Statistical Case Estimation for Long Term Claimants

- Uncovering Drivers of Long Term Claims Cost in Accident Compensation

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Agenda

1 - Introduction and Background

2 - Approach

3 - Key Insights

4 - Applications and Benefits

5 - Summary

1 - Introduction and Background

Aim

- Investigate the drivers behind long term care costs for long term claimants within the TAC
- Used to assist reserving by linking to drivers
- Assists claims management via case by case comparison

Statistical Case Estimation

- Individual estimates of future claims related costs
- Predicted via statistical model using individual characteristics
- Not just a black box

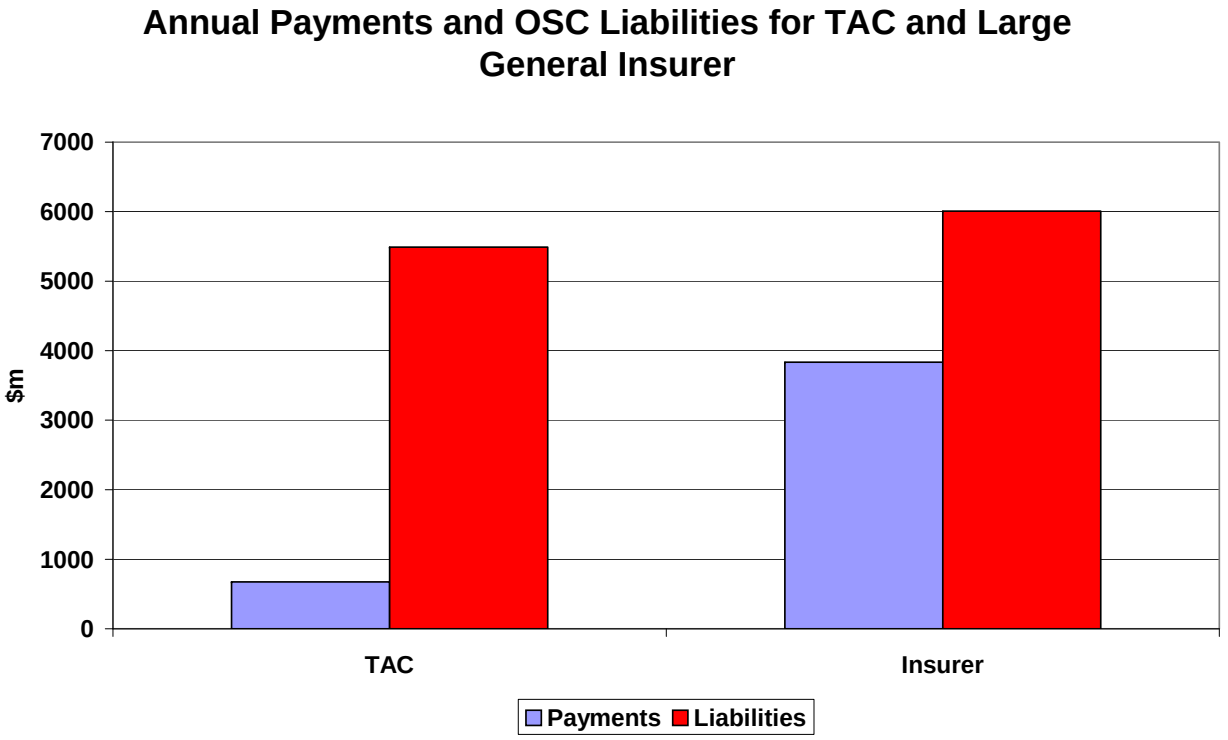
1 - Introduction and Background

Background to TAC

- provides no-fault cover for injuries resulting from motor vehicle accidents
- Common Law benefits also paid but only for Eco Loss and General Damages
- All treatment benefits paid only on periodic basis, resulting in significant liabilities relative to claim payments

1 - Introduction and Background

Long Term Nature of Liabilities



- TAC's liabilities are 8 times annual payments
- Compare with typical general insurer where ratio is 1.5

Source: TAC and Insurer annual reports

1 - Introduction and Background

- Long Term Claimants
  - Community Support Division
  - Primarily neurological impairments and spinal injuries (quadriplegics and paraplegics)

- "Attendant Care and Substitutables"
  - Home based care
  - Group homes and nursing homes
  - Payments for Community Integration

