

## Claim simulations & liability estimation methods

Richard Cumpston & Hugh Sarjeant



## HIH losses

*“The deficiency of several billion dollars has arisen because claims arising from insured events in previous years were far greater than the company had provided for”*

(report HIH Royal Commission, xvii)



## Likely future litigation

*“actuaries are most likely to be sued over relatively small jobs”*

Greg Taylor 2/4/03



## APRA risk margins

- “the new role of appointed actuaries ... is not yet supported by adequate actuarial science”
- “I do not like the Mack method (of estimating risk margins)”
- “I hope a prospective method can be found”

Geoff Atkins, IAA Convention 20/5/03



### Claim simulations

- Using a claim model, simulate many future years of claims
- Using an actuarial estimation method, estimate the liabilities each year
- Compare the estimated and true liabilities
- Obtain the bias, prediction error and prediction distribution for the method



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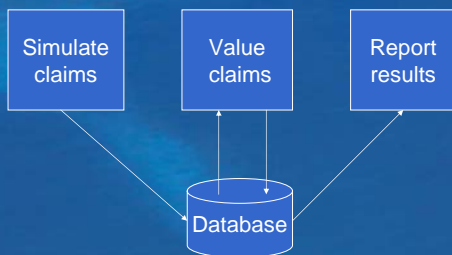
### A sample claims model

- Randomly varying claim numbers around a stable mean
- Defined proportion of claims non-zero
- Defined size distribution for non-zero claims
- Report delay pattern
- Closure pattern (slower for larger claims)
- Defined case estimate distributions for zero and non-zero claims



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### Modelling process



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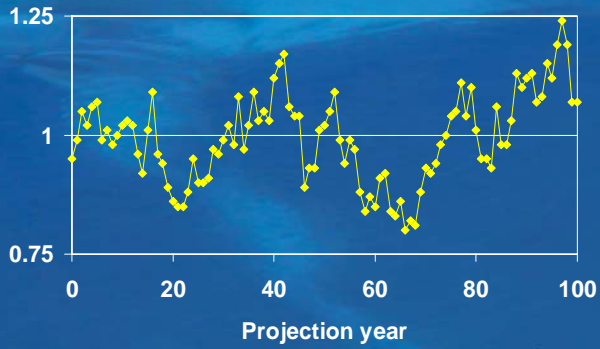
### Database uses

- Store individual claims
- Store valuations using different methods for many years
- Sort valuation errors by size
- Check calculations

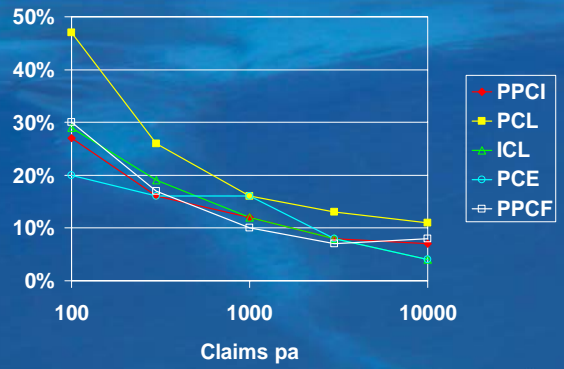


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### Random claim size index



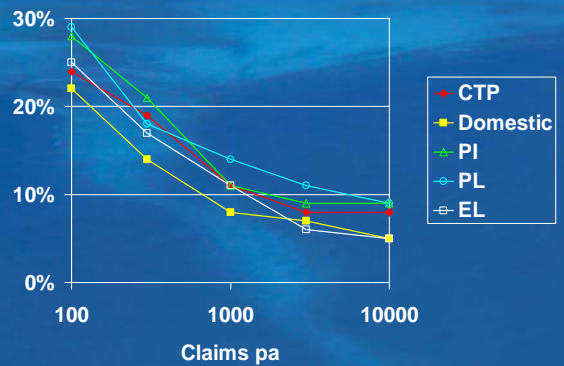
### 75% risk margins for CTP claims



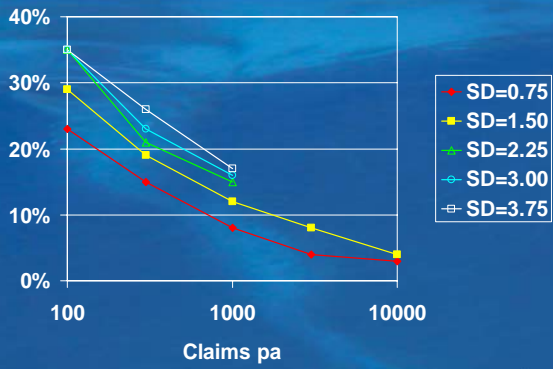
### Initial conclusions

- Margins reduce as claims increase
- At very high numbers, all methods converge to non-zero error
- Payment chain ladder least reliable
- Assumed reliability of case estimates important for ICL & PCE

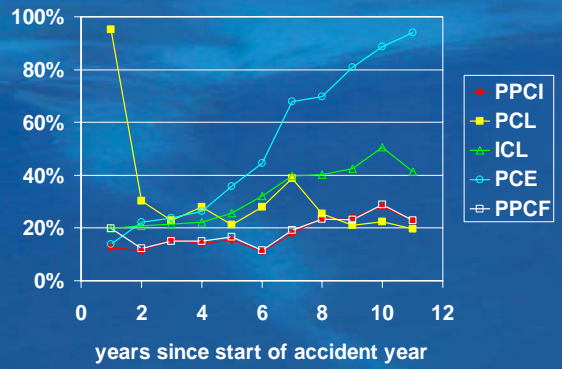
### 75% risk margins for CTP premiums



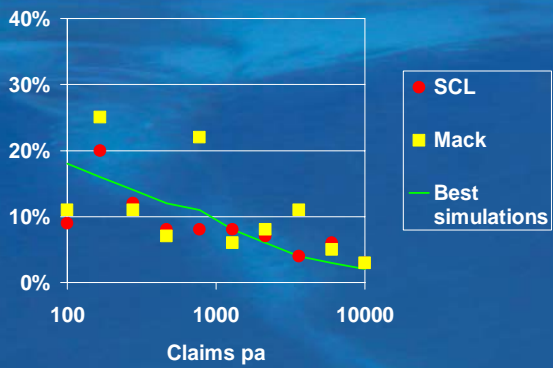
### 75% risk margins for CTP claims – ICL method



### 75% margins for CTP claims – 1000 claims pa



### CTP 75% risk margins from Collings & White



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- Best method can be chosen
- Good case estimates best base



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- Claim simulations are feasible (just)
- Parameters need to reflect practice
- Data needs are heavy for realism
- Premium & claim liability margins
- Best method can be chosen
- Good case estimates best base
- Reasonable agreement with Scott & Collings CTP margins



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## Further work

- Further work is needed on many issues
- We would be happy to collaborate



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