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Messaging and Framing Uncertainty – Findings from the MUQ Working Party

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26 September 2016

Agenda

- Introducing the framework
- Practical case study
- The reserve uncertainty framework
- Summary and questions

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Introducing the framework

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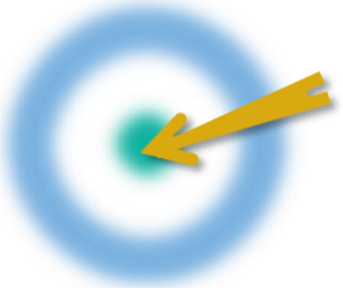
Percentiles – caveat emptor

- Ultimates are estimates, and some practitioners illustrate this point by adding percentiles to show the range
- **Percentiles also have to be estimated**



- Percentiles are often more uncertain than the point estimate and frequently have no mention of their own accuracy
- We recommend you to **think of the user** and **use qualitative methods** and not to rely solely on percentiles

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Australian connection

- Australian Appointed Actuaries have to consider the 75th percentile of the reserves and allowing for internal systemic risk was challenging

The Working Party generalised this starting point to create a framework across reserving risks

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Framework aims

- Promoting **development of best practice** in measuring and communicating reserve uncertainty; by

- Supporting the generation of wider risk considerations
  - Breaking the problem down and structuring the thought process

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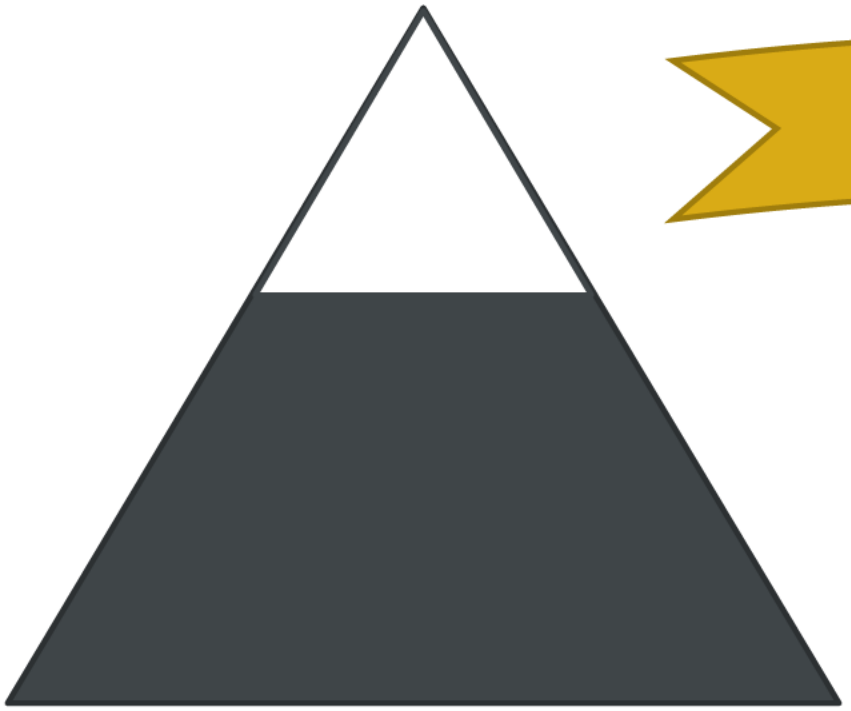
One framework, two levels

- A skilled actuary will undertake comprehensive analysis and then communicate the material elements



High level for user

Full basis for actuaries

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Framework uses

By the actuary

- **Base structure** for their own internal framework
  - Record of areas considered
  - Governance and validation
  - Consistency, with little change needed from year-to-year
- **Articulation tool**
  - For example, to support communication to stakeholders
- **Pooling knowledge** and developing best practice in the profession
- **Training tool**

By the user

- **Awareness** of areas of uncertainty
- Provides **inspiration** for users to ask their actuaries powerful questions

