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IFRS 17 Risk Adjustments: Reserving or Capital Modelling?

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Agenda

- Part 1 – IFRS 17 Basics
- Part 2 – Aggregation and Allocation
- Part 3 – Liabilities for Remaining Coverage (LRC)
- Part 4 – Reinsurance

See R Shiny app: https://emc-actuarial.shinyapps.io/evw_2019_app/

Measurement – General Model

(Para 32)

On initial recognition, an entity shall measure a group of insurance contracts at the total of:

(a) the fulfilment cash flows, which comprise:

1. estimates of future cash flows;
2. an adjustment to reflect the time value of money
3. a risk adjustment for non-financial risk

(b) the contractual service margin (CSM)

Notes:

The CSM falls away after the coverage period

- We can distinguish between losses for incurred claims (LIC) and losses for remaining coverage (LRC)

The implication of Para 32 is that a risk-adjustment is needed for each group of contracts, not just at the aggregate level.

IFRS 17 Summary

What needs to be done

"An entity shall adjust the estimate of the present value of the future cash flows to reflect the compensation that the entity requires for bearing the uncertainty about the amount and timing of the cash flows that arises from non-financial risk." **(Para 37)**

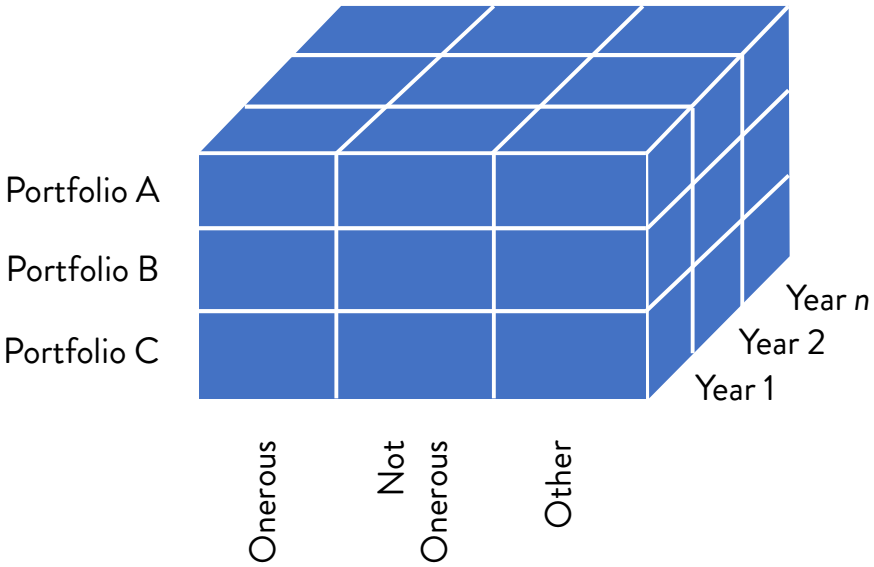
What needs to be disclosed

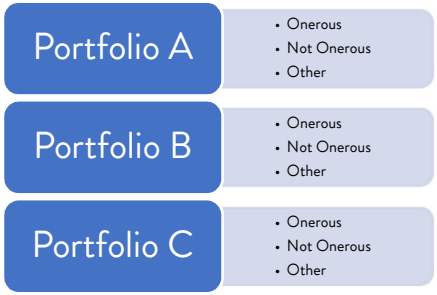
"An entity shall disclose the confidence level used to determine the risk adjustment for non-financial risk. If the entity uses a technique other than the confidence level technique for determining the risk adjustment for non-financial risk, it shall disclose the technique used and the confidence level corresponding to the results of that technique." **(Para 119)**

Questions

- What does “group of contracts” really mean?
- What’s in and what’s out of the cash-flows?
- Lifetime view or one-year view of Solvency II?
- IFRS 17 mentions a risk measure (confidence level), but what is the risk profile?
- Net or Gross discounted future cash flows (or both)?
- How will reinsurance programmes be taken into account?
- What level of aggregation will be used? Portfolio/legal entity/holding company?
- + many more

