IFRS 17 Risk Adjustment

Deriving the Confidence Level

Bertrand Lespinasse
Alexandre Boumezoued

11 MARS 2021

IFRS 17 Risk Adjustment

Overview

“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”

— IFRS 17 Standard; Paragraph 37

IFRS 17 Liabilities

- IFRS 17 liabilities under the General Model (BBA) & VFA model are measured as follows:

IFRS 17 liabilities = **Best Estimate of fulfilment cash flows** + **Risk Adjustment** + **CSM**

CSM

- ***Contractual Service Margin***: *future profits expected to be earned on the contracts*

Risk Adjustment

- ***Compensation for bearing the uncertainty linked to fulfilment cash flows (timing + amount)***

Best Estimate of fulfilment cash flows

- *Current estimates: expected cash flows in / out projected using companies' own data and current best estimate assumptions*
- *Allowance for TVOG*
- *Discount rates based on market conditions + illiquidity premium*

How is Risk Adjustment calculated?

- No prescribed method contrary to Solvency II
- Whatever the method used…
  - **… 5 requirements should be met** when calculating the Risk Adjustment:

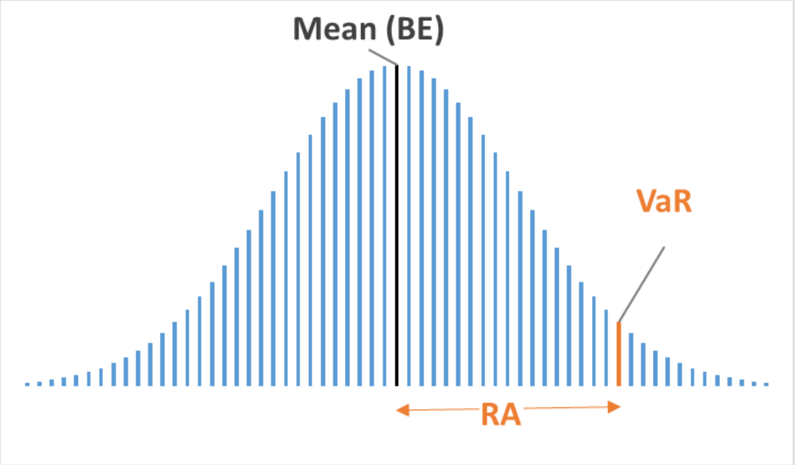
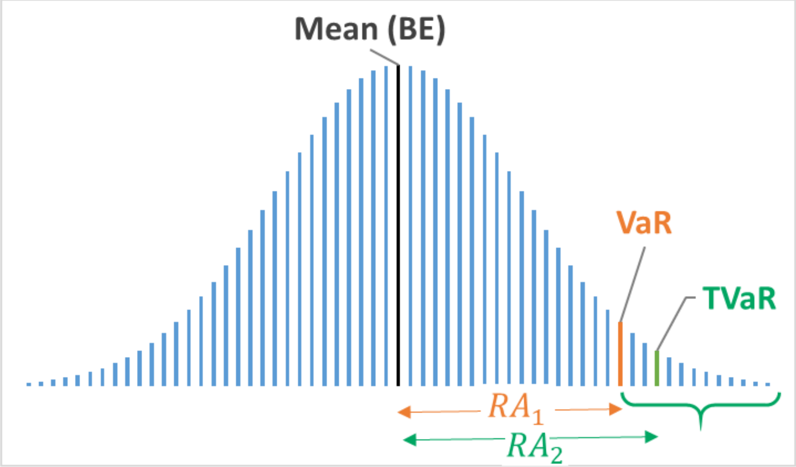
1. Risks with **low frequency and high severity** will result in higher risk adjustments for non-financial risk than risks with high frequency and low severity
2. For similar risks, contracts with a **longer duration** will result in higher risk adjustments for non-financial risk than contracts with a shorter duration
3. Risks with a **wider probability distribution** will result in higher risk adjustments for non-financial risk than risks with a narrower distribution
4. The **less that is known** about the current estimate and its trend, the higher will be the risk adjustments for non-financial risk
5. To the extent that **emerging experience** reduces uncertainty about the amount and timing of cash-flows, risk adjustments for non-financial risk will decrease and vice versa.

