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Making the most of your granular claims data

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What were we trying to achieve?

- What is the distribution of outcomes of large open claims?
- More robust, better understood reserves
- Insights into claims development
- Capital modelling
- Reinsurance optimisation

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Why is it difficult?

- Large claims data is sparse
- But significant proportion of total reserves
- Development patterns different from smaller claims
- Reserving practices change over time

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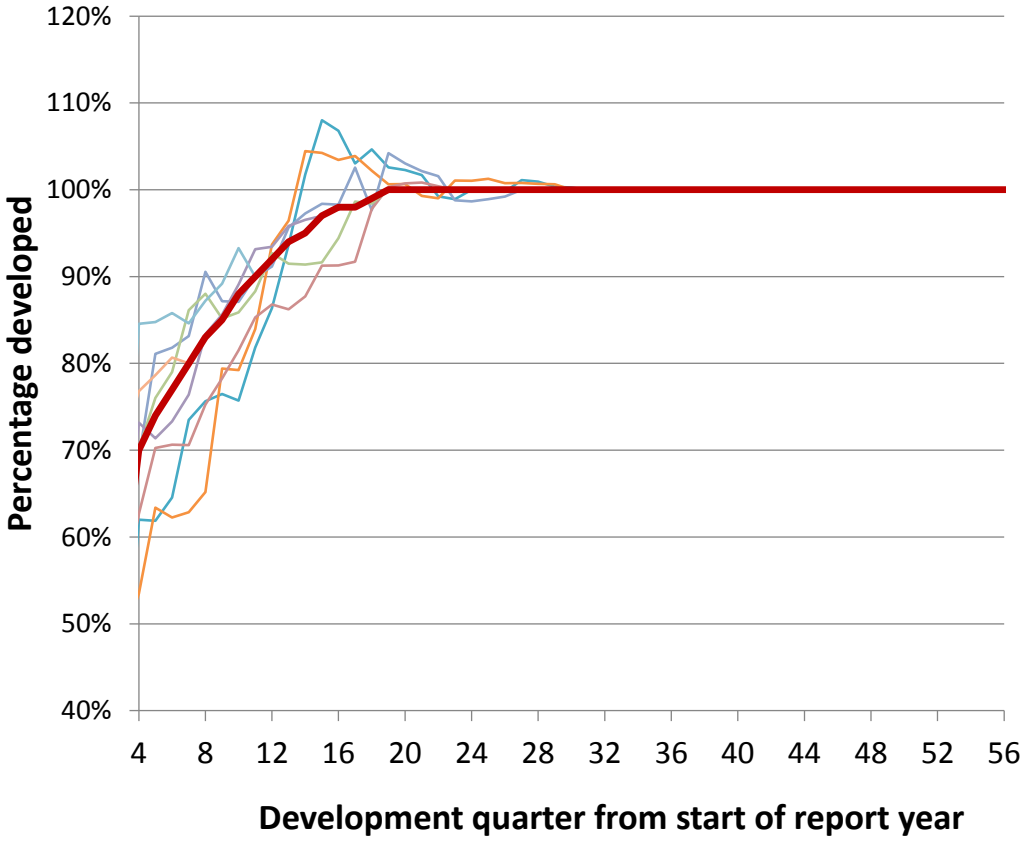
Current approach

- Development triangles
- Graphical / Chain ladder
- Not enough data if just use large losses
- No indication of volatility



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Murphy McLennan model

	Yr 1	Yr 2	Yr 3	Yr 4…
A	400 Open	800 Closed	800 Closed	?
B	500 Open	1,500 Open	750 Closed	
C	1,000 Open	1,000 Open	1,500 Closed	
D	200 Open	500 Open	250 Closed	
			750 Closed	
E	300 Open	150 Closed	150 Closed	
F	150 Open	300 Closed	300 Closed	
		450 Open	225 Closed	
			675 Closed	
		150 Open	75 Closed	
			225 Closed	
		375 Open	188 Closed	
			563 Closed	
		75 Closed	75 Closed	

Key assumptions?

Assumption of Murphy McLennan model
Each development period is independent of the next
Development does not depend on claim size
Claim closure is linked to the final period of development

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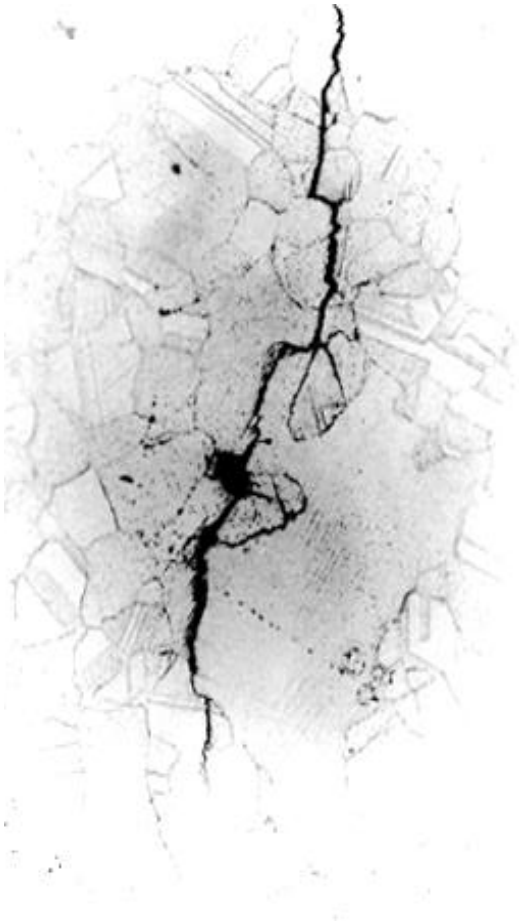
Our approach

- Throw data at a data scientist
  - Long-tail injury data
  - Various data sets with different characteristics
- Aerospace background
  - Similar to development of fatigue cracks on aircraft wings
- No baggage on prior expectations
  - Feed in “expert” knowledge at each iteration



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What did the data show?

Assumption of Murphy McLennan model	Data findings
Each development period is independent of the next	Claims behaviour has a variety of structural dependence
Development does not depend on claim size	Large claims have lower and less volatile development factors
Claim closure is linked to the final period of development	There is a longer closing phase where claims behave differently