Segmentation





- Level of segmentation for IFRS 17 is very likely to be more granular than for Solvency II
- Highly desirable for Solvency II technical provisions and IFRS 17 insurance contract liabilities to be derived from the same cash flow module. Important therefore to ensure a simple mapping of IFRS 17 groups to Solvency II lines of business
- The determination of whether a contract is onerous at initial recognition or has no significant possibility of becoming onerous subsequently is fundamental to the determination of the group of contracts to which it is allocated. Once determined at outset, groups remain fixed

Core principles

"An entity shall estimate the expected value (ie the probability-weighted mean) of the full range of possible outcomes", plus "a risk adjustment for non-financial risk"

- Stochastic reserving for everything?
- It's fulfilment cash-flows, which implies **the traditional lifetime view of risk**, not the one-year view of Solvency II

"The risk adjustment for non-financial risk for insurance contracts measures the compensation that the entity would require to make the entity indifferent between:

- *(a) fulfilling a liability that has a range of possible outcomes arising from non-financial risk; and*
- *(b) fulfilling a liability that will generate fixed cash flows with the same expected present value as the insurance contracts."*

- Looks like the risk adjustment is an attempt to obtain a "market value" of the liabilities
- Unfortunately, a market does not exist (except for private transactions)
- Use "mark-to-model" as a proxy

IFRS 17 Risk Adjustment Techniques

"IFRS 17 does not specify the estimation technique(s) used to determine the risk adjustment for non-financial risk." (B91)

