Heathcliff Neels FIAA FNZSA

20 November 2014

DAILY RESERVING OF NATURAL DISASTER CLAIMS

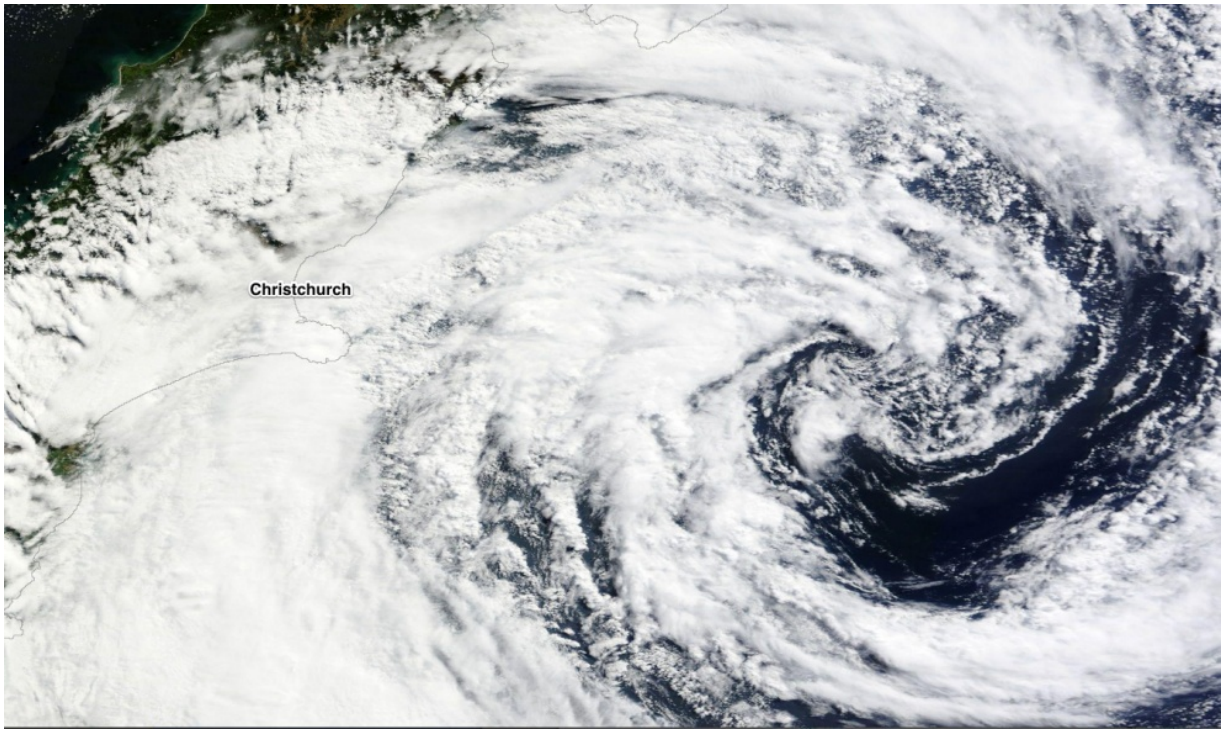
Structure

- **Being in the event**
- **Competing approaches**
- **Daily claims model**
  - Data
  - Methods
  - Communication
  - Pitfalls

- **Caveats**
  - Author’s opinions not necessarily IAG’s
  - Recent data, NZ specific insurance events
  - Primarily short tail property lines of business
  - Idiosyncratic to insurer not to industry
  - Datasets used have been modified and are not suitable for use by other entities

The situation

- **Natural disaster event**
  - Made the news
  - Everyone wants to know how much it’s going to cost
  - Many have an opinion
- **Audiences**
  - Finance: Profit, solvency impact
  - Claims: operational response
  - External Auditors: subsequent or year end storm
- **Imperatives**
  - “Real time” estimates
  - Credible
  - Rumour quenching



IAG
Insurance Australia Group

Current Methods of estimation

- **Dead reckoning**
  - Rules of thumb
  - A Claim manager's estimate
  - Media / weather forecasts
- **Historic comparisons**
  - ICNZ media releases
  - ICNZ industry statistics
  - Internal past event comparisons
- **Actuarial Models**
  - Exposure based models
  - Standard Claims reserving models
  - Daily Claims reserving models

Dead reckoning ….. the **process of estimating** the value of any variable quantity by using an **earlier value** and **adding** whatever **changes** have occurred in the meantime.

Often, this usage implies that the changes are not known accurately.

Dead reckoning is subject to cumulative errors

Rules of thumb (RoT)
Home bias for local events

- **Home bias: Case Study A: April 3 2014, Portland Road, Auckland**

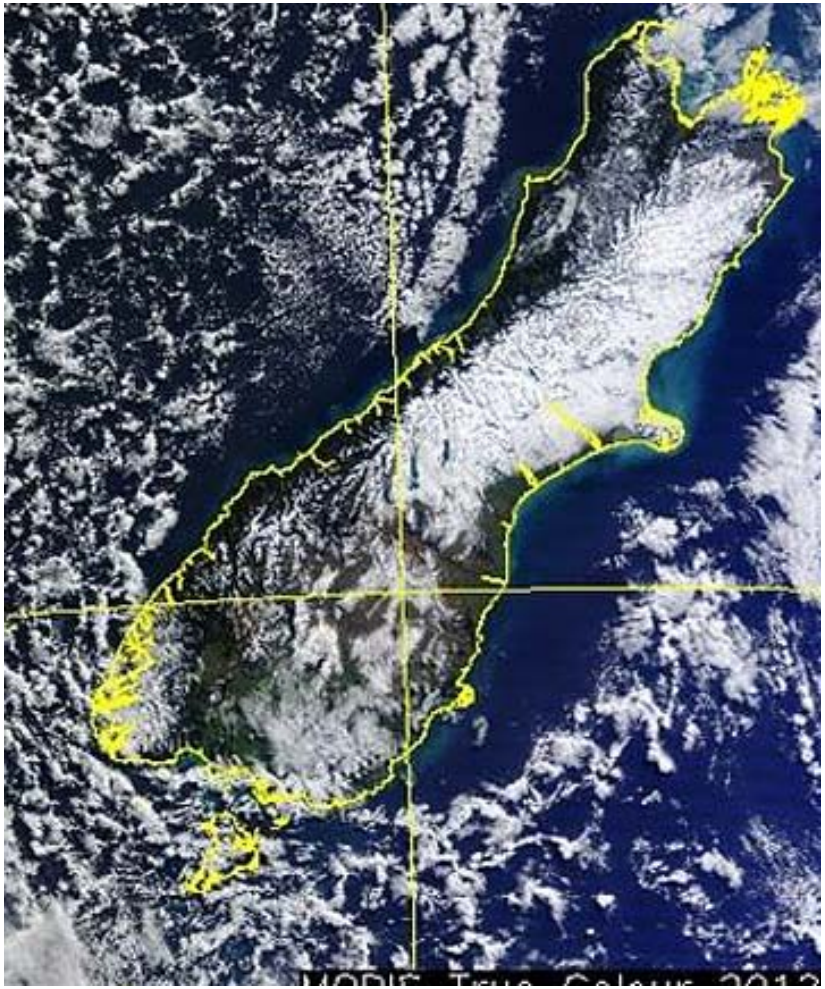
- **A Claim manager's method**
  - Reported claim numbers * Historic Average cost
  - Unreported claims?

