



Visualisation of Capital Modelling Outputs and its Use

Agenda

- Why and what?
- A working party view
- A practitioners view
- Challenges to overcome
- Questions?

Introduction

- Communication of complex and technical work remains a challenge for the profession particularly with regard to capital models as such outputs are used in wider areas such Risk Management.
- Communication challenges arise across all communication groups
- Well thought out visualisations have been used to provide a significant advantage in these communications, enabling a better understanding of the modelling and the calibrations.
- Visualisations could be graphs, charts or even tables; any useful presentations of results. Visualisation can be employed on quantitative forms or qualitative.

Working party abstract

The Data Visualisation working party is a new working party looking at raising the awareness of visualisations, useful when performing risk modelling.

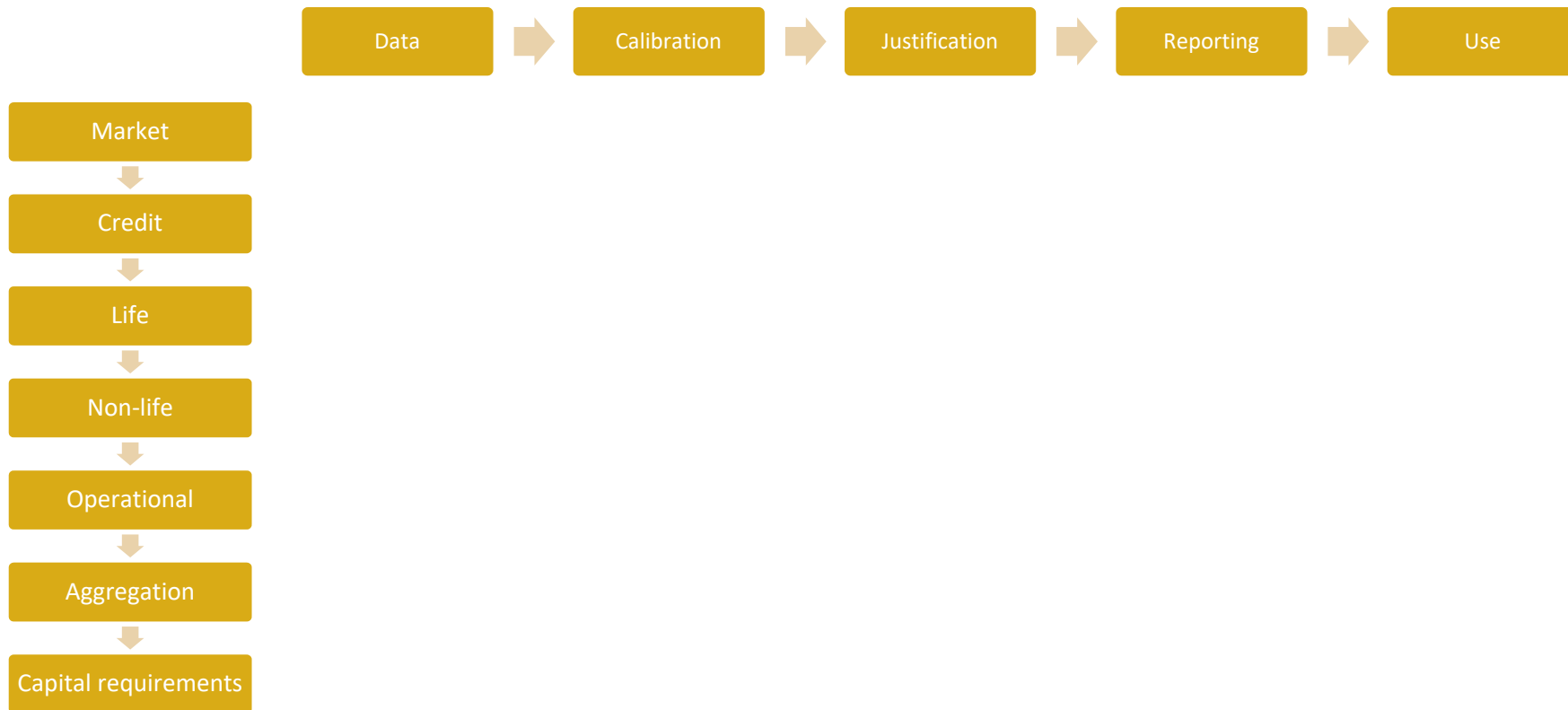
The aim is that those responsible for complex models will have a **better awareness of possible beneficial presentations**. This should ultimately lead to better understood models, and hence better challenge.

The intent is for the working party to gather market practices and create a catalogue, or library, of different presentations as a resource for practitioners.

Just starting!