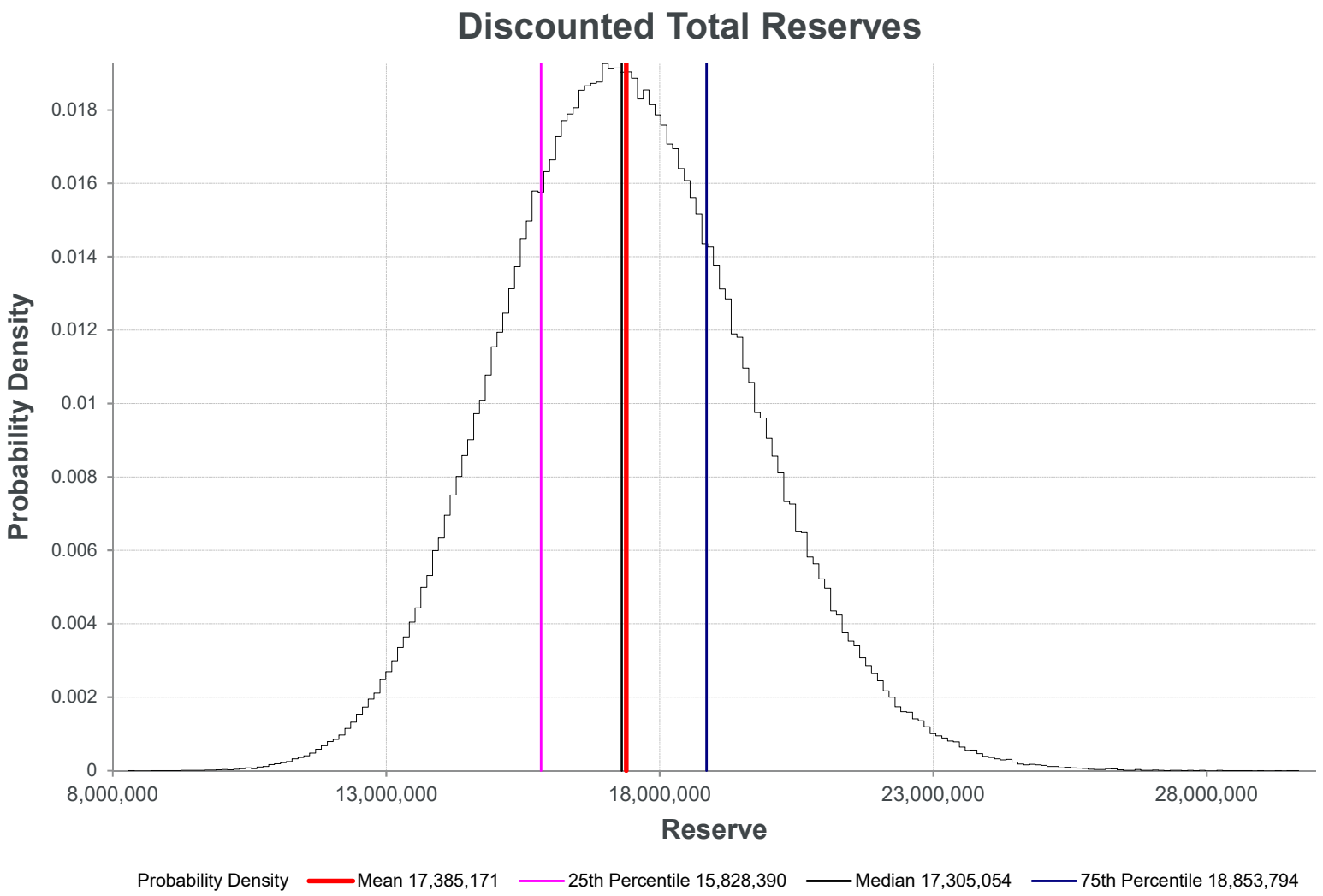
Approach 1

- Use a risk measure applied to a distribution of the discounted fulfilment cash-flows over their lifetime
  - Confidence Level (Value at Risk)
  - Conditional Tail Expectation (Tail Value at Risk)
  - Wang's Proportional Hazards Transform*

Approach 2

- Use a Cost-of-Capital approach
  - Take care over the basis for capital requirements:
  - Lifetime or one-year view?
  - Capital requirements for "groups" of contracts?

* Note: Wright (1997) proposed using Wang's proportional hazards transform for calculating a prudential margin (ie risk adjustment)


Discounted Total Reserves
Probability Density
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
8,000,000
13,000,000
18,000,000
23,000,000
28,000,000
Reserve
Probability Density
Mean 17,385,171
25th Percentile 15,828,390
Median 17,305,054
75th Percentile 18,853,794

VaR, TVaR and PHT: Characteristics

Value at Risk

- VaR is from a single simulation. Could be subject to considerable volatility (especially at higher percentiles).
- Has a range from the minimum to the maximum simulated values
- Some commentators observe that VaR does not adequately pick up skewness/extremes
- VaR is NOT a coherent risk measure, and does not obey the sub-additivity property, so it is not generally useful for allocations to lower levels

Tail Value at Risk

- Uses equal weights above a given percentile level
- Potentially better at catching skewness/extremes
- Note it is still an *equal* weight above a given percentile
- Has a range from the mean to the maximum simulated value
- TVaR is a coherent risk measure, and as such obeys the sub-additivity property, so is potentially useful for allocations to lower levels

Proportional Hazards Transform

- Uses increasing weights across all simulations
- Better at catching skewness/extremes
- Has a range from the mean to the maximum simulated value
- PHT is a coherent risk measure, and as such obeys the sub-additivity property, so is potentially useful for allocations to lower levels

** See Artzner, Delbaen, Eber and Heath (1999) for a discussion of coherent risk measures*

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Bootstrap Method:
- (•) Mack
- ( ) ODP Non-constant Scale
- ( ) ODP Constant Scale

(Uses non-parametric bootstrapping only)