Case Study B: June 2012 Snowstorm

“Forecasts”, Media and Google:

TV3: Residents in the Garden City have been bracing themselves all day for what some forecasters predicted would be the worst storm since the big dump in 1992.

The 27 August 1992 **“Big Dump”** snow storm killed over one million stock in Canterbury and damaged buildings in the Christchurch and surrounding areas. Its overall economic impact was estimated to be somewhere between 50 and 100 million dollars. The 1992 snowstorm had a recurrence interval of about 50 to 100 years.



IAG
Insurance Australia Group

Case Study C: March 2014 Storms (PTC Lusi)

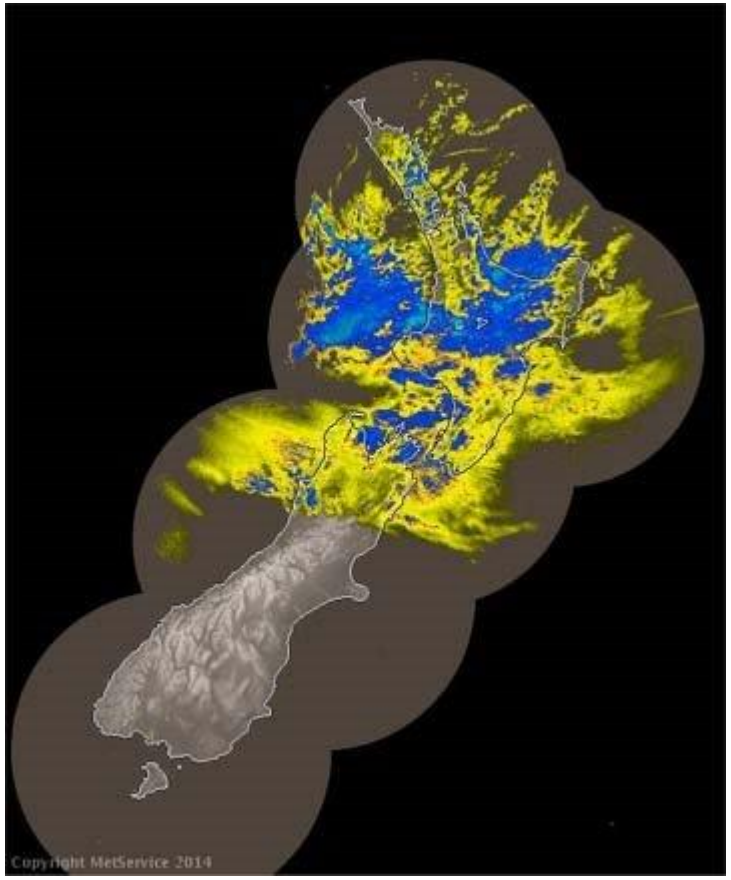
“Forecasts”, Media and Google

IAG
Insurance Australia Group

Case Study D: 17 April 2014 (PTC Ita)

"Forecasts", Media and Google

- ***Wild weather pounding the country is causing widespread damage and destruction, cutting off townships, toppling trees, ripping off roofs, flooding roads, damaging properties, and cutting power. Auckland and West Coast took the brunt of this nationwide storm.***



IAG
Insurance Australia Group

Insured Industry Statistics
ICNZ insurance losses

- **Forecasts, Media and Google versus reality**

Case Study	Year and Event	Industry Cost $m.	Commentary
A	3 April 2014 Portland Rd flooding	NA, minimal	Past correlations have broken down (time to clear the storm water drains?)
B1	1992 August “Big Dump” Canterbury Snowstorm	$11m (2011 $)	50 -100 year return period <> high exposure to insurance losses
B2	2012 June Canterbury Snowstorm	NA, say $10m	Forecast by some as worst since the “big Dump”.
C	2014 March Storm (Post Tropical Cyclone Lusi)	NA, say <$5m	CCC Forecast, 1:100 year event period <> high exposure to insurance losses
D	2014 April Easter Weekend Storm and Floods (Post Tropical Cyclone Ita)	$55m	Fewer “forecasts” in media ahead of event ICNZ media release 10/6/14 for $46m Discard Portland Rd for Tamaki Drive RoT?

Current Methods
Ultimate cost estimation

- **Dead reckoning**
  - Rules of thumb
  - A Claim manager's estimate
  - Media / weather forecasts
- **Historic comparisons**
  - ICNZ media releases
  - ICNZ industry statistics
  - Internal past event comparisons
- **Actuarial Models**
  - Exposure based models
  - Standard Claims reserving models
  - Daily Claims reserving models

Table of woe
Weak
Prone to bias
No real relationship to current exposure
Likely to focus on one feature at expense of others
Prone to hype
Approach slow to respond
Key variables may not be available when needed
Prone to financial and behavioural changes that are not measured directly
Only as useful as the data available

Current Methods
Ultimate cost estimation

- **Dead reckoning**
  - Rules of thumb
  - A Claim manager's estimate
  - Media / weather forecasts
- **Historic comparisons**
  - ICNZ media releases
  - ICNZ industry statistics
  - Internal past event comparisons
- **Actuarial Models**
  - Exposure based models
  - Standard Claims reserving models
  - Daily Claims reserving models