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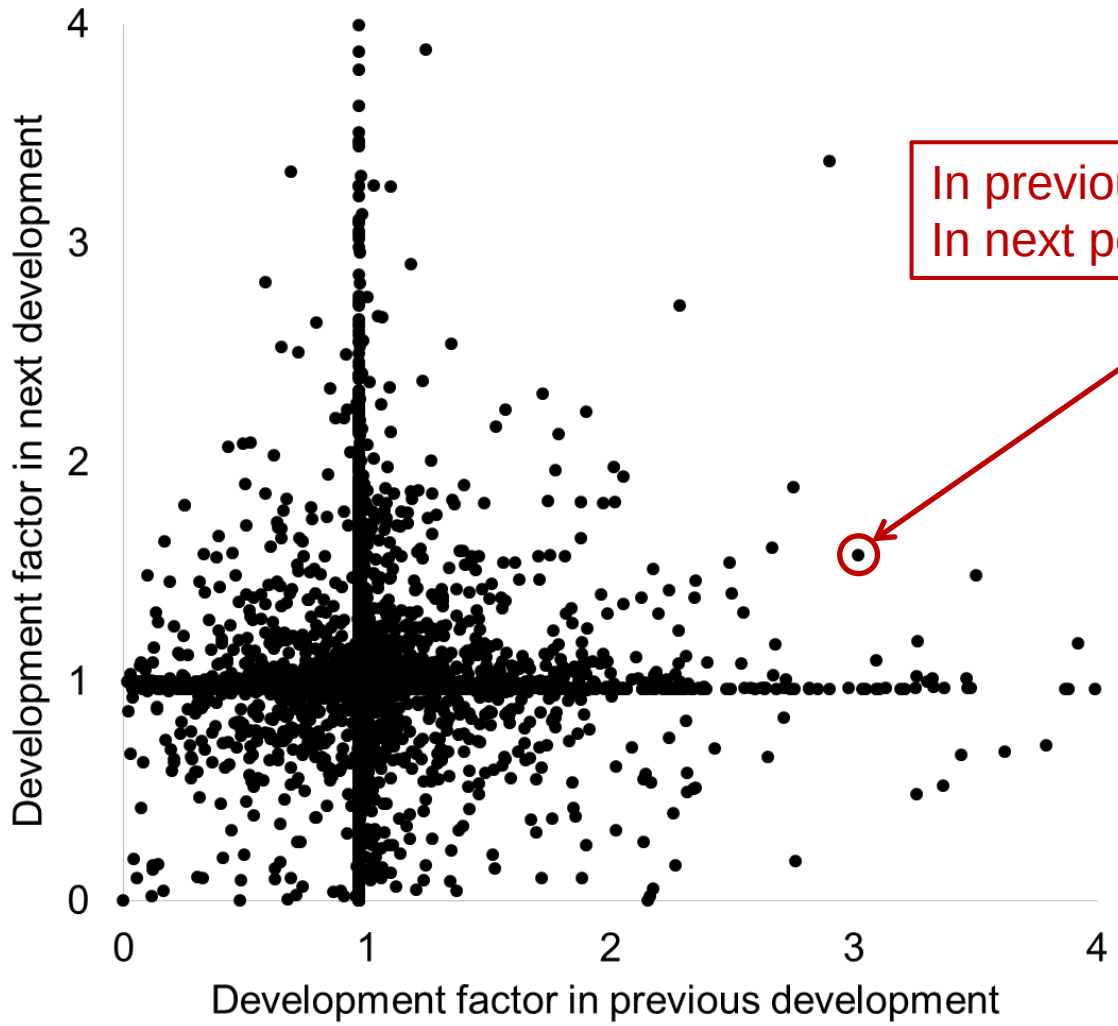
Reserve movements



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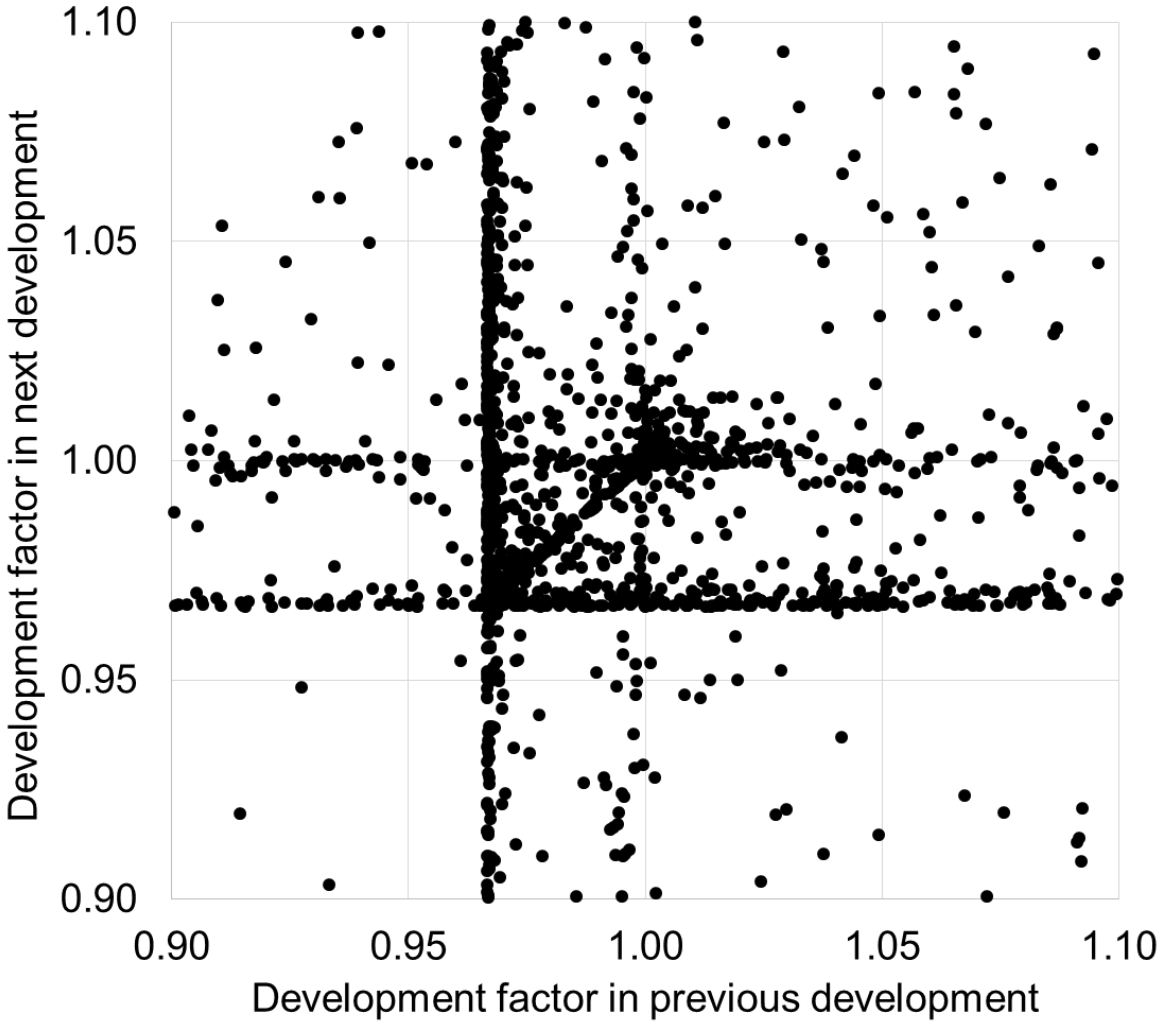
Reserve movements – zoomed



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Inflation allowance

Aggregated triangles

- All comes out in the wash
- Aggregated average inflation
- Project forward implicit past inflations
- Or adjust past data explicitly

Individual claims data

- Incurred estimate “sticky”
- Paid amounts need to be put on consistent money terms
- More research needed