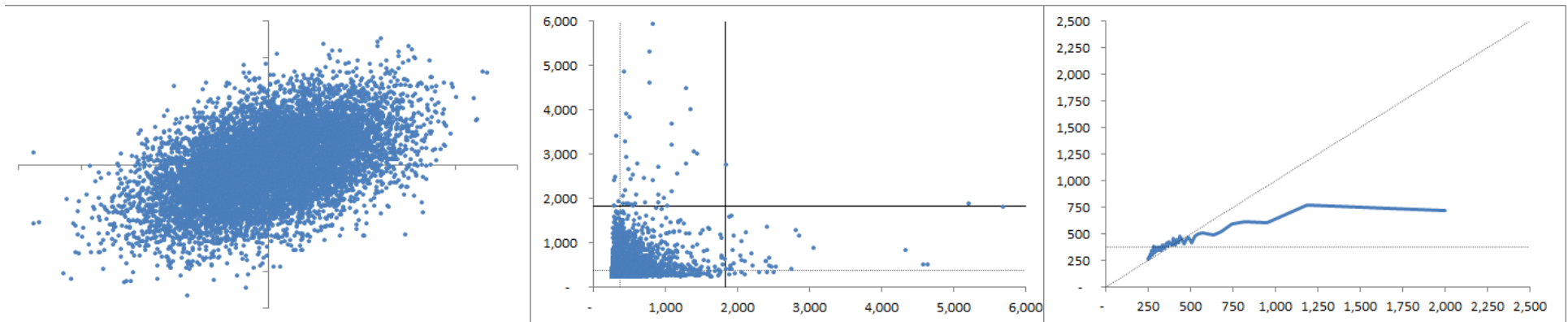
Scope of the working party



Examples

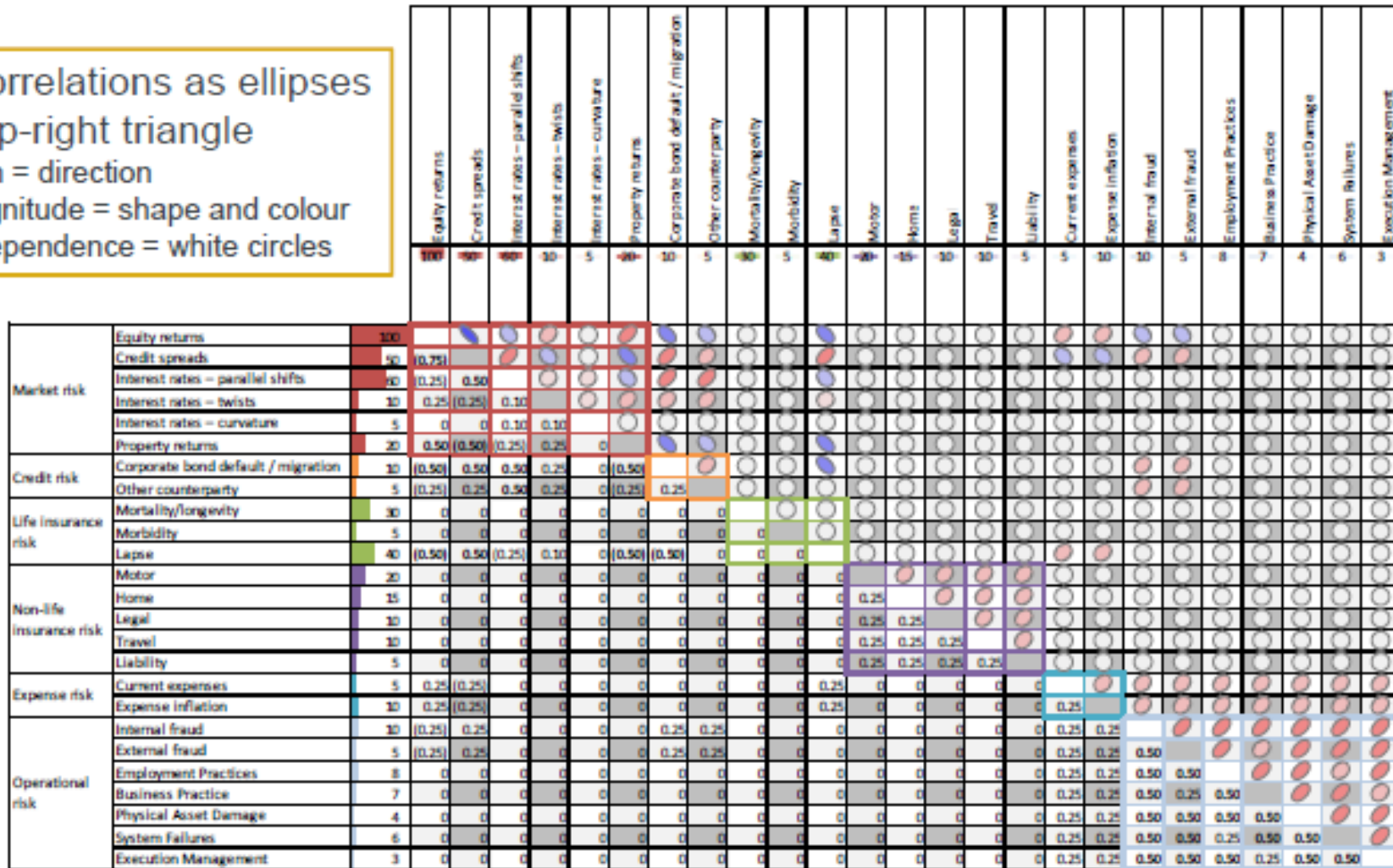
- Some examples of the kind of visualisations the working party might include
- A few looking at the calibration of a dependency shape
- One looking at reporting a correlation matrix for disclosure and challenge
- One looking at justifying/validating reserve risk ranges
- Two looking at use of the model output

Example: Correlation shape



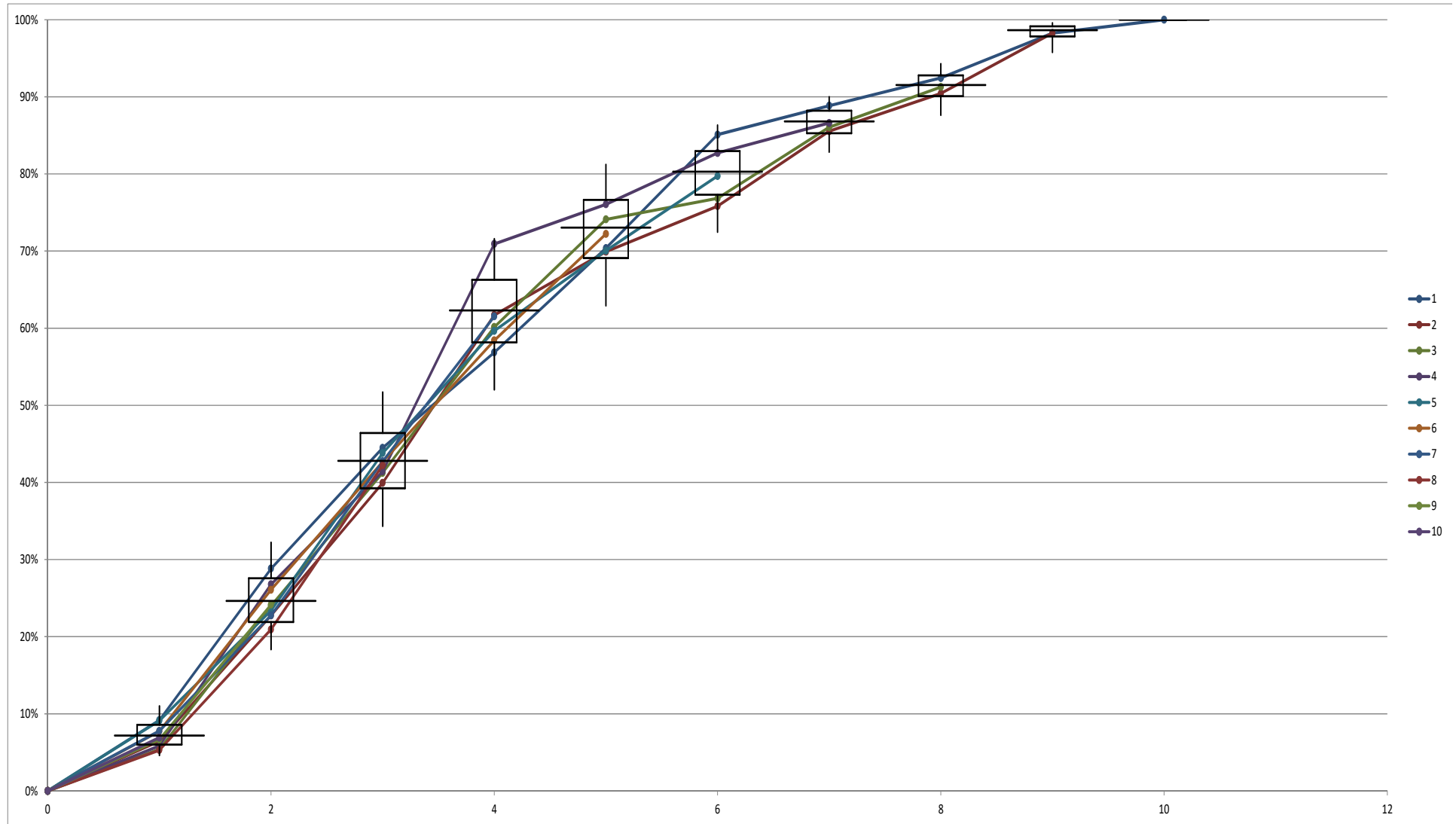
Example: Correlation matrix

Show correlations as ellipses in the top-right triangle
 Sign = direction
 Magnitude = shape and colour
 Independence = white circles