- … and each company should **disclose the method used & the equivalent confidence level**

Milliman

Which methods and which challenges?

- "Usual suspects" are:

Value at Risk (VaR)	Tail VaR	Cost of capital
		$$RA = \sum_{t \geq 1} \frac{\alpha_t \times C_t}{(1+d_t)^t}$$ • C_t : capital, resulting from non-financial risks, to be held at date t • α_t : cost of capital rate at date t • d_t : discount rate at date t
~ *Confidence level directly available (holds if simulations are drawn assuming the relevant risk horizon…)*	~ *No confidence level directly available (except if simulations can be reworked with VaR…)*	✖ *No confidence level directly available*

- **Additional work is often needed to meet IFRS 17 disclosure requirements**

Disclosing the confidence level by closed-form

Advantages over other simplified approaches

Advantages over other simplified approaches

- *Greater accuracy as normal approximation of risks is a significant simplification*
- *Greater transparency in terms of capturing entities' own view of risk*
- *Easier to evidence compliance with IFRS17 RA characteristics*
- *The IFRS17 RA can simply be calculated over different time horizons*
- *Once the solution is developed, a Closed-Form approach would have lower operational overheads as, for example, re-running existing models with different stresses*
- *Confidence intervals can be developed in for Closed-Form approach to determine the uncertainty of the estimate*

IFRS 17 Risk Adjustment

Confidence level disclosure methodology

Confidence level disclosure technique

Overview

- Full solution detailed in paper available at https://fr.milliman.com/fr-fr/insurance/research-and-development
- The closed-form solution approach process is detailed below:

Modeling of risks
Define the stochastic models for each life underwriting risk, models shall fulfill the key requirements.

Quantify risk deviation
Quantify the impact of the risk factor deviation on the liability cash-flows, for each product.

Moment calculation
- For each risk and product, compute the moments of the liability cash-flows deviation distributions.
- Derive the moments of the aggregate distribution in a closed-form manner

Percentile inversion
Using the Risk Adjustment level and the moments of the aggregate distribution, we can compute the confidence level inverting the Cornish-Fisher Value-At-Risk formula.

Confidence level disclosure technique

Modelling of Risks

- The presentation focuses on mortality, longevity and lapse risks:

Mortality Level Risk
Uncertainty in the initial mortality estimate

Mortality Catastrophic Risk
External event, that creates a one-off temporary increase in the mortality assumption

Mortality Volatility Risk
Sampling risk arising from the random outcomes of claims during each projection year

Mortality Trend Risk
The potential adverse development of the risk trend over time

Lapse Risk
Measuring the uncertainty on the surrender rates

- Similar approaches can be applied for other types of risks

Confidence level disclosure technique

Moment calculation

- Based on the specific risk modeling framework, the aim is to derive closed-form formulas for the calculation of the liability cash-flows variation X:
  - The moments estimated are
    - Order 1: expectancy $\mathbb{E}[X]$
    - Order 2: variance $Var(X) = \mathbb{E}[(X - \mathbb{E}[X])^2]$
    - Order 3: skewness $Skew(X) = \frac{\mathbb{E}[(X-\mathbb{E}[X])^3]}{Var(X)^{3/2}}$; measures the asymmetry of the risk distribution
- The derivation of the moments is split into two steps:

1. Consider each risk separately

Compute the moments of the total liability cash flows distribution subject to each risk

2. Aggregation of those risks

Derive the moments of the aggregate distribution in a closed-form manner, allowing for risk dependencies

Confidence level disclosure technique

Cornish-Fisher expansion

- The Value-At-Risk at ***confidence level α*** can be approximated using the **Cornish-Fisher formula** as:

$$VaR_{\alpha}(X) \approx \mathbb{E}[X] + \sqrt{Var(X)}\left(z_{\alpha} + \frac{1}{6}\left(z_{\alpha}^{2} - 1\right)Skew(X)\right)$$

  - where
    - z_{α} is the α-percentile of a standardized normal variable.