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Case Study

It's over to you…

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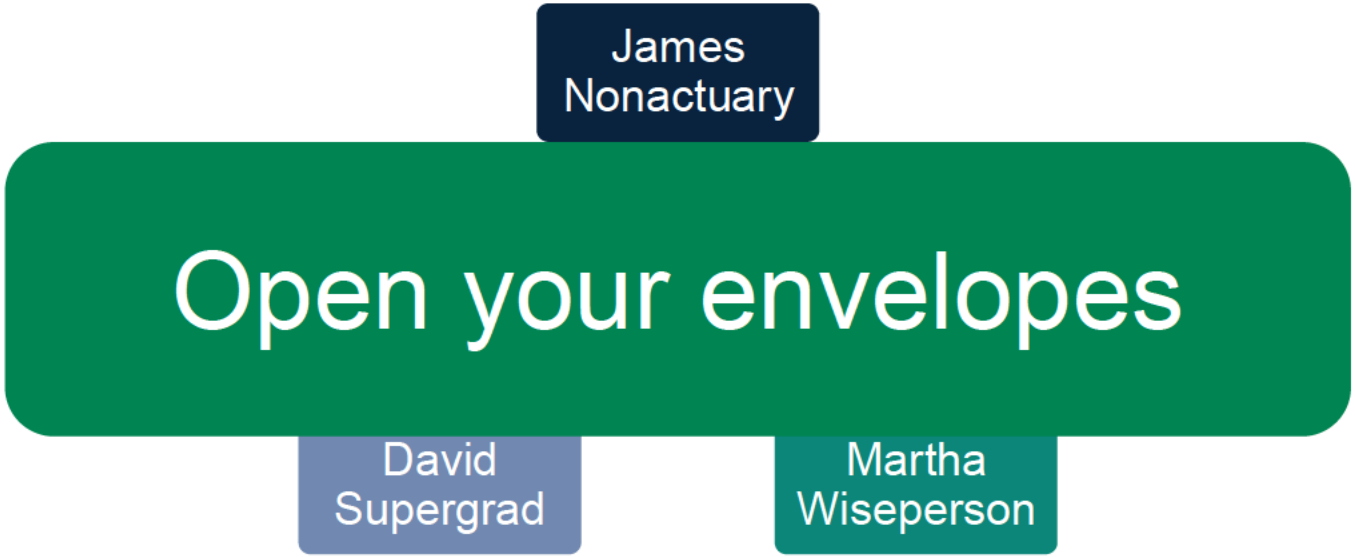
Case Study



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David Supergrad

- David uses Skyscanner.net to identify all flights from London that will arrive in Dublin between 2pm and 6pm on the day required.
- He then uses flightradar24.com for one week to sample all planes landing at Dublin from London, recording the scheduled landing time and actual landing time
- He builds a model to simulate the 95th percentile delay between estimated landing time and actual landing time, which turns out to be 35 minutes
- He identifies that even with a 35 minute delay the 3pm Harp Airways flight from LHR will arrive at 5.35pm at the latest which should give James enough time to get to the start of the dinner.

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Martha Wiseperson?

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Case Study – The Results!

James is presented with two best estimates and two distributions

David Supergrad	Martha Wiseperson
• 95th percentile chance of getting to gala dinner on time is for James to leave London office at 1pm	• 90% chance of James getting to gala dinner on time if leaves London office at 11 am

"Bloody actuaries – is it 11 am or 1 pm – one's two hours before the other.

Don't tell me it can be one of a range of results, I've heard that one before!"

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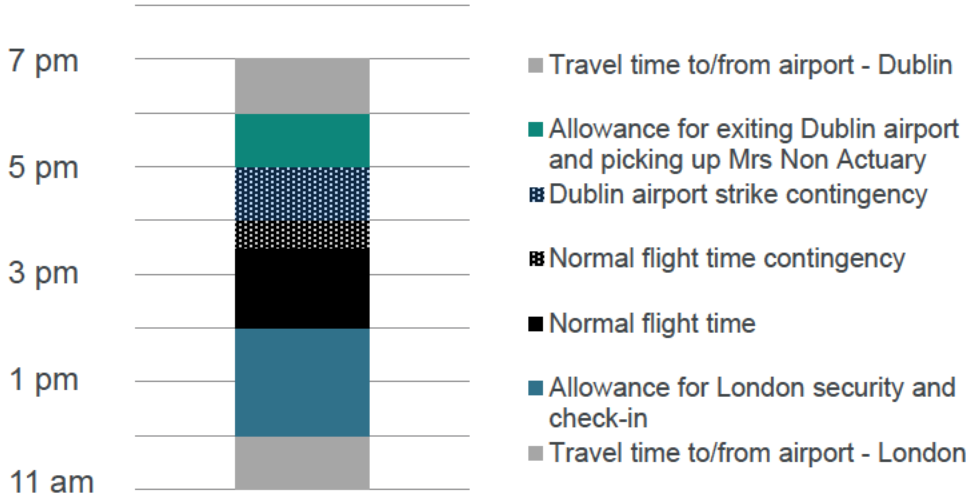
Results - Martha

Leave office at 11am – book 1pm flight



Alternative flights

Carrier	Scheduled departure
BA	**1:00pm**
Harp	3:30pm
BA	4:00pm

It is assumed that getting to/from the airport always takes exactly 1 hour

Key Points

1. Assumes travel by plane on British Airways
2. Flight times have been adjusted for seasonality and time of day
3. London meeting finishes at 11am
4. Gala Dinner starts at 7pm

Key Areas of Uncertainty

- Normal flight time is based on 1 year of data from Dublin airport website
  - Flight time Contingency of 0.5 hours based on 90th percentile
  - It is assumed that there will no extreme weather events impacting the flight
- 1 hour contingency allowed for possible Dublin airport strike, but there is limited data to base this on

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External influences

These are items that could potentially affect any travel time calculations.