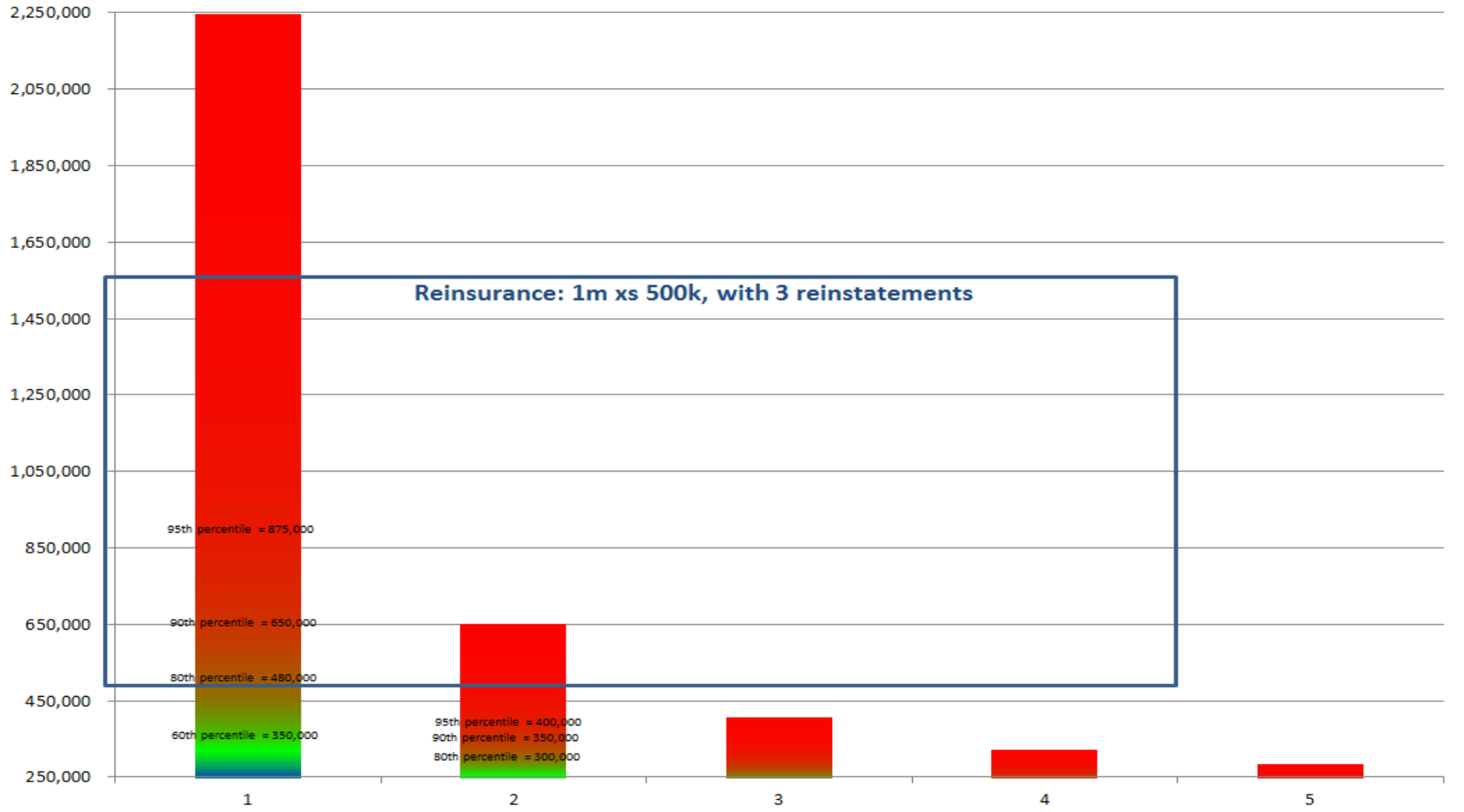


Source: Ellacott & Teggin, Data Visualisation for Business Insight

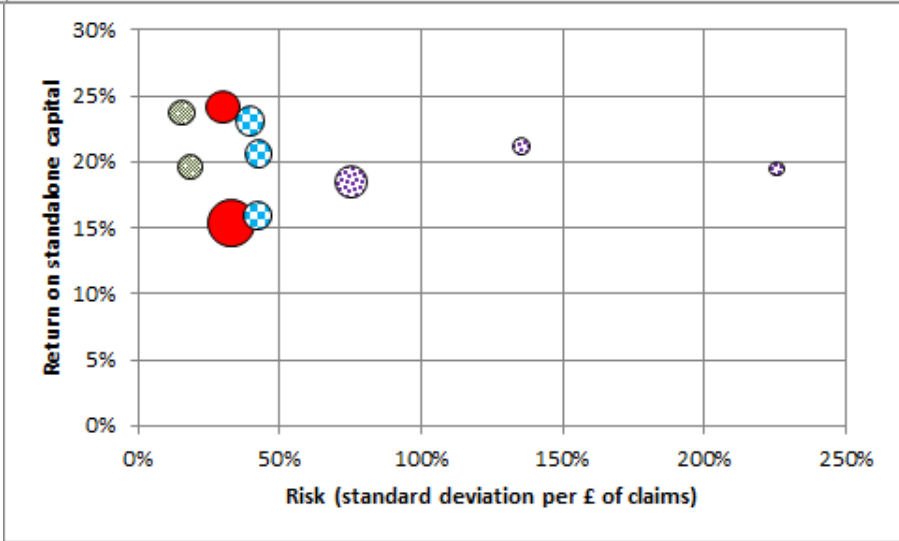
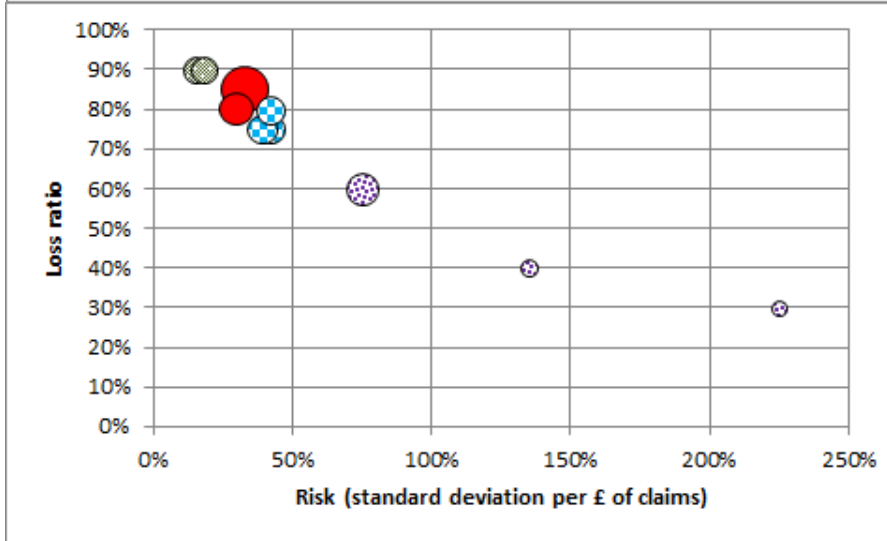
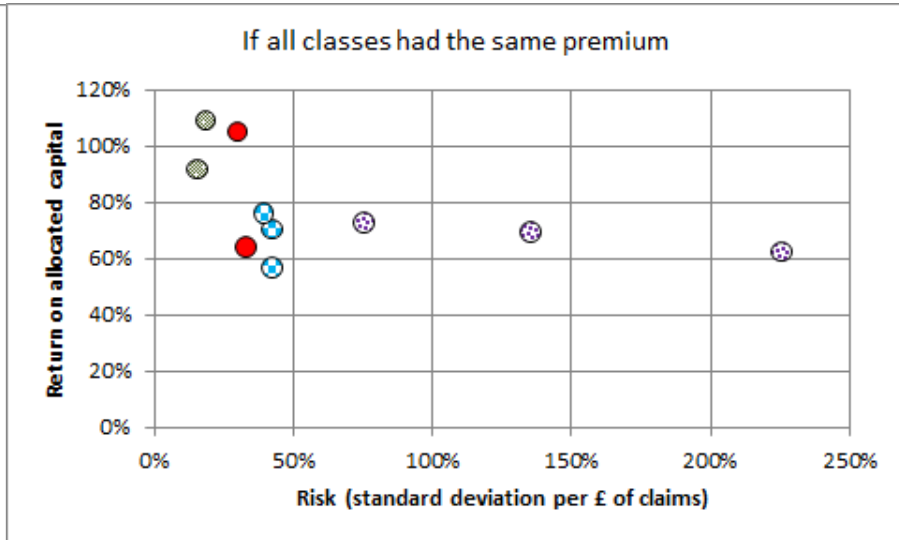
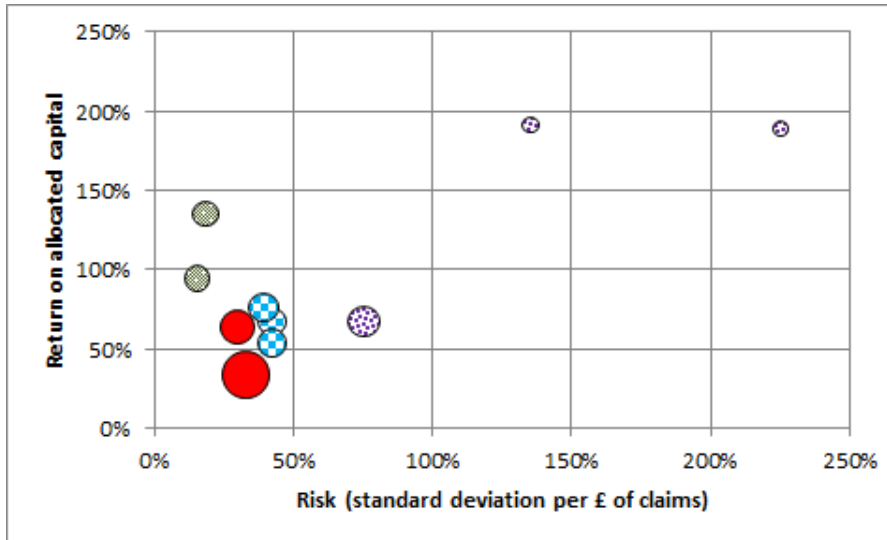
Example: All Years Development Box Whisker



Example: Largest claim with reinsurance overlay



Example: Capital bubbles



What do we want from you?

