Granular Reserving

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Agenda

- Introduction

- The benefits

- The counter view

- How can these be mitigated

- Discuss…

Introduction

- Use all data available to train models that give expected claims for each claim and each policy.

- AKA

  – Individual claim loss reserving

  – Claim by claim reserving

  – Formulaic case estimation

  – Policy by policy reserving

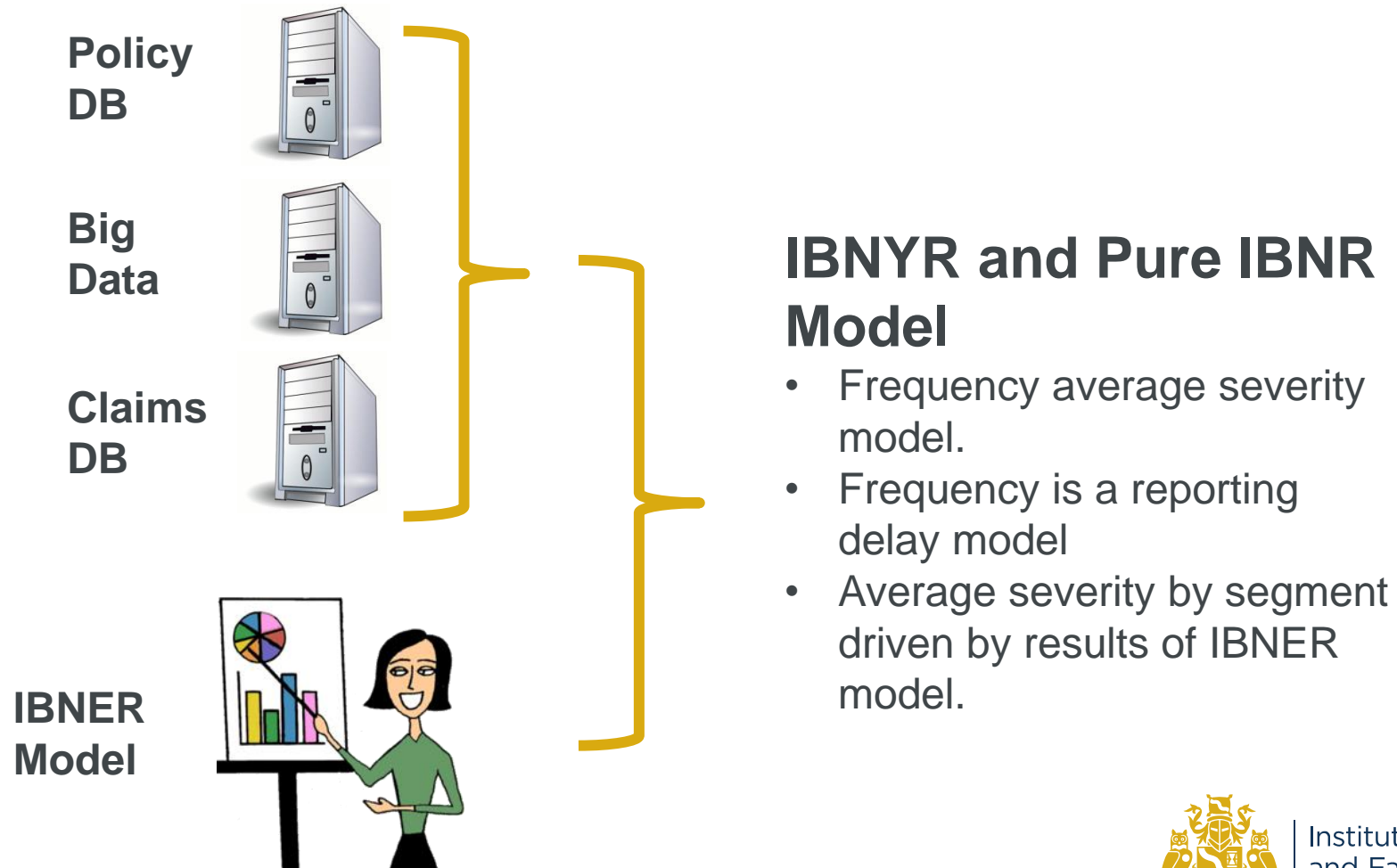# Introduction

Policy DB

Big Data

Claims DB

IBNER Model

- Response is claim movements as at time=t
- Possible rating factors are all information as at time < t