- Approach is not specific to this definition of claimants or these payments.
- Other payments in respect of Long Term claimants are relatively significant and could also be modelled

2 - Approach

Considerations for SCE model design

- Capture the material drivers
- Transparent - we can see how these drivers effect the reserves
- Balance the stability with predictiveness of drivers
- Stable when experience is stable
- Responsive when experience is changing
- Identify superimposed inflation and trends in claim drivers (where they exist)

2 - Approach

Static and Dynamic Drivers

1. Static
   - Largely known when the claim is reported and unchanging
   - E.g. gender, date of accident
2. Dynamic foreseeable
   - Will change in the future in a foreseeable way
   - E.g. age of the claimant, duration of the claim since injury
3. Dynamic stochastic
   - Will change over the lifetime of the claim with a stochastic or random element
   - E.g. litigation status, injury severity, care needs etc.
   - Often the most predictive drivers
   - Will result in biased predictions if used as static drivers hence we need to forecast these drivers

2 - Approach

Data Available for Modelling

- 15 to 20 potential predictors were available for modelling (right)
- Historical annual payments over 10 years for care and therapy

Data items were considered for:

- Quality and appropriateness
- Availability of history for each data item
- Extent to which they are dynamic

Age	Functional code
Care payments	Mobility code
Duration since accident	Service profile
FAM	Days since discharge
FIM	Residential status
Impairment range	Days in accommodation
Injury class	Days in attendant care
Service year	Gender
Therapy payments	Year of accident

2 - Approach

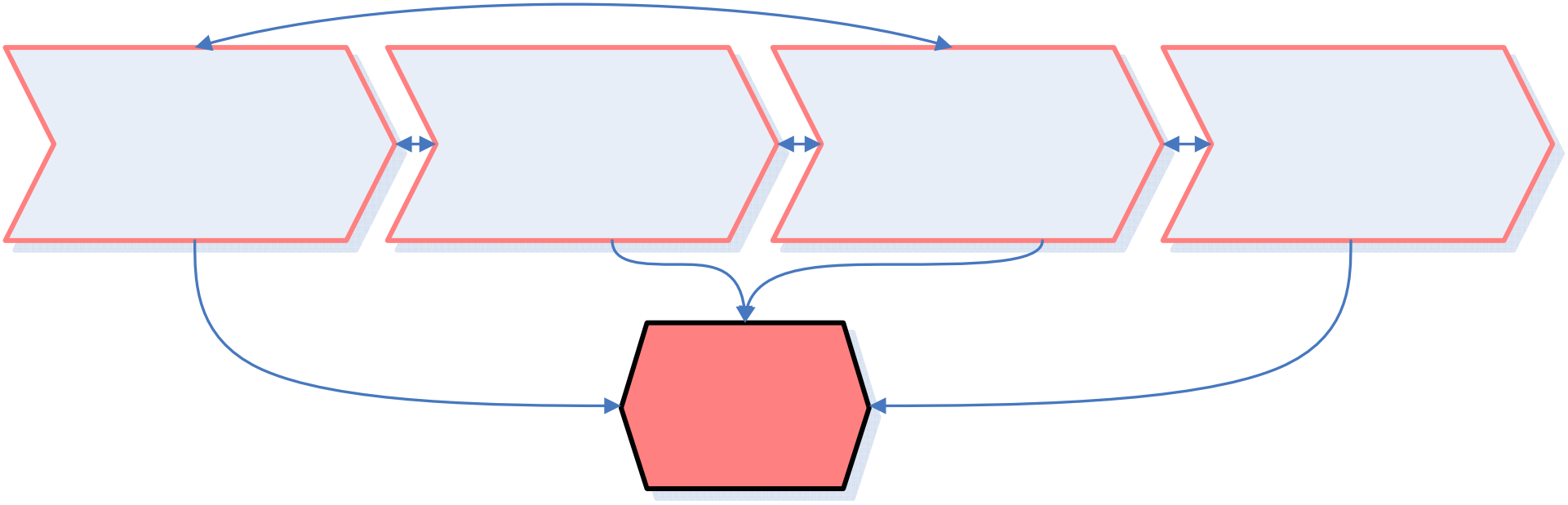
Overall Approach

1. Transition model to forecast dynamic drivers
2. Forecast future claim cash flows **with** past payment levels, where appropriate (Rate of Change increase in payments)
3. Forecast future claim cash flows **without** past payment levels for other claims (Payments Per Active Claim)
4. Combine the probability of each future state with the forecasted cashflows to arrive at probability weighted expected payments.
5. Inflation and discounting is applied and the sum across all future periods is the SCE per claim.