- Your interest
- Prepared to share?
- Prepared to help?



Introduction to uses

- A significant area of use of such outputs will be in the model validation area.
- We focus here on knock on processes such as validation and ORSA reporting. Why?
 - many variables across the whole insurance company
 - Significant amounts of data
 - Complex modelling
 - Lots and lots of stakeholders!!
- ...but the ideas can be extended to other areas and other useful aids
 - **Pricing** can utilise visual aids to understand exposures and the risk profiles of the business
 - **Reserving** can utilise visual aids to assess exposures, as well as uncertainties
 - **Finance** – for business planning and developing strategies for growth areas
 - Etc.
- The slides that follow show example consumption of the visual aids

Example 1 – capital movements

One of the standard checks performed on an annual basis is to review the overall movement in a risk category.

- Often companies have opted to use a table to summarise key percentile points:

Total capital movements			
Percentile	This year	Last year	Difference %
Mean			
St dev			
50th			
75th			
90th			
95th			
97.5th			
99.0th			
99.5th			
99.9th			
Max			

Example 1: Capital movements

What does it show? Compares the shape of the overall profit distribution from the model between this year and last year calculations.

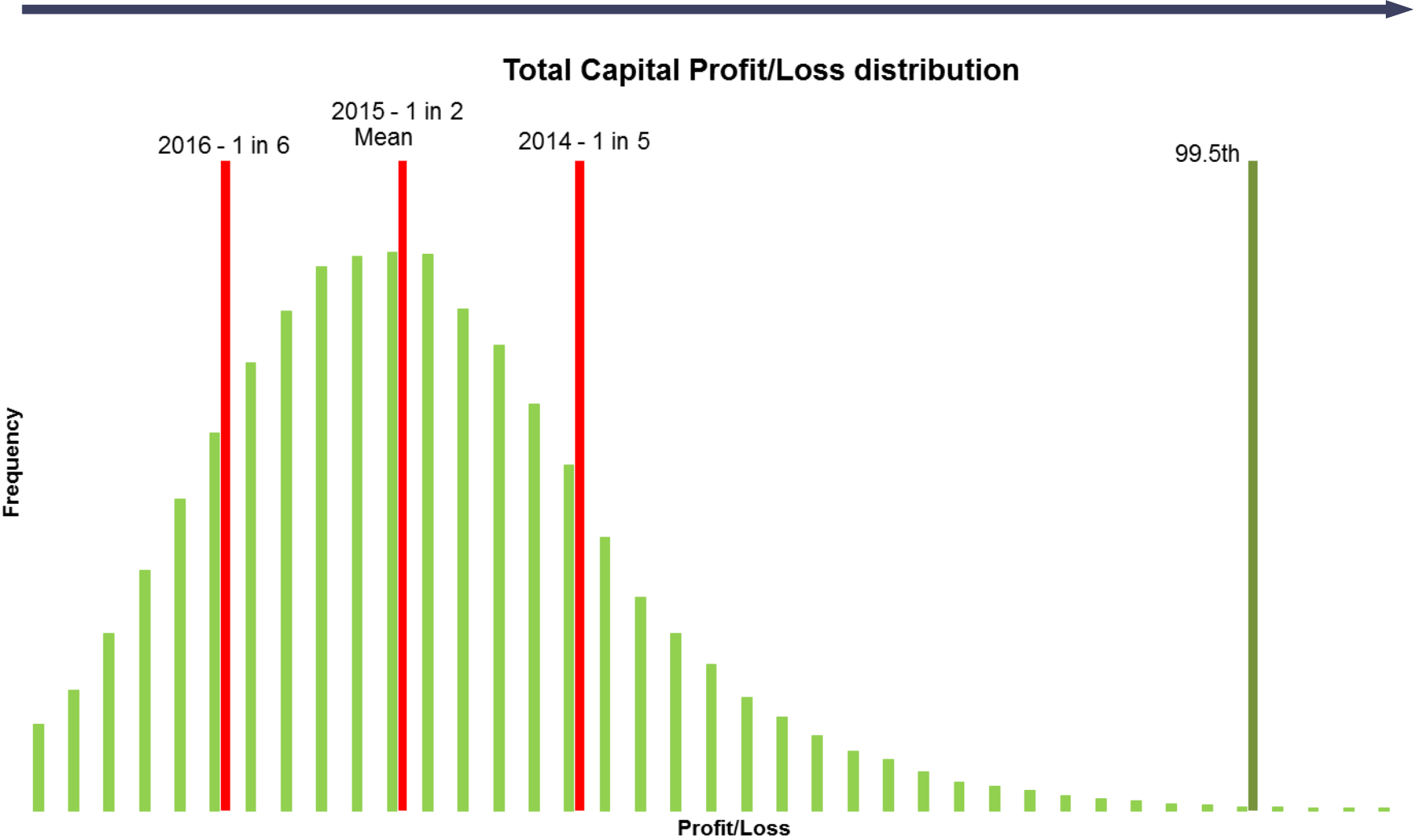
What can this highlight? This could show a shift in expected profits or in the skewness of the distribution. In turn, this could be due to a change in the dependency structures or other calibrations.