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Introduction

Policy DB

Big Data

Claims DB

IBNER Model

IBNYR and Pure IBNR Model

- Frequency average severity model.
- Frequency is a reporting delay model
- Average severity by segment driven by results of IBNER model.

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Introduction

Example Models

Traditional

- The Linear Model: $\mathbf{Y} \sim N(X\boldsymbol{\beta}, \sigma^2)$

- The GLM: $\mathbf{Y} \sim F(\boldsymbol{\mu}=h(X\boldsymbol{\beta}), \text{Var} = \sigma^2 \text{diag}(v(\mu_i)))$

Non Traditional

- Machine Learning

- Artificial Intelligence

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The benefits

Impact on Reserving

Better Reserving

– Reduction in bias

– Material reduction in standard errors

– Change understanding of business

- Identifying Trends

- Identifying Emerging Issues

- Portfolio mix changes automatically addressed

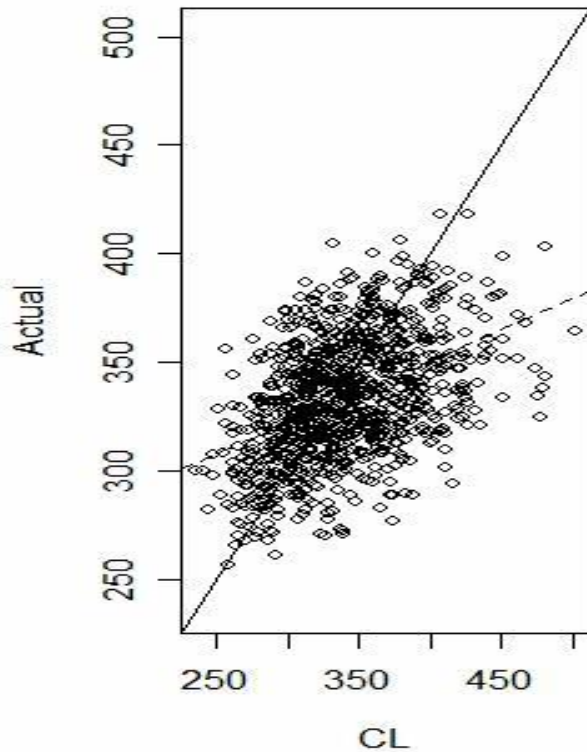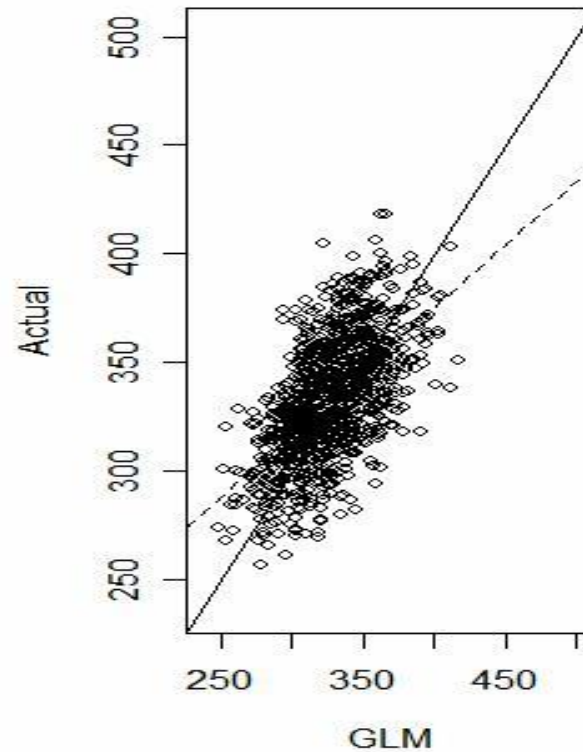- Earlier warning of differences in profitability of different segments

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Impact on Reserving

Reduction in volatility

Impact on Pricing

Importance of Pricing Model

– Clearly having a better view of the "true" technical price of any policy can significantly impact the profitability of an organisation. In competitive markets, being better able to rate than your competitors results in a gearing where you attract better risks and apparently small changes in price can result in much larger increases in profitability.