- What time of day is he travelling and does this change how the past data can be used?
- That time of year is he travelling and does this change how the past data can be used?
- Baggage handlers at Dublin airport have planned a strike so that it will take much longer than usual for bags to arrive after a flight
- Whether everyone is going to Dublin at the same time, which could affect travel times or availability of aircraft

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The reserving uncertainty framework

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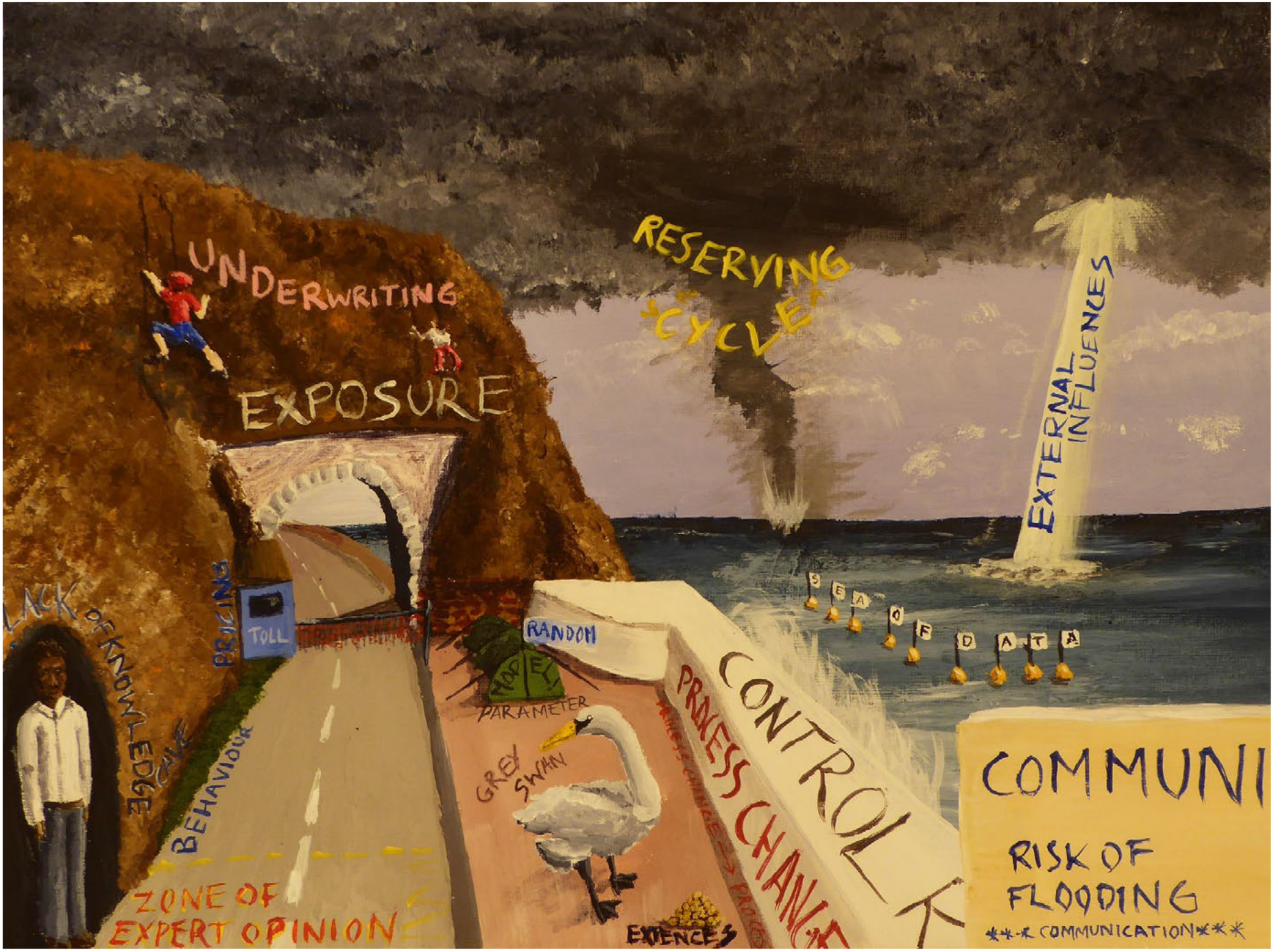
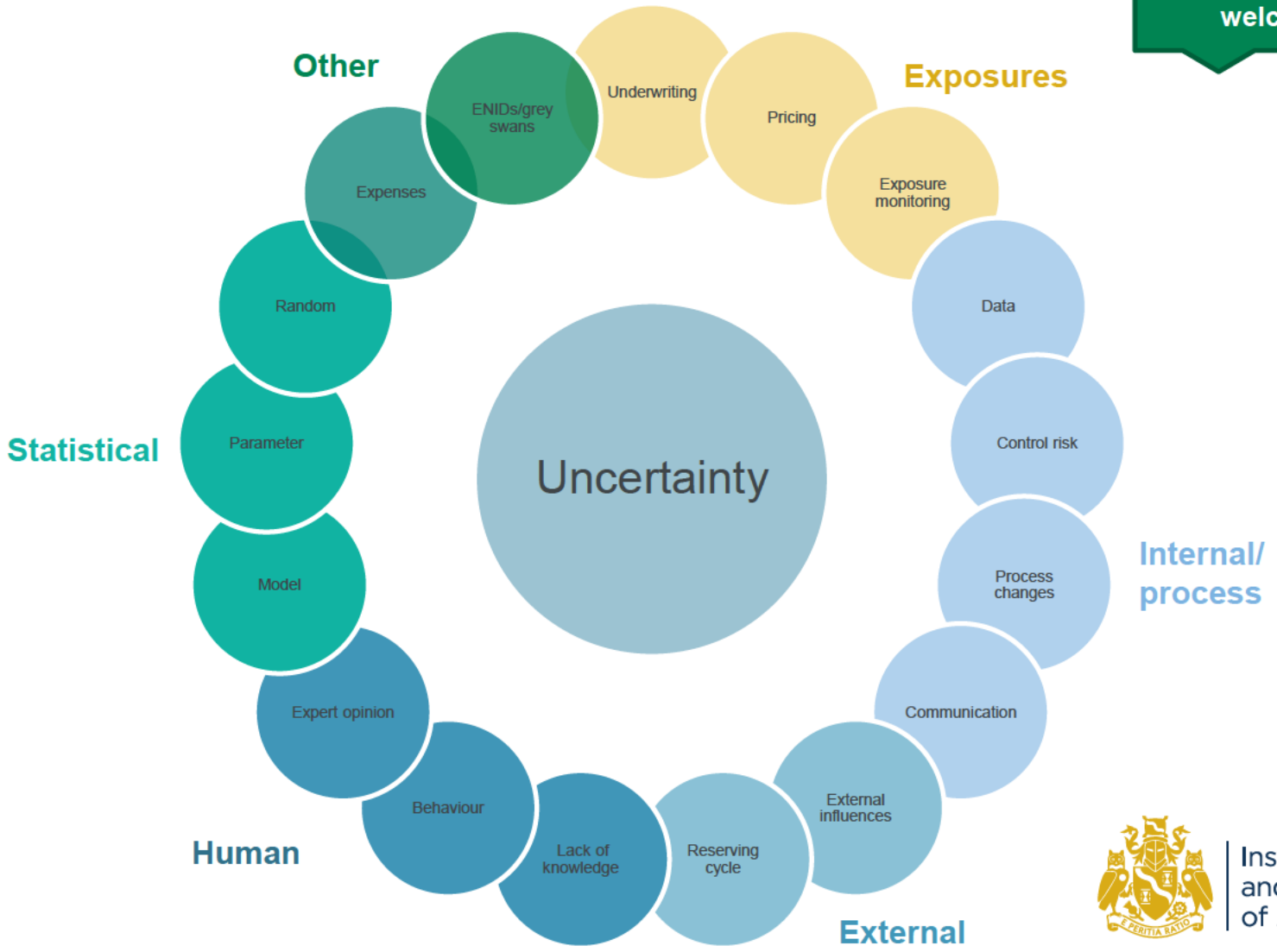

