Analytics in General Insurance
A Global Perspective

28 October 2021

Adoption of Analytics Tools and Techniques in the Australian General Insurance Market

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Agenda

- Introduction and a brief history of analytics from an Australian perspective
- Technical sophistication / complexity
  - Product / market adoption of technology and techniques
  - Natural perils modelling
- Tools and techniques overview
- Use and misuse of complex models
- Black box – addressing a loss of visibility
- What does the future look like?

The Australian GI Market

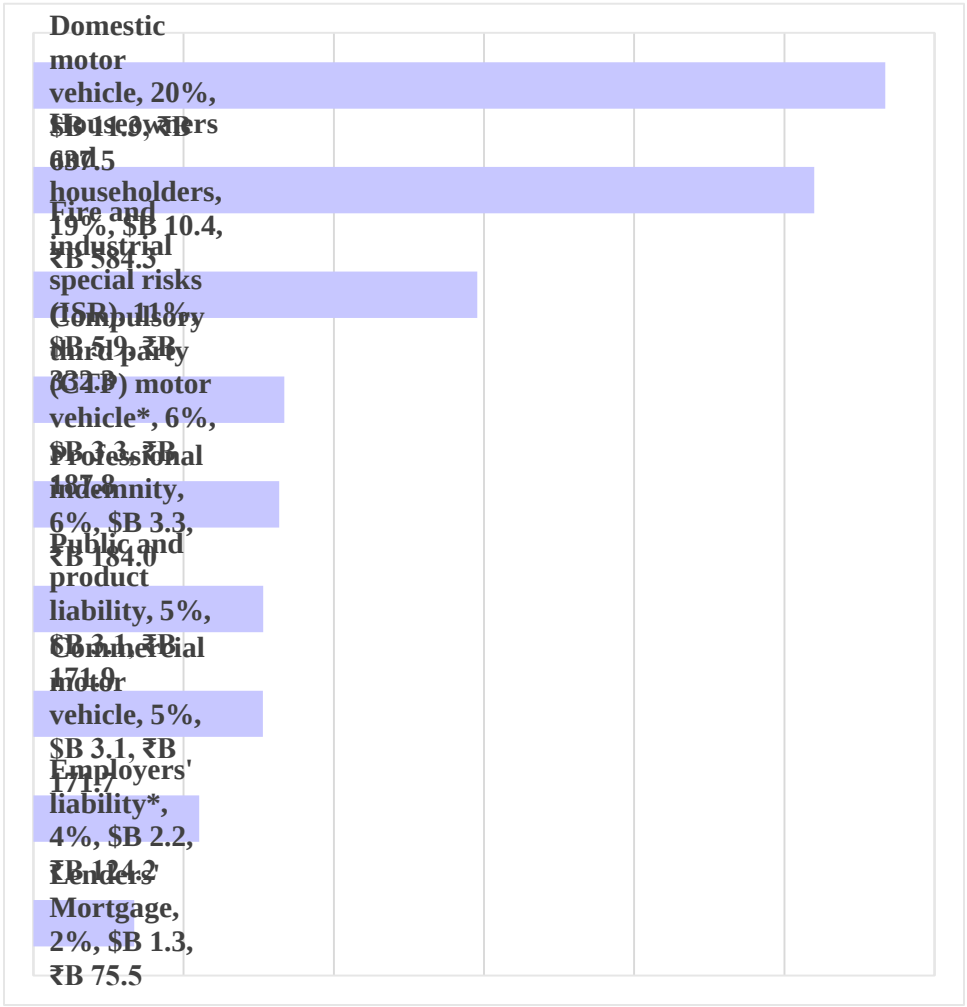
Observations & opinion

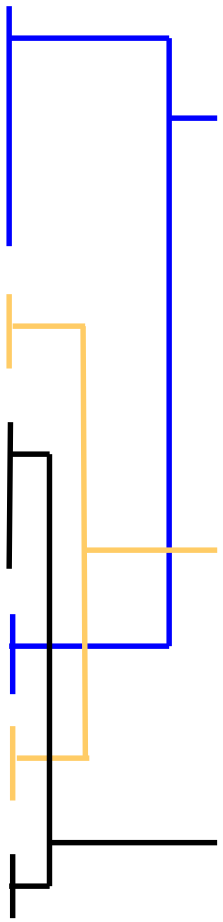
- Evolved from a mainly government / state-gov / mutual model to largely a collection of privatised insurance companies
- Three insurers traditionally held the significant majority of market-share, now arguably a ‘big four’: IAG, Suncorp, QBE and Allianz
- Historically, competition *may* have been less intense than other global non-life markets but this has changed and challenger brands (many internationally owned) have been successful in gaining market share
- Investment in technical capability has been high, with all the major insurers having significant in-house actuarial and analytics teams, large project & software budgets
- Regulatory scrutiny is high, capital standards are stringent, customer and social *fairness* is a priority: all impacting the approach to using data, the models adopted and prices charged
- Australia and New Zealand are subject to a wide range of high-impact, frequently occurring natural perils / catastrophe risks

Premium Composition and Examples of Analytics Applications

Year ending Jun-21, GWP (Private Insurer-Only) by Class of Business

[% Private GI market, ex-Health; $B AUD, ₹B Rupees]





Property classes

- Risk cost models
- Demand models, marketing
- Price optimisation
- Competitor price deconstruction
- Geospatial models
- Natural perils models

Bodily Injury Liability

- Pricing / risk cost
- Claims triage models
- Scheme / insurer / claims manager performance models: return to work, continuance rates
- Regulatory supervision models