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Impact on Pricing

Severity modelling

– This approach naturally allows for a statistically valid allocation of IBNER to each claim. As a result more recent data can be used, without losing the potentially significant effects of the rating factors.

Trends

– Through being able to use more recent data, recent trends in the effect of different rating factors can be more readily identified and allowed for in the parameters of the resultant pricing model.
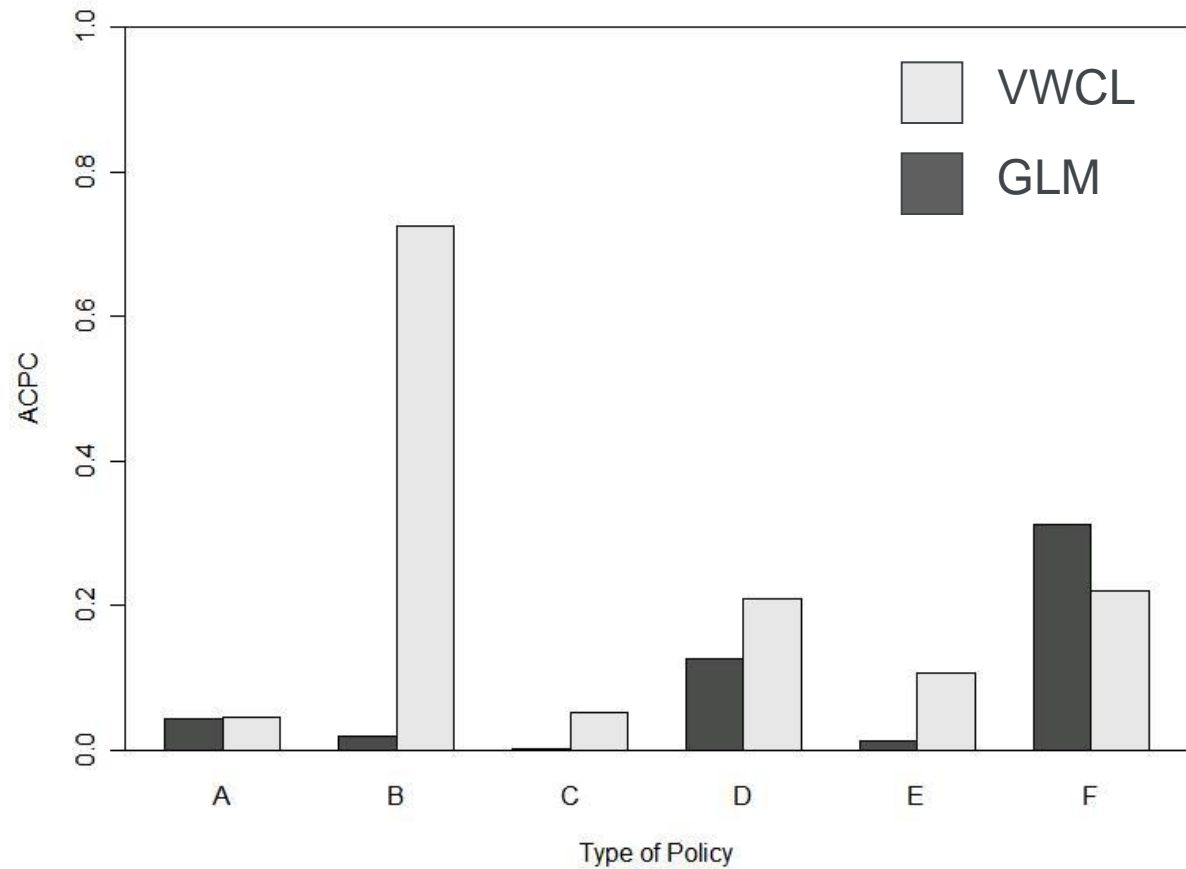
Emerging Issues

– Being able to use more recent data can give an earlier warning and a resultant earlier quantification of the effect of emerging issues.