UNDERWRITING
EXPOSURE
RESERVING
CYCLE
EXTERNAL INFLUENCES
SEA OF DATA
LACK OF KNOWLEDGE
PRICING
TOLL
BEHAVIOUR
ZONE OF EXPERT OPINION
RANDOM
PARAMETER
GREY SWAN
CONTROL
PROCESS CHANGE
COMMUNI
RISK OF FLOODING
COMMUNICATION

Reserve Uncertainty Framework

We want to keep improving: **feedback** is **welcome**



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The framework document

Reserve Uncertainty Framework
MUQ working party 2016

Reserve Uncertainty Framework
MUQ working party 2016

Aim

The aim of the framework is to encourage broader thinking around reserve uncertainty, to help structure the actuarial thought process and to kick start idea generation.

When presenting reserve uncertainty to users of the reserve actuary's work (eg senior management or the board), we do not recommend presenting the detailed framework. We suggest highlighting the top, say, 3 to 5 drivers of uncertainty, supported by quantitative illustrations where feasible. The framework would have been used during the process to help the actuary identify what the most significant reserve uncertainty elements are.

We have chosen to describe what we mean by each element very simply - by just listing examples of the kinds of uncertainty that may be encountered.

This is not intended to be an exhaustive list and we actively discourage use of the framework as a checklist. We have suggested some ways the framework may be used below, but we anticipate individual actuaries will develop their own framework and way of using it. We want to keep improving and updating the framework. Please send feedback to [Link]

For more information, including additional reading, resources on individual framework elements and ideas on how to deal with specific elements of uncertainty, please see the working party's website [Link]

Uses of the framework

For the actuary
- Idea generation
- Base structure for own internal framework
  - Record of areas considered
  - Governance and validation
  - Likely not to need to change much from year to year
- Articulation tool
  - eg to support communication to stakeholders
- Pooling knowledge/developing best practice in the profession
- Training tool

For the user of the actuarial work
- Awareness of areas of uncertainty
- What questions to ask

Background

The GIROC survey [Link] of 2014 recommended that more focus should made by the profession on reserve uncertainty. The survey concluded that on the whole there was a positive feeling about how reserving was being conducted in the UK.

> "However, there was one significant area where improvement is still needed. That is uncertainty - both in measurement and communication. Reserving actuaries are all doing this in different ways which can be confusing for stakeholders. In addition the use of percentiles, whilst popular, can have the potential to be (at worst) misleading for stakeholders where there is a mismatch between expectations and what information they provide."

The MUQ working party was formed in the wake of this finding. Our collective view on how to approach reserve uncertainty can be summed up as:

1. **Actuarial curiosity** is at the heart of reserving – remember to "look out of the window". Ie, understand how numbers in the triangles relate to what is happening in the real world. Investigate, drill down, challenge - ask questions of the wider business.
2. The MUQ working party **cautions the use of percentiles** in communicating uncertainty.
   - If providing a reserve estimate at, say, the 75th percentile then what is the person receiving the advice going to conclude from this? Do they understand the degree of uncertainty in the shape and size of the distribution, and the key assumptions that have gone into deriving it?
   - Could the way the percentiles have been presented be conceived as over promising the level of uncertainty, or could they even be misleading?
3. One of the best ways for humans to communicate is by **telling a story**. Explain what the key **3 to 5 drivers of uncertainty** are and support with quantitative illustrations (scenarios or sensitivity tests) where feasible. Consider it from the users point of view.
4. The skill of the actuary is in identifying what these key drivers are. A lot of complex, detailed actuarial work and judgement will sit behind a simplified and targeted message.

The idea of the framework came from work that has done by actuaries in Australia. After being required to report reserves at the 75th percentile, it was widely recognised that stochastic (eg bootstrap) techniques could understate the reserve uncertainty distribution. A detailed framework process to adjust stochastic results was developed see [Link].

Exposures

Underwriting Risk

How has the level of cover changed?
Have any of the following changed?
- Terms and conditions
- Sums insured
- Limits
- Types of risk written, eg:
  - Country/geography
  - Industry
  - Specialism
  - Type of individual
- Personnel changes – have the underwriters themselves changed? What is the anticipated impact?
- Delegated authority strategy
- New accounts within the reserving line or new intermediaries

Keep a record, so easy to refer to in future years - build up the knowledge each year.

Exposure

Is the underlying exposure and any changes over time understood?
Take into account:
- Accumulations of risk
- Changing business volumes
- Change in mix of business - by distribution, geography, industry, cover level
- New sources of business with particular concentrations
- Changes in underwriting limits leading to different sum insured profile or mix
- Changes in legislation/rules leading to changes in exposure such as the Insurance Act 2015 (the new Act), this will change how insurance companies in the UK handle claims. Economic factors driving changes in exposure - inflation linking, negative equity (MIG)
- Changing competitive environment driving appetite in particular sectors
- Impacts of reinsurance and coinsurance

Is the understanding of exposure and any changes over time clearly documented and understood/agreed across the business?

Have areas where the underlying exposure is not clear been identified and documented? Can the impact be quantified? What improvements can be made going forward?

Have new risks evolving with unknown frequency, severity impact and development, been considered? For example cyber risk, risks associated with driverless cars, these also lead to pricing risk and model risk.

Pricing Risk

How has the pricing basis changed over time?
- Have the pricing models been correctly parameterised and when were they last updated?
- How much have the underwriters deviated from the technical price? Has this been influenced by level of competition in the market or specific business strategy?
- Level of cross-subsidies?
- To what extent are the pricing loss ratios used as IELRs for setting reserves? Are the values something that show common sense - they can be record breaking every year/product.
- Have changes in terms and conditions been adjusted for (i.e. past claims not reflective of the future)?
- Historic rate changes allowed for appropriately in past data?
- Policy features allowed for correctly (eg: aggregate limits and deductibles, reinstatement premiums)? Hard or soft point in the underwriting cycle and how is this affecting the price?
- What exposure measure has been used for pricing? If it is premiums, have historic rate changes been adjusted for appropriately?
- What large losses have been allowed for in the price? Is this consistent with underwriters' and reserving actuaries' views?
- Risk of anti-selection?
- Risk mix index popular in personal lines. This is constructed from either the burning cost model or a measurable change in mix that correlates with changes in the projected KPIs. It gives the relative level of frequency, severity and other KPIs which can be tested for fit to initial reserving projections and then used to guide assumptions for methods to project forward, e.g. Bornhuetter-Fergusson methods. How much of the account is covered by the risk mix?