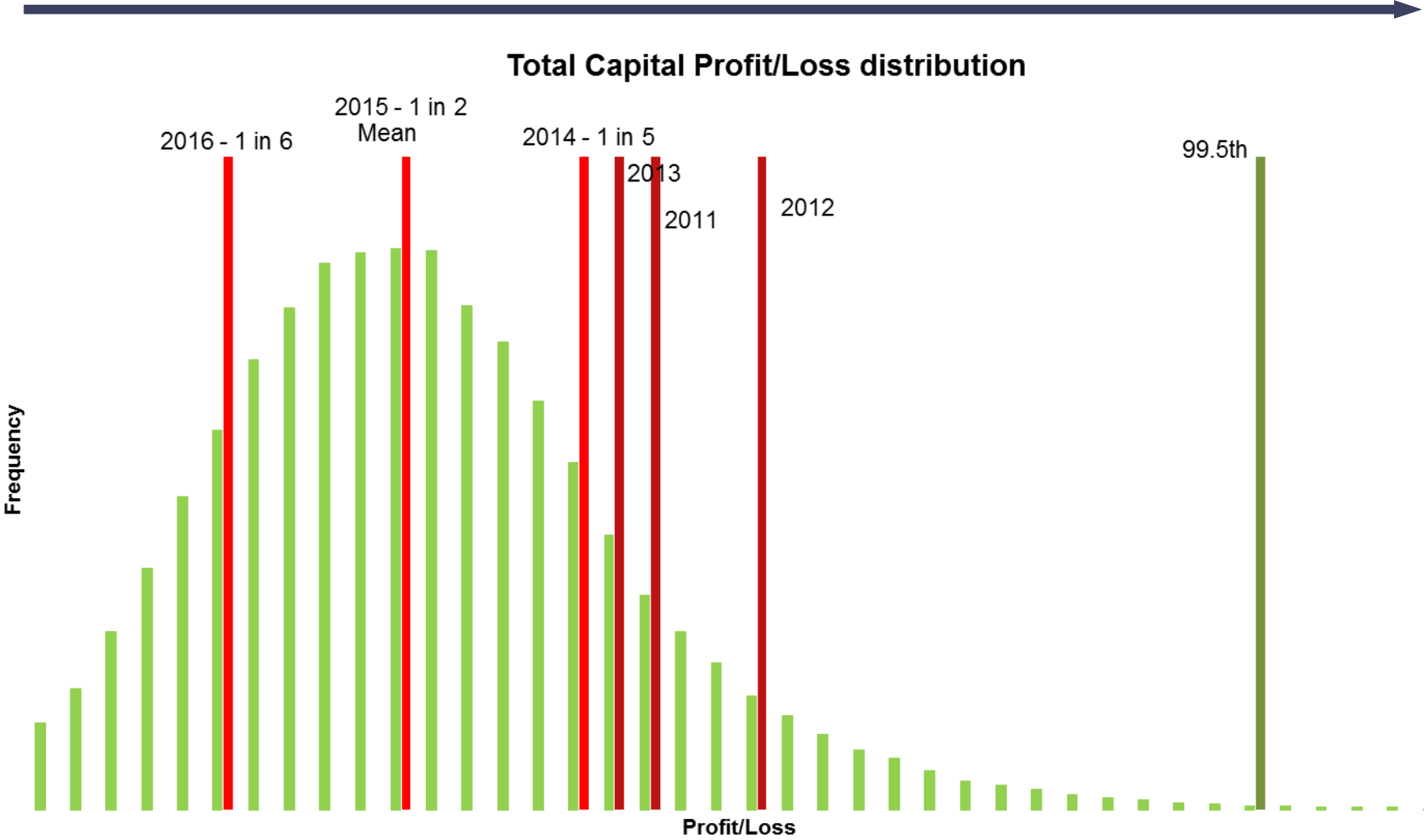
Example 2: P&L Attribution

Accounting item	P&L		
	2016	2015	2014
GWP	1 in 2	1 in 3	1 in 2
Incurred claims	1 in 4	1 in 2	1 in 10
Expenses	1 in 20	1 in 10	1 in 2
Underwriting result	1 in 3	1 in 2	1 in 8
Investment income	1 in 20	1 in 2	1 in 2
Profit	1 in 6	1 in 2	1 in 5

Example 2: P&L Attribution



Example 2: P&L Attribution

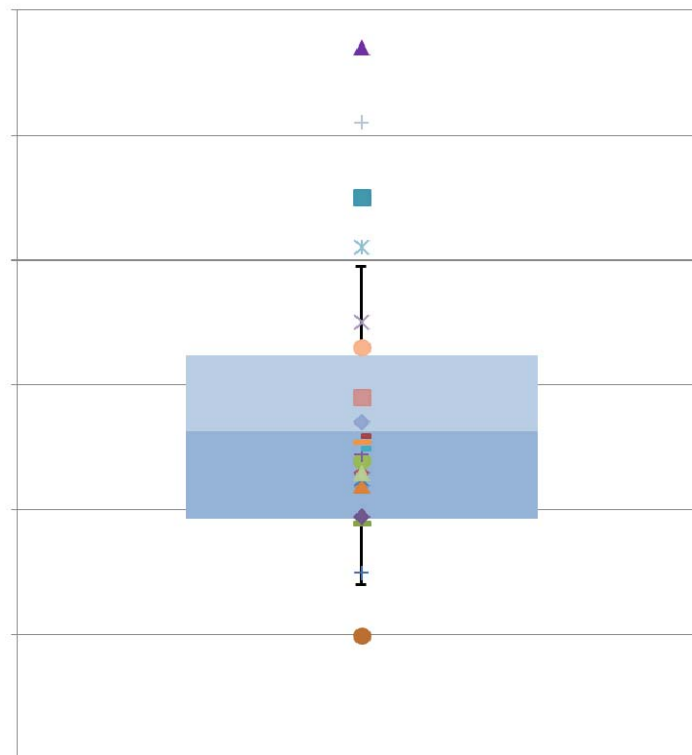


Example 3: Back-testing

What does it show? Compares the modelled Reserve Risk distribution to the actual observed historical deteriorations.

What can this highlight? Clear cut odd points

Box and Whisker: Reserve risk vs historical deteriorations

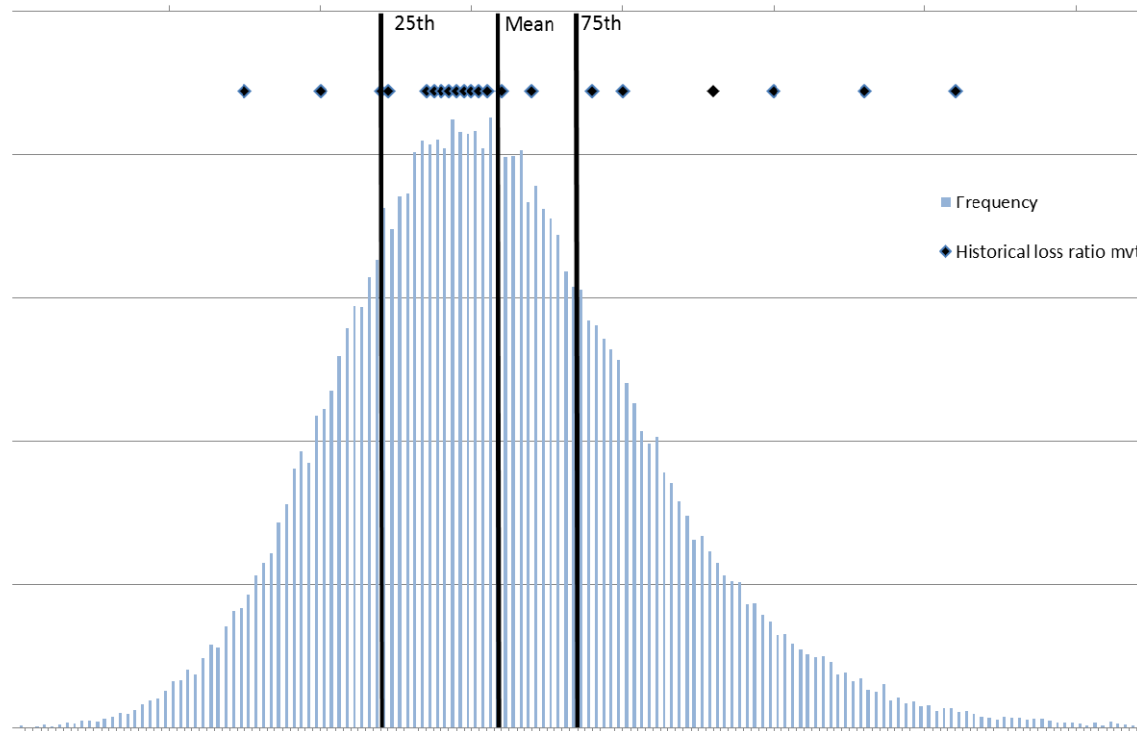


Example 3: Back-testing

What does it show? Compares the modelled Reserve Risk distribution to the actual observed historical deteriorations.

What can this highlight? Clearer image of the shape of the distribution.