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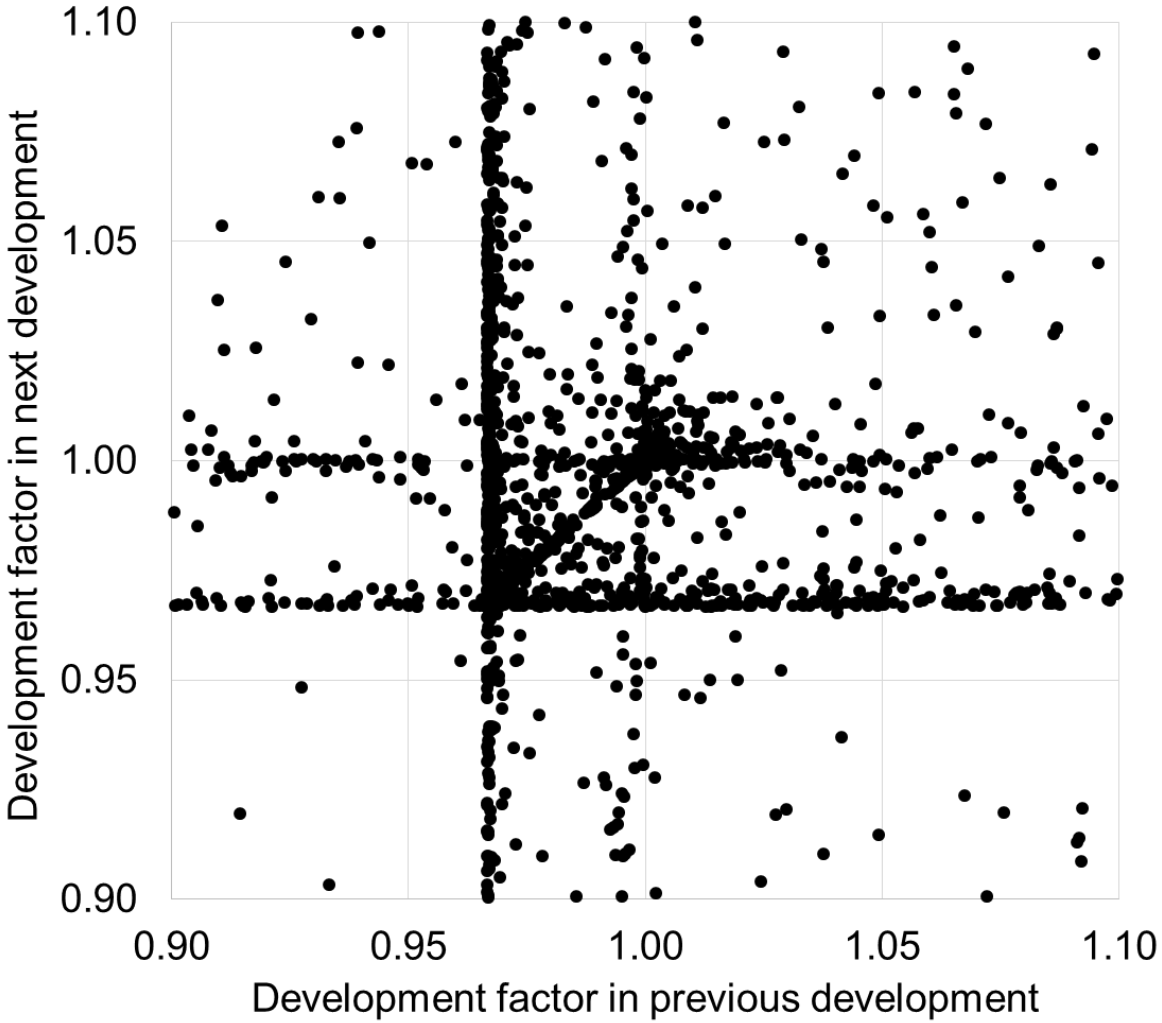
Reserve movements – zoomed



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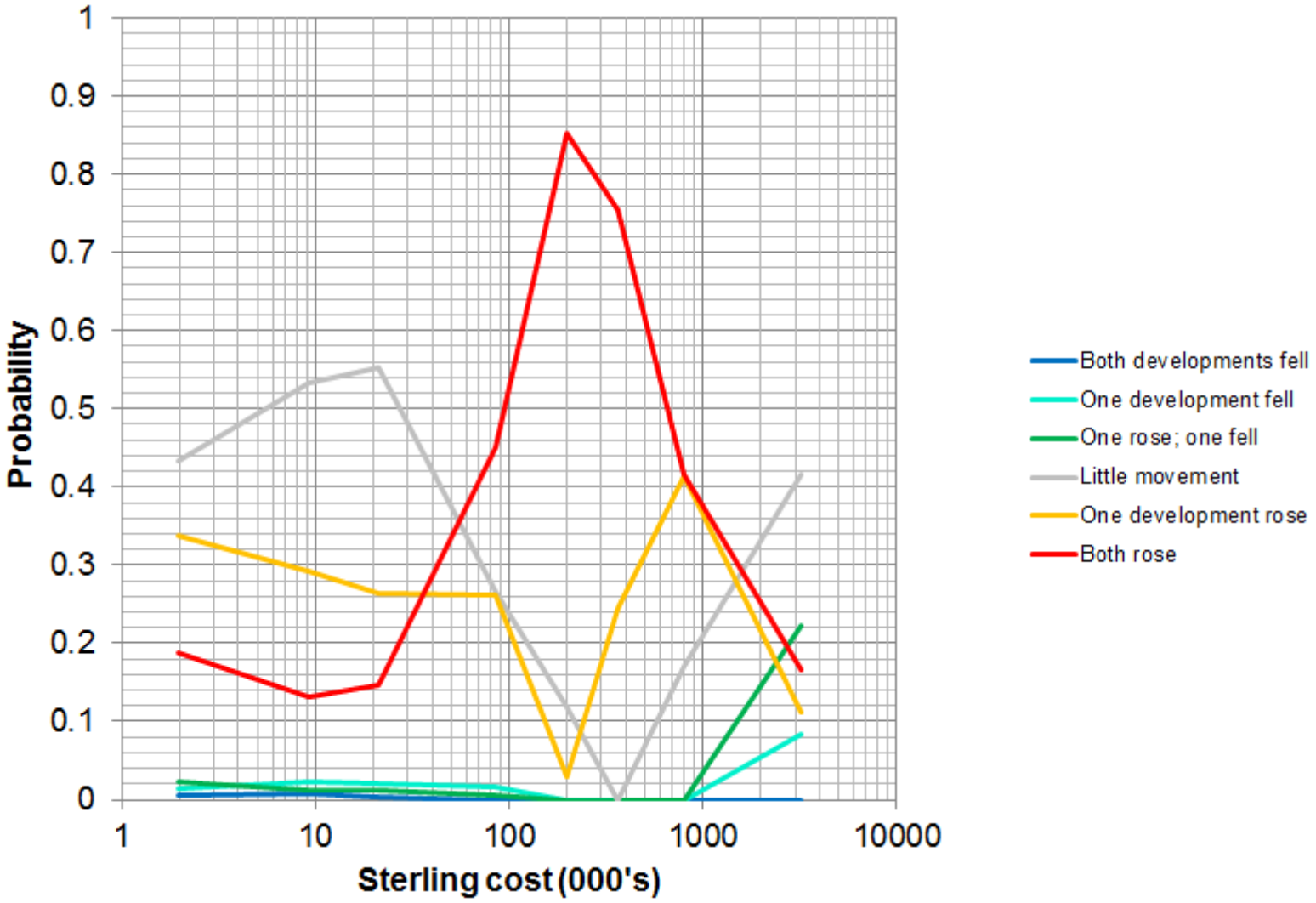
Translating movements to parameters