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Impact on Pricing

Example:

Average cost per claim by policy type where the claims reserves is calculated by the VWCL and GLM.

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The counter view

Background

Timeline

- 2002, 2004, 2006 – Taylor et al granular reserving papers
- 2007 – Simon's granular reserving CAS and GIRO presentations
- 2008 – Simon's granular reserving GIRO presentation
- 2009 – Simon's granular reserving GIRO presentation
- 2011 – I took over a LM reserving project using granular reserving
- 2012 – I changed methodology to standard techniques for that project
- 2013 – GIRO granular reserving plenary
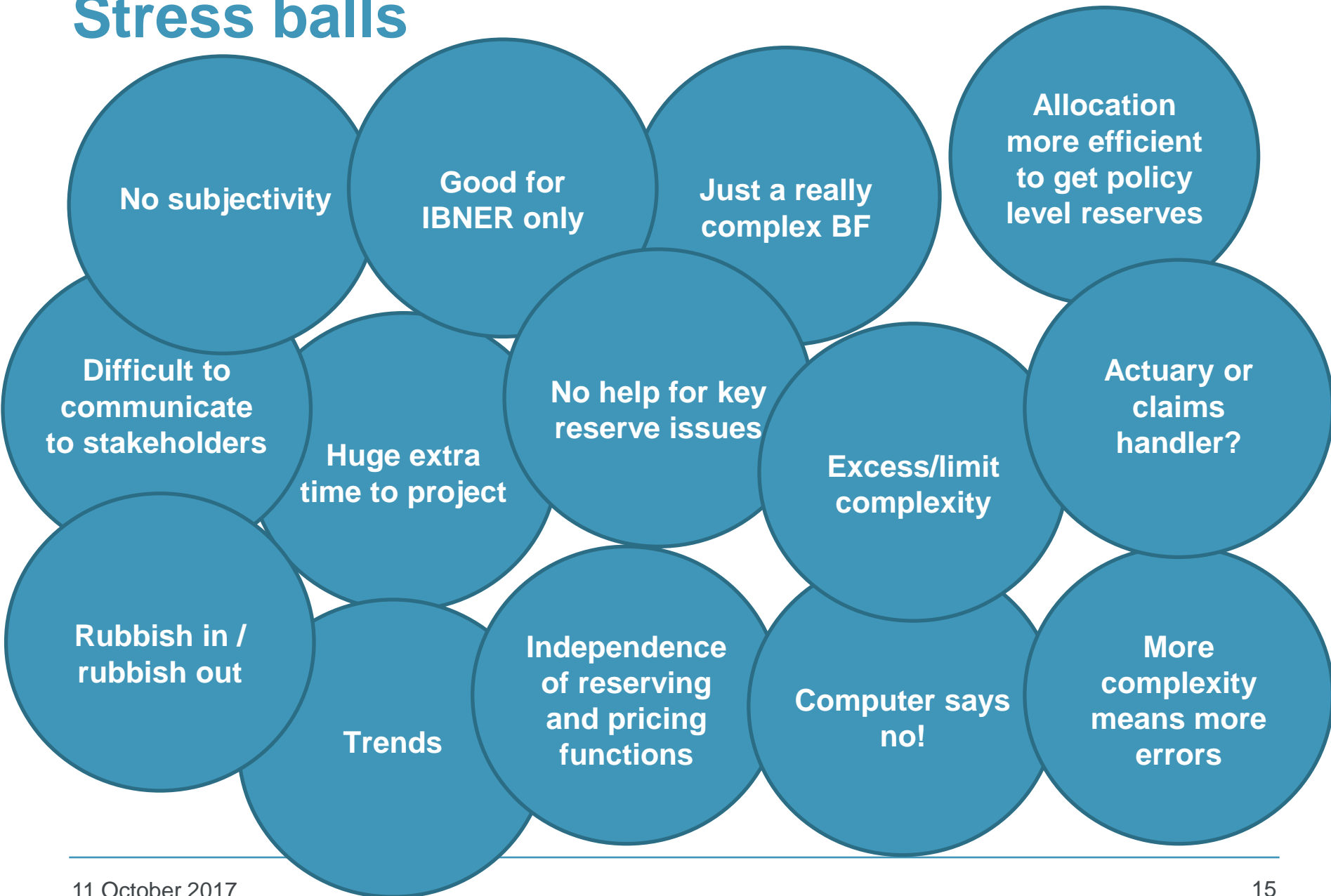- 2017 – mooted GIRO granular reserving WP