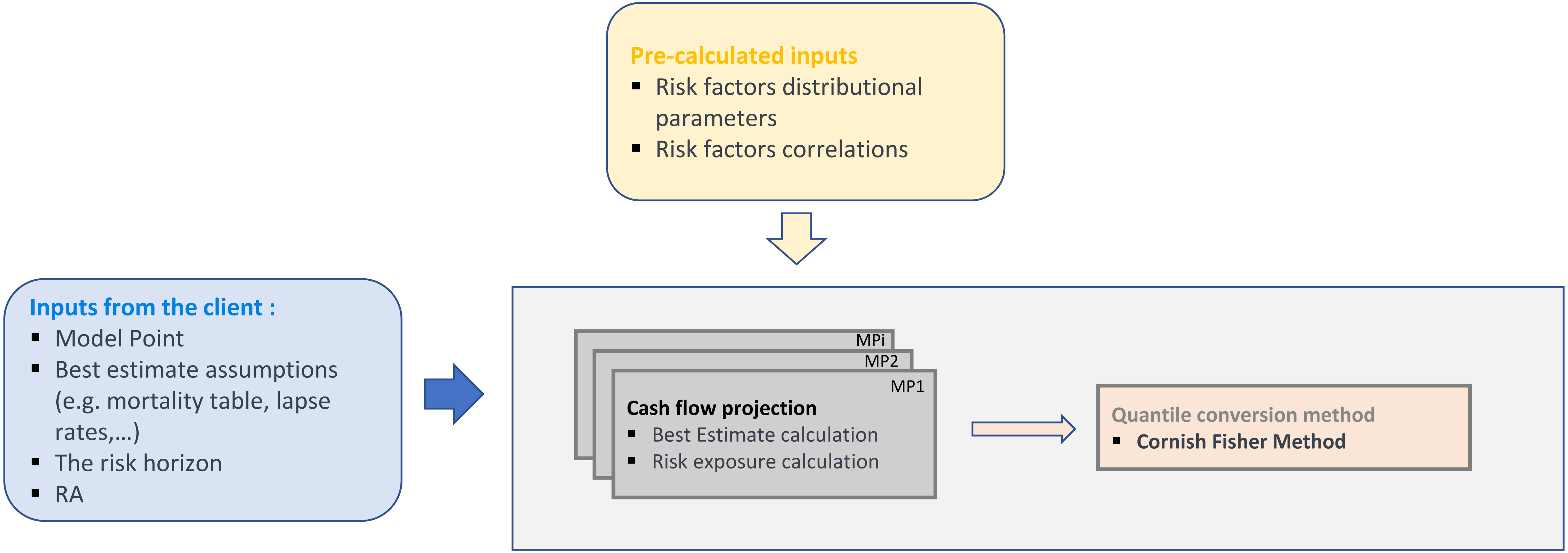
Computation of the Value-At-Risk*, knowing the moments and the* ***confidence level****.*

- References
  - Fisher & Cornish (1960)
  - Lee, Y. S., & Lee, M. C. (1992)
  - Chevallier, F., Dal Moro, E., Krvavych, Y., & Rudenko, I. (2018)

Confidence level disclosure technique

Workflow of the underlying solution

- The proposed methodology to convert the Risk Adjustment amount being given into a percentile level and related workflow are illustrated below:



Comparison between closed-form and simulations

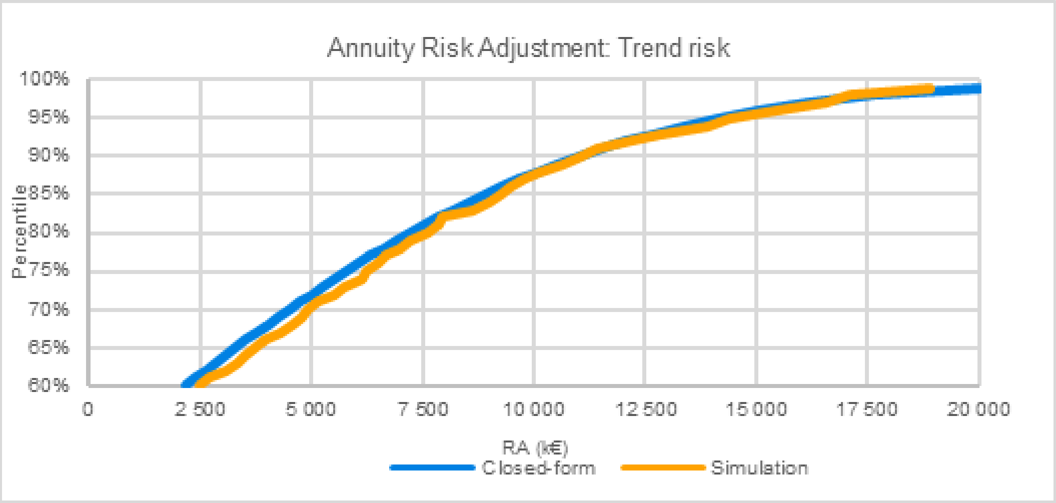
Example for 2 typical products

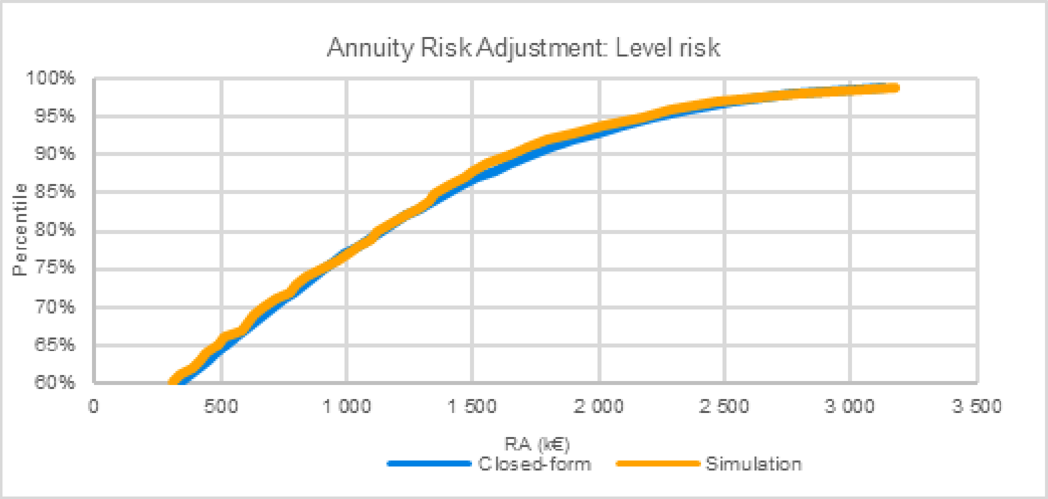
- The derivation of the percentile level is illustrated for two types of products:
  - Annuities in payment
  - Term Assurance (regular and single premium)
- For each product, the derivation of the Risk Adjustment using the closed-form methodology is compared to a full simulation approach.
- This allows an assessment of the accuracy of the closed-form approach and to identify its range of validity in terms of both percentile level and type of risk.
- For the purpose of illustration, we consider a multi-year approach with a 5-year risk horizon.

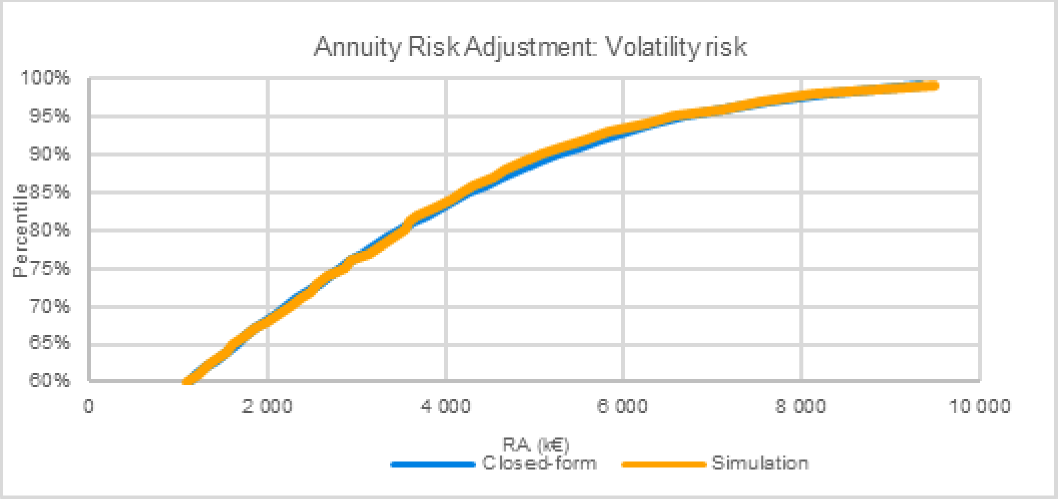
Comparison between closed-form and simulations

Annuity product

- The closed-form approach provides the confidence level with good accuracy.
- Note that no lapse risk nor mortality CAT risk are included for this product.