Actual deteriorations vs modelled

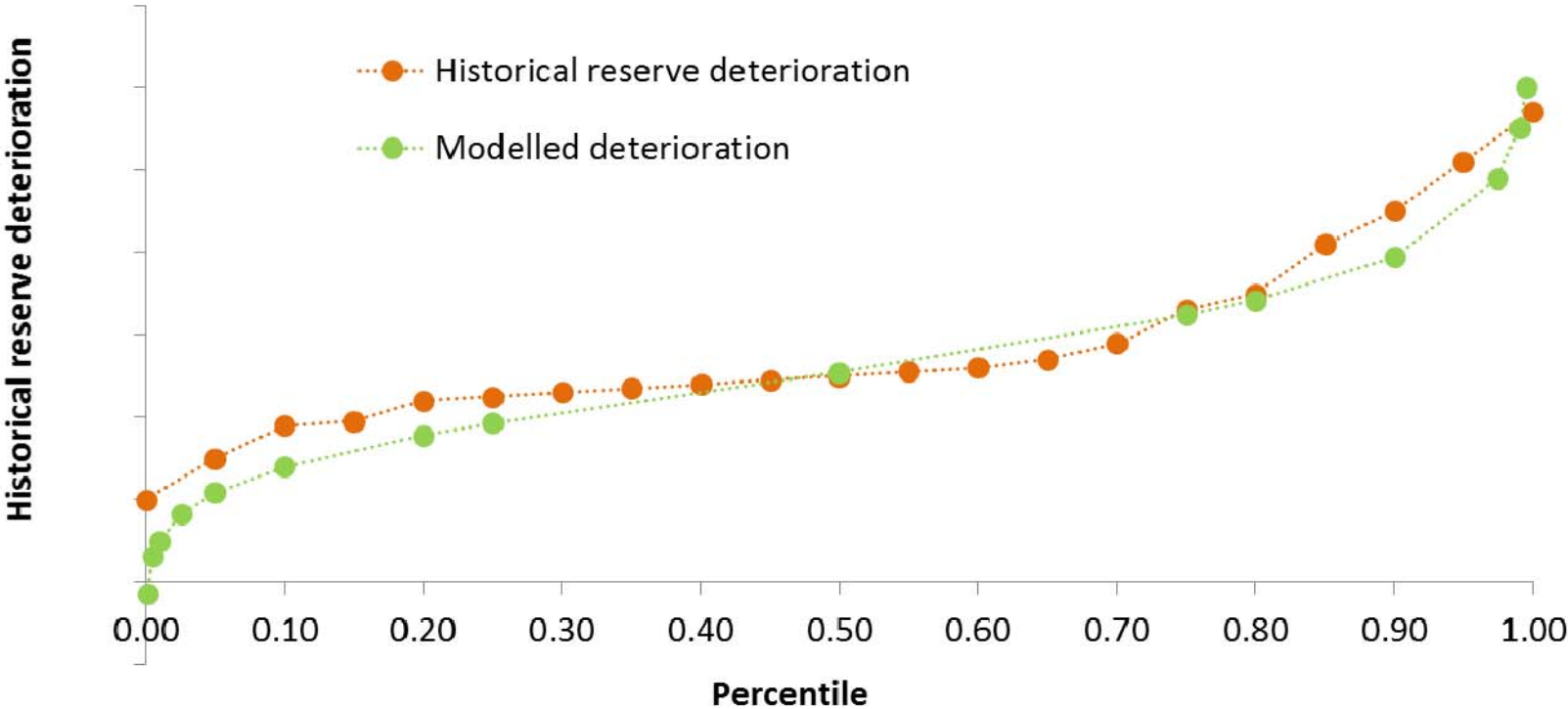


Example 3: Back-testing

What does it show? Compares the modelled Reserve Risk distribution to the actual observed historical deteriorations.

What can this highlight? Another image of the shape of the distribution.

Modelled distribution vs. historical reserve deteriorations

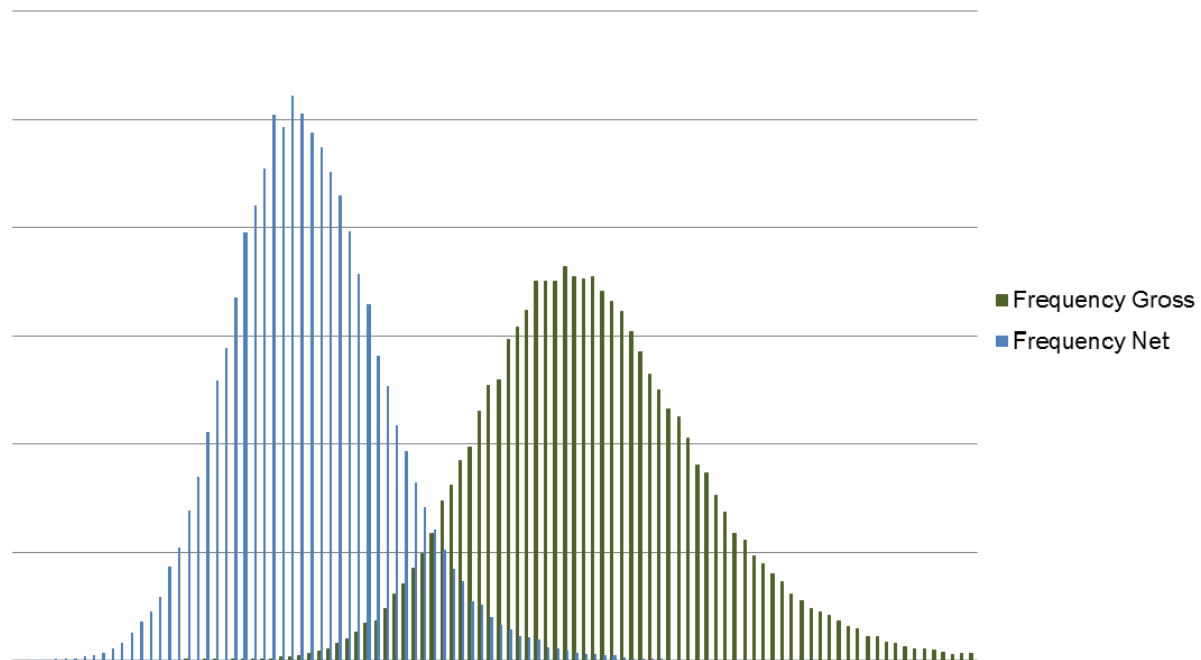


Example 4: Gross vs Net

What does it show? Compares the modelled reserve risk distributions Gross and Net of reinsurance.

What can this highlight? This could show that the netting down process is not working properly (e.g. reinsurance exhaustion not allowed for).

Gross and Net Reserve Risk distributions

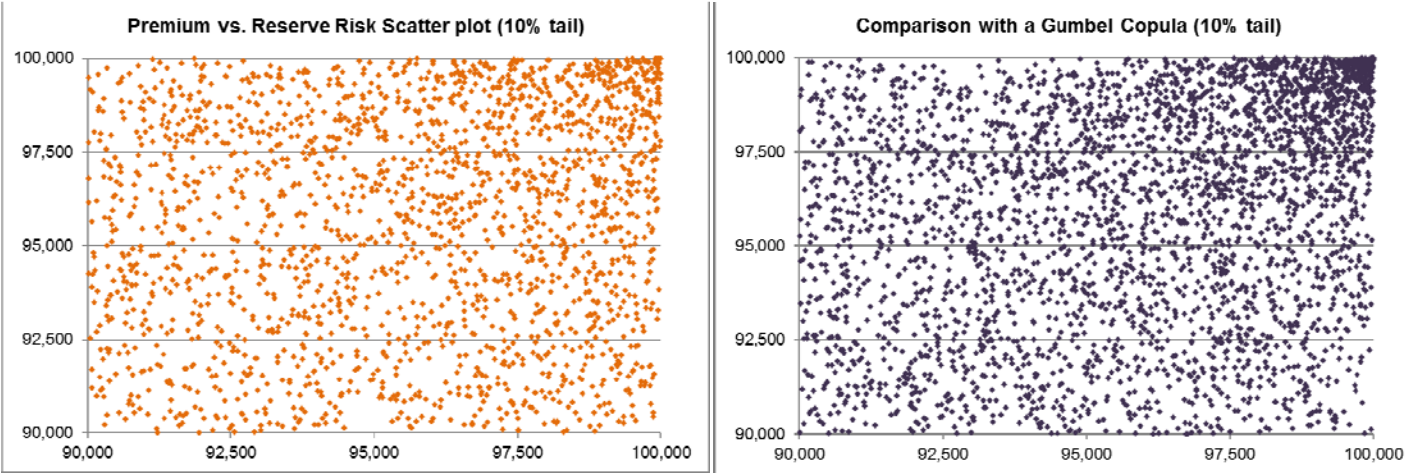


Example 5: Tables and Scatter plots

What does it show? Looks at the strength of the output correlations in the tail between two risk types. As a comparison, what would be achieved using a Gumbel copula is shown.

What can this highlight? This could show that the achieved correlations in the tail are lower than what was initially parameterised, indicating potential dilutions due to the dependency structures, granularity and hierarchy imposed.