Forecast Distribution:
- ( ) Non-parametric
- (•) Gamma

Simulations (max = 50,000): 1000

Seed Point: 321

Discount rate: 0.03

Simulate

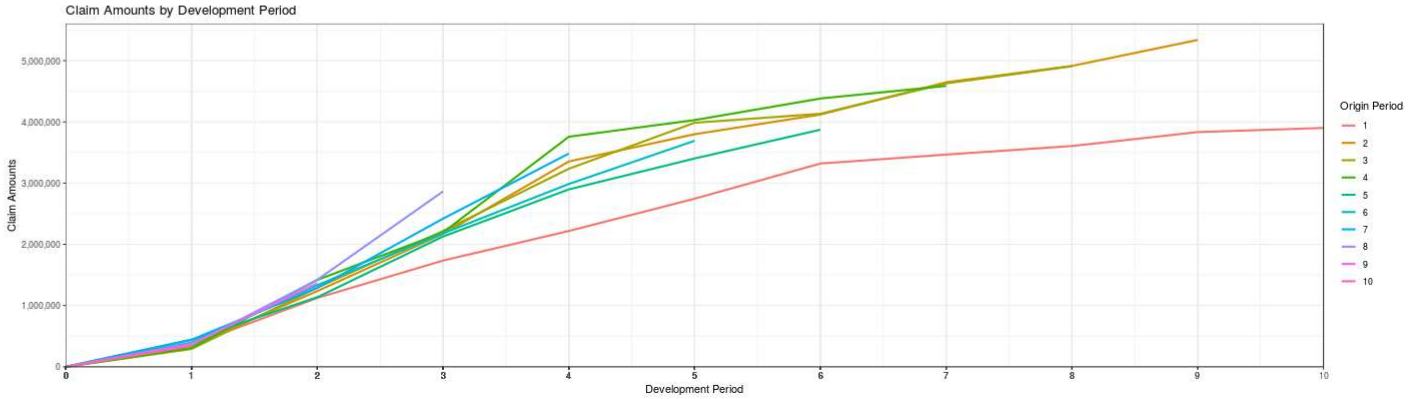
App for: England, Verrall and Wüthrich (2019)

Data | Ratios | Residuals/Scale | Summary Tables | Histogram | Claims Development | Risk Adjustments | References

Taylor and Ashe (1983) Data

☐ Show Incremental

	DP 1	DP 2	DP 3	DP 4	DP 5	DP 6	DP 7	DP 8	DP 9	DP 10
OP 1	357,848	1,124,788	1,735,330	2,218,270	2,745,596	3,319,994	3,466,336	3,606,286	3,833,515	3,901,463
OP 2	352,118	1,236,139	2,170,033	3,353,322	3,799,067	4,120,063	4,647,867	4,914,039	5,339,085	
OP 3	290,507	1,292,306	2,218,525	3,235,179	3,985,995	4,132,918	4,628,910	4,909,315		
OP 4	310,608	1,418,858	2,195,047	3,757,447	4,029,929	4,381,982	4,588,268			
OP 5	443,160	1,136,350	2,128,333	2,897,821	3,402,672	3,873,311				
OP 6	396,132	1,333,217	2,180,715	2,985,752	3,691,712					
OP 7	440,832	1,288,463	2,419,861	3,483,130						
OP 8	359,480	1,421,128	2,864,498							
OP 9	376,686	1,363,294								
OP 10	344,014									



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VaR, TVaR and PHT: Example

	Value at Risk	Tail Value at Risk	Proportional Hazards Transform
Risk Tolerance *	75.00%	40.00%	1.85
Best Estimate (Disc)	17,382,445	17,382,445	17,382,445
Risk Adjustment	1,467,959	1,431,203	1,456,272
Total	18,850,404	18,813,648	18,838,717
Risk Adjustment %	8.45%	8.23%	8.38%

** Risk tolerances selected to give approximately similar results only*

Obtaining Equivalence Between Cost-of-Capital, VaR, TVaR, and PHT approaches

	Cost-of-Capital (Best estimate basis)	Value at Risk	Tail Value at Risk	Proportional Hazards Transform
Risk Tolerance *		65.4%	21.7%	1.44
Best Estimate (Disc)	17,381,682	17,382,445	17,382,445	17,382,445
Risk Adjustment	818,269	818,591	818,344	816,826
Total	18,199,871	18,201,036	18,200,789	18,199,271
Risk Adjustment %	4.71%	4.71%	4.71%	4.70%

The “confidence level” corresponding to the cost-of-capital technique is 65.4%

With this example, the Cost-of-Capital risk adjustment looks quite low (or the distribution used for the cash-flow risk profile is too wide)

What's In and What's Out?