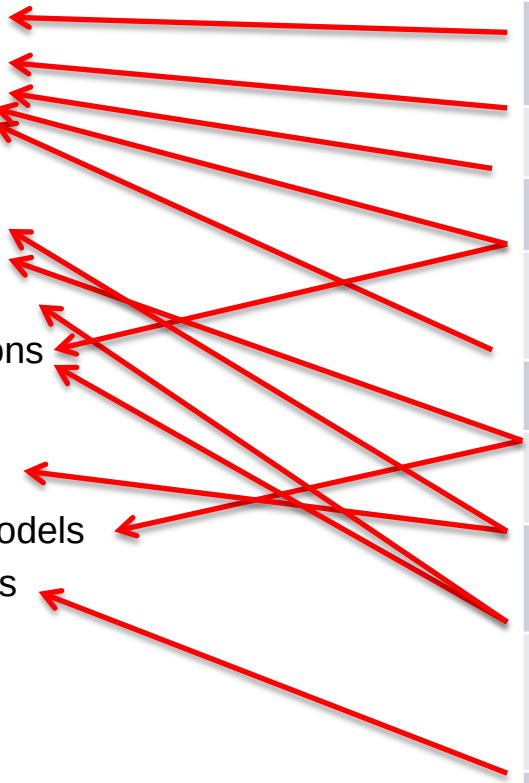
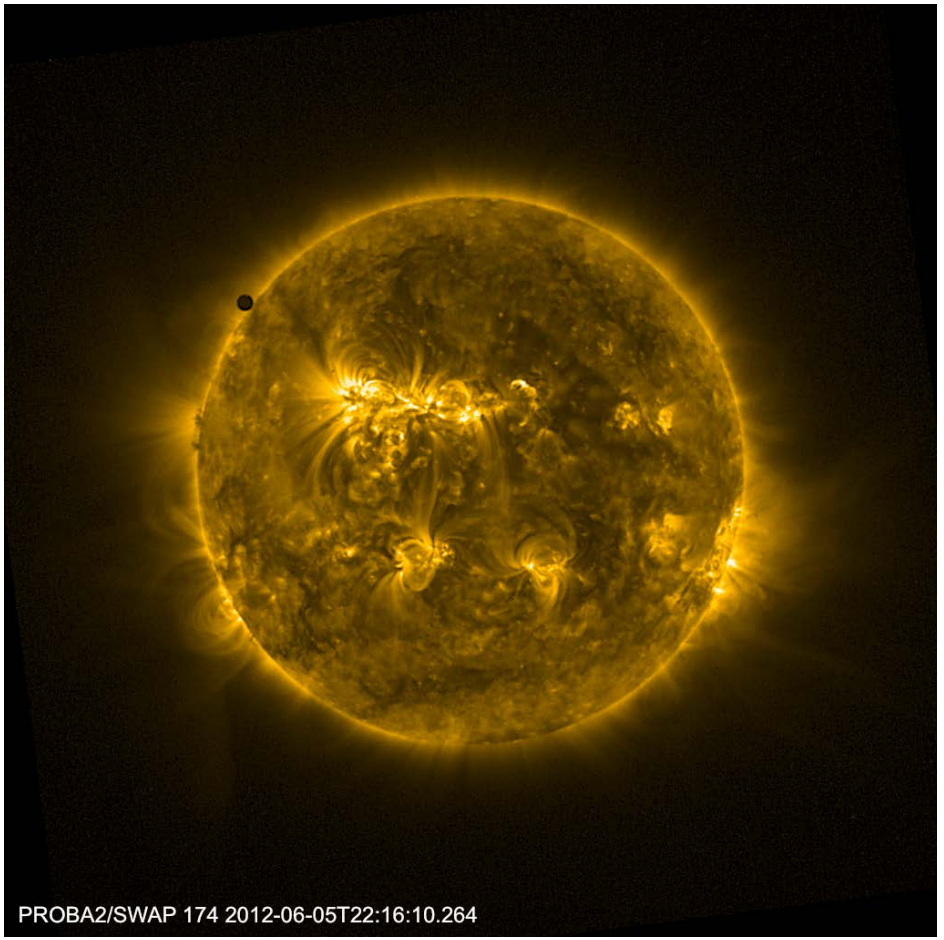


Table of woe
Weak
Prone to bias
No real relationship to current exposure
Likely to focus on one feature at expense of others
Prone to hype
Approach slow to respond
Key variables may not be available when needed
Prone to financial and behavioural changes that are not measured directly
Only as useful as the data available

All models are wrong but some are useful (?)

Prerequisites for daily claims reserving

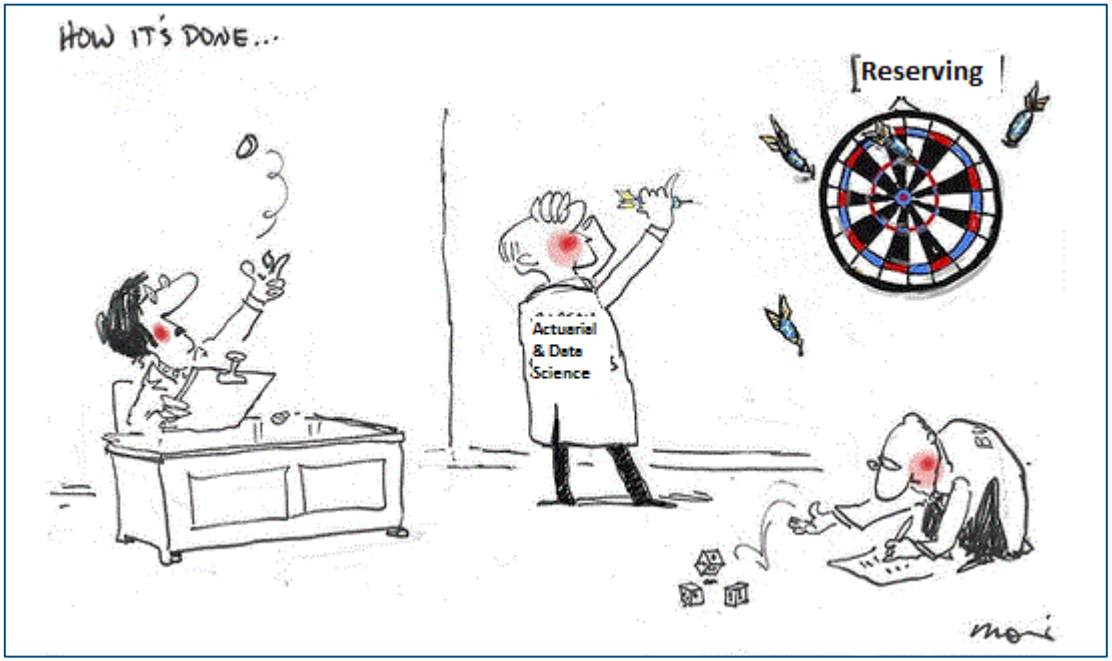
- **Natural Perils Event Data**
  - Cat coding used to identify events at time claim reported
  - Cat events have useful description
  - Historic event data available
- **Data extracts**
  - Accessible daily
  - Available promptly
  - Consistent to reserving data extracts
- **Reserving / Provisioning**
  - Natural Perils reserving class
  - Event based reserving (or accident month proxy)
  - Reinsurance wording for events



IAG
Insurance Australia Group

Estimation
Overview

- **Deterministic Methods**
  - Path based
  - Average Cost / claim numbers
  - Incurred Claim Development
- **Data analysis**
  - Statistics
  - Categories
  - Event Size
- **Parameters**
  - Estimation from data analytics
  - Notional Day of Event
  - Day of development selection