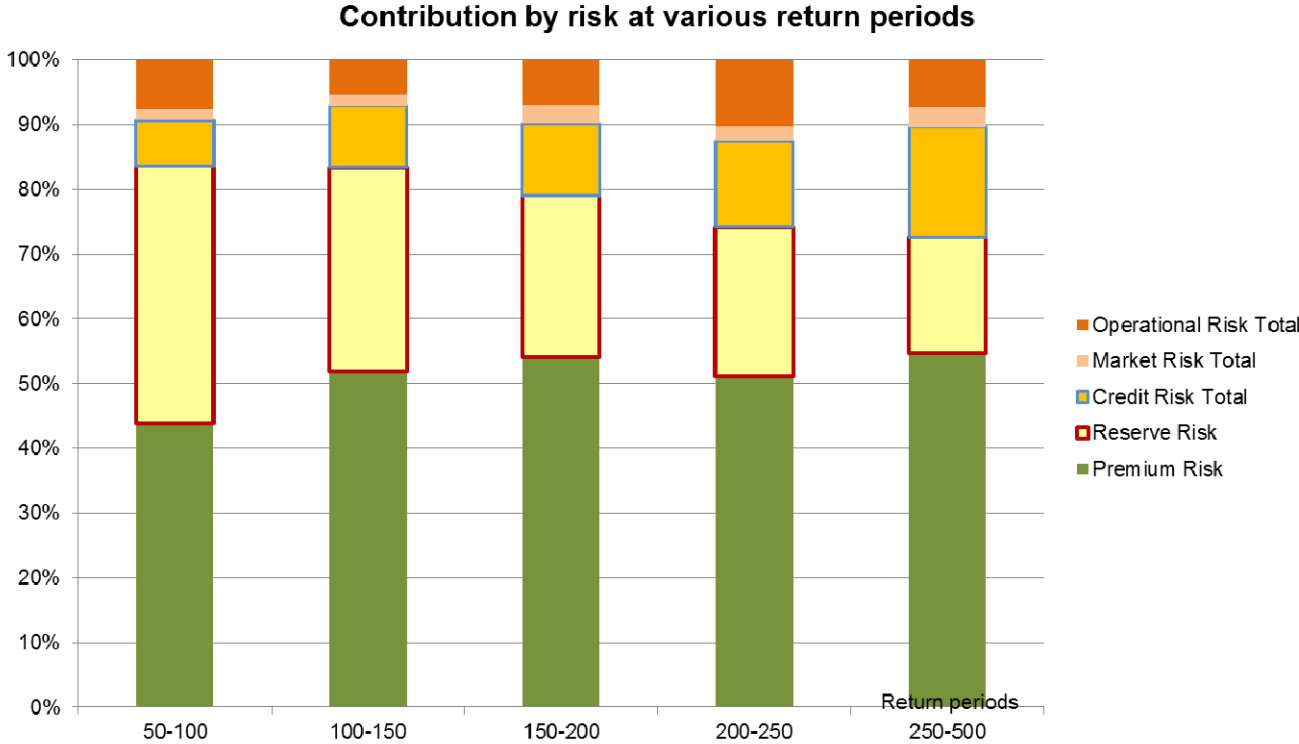
Reserve risk / Premium risk				
Percentile	Return period	CEP at independence	Achieved CEP	What if I used a Gumbel?
90th	1-in-10	10%	15%	25%
95th	1-in-20	5%	12%	22%
97.5th	1-in-40	2.50%	7%	17%
99.0th	1-in-100	1%	4%	15%
99.5th	1-in-200	0.50%	2%	13%



Example 6-1: Risk type contribution

What does it show? Looks at the contribution to the overall profit/loss distribution for each risk type, at various return periods. This also shows what is driving the tail and how dependencies between risk types come into play over and above the mean.

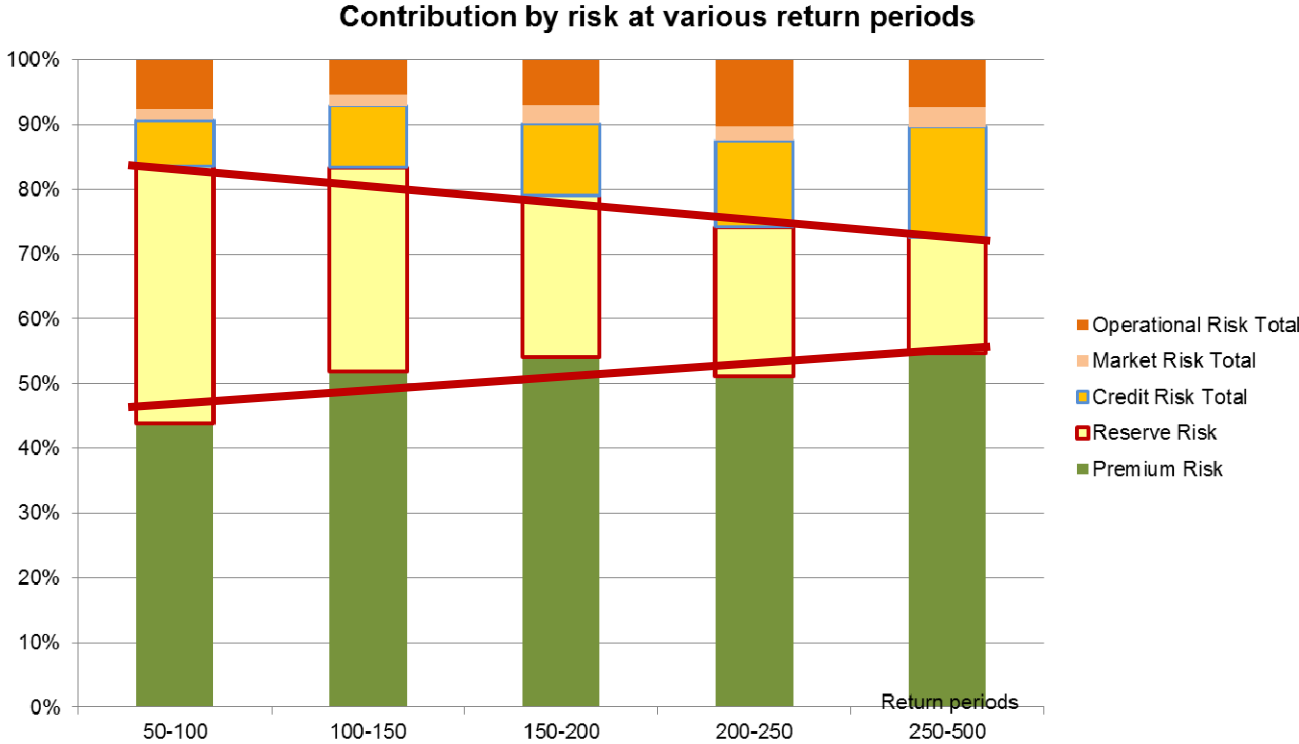
What can this highlight? Can assess the percentile hit by risk category and if that is line with the risk profile of the business.