"...the risk adjustment for non-financial risk shall reflect all non-financial risks associated with the insurance contracts. It shall not reflect the risks that do not arise from the insurance contracts, such as general operational risk" (B89)

- Included:
  - Claims, benefits, services etc
  - Expenses associated directly with fulfilling the contracts
  - Premiums, fees etc receivable
- Excluded:
  - Investment income
  - Overhead and other expenses
  - Asset risk
  - Operational risk
- Note risks excluded if a cost-of-capital risk adjustment is used, compared to Solvency II

- Note also that traditional approaches to reserve risk usually consider paid or incurred amounts only (eg bootstrapping a paid loss triangle). For IFRS 17, it is necessary to consider all fulfilment cash flows
- How to allow for premiums and expenses?

Method 1: Use traditional stochastic approaches for loss amounts then adjust simply for premium/expenses

Method 2: Obtain a single triangle of all fulfilment cash flows, then apply traditional stochastic reserving techniques

Method 3: Obtain distributions of all component cash flows, then combine using an appropriate dependency structure (copula).


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Aggregation and Allocation

Level of Aggregation

(B88) Because the risk adjustment for non-financial risk reflects the compensation the entity would require for bearing the non-financial risk arising from the uncertain amount and timing of the cash flows, the risk adjustment for non-financial risk also reflects:

(a) the degree of diversification benefit the entity includes when determining the compensation it requires for bearing that risk; and

(b) both favourable and unfavourable outcomes, in a way that reflects the entity's degree of risk aversion.

Note that diversification benefits should be reflected, but neither the level of aggregation nor the methods used for quantifying diversification are specified.

Note also that "risk" correctly considers favourable and unfavourable outcomes. That is, we need a risk profile of all outcomes around the "probability weighted mean".

It is important to remember that a risk adjustment is required for "groups of contracts" (Paras 29 and 32), although it is unclear at what level disclosure is required.

Level of Aggregation

Method 1: Create aggregate distribution at the highest reporting level, then apply risk measure

- Given (simulated) distributions of fulfilment cash flows at lower levels, combine the distributions with dependencies (using copulae) to provide an overall aggregate distribution
- Apply a risk measure (VaR, TVaR or PHT) to the aggregate distribution, and obtain the risk adjustment (or use CoC) at the aggregate level
- Allocate the risk adjustment back to lower levels
  - Different allocation methods will give different results
  - It is possible to apply methods that are naturally additive

This approach is logical, statistically sound, and obeys the principles behind insurance. It is the aggregate distribution that is important.

Method 2: Create risk adjustments at lower levels, then sum the risk adjustments and apply a "diversification benefit"

- Given (simulated) distributions of fulfilment cash flows at the lowest level, apply the given risk measure to give risk adjustments at the lowest level
- Sum the risk adjustments to give an overall risk adjustment before diversification
- Attempt to allow for "diversification" in some arbitrary way, and allocate back
- (Note: an aggregate distribution is still required to obtain the equivalent confidence level)

Although this approach is popular, it is unsatisfactory and lacks statistical rigour (except in some contrived examples)

Level of Aggregation

Consider the following:

1. A monoline insurer operating in a single country

   Straightforward. Create an aggregate distribution of fulfilment cash flows and apply risk measure

2. An insurer writing many lines of business operating in a single country

   Straightforward. Create an aggregate distribution of fulfilment cash flows (with dependencies) and apply risk measure. Allocate to line of business/portfolio/group.