IAG
Insurance Australia Group

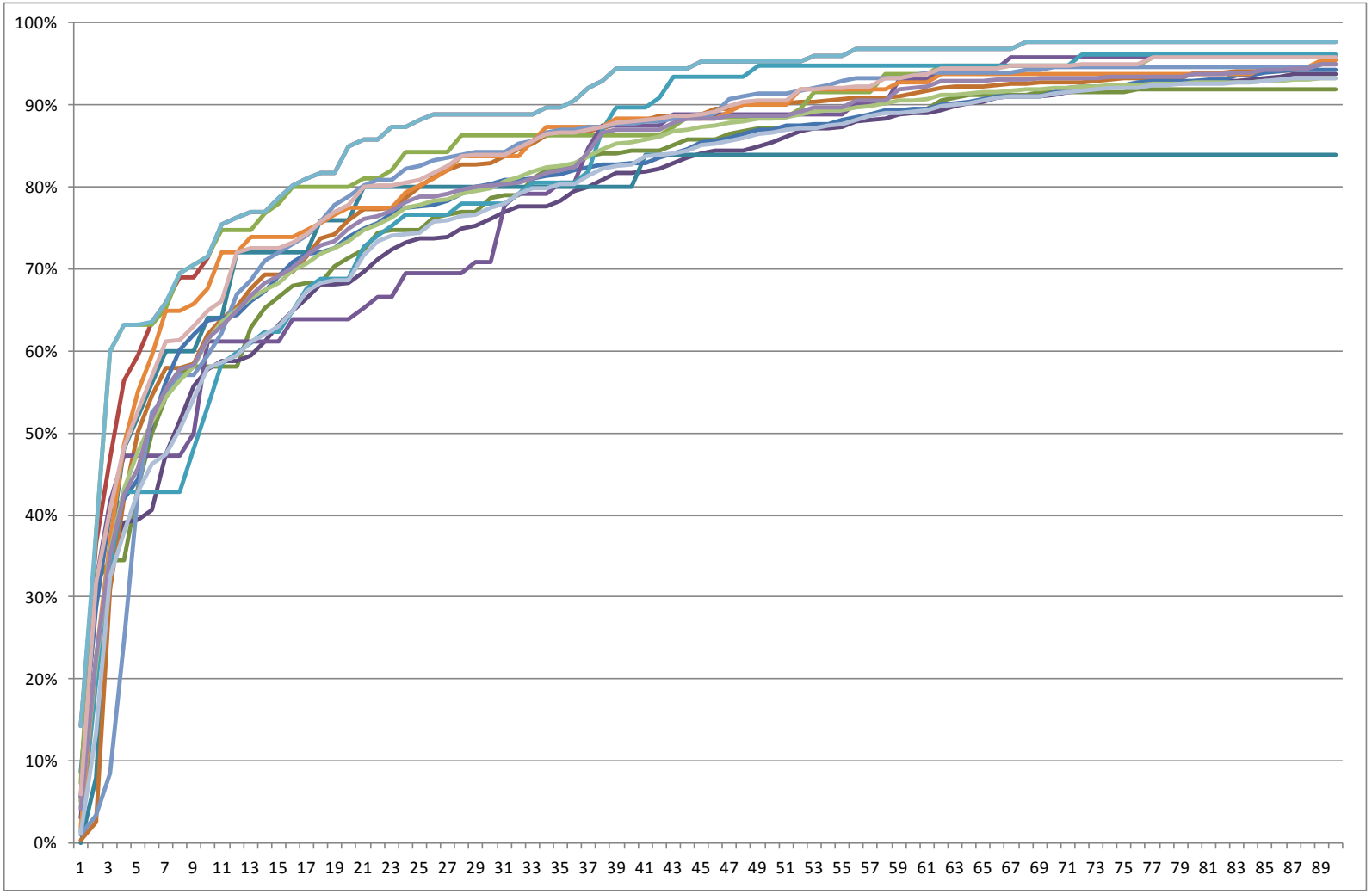
Daily Data

North Island - Storm - 1 to 2 Jun 2010

- **The Event**
  - Day and Time of event affects claim reporting
  - Duration of event (timing of damage)
  - Nature of event affects reporting and development
- **Data access**
  - System extract times
  - Reporting times
  - Uploading to daily model
- **Relying on the data**
  - Weekend development, Working day vs. 7 days development
  - Categorisation issues (more categories => noisier data)
  - History / changes in claims' practices

Delay (Days)		Lodged Claims	Reported Incurred
0	Tue 1 June	66	$ 43,177
1	Wed 2 June	241	$ 319,179
2	Thu 3 June	78	$ 163,483
3	Fri 4 June	33	$ 80,646
4	Sat 5 June	4	$ 0
5	Sun 6 June	1	$ 0
6	Mon 7 June	9	$ 1,633
7	Tue 8 June	18	$ 152,634
8	Wed 9 June	12	$ 20,472
9	Thu 10 June	6	$ 60,285
10	Fri 11 June	10	$ 327,480
11	Sat 12 June	2	$ 2,000
12	Sun 13 June	3	$ 5,198
366	Cumulative	578	$ 4,564,375

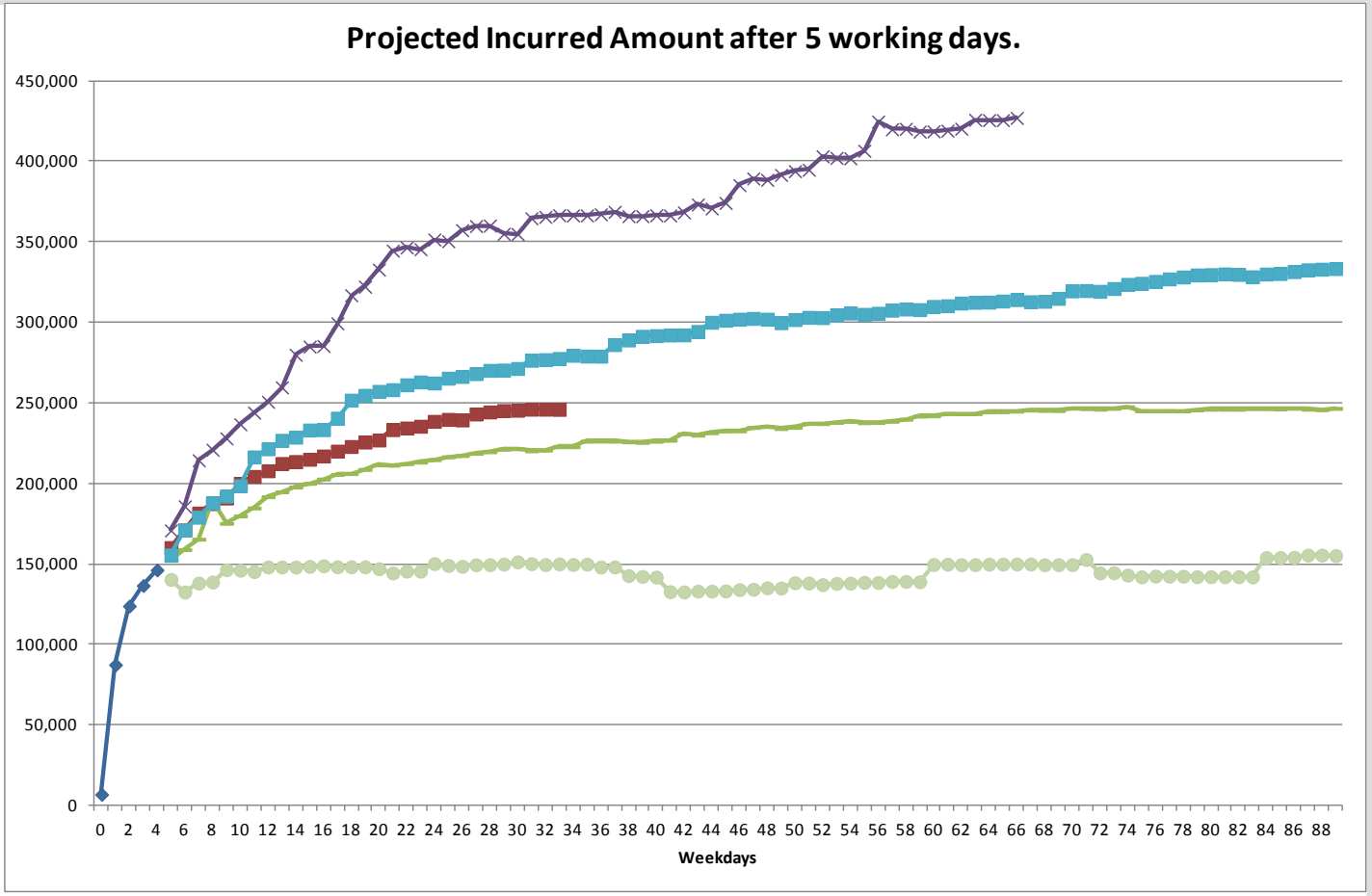
Estimation
Deterministic Methods:



IAG
Insurance Australia Group

Estimation
Deterministic Methods: Path Based

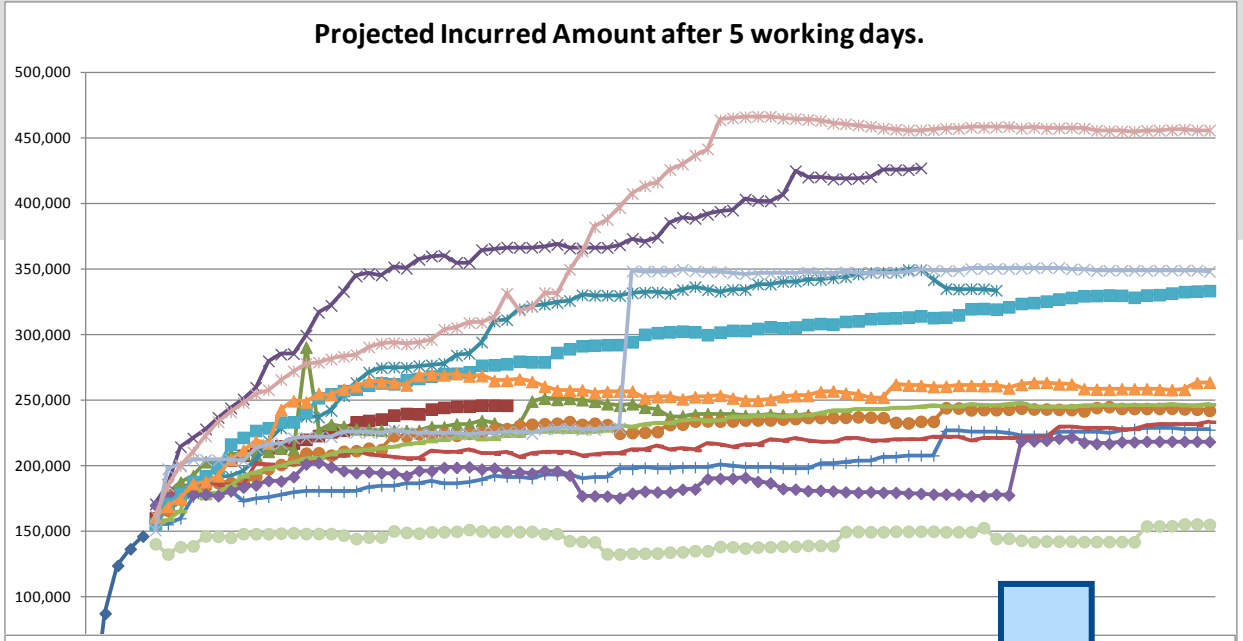
- **Path based**
  - 10 working day vs. 20 working day projection
  - Recent events (no filters)
- **Model**
  - Extrapolation issues
  - Need for categorisation evident
  - Population data develops over time

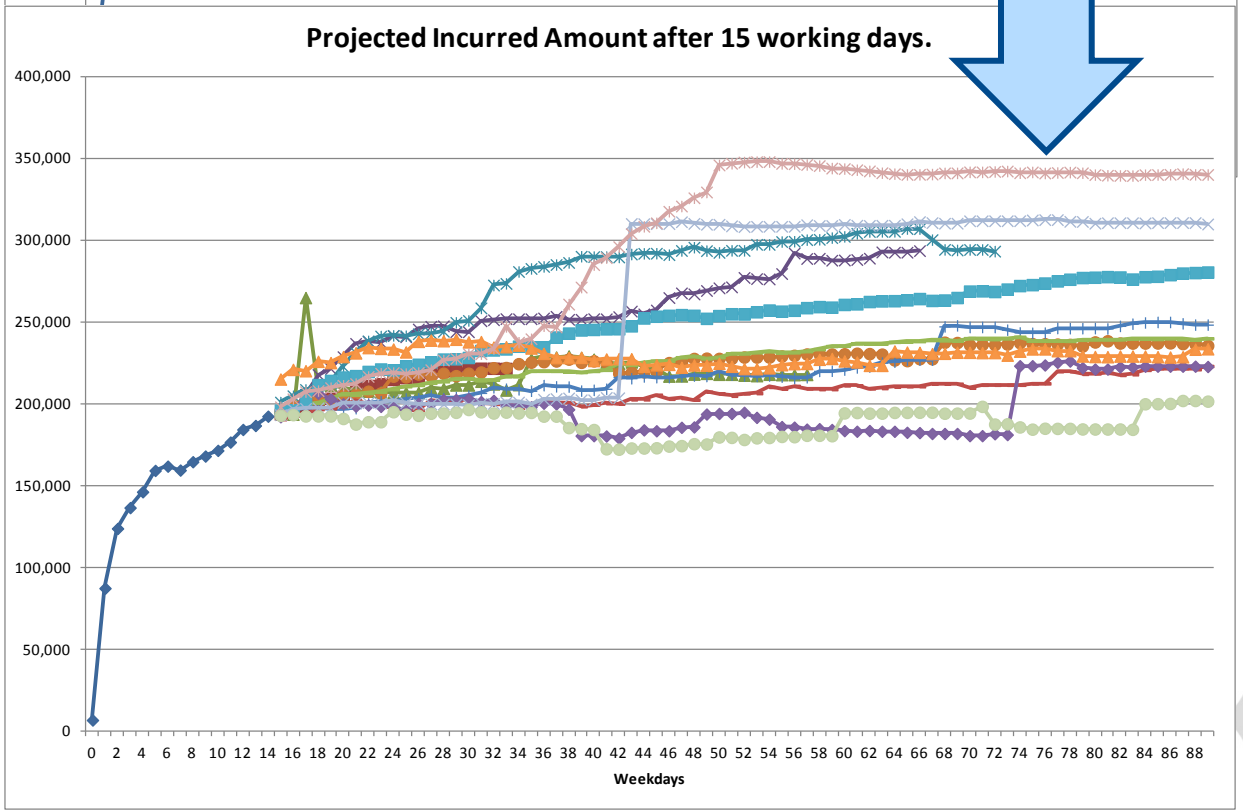


IAG
Insurance Australia Group

Estimation
Path Based

- **Results**
  - Communicates uncertainty
  - Event Uncertainty reduces over time
  - Helps with event selection for parameters