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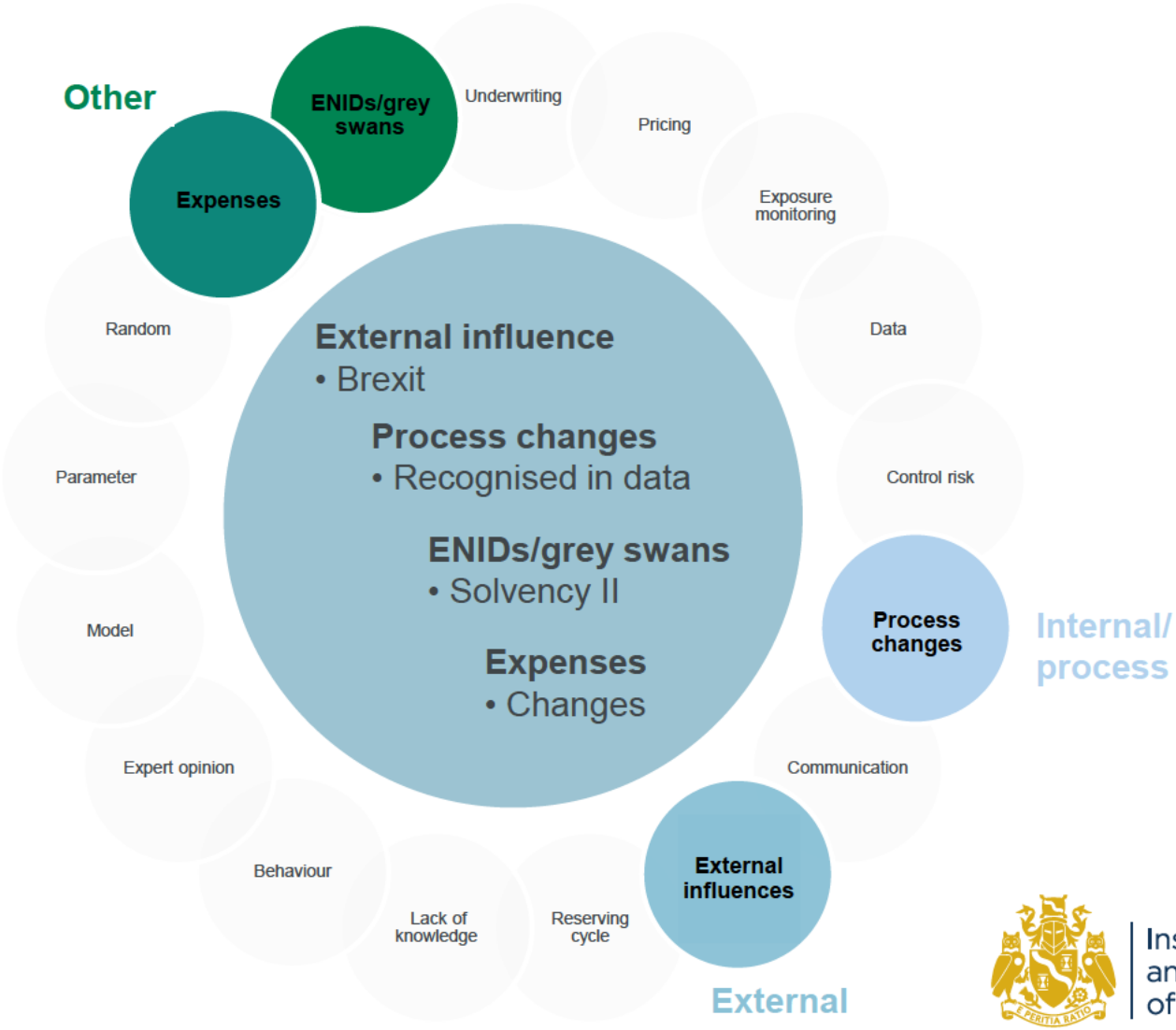
Framework Example – Brexit