3. An insurance group with multiple legal entities, but operating in a single country

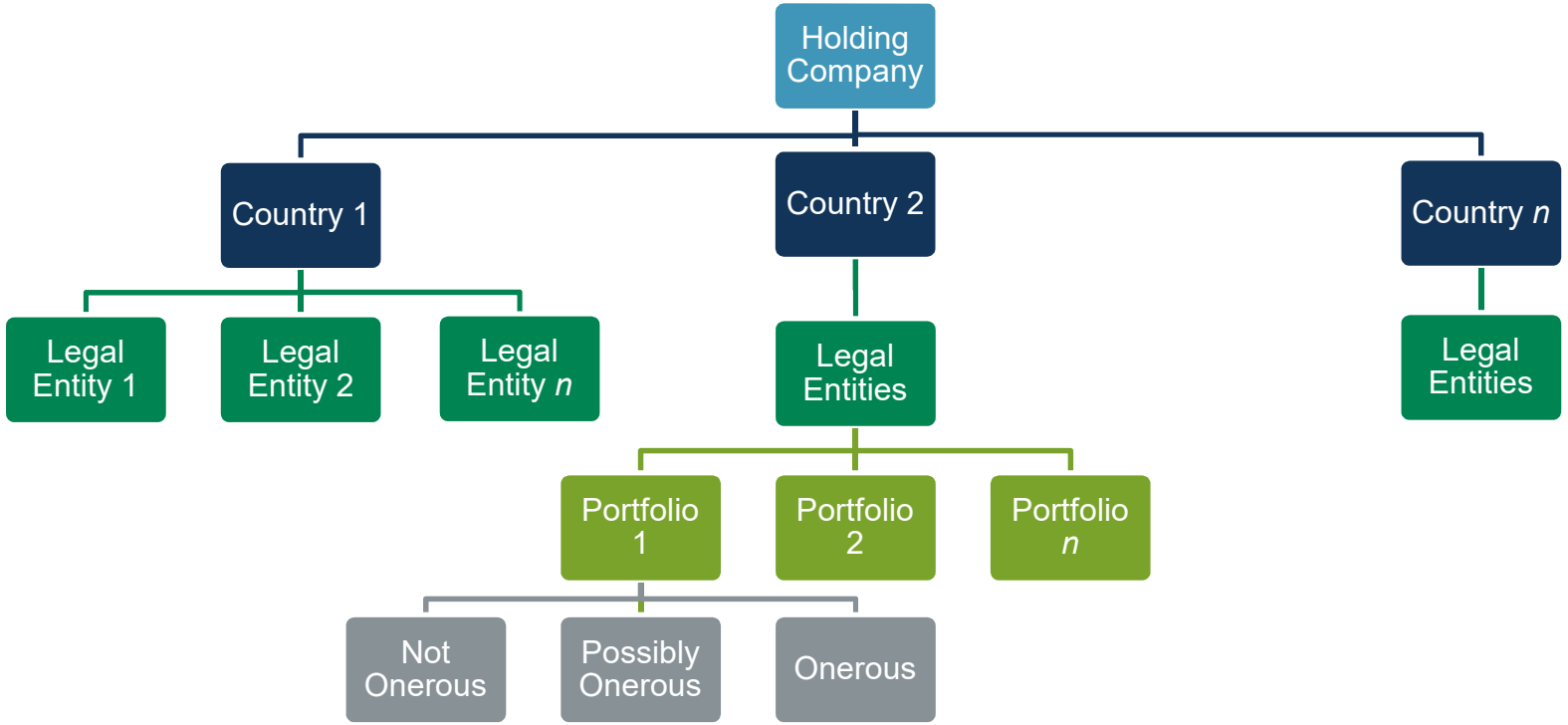
   Slightly harder since each legal entity will need its own accounts. Create an aggregate distribution of fulfilment cash flows (with dependencies) at the holding company level and apply risk measure. Allocate to legal entity level in a way that takes account of diversification at the holding company level.

