The Future of Claims Reserving?

Peter England PhD CStat HonFIA, Zürich, September 2018
Bootstrapping in Non-Life Insurance: History

1986
Frank Ashe: Bootstrapped the PPCI and PPCF models using GLMs (ASTIN)

1988
Greg Taylor: Discussed bootstrapping (PCAS)

1993
Brickman et al: Discussed bootstrapping (GIRO)
Mack's model appears, with prediction errors calculated analytically

1994
Lowe et al: Discussed bootstrapping (GIRO)

1996
Richard Verrall: Bootstrapped GAMs (IME)
Bootstrapping in Non-Life Insurance: History

1999

England & Verrall (IME): Bootstrapped the chain ladder using GLMs

2002


England (IME): Predictive distributions from bootstrapping

2006

England & Verrall (AAS): Predictive distributions – Bootstrap and MCMC methods

2008

+ other papers Pinheiro et al, Björkwall et al, Kirschner et al...

2018

England, Verrall and Wüthrich (SSRN): One-year and Lifetime view, with application to IFRS 17
“I choose a lazy person to do a hard job. Because a lazy person will find an easy way to do it”
“This is a well written paper, however the method is fundamentally flawed...”

- Dr Thomas Mack

“When Thomas Mack presented his paper a few years ago, I thought there was nothing more to be said. However, what you have presented is very elegant, and actuaries will find the simplicity of bootstrapping very appealing.”

- Prof Dr Hans Bühlmann
Note: This is misleading, since it is possible to bootstrap Mack’s model!
“Modern computer simulation techniques open up a wide field of practical applications for risk theory concepts, without the restrictive assumptions, and sophisticated mathematics, of many traditional aspects of risk theory”.

Has Bootstrapping Claims Triangles Had Its Day?

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<tr>
<th>Solvency II</th>
<th>IFRS 17</th>
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<tr>
<td>- Internal models/ORSA</td>
<td>- Risk adjustments by group</td>
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<td>- Bootstrapping is still the main technique used for obtaining predictive distributions of reserve cash-flows, or as part of a calibration process</td>
<td>- Disclosure of equivalent confidence level</td>
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<td>- Requires a distribution of fulfilment cash-flows over the lifetime of the liabilities</td>
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<td>- Bootstrapping is an ideal candidate for obtaining the relevant distributions, or for calibration</td>
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With the rise of risk-based reporting requirements, bootstrapping (and MCMC) techniques will be here for a while yet. The underlying models however will come under greater scrutiny.
The Future of Reserving?

Future of Reserving
SOME THOUGHTS BY WPNL

Reserving Members

Forward-looking companies may need to consider the implications of new and emerging trends in the market. The advent of new technology offers significant opportunities for the insurance industry, including the potential to improve efficiency, reduce costs, and enhance customer service. However, these opportunities also present challenges, such as the need for continued investment in technology infrastructure and the challenge of maintaining data security and privacy. It is important for companies to carefully consider the implications of these trends and develop strategies to leverage them effectively.
“From the viewpoint of a forecaster who is not laden with the baggage of loss reserving history and convention, there is no clear reason for using [triangulation] data, and the loss of information provides an incentive (at least *prima facie*) for not doing so.

From this viewpoint, a more natural approach is to forecast future claims experience on the basis of the data in the fullness with which it is available.”

Individual Claims Reserving

**High Frequency/Low Severity (Attritional) Claims**

- Use Machine Learning/data analytics techniques to analyse large datasets of underlying claims and policy data
  - Claims triage – automatically assessing claims as they come in and assigning them to the correct claims handlers
  - Improved assessment of claims costs on a case by case basis
  - Annual, Quarterly, Monthly, Weekly, Daily reserving?
    - Set up a notional “reserve” at the point of sale
    - Manage claims as they come in
  - Identification of “drivers” of reserve movements
  - Identification of fraudulent claims
  - Are Reserving and Pricing just part of the wider spectrum of claims analytics?

**Low Frequency/High Severity (Large) Claims**

- Less amenable to machine learning techniques
- Develop open large claims to their ultimate position stochastically using simulation techniques
- Net down simulated large claims by passing them through the appropriate reinsurance programme
- Requires modelling of the reinsurance programmes by year of account
- Could be useful for IFRS 17 risk adjustments

Most of the above is already being done. Companies are already using Machine Learning techniques for reserving applied to individual claims databases. A US patent has been filed for automated reserving using neural nets. There is a growing number of papers on the topic, and lecture notes are available.
Have Actuaries Had Their Day?

In artificial intelligence, an expert system is a computer system that emulates the decision-making ability of a human expert. Expert systems are designed to solve complex problems by reasoning about knowledge, represented mainly as if–then rules rather than through conventional procedural code.


- Observe procedures and decisions made by actuaries in the reserving process
- Build a computer system that mimics the actuary
  - Allow the actuary to focus on other value added work, or...
  - ... sack the actuary
- How hard can it be? (Discuss)
Expert Systems and The Actuary
The Story So Far

- (2007) Building a Reserving Robot

Actually, an expert system can be thought of as a spectrum, and the journey has already started
- (Partly) Automating the end-to-end reserving process
- Automatic roll-forward of reserve analyses
- Automatic diagnostic checks and validations
- Prioritisation of review
- What next?
Data and Computers

- 1988: 1Mb RAM, 40Mb Hard Disk, 12 MHz processor (turbo)
- 2008: 4Gb RAM, 2*250Gb Hard Disk, 3+ GHz dual core processor
- 2018: 64Gb RAM, 1 Tb SSD Hard Disk, 4.6 GHz six-core processors, 64-bit OS
“The past is a foreign country; they do things differently there.”