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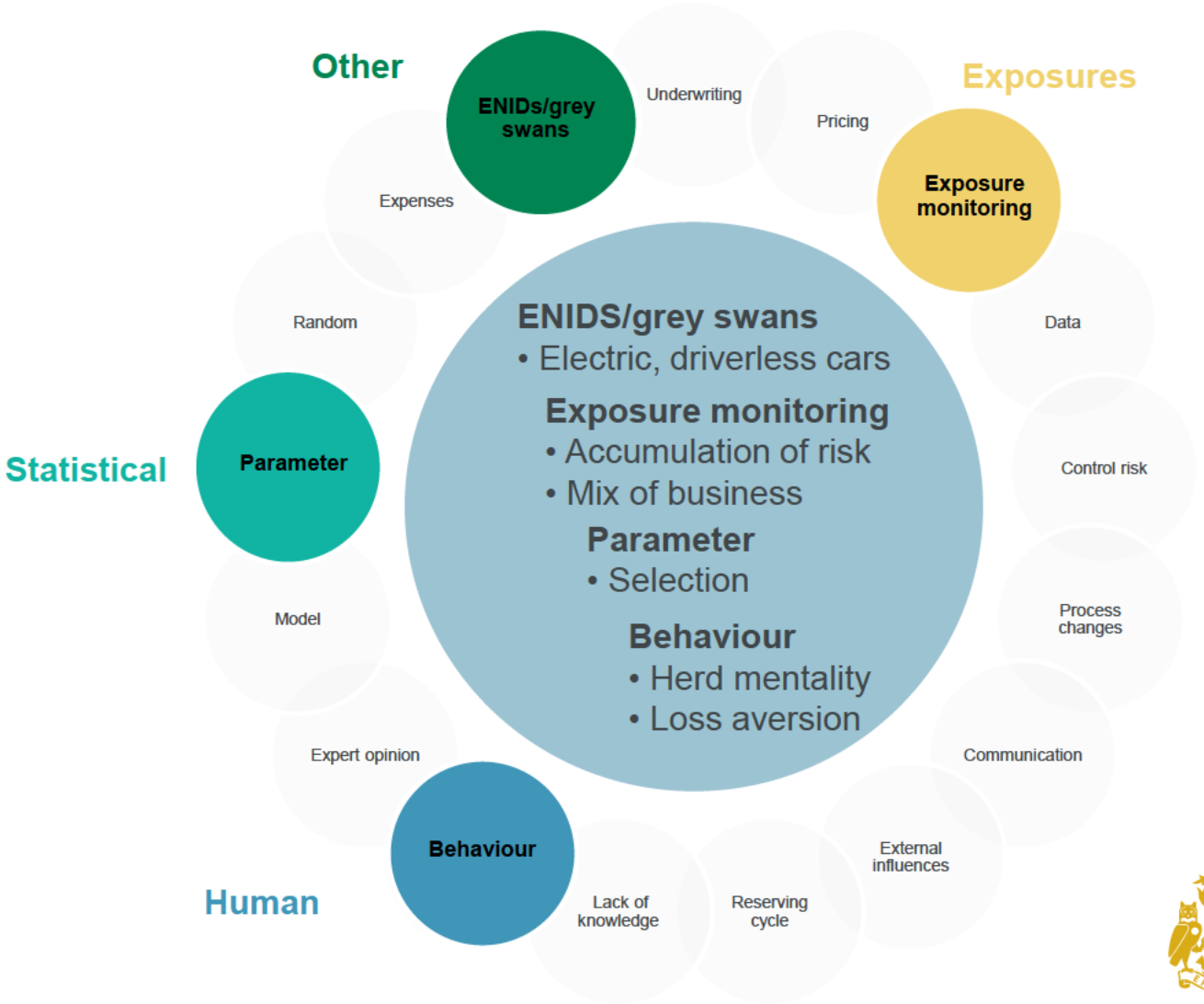
Framework Example – Driverless Cars