Computing power exponentially improving

Insurer internal and external data improving

Big data – big opportunity!

Stress balls

No subjectivity

Good for IBNER only

Just a really complex BF

Allocation more efficient to get policy level reserves

Difficult to communicate to stakeholders

Huge extra time to project

No help for key reserve issues

Excess/limit complexity

Actuary or claims handler?

Rubbish in / rubbish out

Trends

Independence of reserving and pricing functions

Computer says no!

More complexity means more errors

Really stressful balls

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What granular reserving could look like

Just a really complex BF

Information known about policy X

- Driver
- Location
- Past claims history

Big data on policy X

- Traffic density in locality
- Friends on Facebook…
- Credit rating

Emerging data since underwriting

- Claim count and cost
- Other policy claim count and cost
- Trends in other policies

Clever maths

End product for policy X

- Closed: 0, Reported: 0, Ultimate count: 0.1
- Paid: 0, Incurred: 0, Ultimate cost: £50

The clever maths

Just a really complex BF

Financial data for policy X
- Closed: 0, Reported: 0
- Paid: 0, Incurred: 0

Reopened claims module
- Closed: 0
- Expected reopened: 0
- Expected ultimate: 0

IBNER claims module
- Open: 0
- Closed: 0, Reported: 0
- Paid: 0, Incurred: 0

IBNYR claims module
- Expected IBNYR count: 0.1
- Expected average cost: 500
- Expected IBNYR: 50

End product for policy X
- Closed: 0, Reported: 0, Ultimate count: 0.1
- Paid: 0, Incurred: 0, Ultimate cost: £50