Other / All

- Fraud detection models

Source: APRA quarterly GI performance statistics, Dec 2002 to June 2021

** CTP and Employers' Liability premiums exclude significant publicly underwritten components*

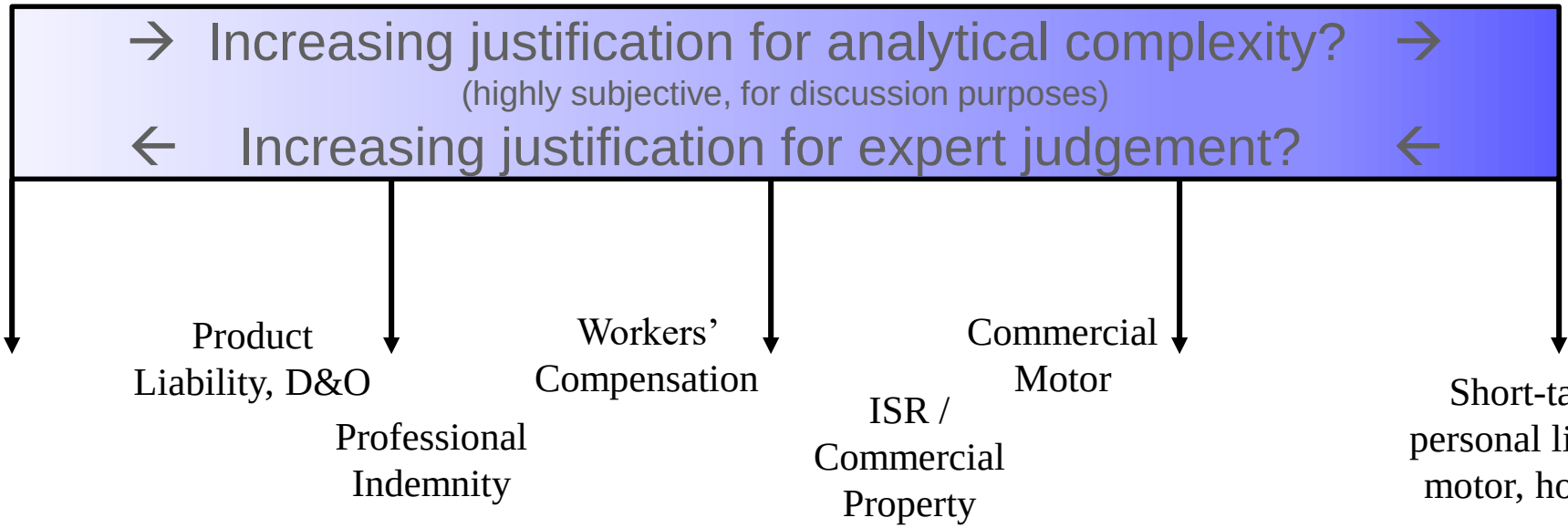
Analytics Complexity

Why?

- Data volumes permit complexity
- The process or relationship being modelled is itself complex
- Competition is fierce
- Prices are free to move / decisions are unrestricted

Why not?

- Data is sparse
- The relationships being modelled are simple and well-understood
- Expert judgement and qualitative assessment are superior to analytical techniques
- Complexity is contrived



Tools & Techniques