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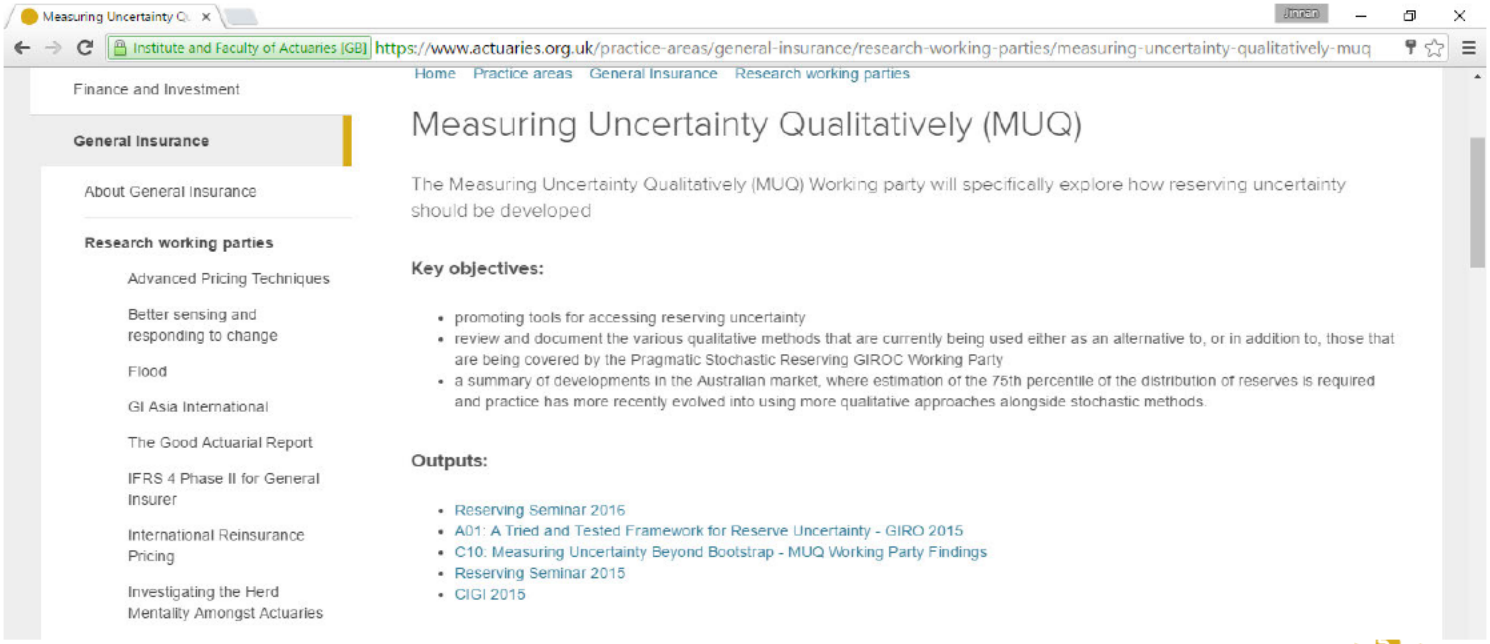
Our website

- The full framework to download
- References and our work from last year
- Past presentations

Type “MUQ” into the IFoA search bar



https://www.actuaries.org.uk/practice-areas/general-insurance/research-working-parties/measuring-uncertainty-qualitatively-muq

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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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Appendix

Case Study

James Nonactuary, CFO, BigInsCo is planning to attend the GIRO Gala Dinner in Dublin (7pm, 22 September) to see what all his actuaries get up to in their spare time.

A week before he is due to attend he approaches David Supergrad and Martha Wiseperson, two members of his actuarial team with the following problem…

> James wants to travel to Dublin on the day of the Dinner.
>
> At what time will he need to leave the London office (next to Liverpool St station) to be pretty certain of making the start of the dinner?

James rushes off to a meeting shouting "be realistic, tell me I need to leave the day before and I'll have to spend most of the next day in the Guinness museum!" and asks for a response two days before the seminar.

Taking into account what will be important for James, put together a short list of things Martha needs to consider to come up with her estimate.

You can assume that getting from the London office to the entrance of any London airport always takes exactly 1 hour and from the exit of Dublin airport to the conference centre always takes exactly 1 hour

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Case Study

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James rushes off to a meeting shouting "be realistic, tell me I need to leave the day before and I'll have to spend most of the next day in the Guinness museum!" and asks for a response two days before the seminar.

Taking into account the inherent uncertainties of such a journey, put together a short list of things Martha needs to consider to come up with her estimate.

You can assume that getting from the London office to the entrance of any London airport always takes exactly 1 hour and from the exit of Dublin airport to the conference centre always takes exactly 1 hour

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Underwriting Risk

Underwriting risk in this context is the risk that the wrong question is being answered – essentially that the terms and conditions of the question are different to what the actuary assumes at the start of the process.

- James expects you to know (but doesn't tell you) that Mrs Nonactuary is accompanying him to the dinner and he needs to pick her up from the hotel in Dublin.
- James has a British Airways frequent flyer account, so he doesn't like flying on any other airline as he wants to collect Avios.

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Communication

Communicating with all related areas to find out additional relevant information.

- James's PA could tell you that he has an important meeting that day that is due to finish at 11am
- Internal travel assistants may have a preferred supplier for all travel that must be used
- Has anyone had to do this calculation before for James? If so, what was the outcome of the model and what actually happened?

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ENIDs/Grey Swans

Events that could affect travel time that haven't been reflected in the past data and may not have been considered:

- GIRO gets moved to London due to flooding at the Dublin conference centre
- A bomb threat shuts down Heathrow Airport so that all flights are suspended or delayed on the day of travel
- Heavy fog in London means that only half the usual flights can take off and land from any airport
- One of the airlines on the London-Dublin route goes bankrupt and can no longer fly

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