   Could also create aggregate distributions and apply risk measure at legal entity level, then sum risk adjustments, ignoring further diversification, depending on beliefs.

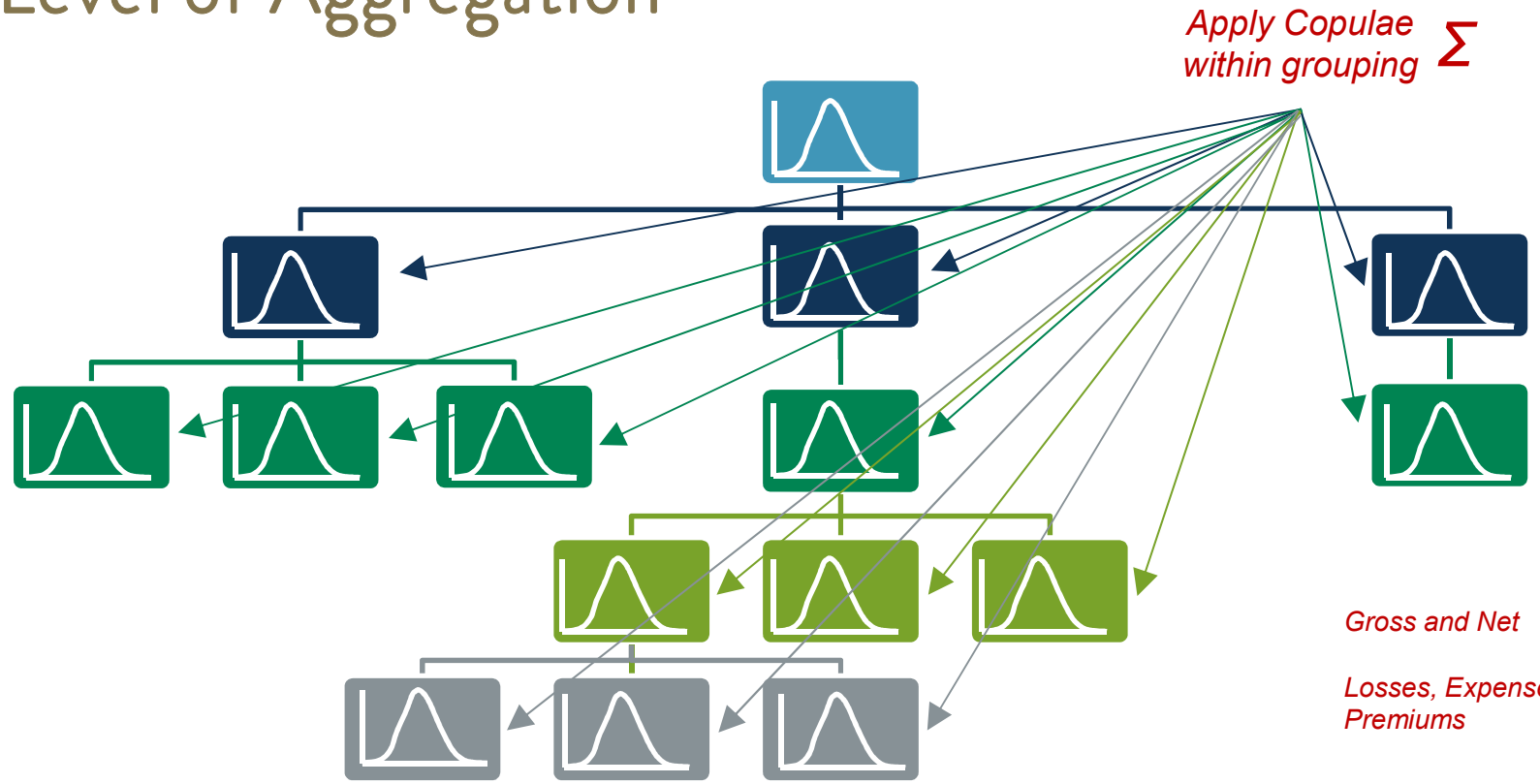
4. A multi-national insurance group, with many legal entities

   Like (3), but more complicated. Different jurisdictions may have different accounting regimes (not IFRS 17), or local interpretations. There may be rules around fungibility of “capital”, implying that diversification across legal entities/countries is not possible.