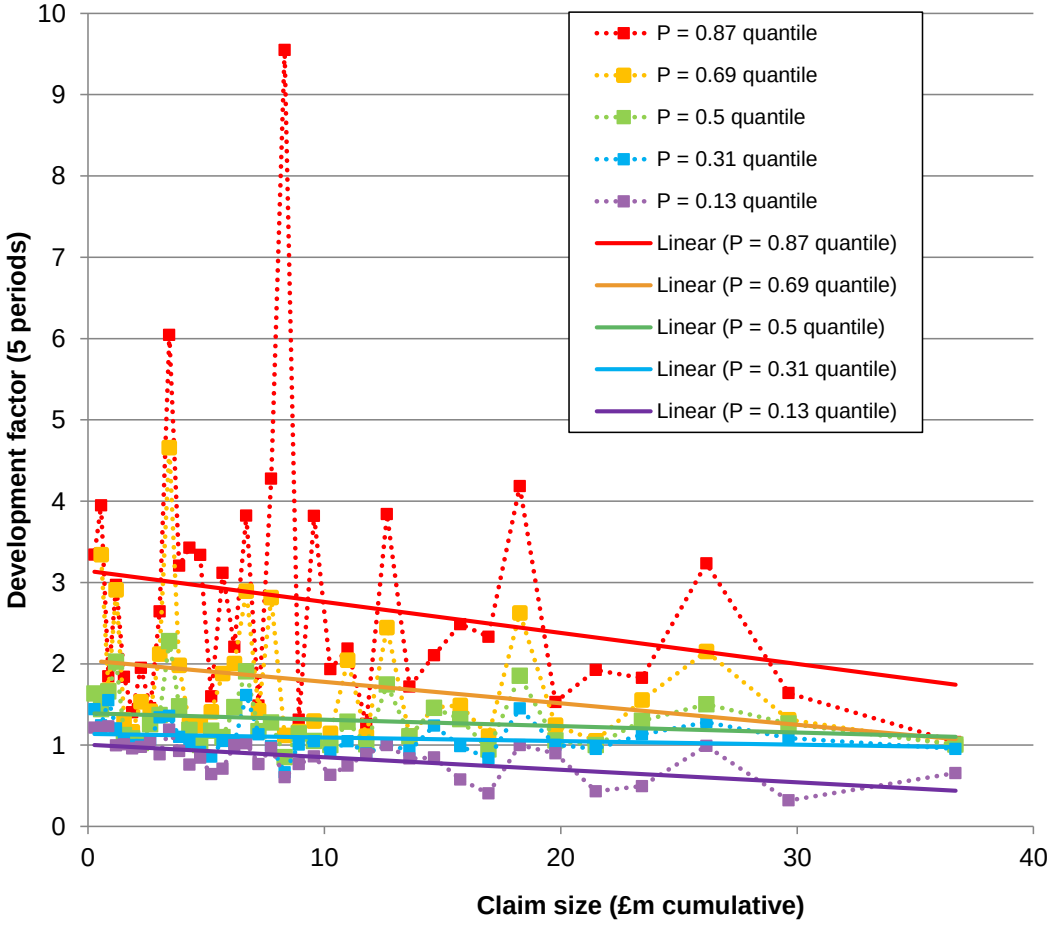
Transition matrix

Status transition probability		This development				
		<-3%	<-2%	<-0.01%	<0.01%	>0.01%
Previous development	<-3%	0.20	0.36	0.14	0.08	0.23
	<-2%	0.18	0.57	0.04	0.00	0.21
	<-0.01%	0.13	0.17	0.33	0.08	0.29
	<0.01%	0.02	0.06	0.08	0.68	0.16
	>0.01%	0.17	0.33	0.10	0.06	0.34

Diagnostic output



Movements depend on size of claim



Insight

- Claims developments are both smaller on average, and less volatile for larger claims

Model

- Allows for the shift in development factors due to claim size by adjusting the sampled development path.

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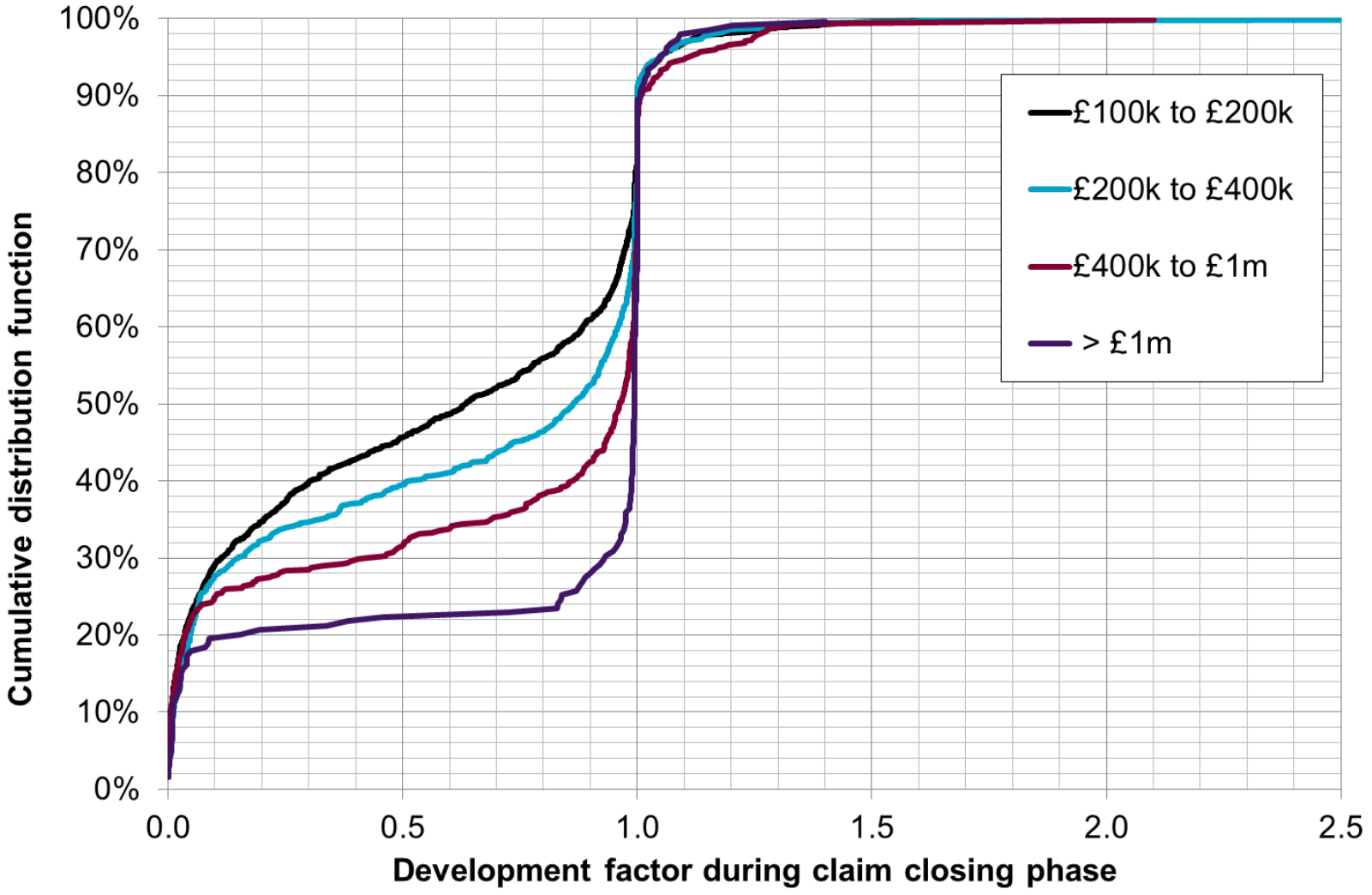
Closing phase