IBNR flows weighted to IBNYR

Just a really complex BF
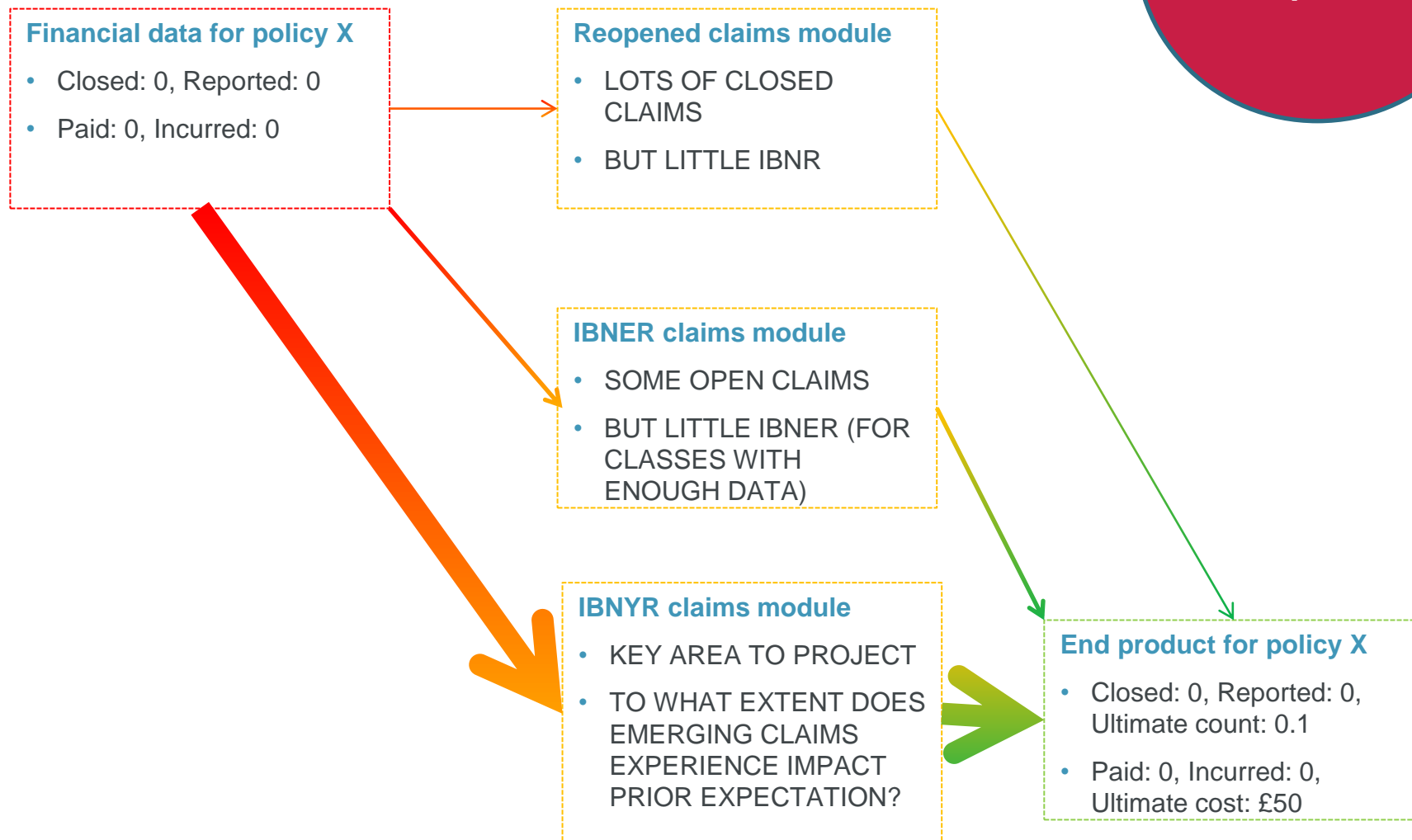
Financial data for policy X

- Closed: 0, Reported: 0
- Paid: 0, Incurred: 0

Reopened claims module

- LOTS OF CLOSED CLAIMS
- BUT LITTLE IBNR

IBNER claims module

- SOME OPEN CLAIMS
- BUT LITTLE IBNER (FOR CLASSES WITH ENOUGH DATA)

IBNYR claims module

- KEY AREA TO PROJECT
- TO WHAT EXTENT DOES EMERGING CLAIMS EXPERIENCE IMPACT PRIOR EXPECTATION?

End product for policy X

- Closed: 0, Reported: 0, Ultimate count: 0.1
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IBNYR module calculation

- Module seeks to adjust expected claims experience

- One option is to use reported time lag and simply reduce expected claims experience by this factor

- So expected future IBNYR = initial expected ultimate reported x (1-% expected reported)

- Bornhuetter Ferguson future IBNYR = initial expected ultimate reported x (1-% expected reported)

- So total projected IBNYR will not differ between complex and simple model.

  – Seeking to build most simple model that reflects reality

- Splitting into frequency and severity components can improve this method by allowing for different characteristics of later claims

IBNYR module and emerging claims experience

Just a really complex BF

- Cannot run the GLM model on latest data given deadlines

- So prior expectation of losses is in arrears for this module

- Does the emerging evidence in the IBNER module flow through into the IBNYR module?

  – If link then model becomes much more complex and time consuming

- Could use machine learning to fix time issue but danger that model becomes a black box

- BF slows down recognition of emerging trends

  – So benefit of more complex model for spotting trends will be lost

Policy level projection

Actuary or claims handler?