2 - Approach

Forecasting Dynamic Drivers

- Create claim states which capture the information in the dynamic drivers
- Use a transition model to forecast these states (using GLMs)
- The states selected leveraged past care and therapy payment status



2 - Approach

Forecasting Cashflows

Approach 1 - Rate of Change in Payments

- What? - For future Active High payments, applied to claims currently in the Active High state
- Why? - Incorporates the best predictor of future payment levels i.e. past payment levels.
- Other drivers include age and injury type

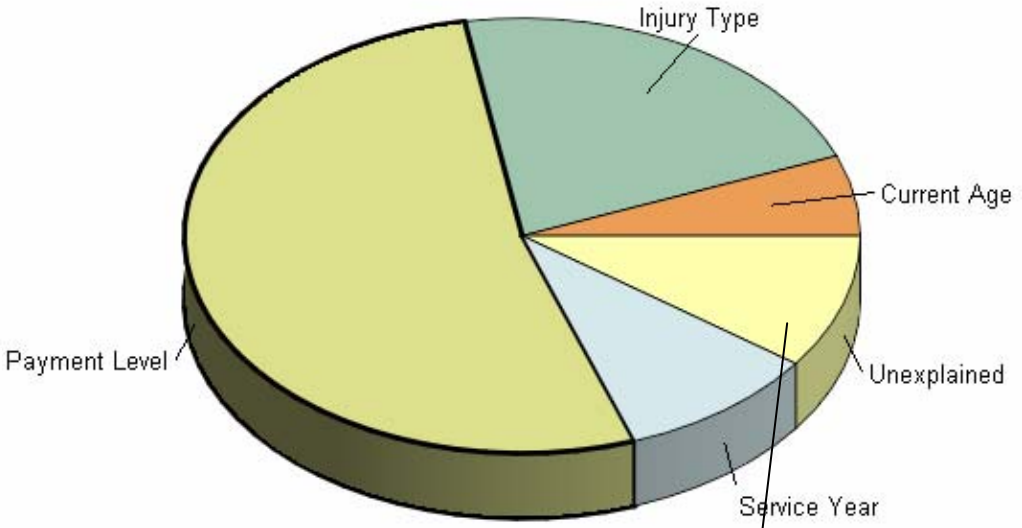
Approach 2 - Payments Per Active Claim (PPAC)

- What? - For future Active High and Active Low payments, applied to claims currently NOT in the Active High state
- Why? - Inactive claims will have $0 payments and hence a Rate of Change is not sensible
- Why? - Currently Active Low claims will have highly variable Rates of Change and hence the PPAC is more appropriate.
- Other drivers include injury type, age, and impairment level

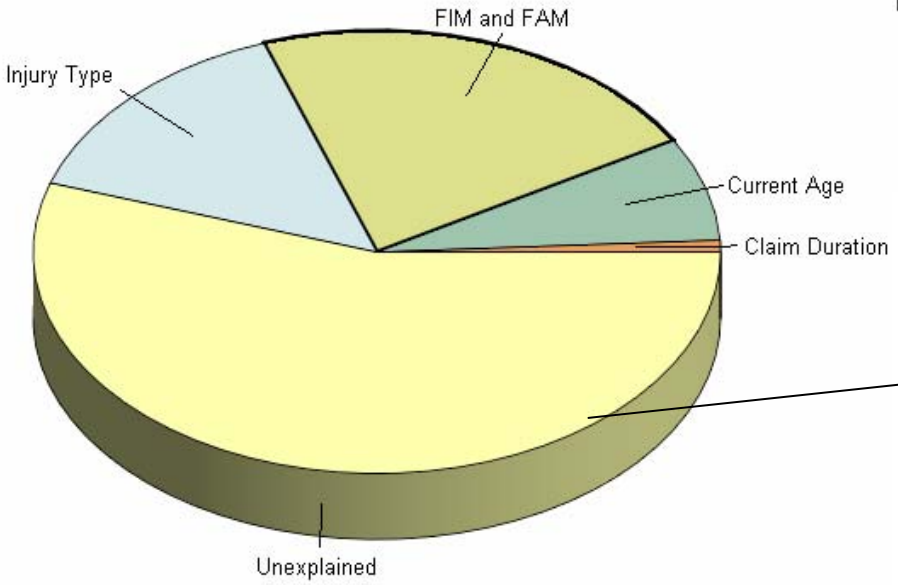
3 - Key Insights

What is the contribution of each of the key drivers to the model predictiveness?