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*A **limited sample** of software packages commonly used for analytics applications in Australian general insurance:*

Long-standing

SAS
Excel / Visual Basic
SQL
Access
…

Freeware

R
Python
…

Proprietary Modelling

EMBLEM
RADAR
CART/MARS
…

Visualisation

Tableau
Power BI
R / R Shiny
…

*A **limited sample** of techniques commonly used for analytics applications in Australian general insurance:*

Traditional (?)

- Regression
- Generalised Linear Models (GLMs)
  - Pricing risk models
  - Statistical case estimation
  - Demand models
  - …
- Decision Trees

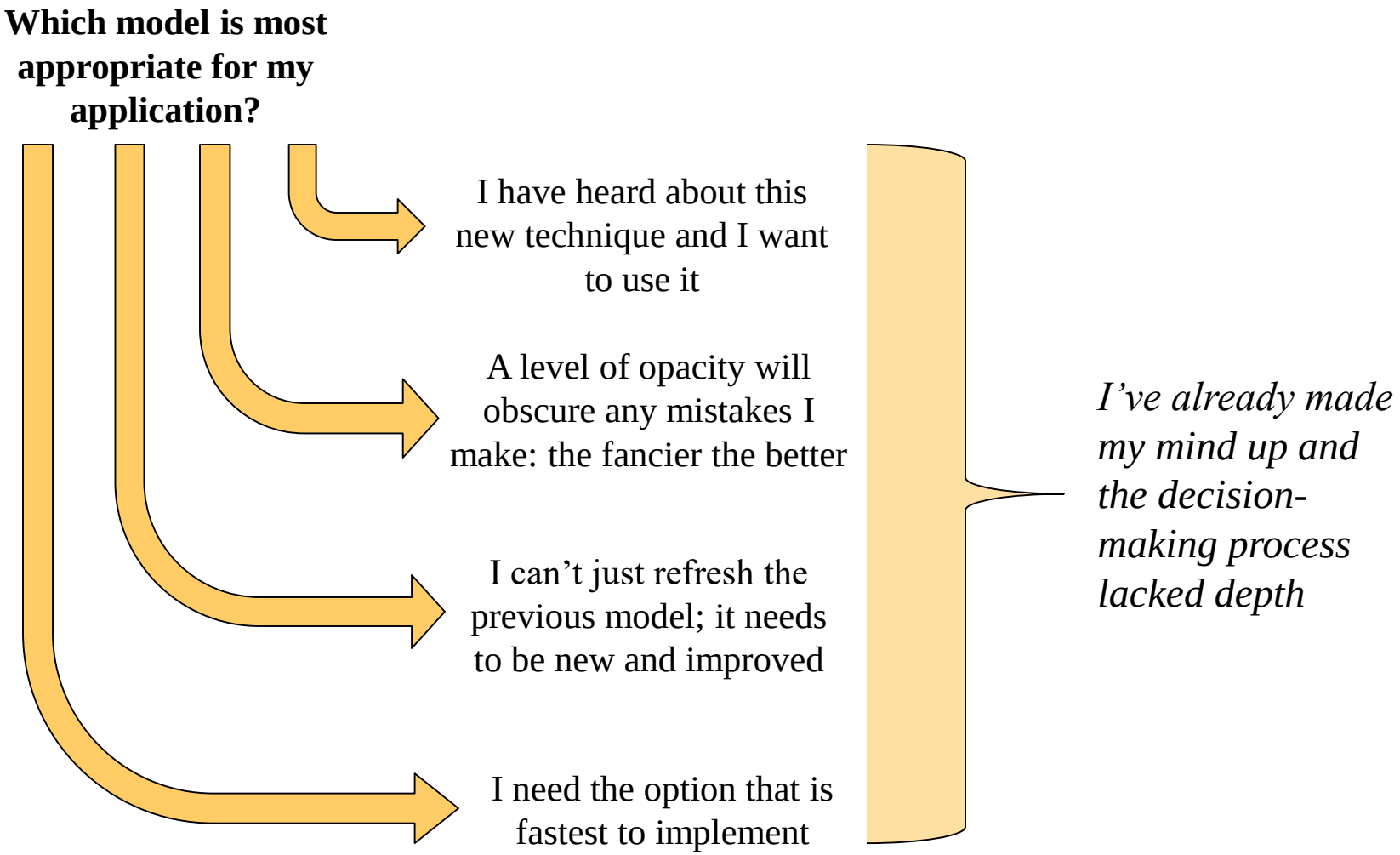
Modern (?) & Emerging (?)