What did we do differently?

Assumption of Murphy McLennan model	Data findings	Model feature
Each development period is independent of the next	Claims behaviour has a variety of structural dependence	Use remainder of the development path
Development does not depend on claim size	Large claims have lower and less volatile development factors	Adjust development path based on claim size
Claim closure is linked to the final period of development	There is a longer closing phase where claims behave differently	Modelled closure separately

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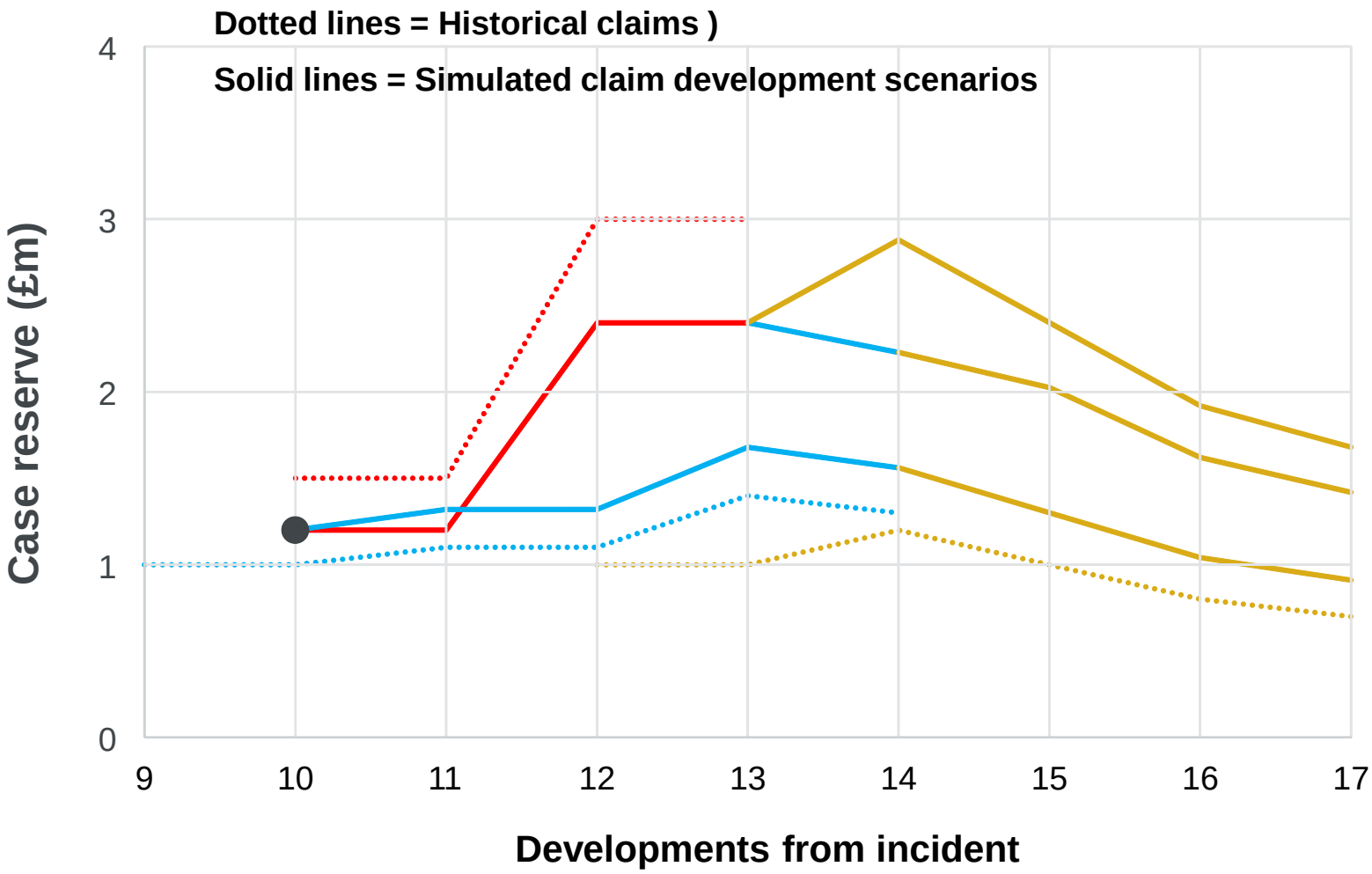
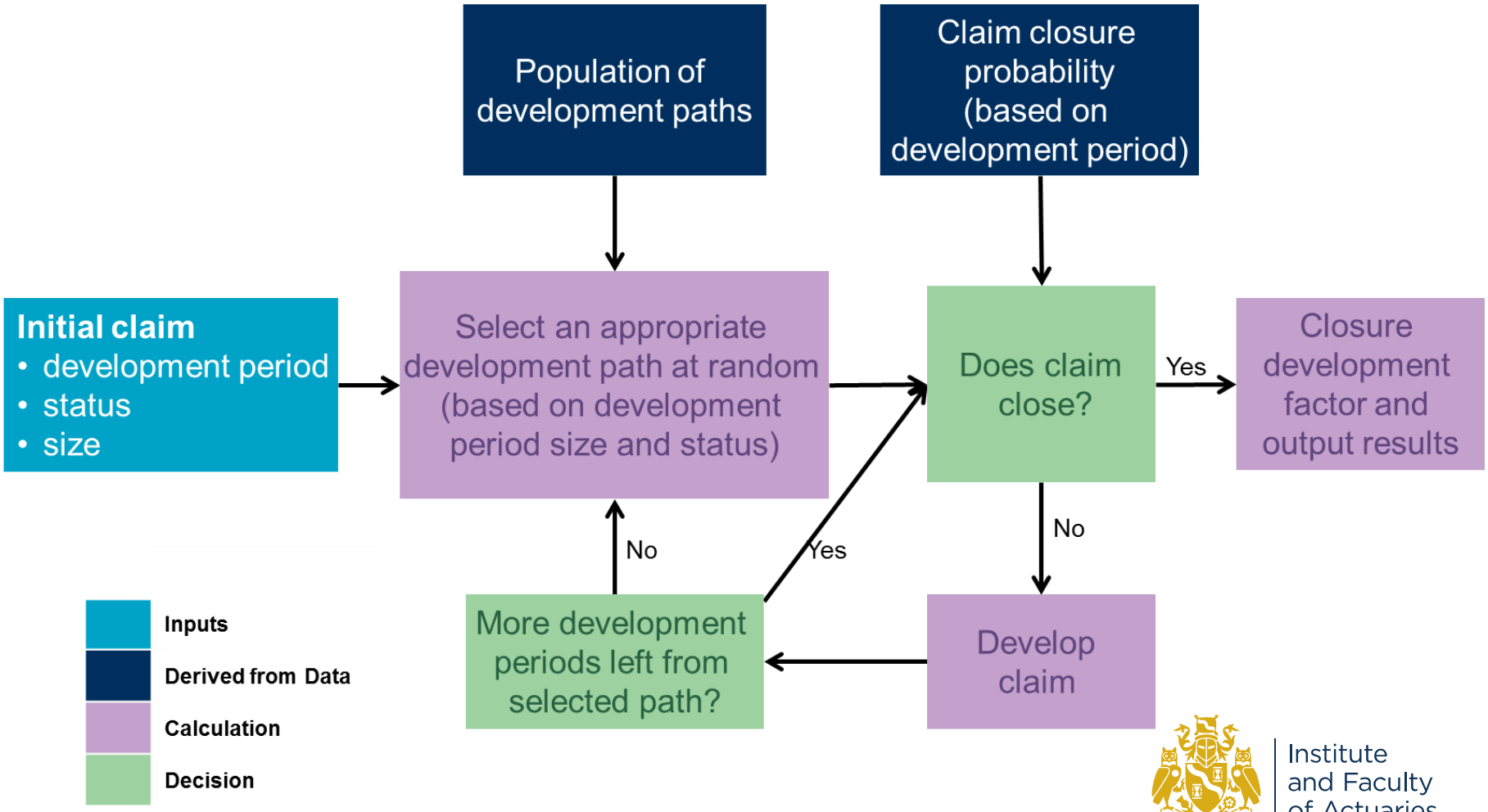
Legs