With past payments



Without past payments



There was significantly less unexplained variation when past payments are included

3 - Key Insights

Significant Drivers

- Key drivers are included the models where significant
- We also look at which variables are not significant?

Quantification of Drivers

- e.g. “Young claimants on high levels of Attendant care are up to 3 times more likely NOT to continue at these high levels”

Variable	Rate of Change model	Active High payment model	Active Low payment model	Transition models
Age	✔	✔	✔	✔
Care Payments	✔	✖	✖	✔
Duration since accident	✖	✖	✖	✔
FAM	✖	✖	✖	✖
FIM	✖	✖	✖	✖
Impairment range	✖	✔	✔	✖
Injury class	✔	✔	✔	✔
Therapy payments	✖	✖	✖	✔

Variable	Rate of Change model	Active High payment model	Active Low payment model	Transition models
Functional code	✖	✖	✖	✖
Mobility code	✖	✖	✖	✖
Service profile	✖	✖	✖	✖
Days since discharge	✖	✖	✖	✖
Residential status	✖	✖	✖	✖
Days in accommodation	✖	✖	✖	✖
Days in attendant care	✖	✖	✖	✖
Gender	✖	✖	✖	✖
Year of accident	✖	✖	✖	✖

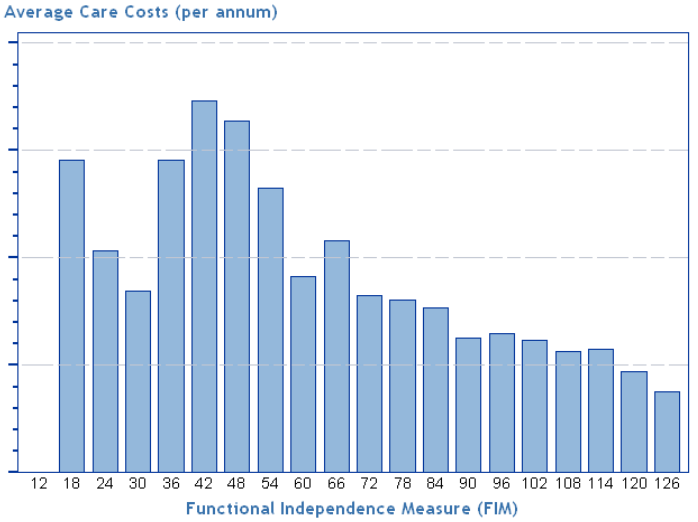
3 - Key Insights

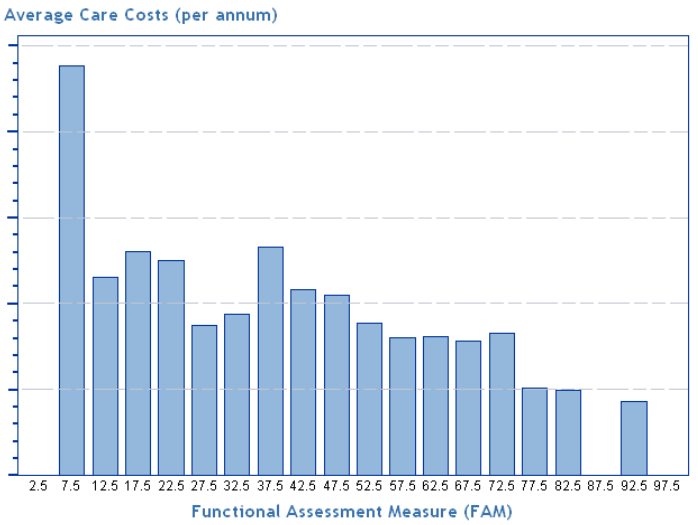
Extension - Incorporating FIM and FAM

- Ratings of the independence and function of seriously injured people in performing daily activities
- Not recorded across all claims and hence could not be used in the main SCE model
- We re-constructed the Rate of Change and PPAC models with FIM and FAM added

Findings

- When added, FIM and FAM are very significant predictors
- There is much less reliance on injury type when FIM and FAM are known