Level of Aggregation



Level of Aggregation



Allocation Techniques

- Risk adjustment allocation is essentially the same as capital allocation
- Many techniques have been proposed
- Each technique gives different results
- Each technique has its own characteristics, and will be useful in different circumstances
  - E.g. Are negative allocations desirable?

- Proportional allocation
- Covariance allocation
- Euler allocation
- “Coherent” allocation
- Myers-Read
- Shapley
- Aumann-Shapley
- etc

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Liabilities for Remaining Coverage (LRC)

Risk Adjustment – BBA vs PAA

- For business that has been written but not yet earned, the situation could become complicated
- If the PAA approach is used, it is straightforward. A risk adjustment is not explicitly calculated – it is assumed to be included in the market premium
  - Note that it will therefore be excluded from the risk adjustment at the aggregate level
- If the BBA approach is used, it is complicated.
  - A distribution of discounted fulfilment cash flows is required
  - Loss amounts, premiums, expenses etc
  - Calculations at contract, group or portfolio level?
  - For the risk measure, what risk tolerance level should be used when taking account of diversification?
  - Dependencies between earned and unearned elements?
  - Catastrophe exposed business?
- With claims reserving triangles, an additional origin period (or periods) could be added, then:
  - Simulate fulfilment cash flows for the additional period(s)
  - Apply a dependency between the additional year(s) and prior years
  - Combine with other groups/reserving classes/portfolios in the usual way
  - Reinsurance could get complicated

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Reinsurance

Reinsurance

- An explicit risk adjustment for reinsurance is required
  - Calculate using distribution of reinsurance cash-flows, or use gross and net distributions of the underlying and take the difference?
  - Either way, a distribution of the reinsurance cash-flows is required
- This hints at modelling the reinsurance programmes, contract by contract, year of account by year of account
- Modelling all reinsurance programmes could be a lot of work, and requires individual claims data
- **The traditional approach of using aggregate gross triangles and simulating an approximate net to gross ratio looks increasingly inadequate**

Reinsurance modelling for risk adjustments?

- Use triangle approaches (eg bootstrapping) for attritional claims
- Develop open large claims (and claims that could become large) to their ultimate position stochastically
- Obtain cash-flows for the development of large claims
- Pass simulated large claims through the non-proportional reinsurance programmes (quota share is easy) and net down
- Take care over aggregates etc for which knowledge of the sum of existing closed claims is required
- Remember re-instatement premiums
- Obtain total reinsurance cashflows across all contracts and years of account, and subtract from gross cash-flow distributions to obtain a net distribution

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Conclusions

Conclusions

- Approaches to estimating the risk adjustment under IFRS 17 using a risk measure applied to the distribution of fulfilment cash flows are straightforward to apply
  - Given a distribution of the fulfilment cash flows, select a risk measure and risk tolerance level
- The cost-of-capital method is more complex and requires additional assumptions
  - The equivalent "confidence level" has to be disclosed anyway
- When obtaining a distribution for LIC, we need to consider all cash flows: premiums, losses, expenses etc
- If the PAA approach is not used for LRC, a distribution is required for the unearned exposures, and the dependency between LIC and LRC needs to be considered
- Reinsurance could get (very) complicated
- Allocation of an overall risk adjustment is very much like capital allocation
- IFRS 17 risk adjustments using simulation techniques require methods that are generally more familiar to capital modelling specialists than reserving specialists

Questions

Comments

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