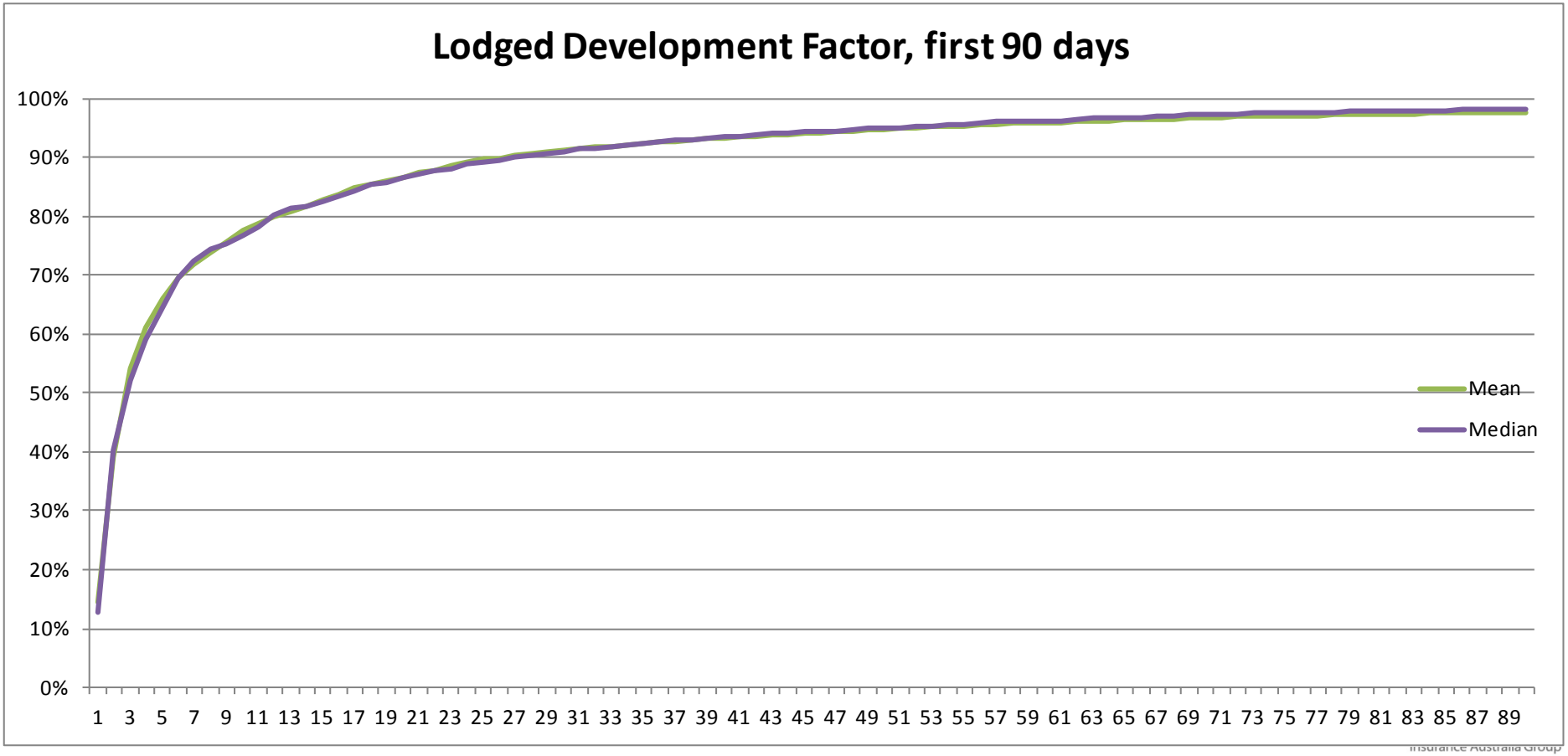
Estimation

Deterministic Methods: Average Cost / Claim development

Ultimate = Reported average costs * VF1 * Lodged Claims * VF2

IBNR model (VF2)

- **Claims lodged development less variable, develops faster (intuitively true)**

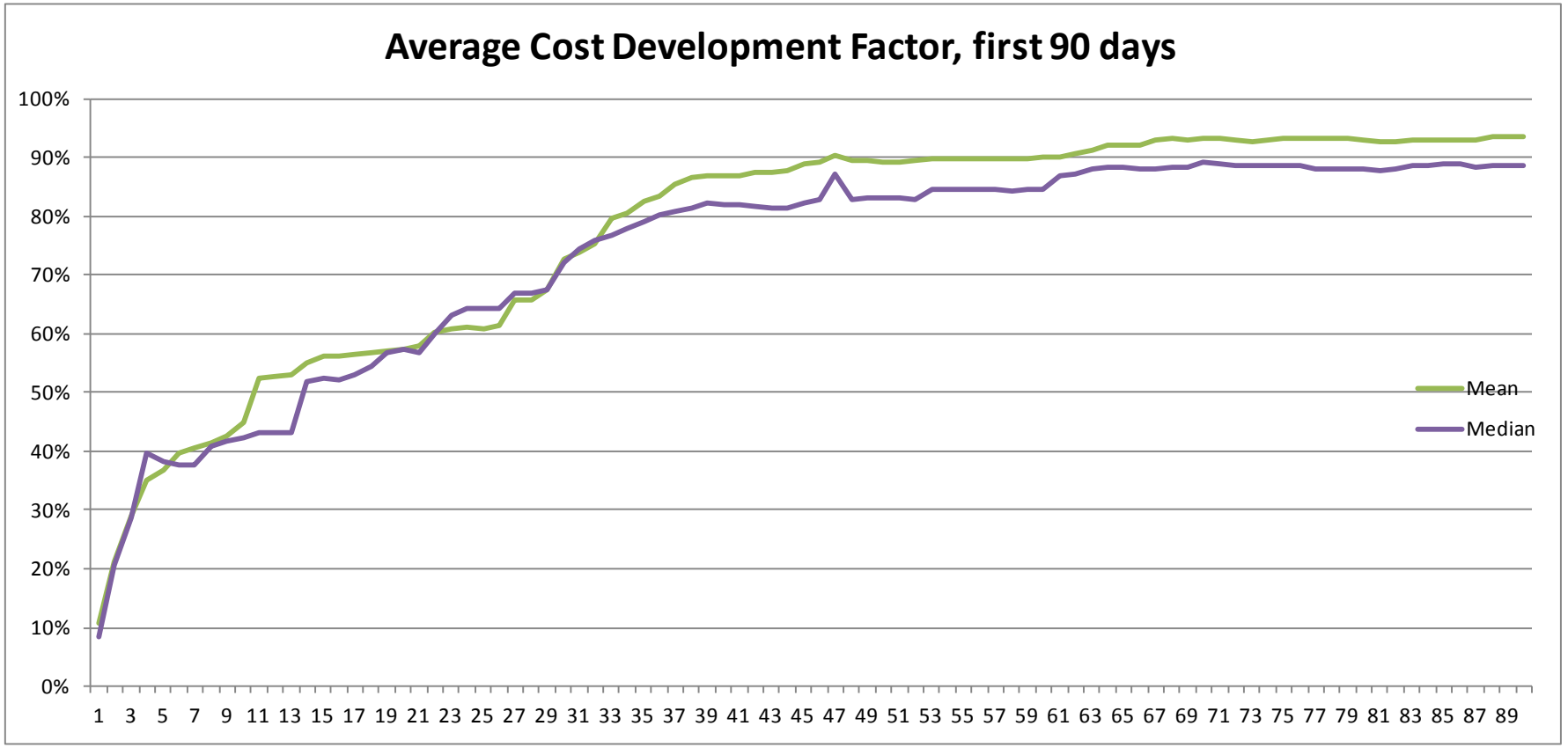


Estimation

Deterministic Methods: Average Cost / Claim development

IBNER* model (VF1)