Example 6-1: Risk type contribution

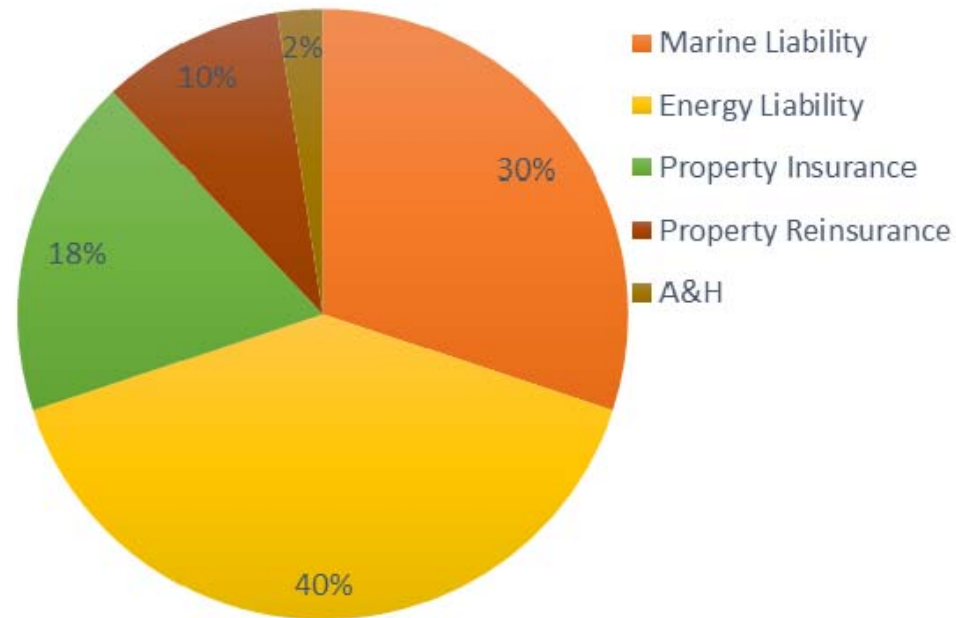
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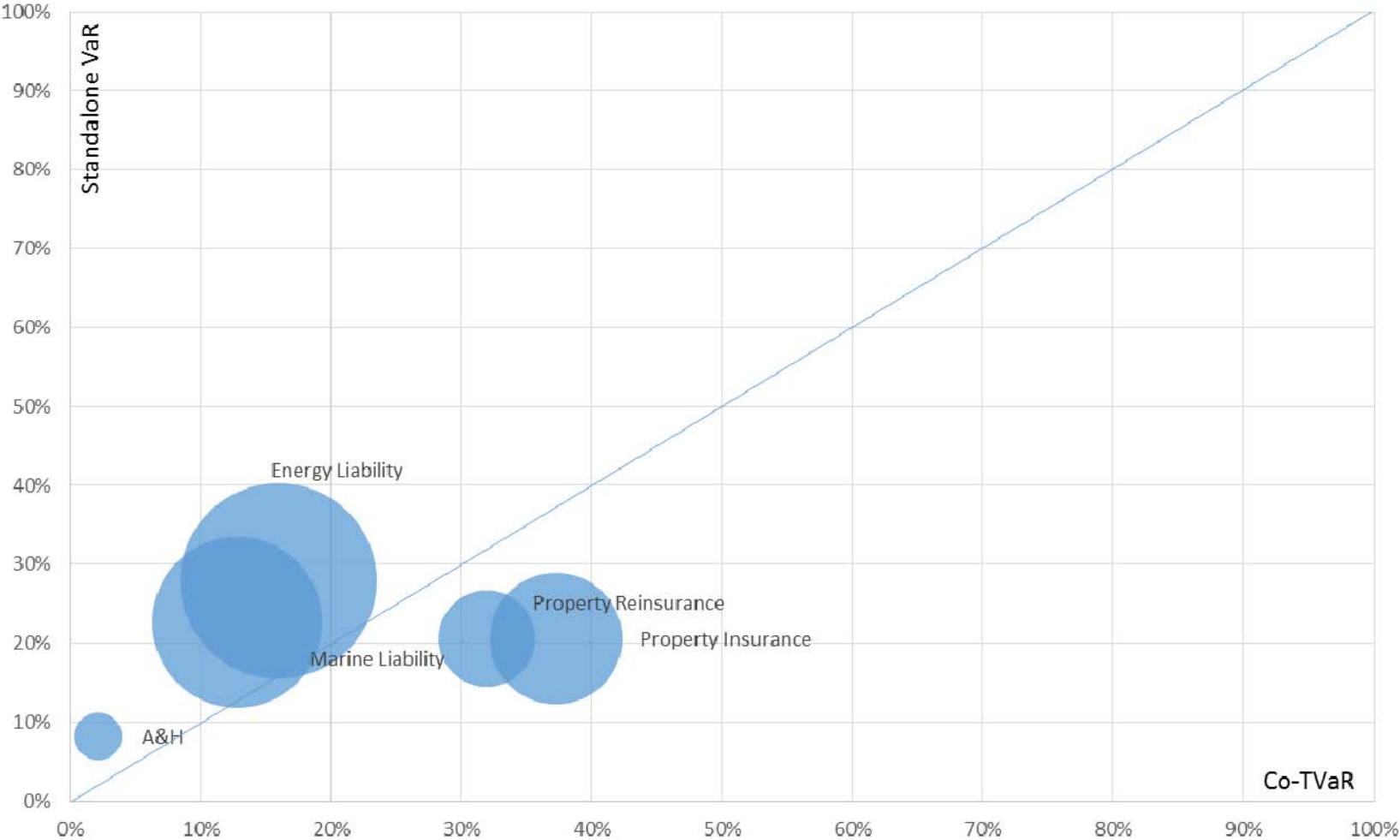


Example 6-2: Risk type contribution

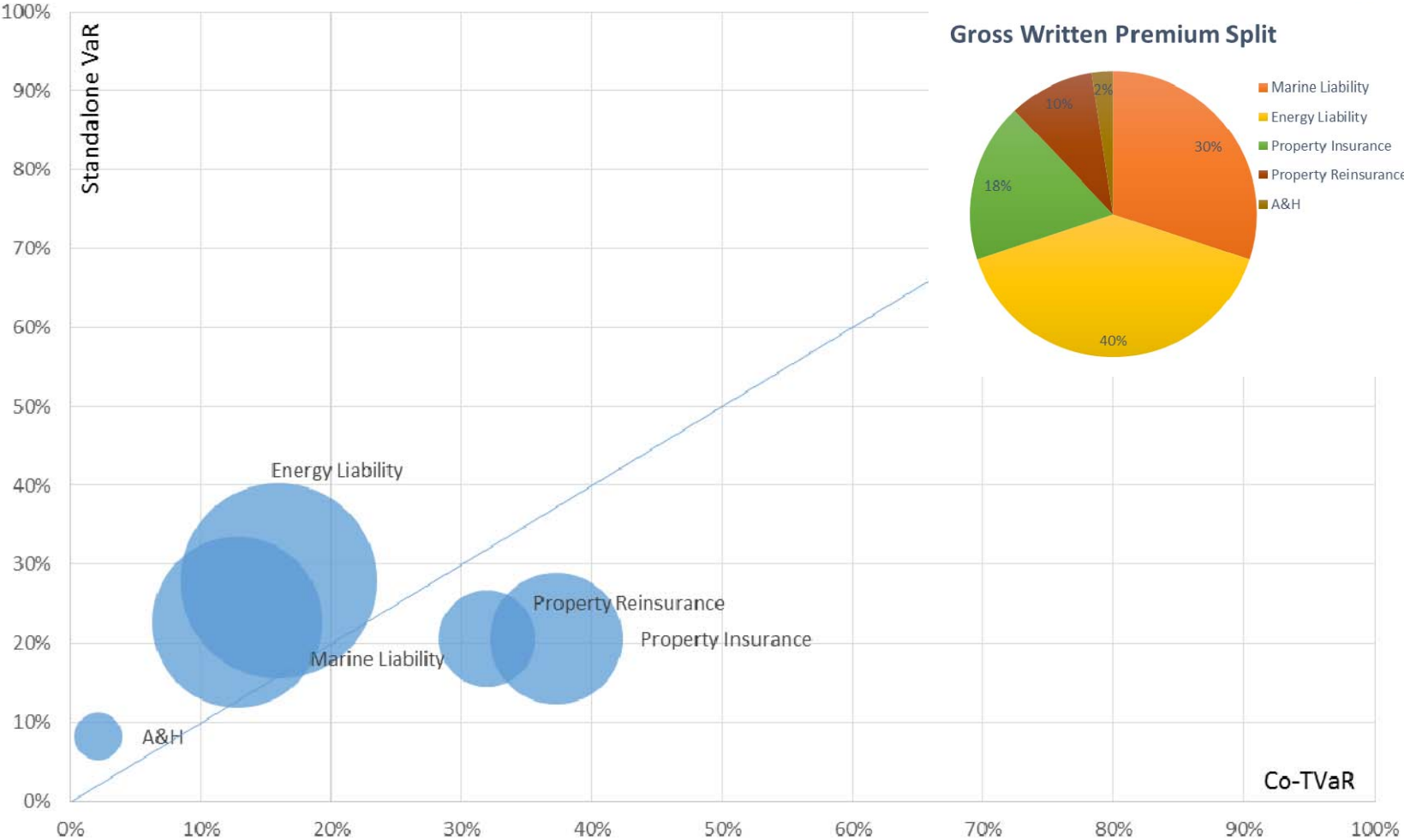
Gross Written Premium Split



Example 6-2: Risk type contribution



Example 6-2: Risk type contribution



Challenges to overcome

- Often company specific visuals are adopted but each year refinements are often made and indeed, in some cases, new graphics are designed due to the ad-hoc nature of their consumption. Some visuals have been very effective whilst other less so.
- Even repeating the same visual aids typically consumes a significant amount of processing time.
- There are many software options in the market which efficiently allow us to be able to produce such visual aids.
- Using tools like this, validation and other teams can benefit for repeatable automated reporting processes, allowing you to spend more time thinking about the “why?”



Questions



Comments

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Thank you

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