- Ensemble learning (e.g. boosting)
  - Fairly common for a machine learning model to be at least considered to supersede a traditional pricing model
- Clustering
- Neural networks

!!! Actually, many techniques thought to be modern have existed for decades!

Model Selection

Examples of a **less open approach** to choosing a technical model:



Model Selection

Examples of more considered approach to choosing a technical model:

What is the purpose of my model?

- Exploratory Model
- Inference
- Predictive Model

How much time do I have? It may be better to start with an approach I'm familiar with.

What is my most interpretable option?
…

How detailed is the data? What level of predictive power do I require?
…

I've narrowed my options down to two? Examples of user-specific considerations:

GLM

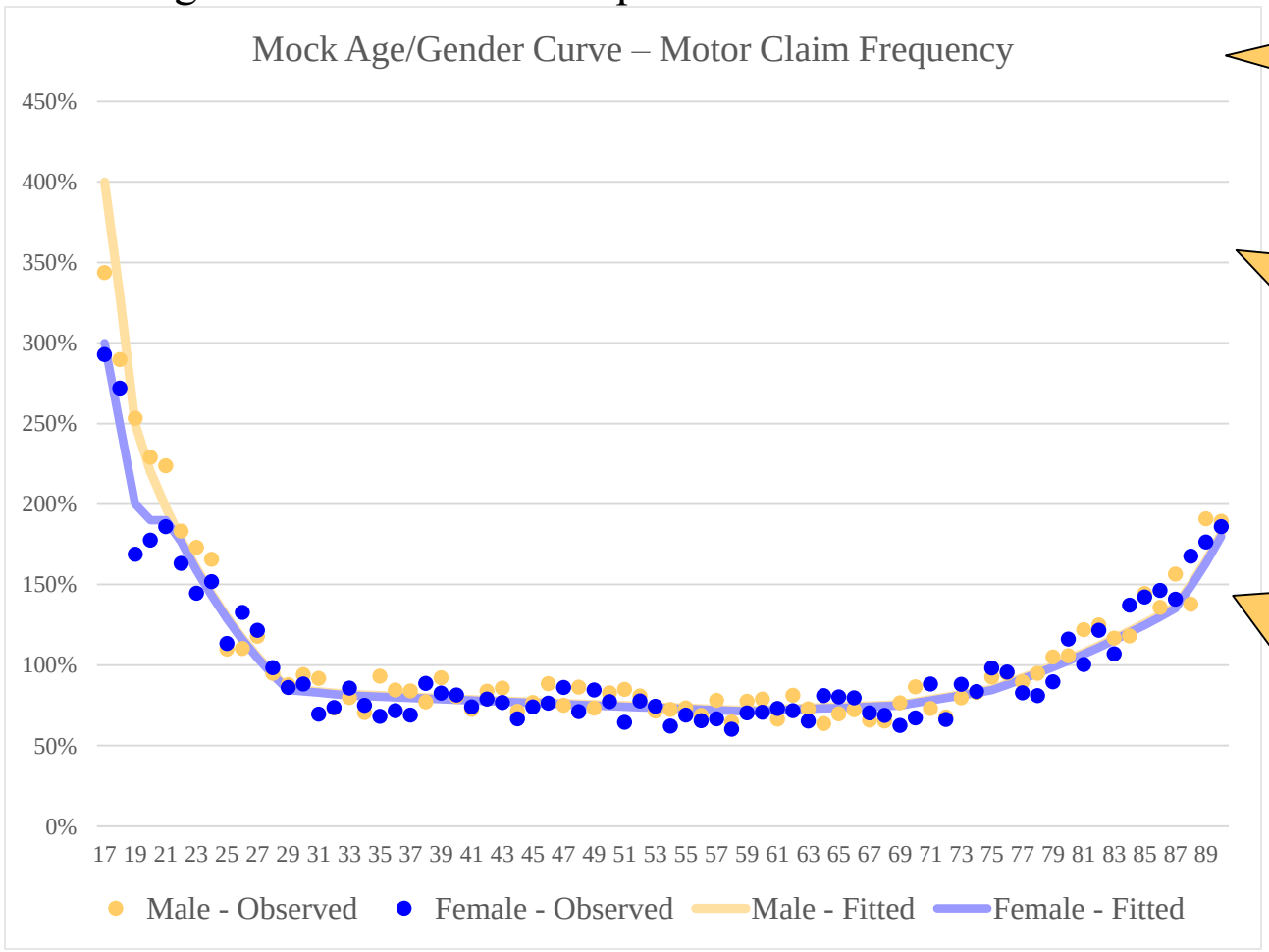
- Am I familiar with the underlying statistical concepts?
- How am I planning to choose a model structure?
- What will my diagnostics be?

Gradient Boosting

- Am I familiar with the technique, its documentation, source code?
- If not, am I comfortable to use the technique?
- What will my diagnostics be?

Visibility of Model Structure

A simple example of where a traditional, visual technique helps avoid overfitting and the ‘black box’ equivalent:



More traditional modelling techniques tend to have clearer structures and more flexibility to force relationships

More computationally intensive machine learning techniques tend to offer poorer visibility, requiring additional diagnostics (e.g. partial dependence plots) to visualise relationships

Overfitting can generally be avoided using a visual approach in conjunction with statistical tests, without requiring cross validation, train-test, out-of-bag testing, PDPs, etc. While forcing a relationship in some machine learning techniques (to be linear, exponential, for example) can be difficult.

Natural Perils / Catastrophes

Australia and New Zealand are subject to a wide range of high-impact, frequently occurring natural perils / catastrophe risks

- Storm / Hail
- Flood
- Cyclone
- Bushfire
- Earthquake

Many future advances in analytical capabilities could be in the natural perils / geospatial categories, as this is may be the area of greatest uncertainty / change.

What does the near future look like?

Competition to become the dominant, most respected advisor in the analytics space?

Regulatory and public scrutiny will continue to shape the applications of analytics and the data available / acceptable to use in Australia.

- Optimisation, elasticity, customer loyalty
- Data and privacy
- Ethical use of data

What is the current pace of innovation and technical development in the Australian GI market?