Dotted lines = Historical claims)
Solid lines = Simulated claim development scenarios
Case reserve (£m)
0
1
2
3
4
9
10
11
12
13
14
15
16
17
Developments from incident

Overview of model



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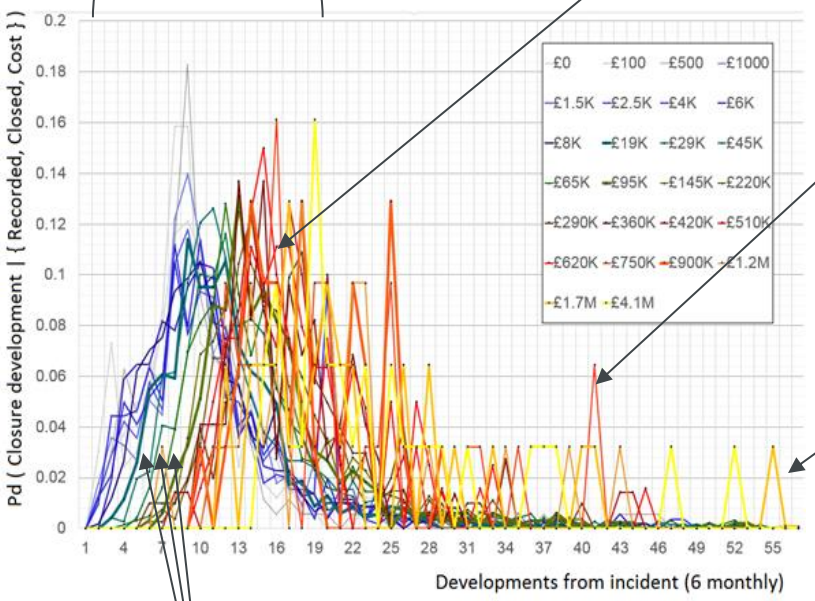
Complex problem

How representative is the sample?

How to lower noise floor without distorting?

Spikes represent what?

What rate at higher developments?



Bayes badly behaved in tail region?

How to increase information using adjacent data?

