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Practical Considerations Regarding the Adaption of ML in the UK Reserving Market

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Overview

- This presentation discusses the practical considerations that have historically affected, and continue to affect, the adaption of Machine Learning (ML) techniques in the UK market.
- Particular focus is given to the time & resource constraints that prevent UK reserving teams from investing in ML.
- Suggestions are given as to how senior management might consider mitigating these constraints.
- A more extensive review of the topics of this presentation will be available on the GI Machine Learning in Reserving Working Party's blog.



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About Me

- I am a Data Scientist and recently qualified Actuary who has 4 years of work experience in the UK GI Market.
- The majority of my experience is in UK Personal Lines, but I have recently branched out into commercial lines in my current role.
- I've spent 2 years in a Pricing team in a mid-sized UK London Market firm, and 2 years in a Reserving team in a Top 10 UK Motor insurer.
- I have a PhD in Data Science (*Machine Learning Algorithms for Crime Prevention & Predictive Policing*) from Cardiff University.



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Disclaimer

- This presentation is an adaptation of a presentation given to the GI Machine Learning in Reserving working party in 2021.
- Although this is being presented as a part of the work completed by the GI Machine Learning in Reserving Working party, some of the discussion falls outside of the remit of the working party.
- However, the working party believes that the material that falls outside its remit is valuable when considering the material that is within its remit, and therefore should be included as part of the presentation.



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Why are Machine Learning models & techniques not being widely adopted by reserving teams within the UK GI market?



GI MLR UK Survey

As stated in [the MLR Working Party UK Survey](#), the three recurring themes are:

1. Resource & time limitations
 - “Many reserving teams are already stretched just keeping up with business as usual, or with ad hoc projects.”
 - “Investment in R&D for new reserving methodologies has not been a priority for many companies.”
2. Accessibility of knowledge
3. Explainability of models & results
 - “How can actuaries understand what the models are doing themselves, let alone explain it to management, regulators or auditors?”



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Time Constraints



Time Constraints

Running BAU reserving processes and ad-hoc requests take up a large amount of a reserving actuary's time. **Why is this?**

- Poor data quality
- Poor process quality.

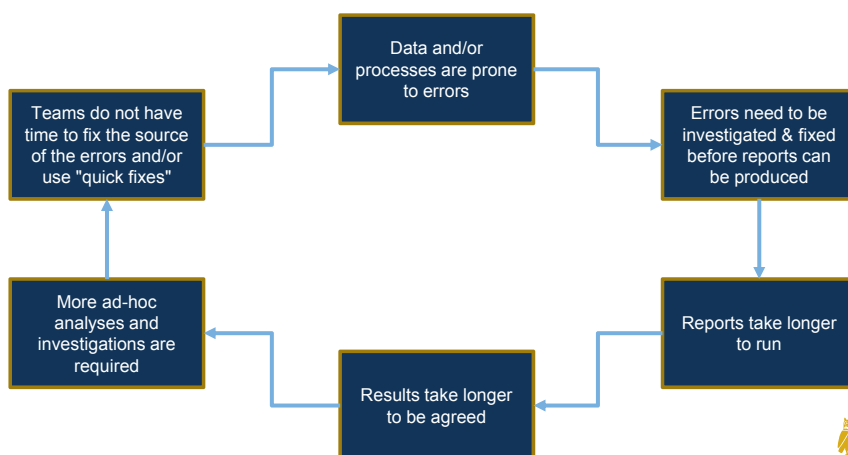
Whether the causes of the above are internal or external, the result is the same.

- Poor quality of data and processes...
- ...leads to a higher likelihood of an error appearing in either case...
- ...and will be more likely to take longer than expected to run...
- ...thereby impacting reserving actuaries' time.



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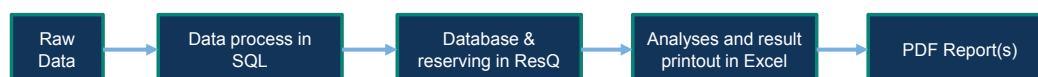
Time Constraints: The "Time Catch-22"



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Time Constraints



Process design affects the likelihood of process error.

- The more stages that a process goes through, the more likely it is that an error will appear...
- ...the more stages must be checked for the error...
- ...and the longer it takes to run in the first place!