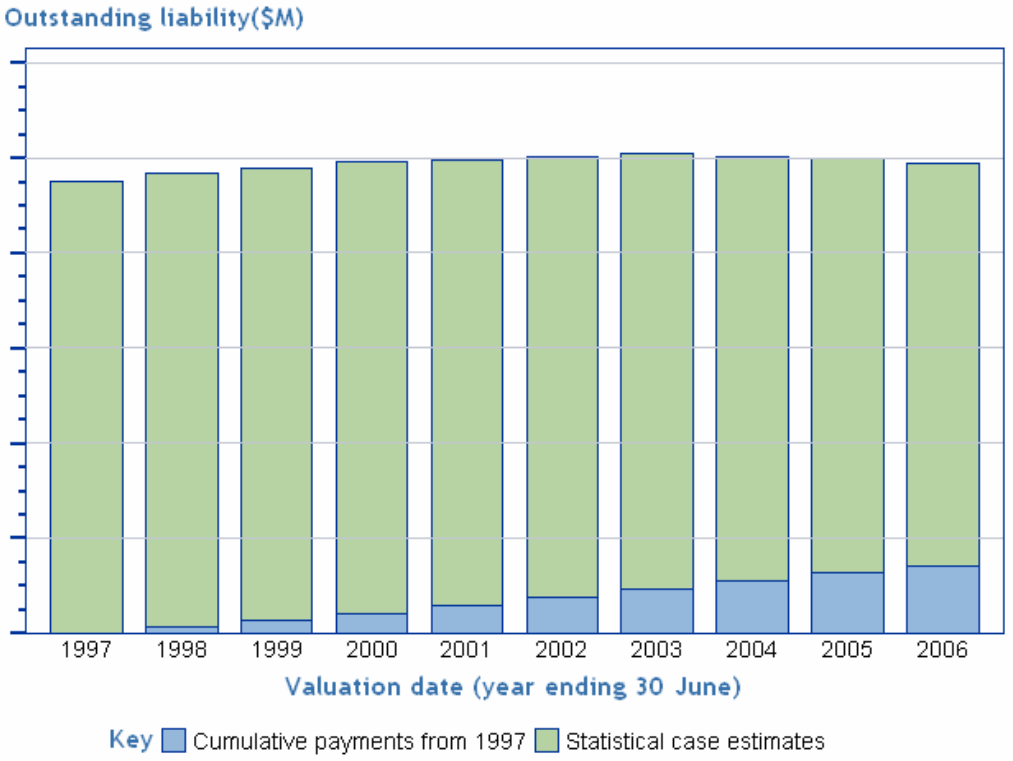
4 - Applications and Benefits

Reserving diagnostic - Incurred Cost Development

- Reserve levels appear to develop consistently for the SCE model

How have we used it?

- Supporting model for the main valuation
- Reserves were broadly consistent with the main valuation model
- Some insights from the SCE model were used to improve the main valuation model



4 - Applications and Benefits

- Need to note long term nature of attendant care benefits and be aware of systemic factors in setting reserves such as
  - Changes in expectations of what care is “reasonable”
  - Change in provision of care from family (unpaid) to paid care
  - Impact of ageing population
  - Availability of care and impact of availability on the cost of attendant care
- Also need to be aware of past changes in legislative and claims management environment
- Even bearing these uncertainties in mind, a sound statistical approach reduces variation from known factors (i.e. those observed in the data)

4 - Applications and Benefits

Claims management

- Construct a tool to estimate the expected attendant care costs for claimants just leaving hospital.
- Provides a guidance and benchmarks as to the levels of care required.
- Compare with estimates placed on claims by claims management staff

Claim characteristics	
Injury class (expanded)	Sev ABI - 1
Current development year	2
Current age	45
Previous year payments (ATC and ACC)	5,000
Current service year	2006
Inpairment % range	50%+

Current Transition State	Active Low

Active High Expected Payment	
Predicted annual percentage change of payment level	N/A
Predicted annual payment level for remaining in Active High	$ 110,032
Predicted transition probability of transition to Active High	20.9%

Active Low Expected Payment	
Predicted annual payment level for claim in Active Low	$ 16,853
Predicted transition probability of transitioning to Active Low	70.8%

Expected Payment in the Next Service Year	$ 34,883

5 - Summary

The key benefits of the model were:

- Uncovering claims cost drivers
- Design an approach based on these drivers
- Linking these drivers to the reserves
- Applications in claims management