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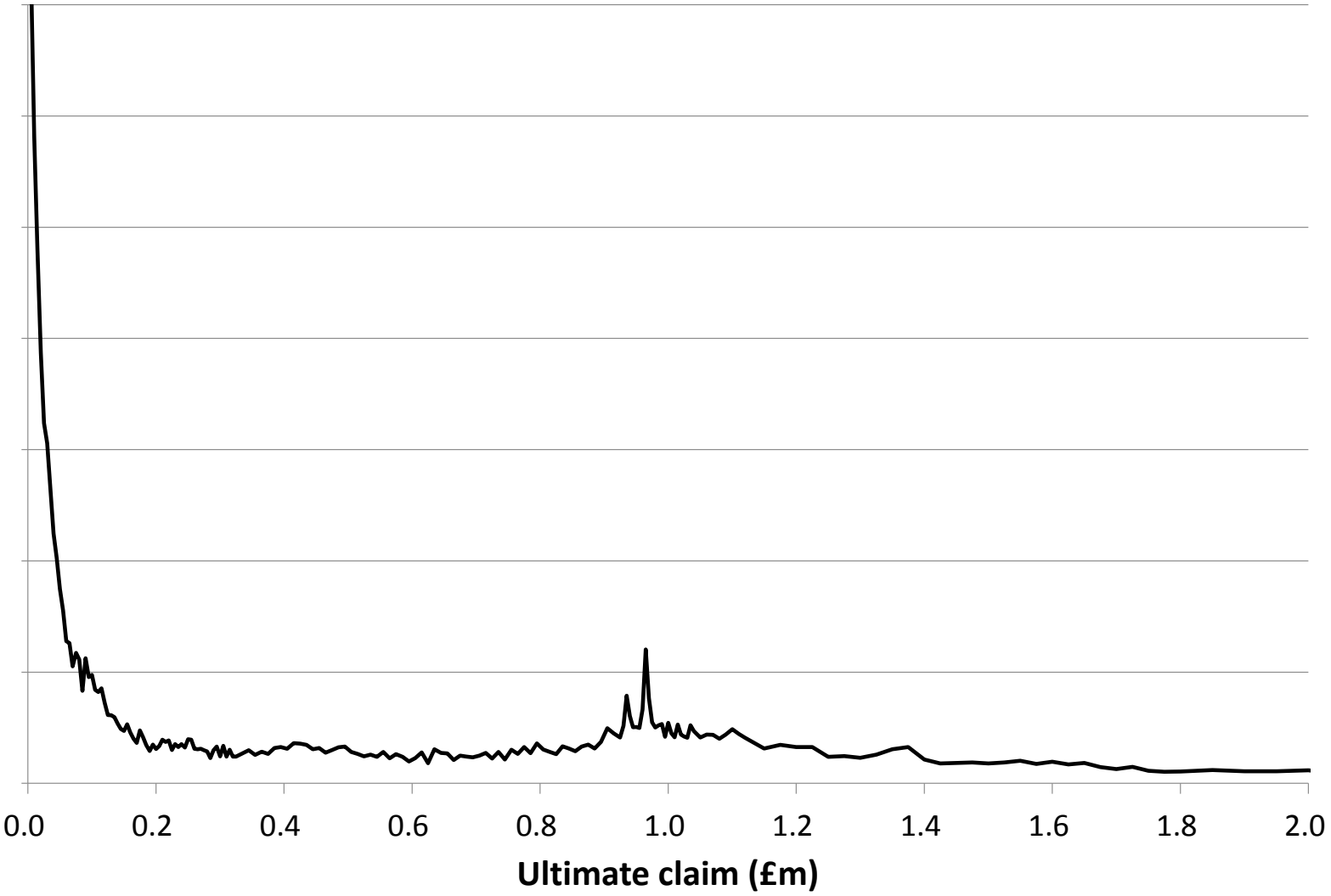
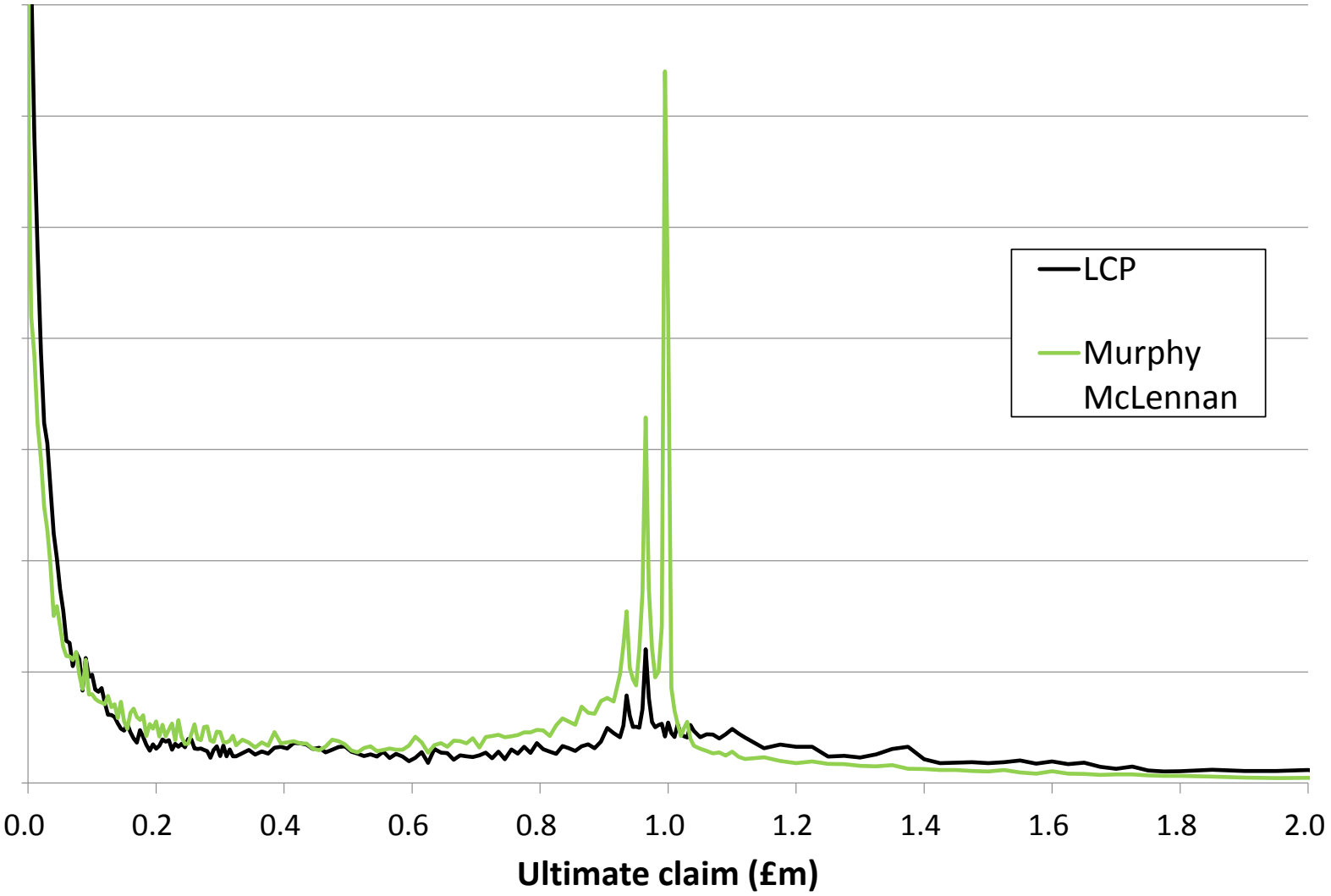
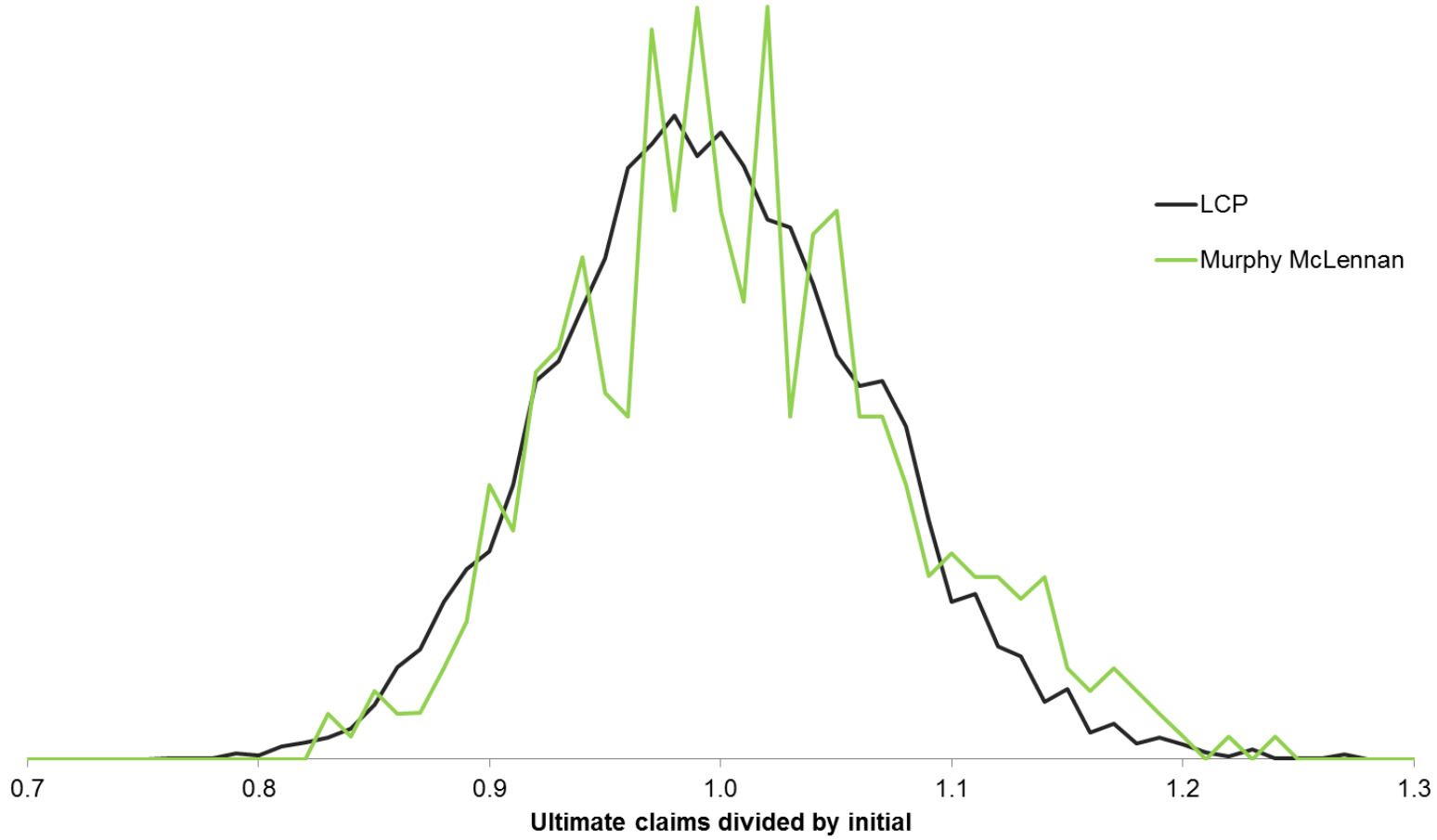
Single £1m claim – distribution of modelled outcomes