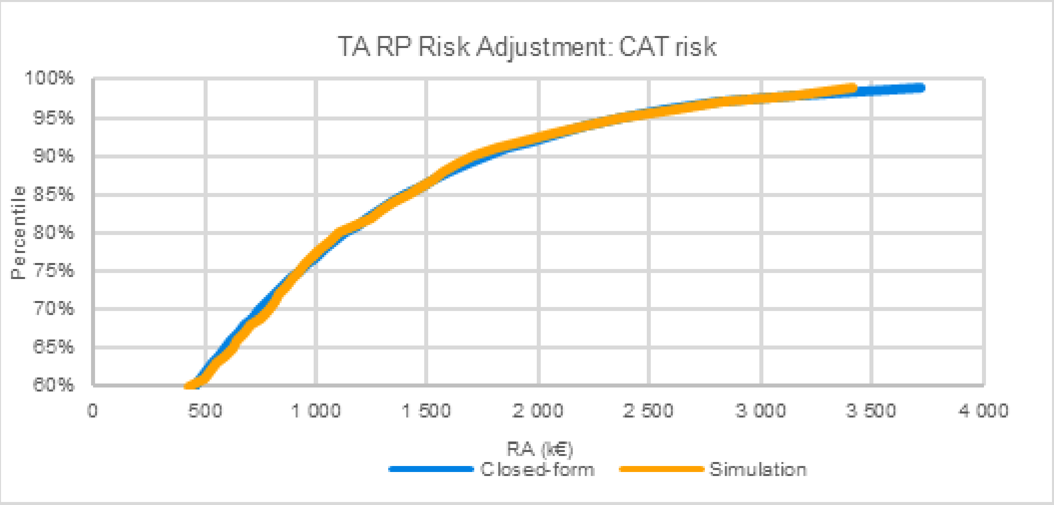


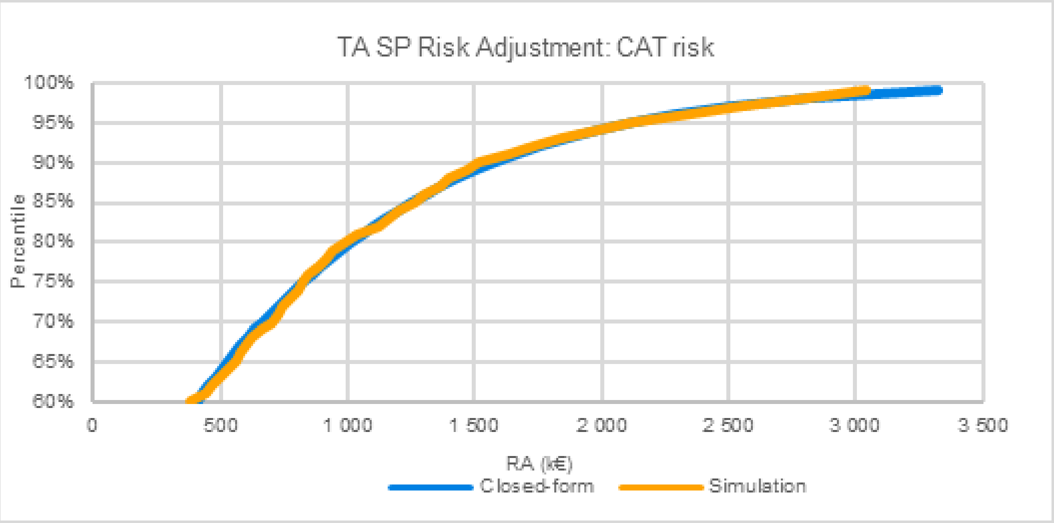


Comparison between closed-form and simulations

Term Assurance products

- The derivation of the confidence level is illustrated for mortality CAT risk for Term Assurance, with either single (SP) or regular premiums (RP).
- A good fit is observed compared to the simulated results, with some differences for the higher percentiles.

