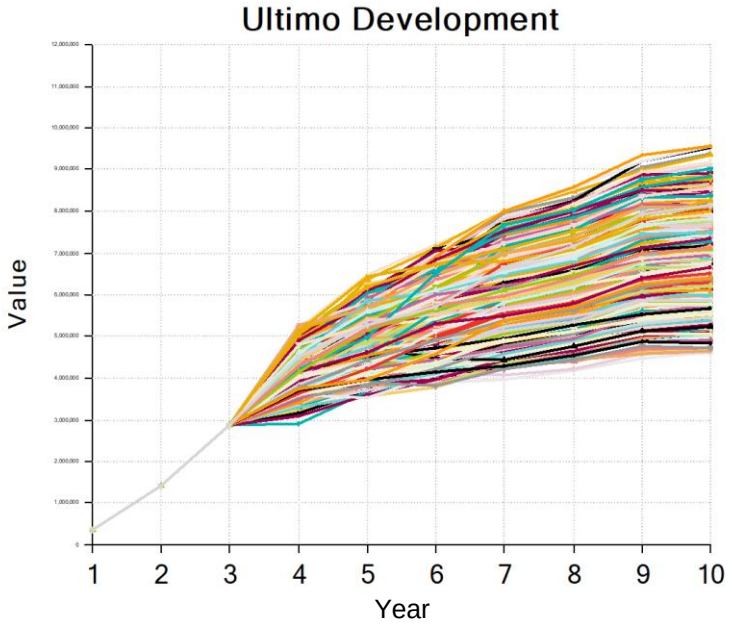
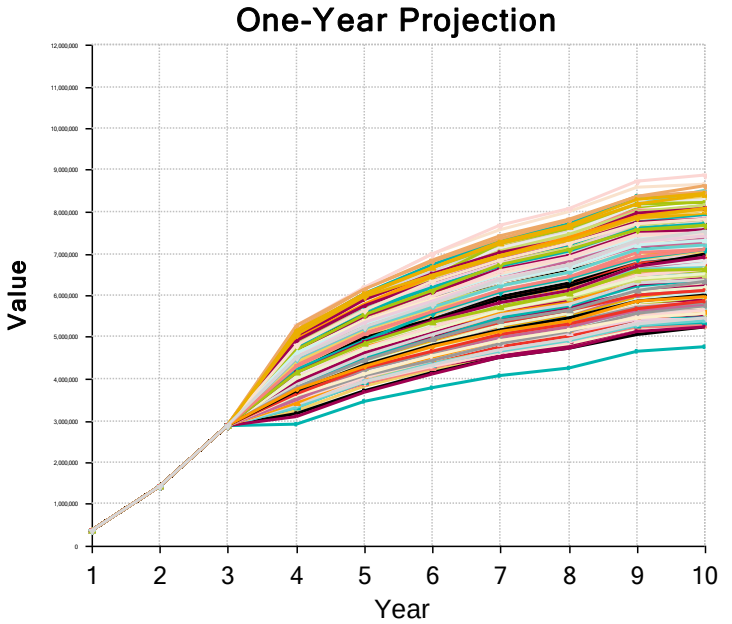
Time horizons





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Pragmatic Stochastic Reserving Working Party

Papers

- “A Practitioner’s Introduction to Stochastic Reserving” (2016)
- Sequel: “The One-Year View” (mid-2019)

Example models

- Ultimate and one-year
- Tyche
- Excel, R, Python

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Current models

Model	Mean analogue	Analytic CoV?	Analytic distribution?
Mack	Incurred chain ladder	Yes	No
Over-dispersed Poisson	Paid chain ladder	Yes*	Yes*
Stochastic BF	Paid BF	No	No

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Bootstrapping triangles

Resample residuals

↓

Project from new triangle

↓

Simulate process error

… and repeat for every simulation

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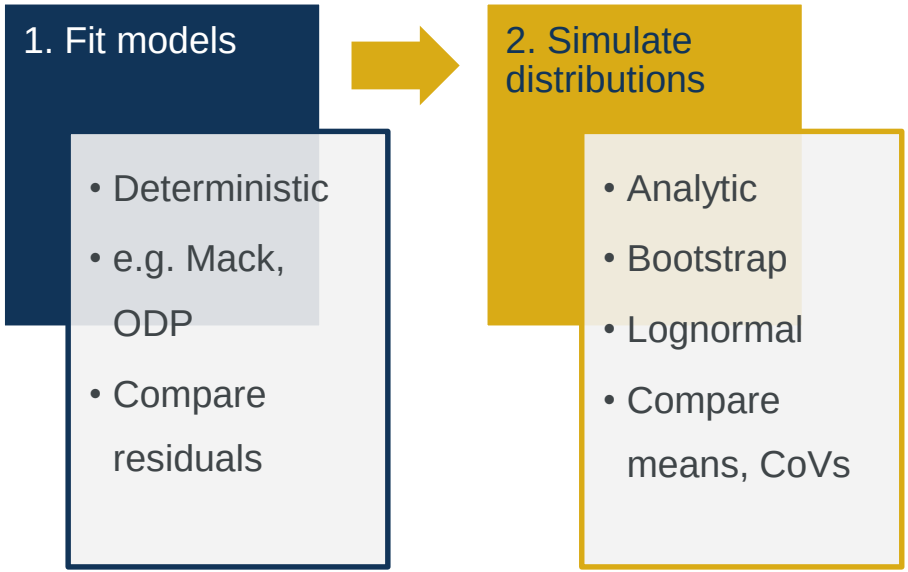
Two-step process



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Applications: examples

Capital model parameterisation

Actual versus expected

Risk premium estimation

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Traditional models

Deterministic

- Chain Ladder – 1960s
- Bornhuetter-Ferguson - 1972

Stochastic

- Mack's model – 1993
- ODP - 1994

How can we meet the challenges?

Challenges

- Stochastic models are stochastic versions of deterministic models
- Highly aggregated
- Ignore important real features e.g. calendar year effects
- Not clear how robust they are when data departs from model assumptions

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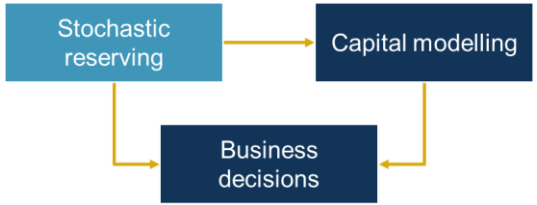
What is a model for?

Help managers understand the business and make decisions in a changing environment

- Interpretable and reflecting real-world features
- Models the key features of the business
- Copes robustly when reality departs from model assumptions or changes

Other important features

- More accurate predictions
- Automatable and runs quickly
- Can use the data that is available



Model choice is always a trade-off among the various advantages and disadvantages

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Possible future directions

Machine learning

- Broad topic, many different methods: Neural Nets, Gradient Boosting Machine, Random Forests, LASSO
- Could be used to identify important claims features
- Question about how interpretable these models are
- Gaussian processes
  - new but promising idea in claims reserving

Individual claims reserving

- Parodi 2012 – Triangle-free reserving

Better understanding of model limits

- How do models behave when the assumptions don't hold?

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Questions

Comments

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