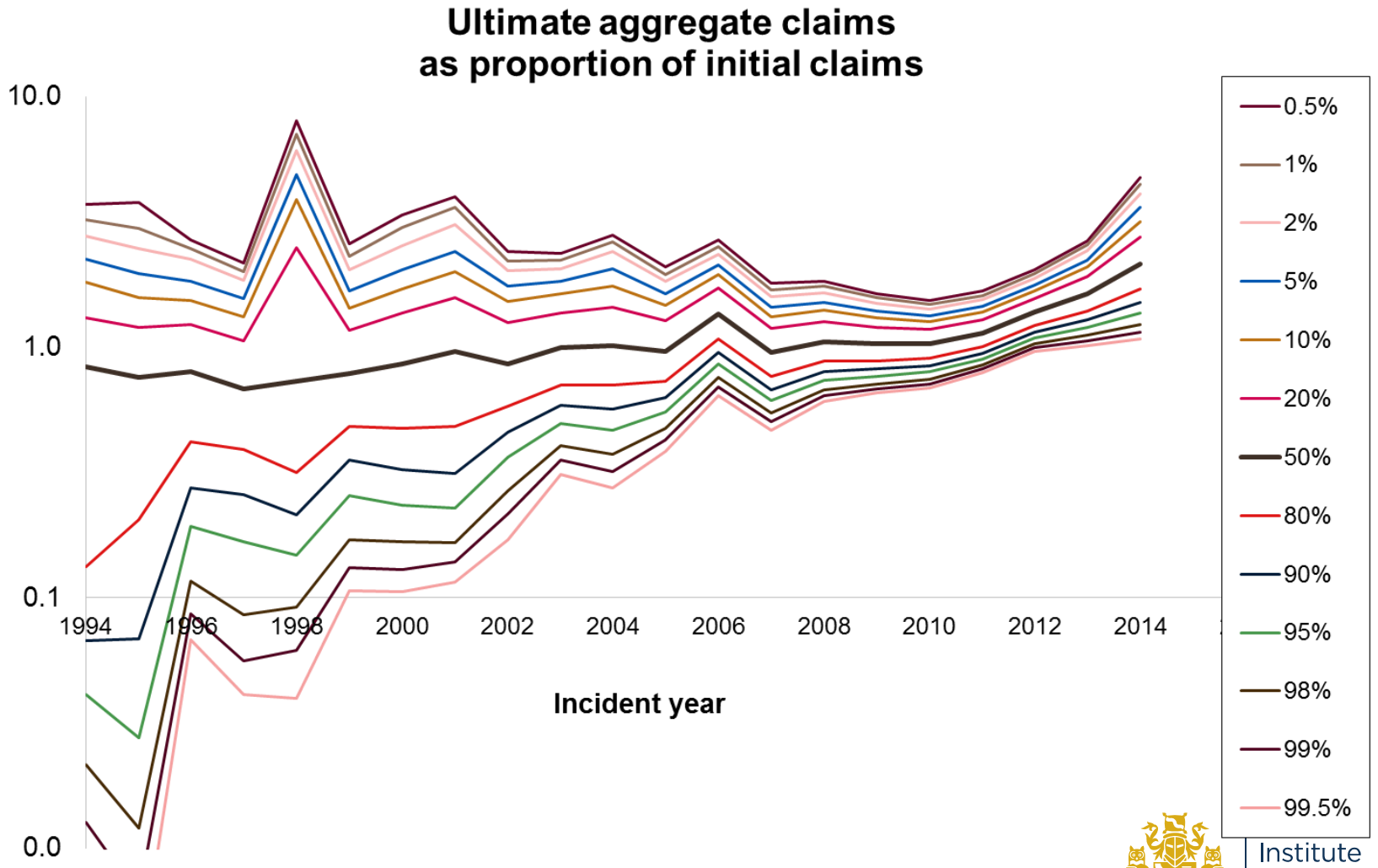
Single £1m claim – distribution of modelled outcomes



Portfolio of claims – distribution of modelled outcomes



What did it tell us?



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What else have we learned?

- Stochastic development models are tricky
  - Small data effects can distort results
  - Many intricate sampling correction techniques needed
  - Add “sensible” limits on outcomes
- Data scientists are great
  - But need to inject a heavy dose of reality
  - Don’t know your data until someone pulls it apart
- Inflation is tricky

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What next?

Improvements to model / data capture

- Simplify model back down to core components
- Project paids / outstandings separately
- Calendar year effects

Business uses

- Large loss capital modelling including one-year recognition
- Reinsurance optimisation
- Early warning indicators to changes in claims practices

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Questions

Comments

Expressions of individual views by members of the Institute and Faculty of Actuaries and its staff are encouraged.

The views expressed in this presentation are those of the presenter.

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