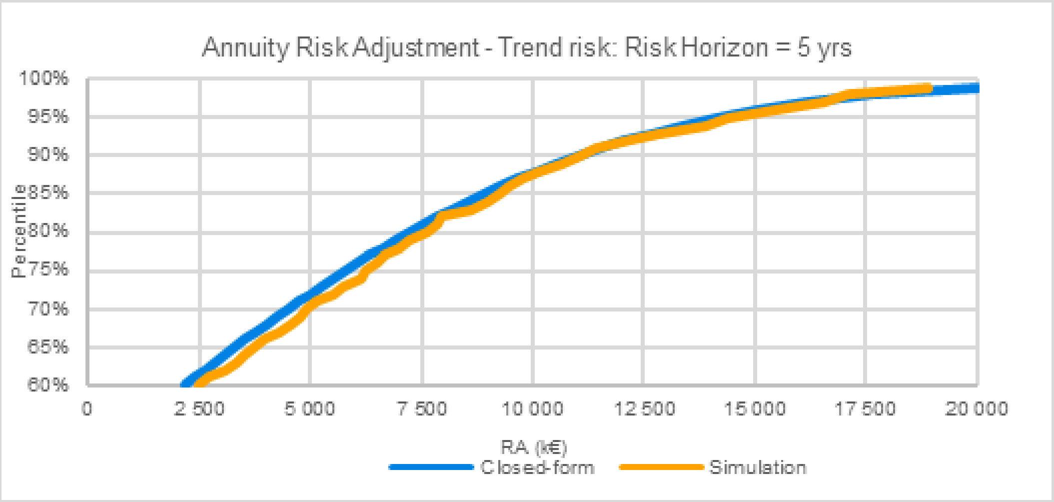


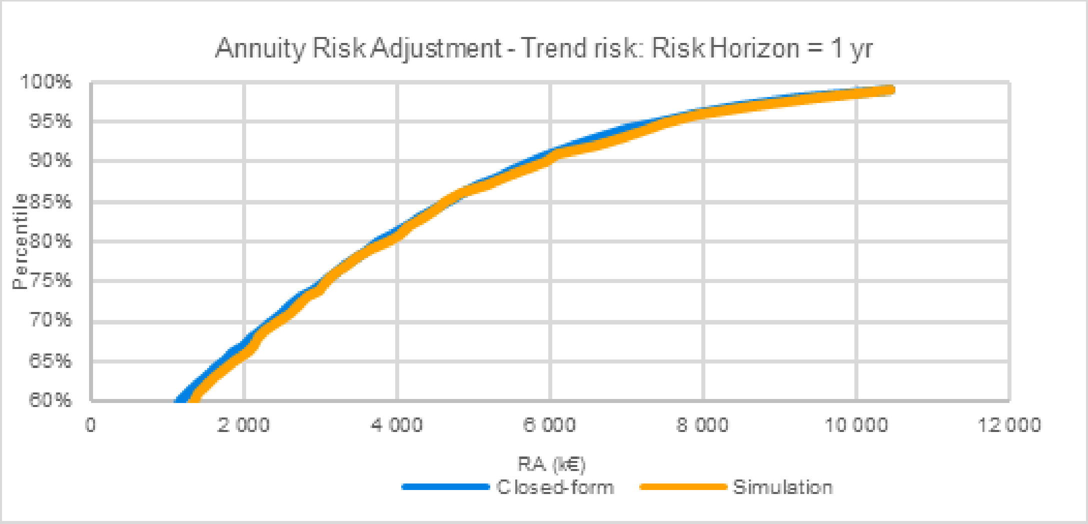


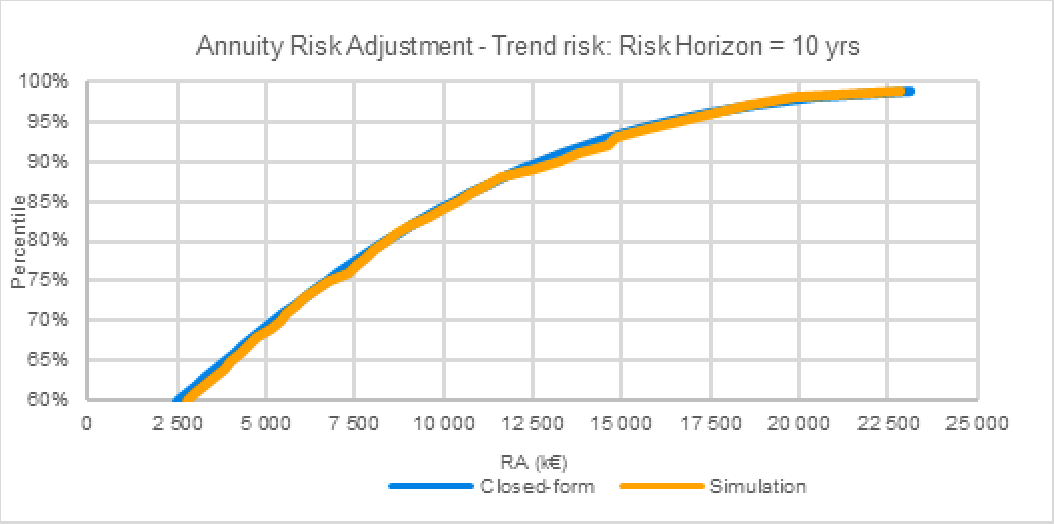
Comparison between closed-form and simulations

Sensitivity to the risk horizon

- A sensitivity analysis is performed with respect to the risk horizon. The results are depicted for the Annuity product and the longevity trend risk factor for a risk horizon of 1, 5, and 10 years.
- A good fit is observed compared to the simulated results, with some differences for the higher percentiles. It is recalled that the closed-form methodology can be applied to any time horizon, from 1 year up to the ultimate.