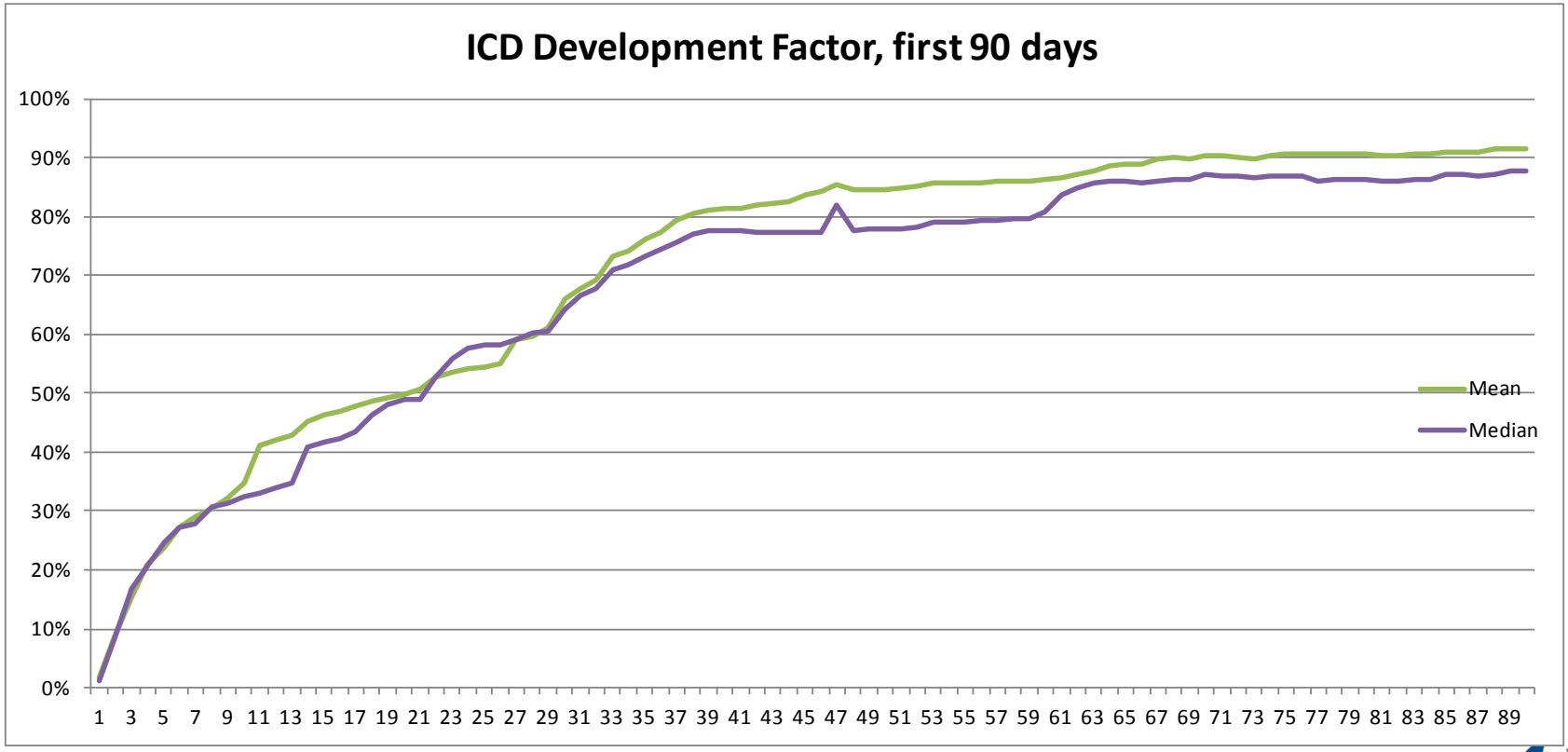
- **Average Cost slower, highly variable in dataset between selected events**



IAG
Insurance Australia Group

Estimation
Deterministic Methods: Incurred Claim Development

- **ICD Model**
  - For this particular dataset more stable parameter development for the dataset used by employing an ICD model
- **Ultimate = Reported Incurred Claims costs * Cumulative ICD factor**



IAG
Insurance Australia Group

Estimation: Data analysis: Categorisation

- **Product / Risk Class of Business**
  - Residential / Commercial
  - Home / Contents / Motor / Material Damage etc
- **Event Categories**
  - Floods / Storms / Other
  - Earthquakes / Landslips
- **Event Size**
  - (Too) small
  - Medium – Large
  - Catastrophic

- **Tables in Appendix that cover categories and NZ experience in more detail**

Estimation
The 90 day Ultimate Estimate model

1. **Event, valuation date specific; categorisation of Peril type**
2. **Reported claims data**
3. **Early Warning System on fit**

Under 90 Day Ultimate Claim Cost Valuation Model

201412 North Island - Storm - 8 to 13 Jul 2014

Reported Claims 30/07/2014

Delay 18.0 days

4 5 7

Jul-14	Claim Numbers reported	Average Cost per Claim	Reported Incurred Cost		Average ACPC	Z Score for this Event	Comment
Commercial	321	$ 6,550	$ 2,102,508	17	$ 6,893	0.14	
Personal	1258	$ 3,383	$ 4,256,134	17	$ 1,613	2.02	Extreme value
Total	1579	$ 4,027	$ 6,358,642				

Estimation
The 90 day Ultimate Estimate model

4. **Projected reported incurred for the next month end**
5. **Range of results,**
6. **Point estimate**

$ 9,831,210 Expected Reported Incurred Next Valuation

Ultimate Cost Model ($M's)

	Extreme Low	Low (+2 days)	Central	High (-2 days)	Extreme High	Ultimate Claim Numbers		
Commercial	2.3	3.0	3.1	3.1	4.8	437	$	7,032
Personal	4.4	8.7	8.8	9.8	21.9	1467	$	6,022
Total	6.7	11.7	11.9	12.9	26.7	1904	$	6,254
			1.872	$ 5,547,584				

Model utilises incurred values
Named ranges in pvt sheets assume that there are only 90 rows of valuation data being used
Parameters selected based on uesr selection of various events

Communication

- **Simple – Easy – Credible method**
  - Simple model
  - Easy to communicate
  - Credible explanations of development
- **Reporting Package**
  - Reported Ultimate and Ranges
  - Under / At / Over retention indication
  - Prior storms similar and worst case

Email: (seven days after June 2014 Storm)

As you know from early estimates of past storms there is lots of potential for variation.