- This model will create an actuarial best estimate for each individual policy

- This leaves the actuary open to challenge in too many areas

- In my experience, stakeholders challenge where they perceive the actuary's ultimate claims assessment is too high

  – Challenging where the actuary is too low is less common

- It is much harder to defend a claim level projection than an aggregate projection

  – You simply don't have the detail which a claim handler does

- So results will be inherently biased or stakeholders will be dissatisfied

- Time taken to make all these manual adjustments

  – It felt like I had more adjusted ultimates than unadjusted!

Complex models don't build trust

- If senior management trusted Internal Models then we'd:
  - be buying far less reinsurance
  - be buying far more equities and
  - be expanding into uncorrelated classes of business

- If you can't explain what you mean in a few simple sentences then you can't build trust

- Granular reserving has to produce more accurate results to be worth the effort…

- …but do you think the following will happen?:
  - Stop writing class X as new method says it is less profitable than we thought
  - Increase/decrease total booked reserves by £millions
    - And get them signed off by the auditors
  - Change reserving team from actuaries to data scientists

No help for key reserve issues

- Ogden / PPOs / BI frequency trends by layer
  - Granular reserving is of no assistance here
  - But my windscreen projection will be spot on

Allocation more efficient to get policy level reserves

- Allocation to policy achieves all the benefits of granular reserving but is quicker and simpler, and you don't have to justify every individual claim projection

Independence of reserving and pricing functions

- If get pricing wrong then double whammy when prices and reserves change
  - Can allow for exposure changes by using pricing risk mix index as input to standard reserving
  - Governance issues when independence not respected

No subjectivity

- Reserving is an art not a science. Back of the envelope methods simple to explain and justify to stakeholders.

How these can be mitigated

11 October 2017

IBNYR module calculation

Just a really complex BF

- Results of IBNER model feeds into IBNYR model

- This along with model driven reporting delay model drives an appropriate segmentation (rather than the one we first thought of)

- We should note that a traditional BF makes an assumption that % expected reported = 1/(factor to ultimate)

- All things being equal this gives a biased estimator (understated) due to right skewed nature of claims distribution

- Ie GR Model will give different answers!

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IBNYR module and emerging claims experience

Just a really complex BF

- Model can be trained on older datasets and applied to current data so as to meet deadlines

- Link to IBNER model is key, but training can be on earlier dataset.
  - Ensures trends, etc identified at an early stage

- There are ways of visualising GLM, ML, AI, AA approaches

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Policy level projection

- This model will create an actuarial best estimate for each individual policy

- Actuaries should not be afraid of challenge
  - Strong challenge is already present at an aggregate level and this is often biased in nature

- It is reported large losses where challenge is most likely and where claims manager have most information. Indeed reserves on these losses are already likely to be driven by a deeper understanding of the issues on the claims.

- A granular approach actually gives you some defence against claims managers.

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Complex models don't build trust

Difficult to communicate to stakeholders

- Effort is required to enable senior management to understand these models.

- These models are genuinely more accurate
  - This helps generate trust in these models

- Actuaries should not be surrendering this area to data scientists
  - Many companies already have teams looking to add value
  - Data scientists are relatively cheap

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No help for key reserve issues

- GR is not magic – it just maximises value from the data
  - It cannot help predict Ogden rate, legislative changes, FCA rulings, cats, etc
  - But my windscreen projection will be spot on!!!

Allocation more efficient to get policy level reserves

- Allocation is usually very crude and is not based on models driven by identified rating factors

Independence of reserving and pricing functions

- The potential link to pricing is via IBNYR or unearned exposures. These are already linked to business plan which is already linked to pricing. Note IBNER projection may produce alternative expected loss cost results by policy. The IBNER projection in GR is independent of pricing.

No subjectivity

- There is no excuse for not using the data to its full potential. There are aspect of judgement that still need to be applied. Eg pricing models are not devoid of judgements

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Discussion

Proceed with caution?

Or full steam ahead?

We invite your views, comments and questions

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 presenters.

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