The choice of program and is also important.

Errors in programs like Excel, which do not have robust error-checking procedures by default, can be difficult and time-consuming to debug compared to line-by-line code.



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Time Constraints: What Can Be Done?

1. Recognise required resources
2. Clean up processes
3. Automate where possible
4. Ensure sustainability



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Resource Constraints



Resource Constraints

A lack of resourcing in reserving departments leads to few reserving actuaries investing in ML techniques. **Why is this?**

- Insufficient resources -> essential functions are prioritised
- Essential functions being prioritised -> little time or emphasis on learning ML techniques.

In addition:

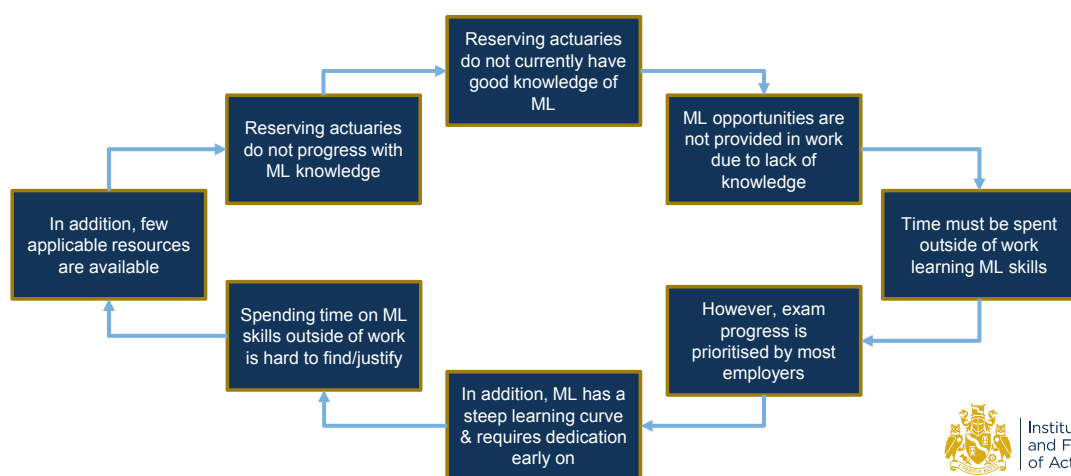
- Availability of learning materials specific to reserving actuaries is low (but being worked on!)
- Requirements to learn R or Python language are frequently a barrier
- Data science resource is often not available to support reserving teams
- Many individuals in senior management question the value of ML in reserving.



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Resource Constraints: The Catch-22



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Resource Constraints: What Can Be Done?

- Make time for learning - e.g.:
 - Lunch & learn coding sessions with the Data Science team
 - Technical training given by external providers
 - Provision of research time.
- Encourage specific training - e.g.:
 - Encourage team to attend ML conferences & lectures
 - Encourage team to complete the Certificate in Data Science, or other relevant courses.
- Ask for help!
 - Ask for resource to be seconded from other teams to upskill the team
 - Ask for IT to make ML software available to your team
 - Buy in external resources from a consultancy
 - Hire a "resident data scientist" or a data science/actuarial hybrid into your team.



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Explainability



Explainability

- It is not surprising that while ML methods are seen as a “black box”:
 - “Individuals are reticent” and...
 - ...there is considered to be a “lack of transparency” in the methods.
- However, recently, there have been a number of developments in this area. For example, the following packages help users to explain the results of their models:
 - Yellowbrick
 - LIME
 - SHAP
- The aim of these packages is to “open the black box” in varying ways, and their use is often common within Data Science teams, but rare in Actuarial functions.



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Summary

- The practical constraints faced by most Actuarial teams in terms of time & resources available have contributed to a lack of investment in ML within the UK GI reserving market.
- These issues are not easy to solve, as lack of time & resources often propagates a vicious cycle, or "Catch-22", in which the lack of time & resources available to a team persists over time.
- Breaking these cycles in order to obtain the time & resources required to make an investment into ML can be difficult, and requires investment into both processes and people.
- In addition, a lack of knowledge about ML techniques, their benefits and improvements in the explainability of models can be difficult to overcome.
- However, there are actions that can be taken to encourage the development of ML within reserving teams, as outlined on the previous slides.



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