At this stage this event appears to be under retention …

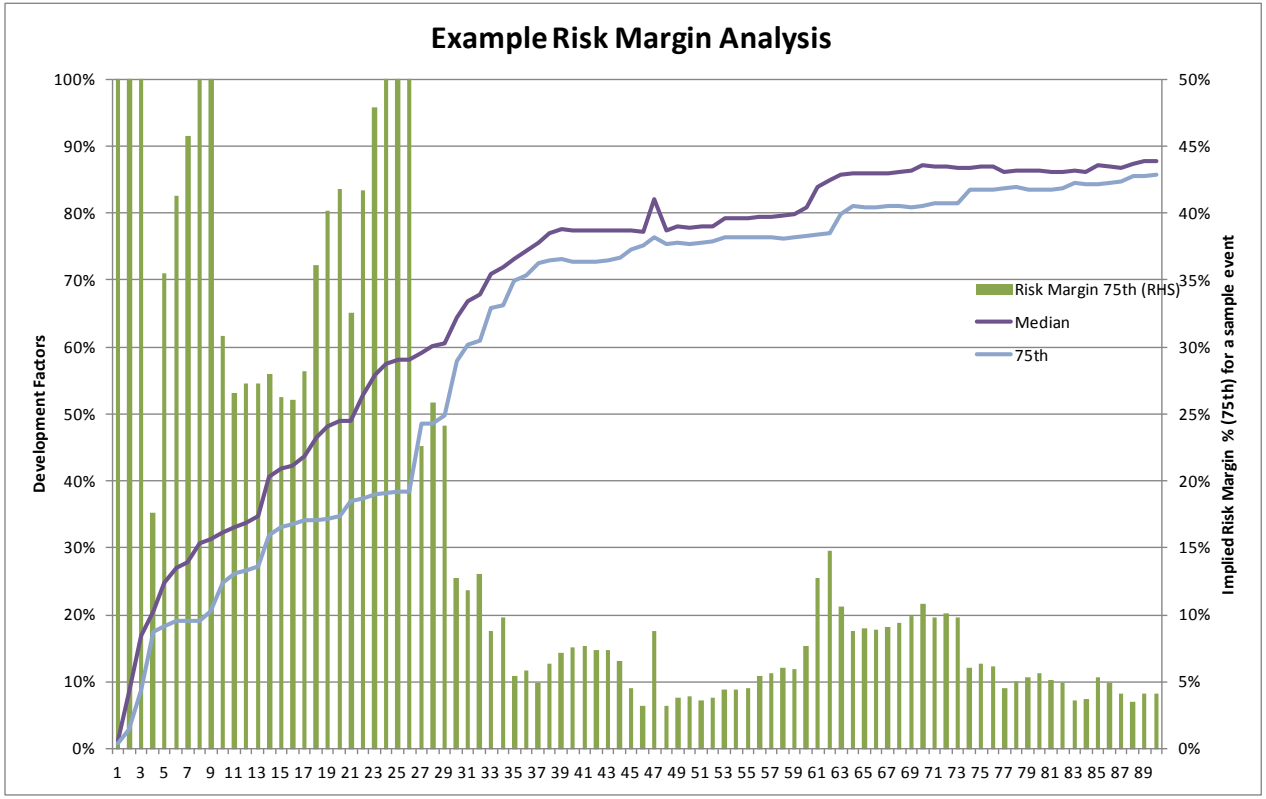
Central estimates of the ultimate are as follows, and will change as claims develop

16/06/2014	Median Ultimate	Range	Range
Category x	8.4	5.5	18.0
Category y	11.2	7.6	22.4

These estimates require almost tripling the reported incurred, so are highly uncertain, as illustrated by the range shown.

Further Analysis

- **Refinement**
  - Greater differentiation
    - Working / Large claims
    - Cost centre / channels
    - Products / Classes
  - Event categorisation
    - Floods vs. Rain Storms vs. Snow Storms
- **Valuation Process**
  - Ultimate estimation on month end listing of events,
  - Data feed for an event based Natural Disasters model differentiation
  - Curve fitting of distributions
- **Risk Margin implications**
  - Within event
  - Within a book



IAG
Insurance Australia Group

Pitfalls and Fishhooks

- **Data**
  - Recent natural perils in NZ
  - Idiosyncratic to insurer and nation
  - Typically a lack of data for larger and/or rarer events
- **Event noise**
  - Large claims / Z score
  - Categories, labels
  - Nationwide storm (variable damage, loss type & timing)
- **Perils with using other entities' development curves**
  - Idiosyncratic findings
  - Case study on bootstrapping

Wrap up

- Various “models” to estimate storm damage
- Information limited, Forecasts often wrong
- No perfect model
- Communication of variability as important as the model
- Development factors shown not suitable for other Companies

IAG
Insurance Australia Group

APPENDIX

Estimation: Data analysis: Categorisation of Natural Peril type

Category			Commentary / Observations
Flood Storm Other	Flood	Flash flood	Rainstorm driven inundations, waters recede very quickly
		Standing Flood	Usually Rainstorm driven and involves floodgate control affecting flood level. Waters recede slowly causing additional damage and slow development
	Storm	Rainstorm	Wind (Gales) & Water (Heavy Rain) damage. Flash floods and landslips part of event
		Snowstorm	Wind & Snow damage. Subsequent big freezes can lead to gutter/roof damage (i.e. escalation of average cost)
	Other	Volcanoes, wind only events	Little or no data available on events of a material size
EQC	Earthquake	Single event Dual event. Multi event	Domestic develops slower than FSO 90 day EQC deadline creates hiccup in Domestic reported claims development Slow development in average cost
	Landslip	Rainstorm or water main fault; involves drainage system issues	Domestic develops slower than FSO Can involve past land use decisions (e.g. local deforestation, poor zoning)

Estimation: Data analysis: Categorisation by Event Size

Category	Small	Medium	Large	Catastrophic
Reported Claim Development	Rapid		Slow	Very Slow
Average Costs	Tend to be low and less spread	A few large claims can distort averages		Multiple large / very large claims can Skew ultimate costs
Average Costs Development	Rapid		Slow	Very Slow
BAU claims handling	No impact	Little impact	Can slow down processing	Disruptive
Event Frequency, implications	Plenty of events and data			Few if any for the rarer events

Estimation: Data analysis:
Categorisation of recent NZ Natural Perils by type and size

Category	Small	Medium	Large	Catastrophic
Flash flood	x	x		
Standing Flood			x	x
Rainstorm	x	x	x	x
Snowstorm	x	x	x	x
Volcanoes	x			?
Wind only events	x			
Single earthquake	x	x		
Dual earthquake		x		
Multi earthquake	x	x	x	x
Landslip	x			

Estimation
The 90 day Ultimate Estimate model

1. **Event, valuation date specific; categorisation of Peril type**
2. **Reported claims data**
3. **Early Warning System on fit**
4. **Range of results, including point estimate**

Under 90 Day Ultimate Claim Cost Valuation Model

201412 North Island - Storm - 8 to 13 Jul 2014

Reported Claims 30/07/2014

Delay 18.0 days

4 5 7

Jul-14	Claim Numbers reported	Average Cost per Claim	Reported Incurred Cost		Average ACPC	Z Score for this Event	Comment
Commercial	321	$ 6,550	$ 2,102,508	17	$ 6,893	0.14	
Personal	1258	$ 3,383	$ 4,256,134	17	$ 1,613	2.02	Extreme value
Total	1579	$ 4,027	$ 6,358,642				
			$ 9,831,210	*Expected Reported Incurred Next Valuation*			

Ultimate Cost Model ($M's)

	Extreme Low	Low (+2 days)	Central	High (-2 days)	Extreme High	Ultimate Claim Numbers	
Commercial	2.3	3.0	3.1	3.1	4.8	437	$ 7,032
Personal	4.4	8.7	8.8	9.8	21.9	1467	$ 6,022
Total	6.7	11.7	11.9	12.9	26.7	1904	$ 6,254
			1.872	$ 5,547,584			

Model utilises incurred values
Named ranges in pvt sheets assume that there are only 90 rows of valuation data being used
Parameters selected based on uesr selection of various events