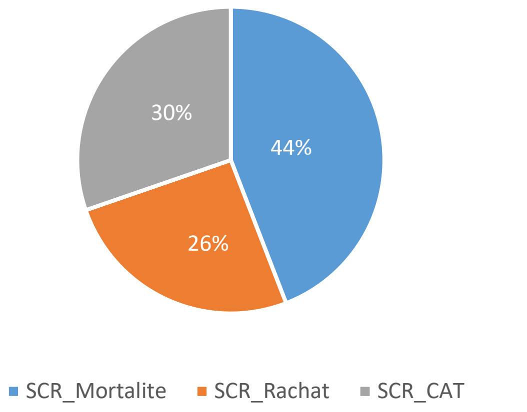
IFRS 17 Risk Adjustment

Case study

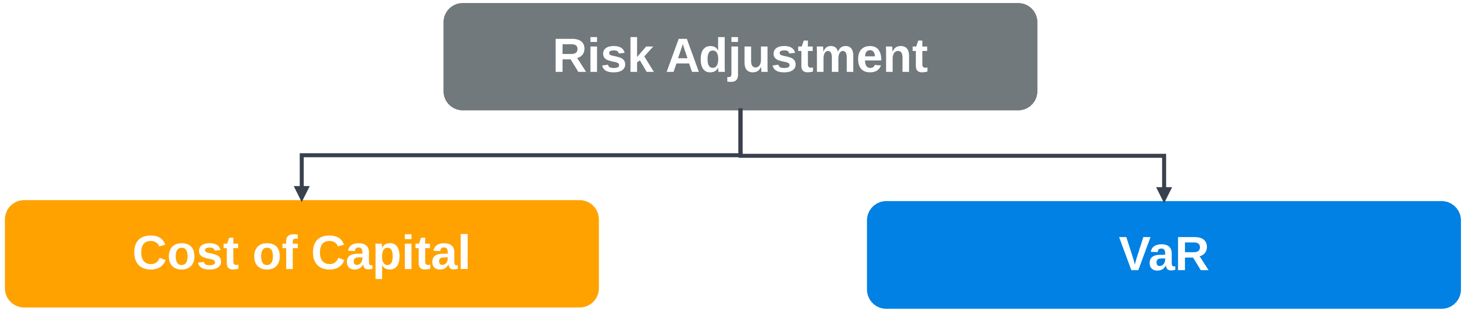
Case study

General framework

- Creditor insurance portfolio
- Death cover only
- Risk factors modelled:
  - Death
  - Lapse
- The company tests 2 approaches to derive the amount of Risk Adjustment:



Breakdown of the Life SCR



Case study

General framework

- In practice, the company wants to **reuse as much as possible Solvency II tools and processes already in place**:

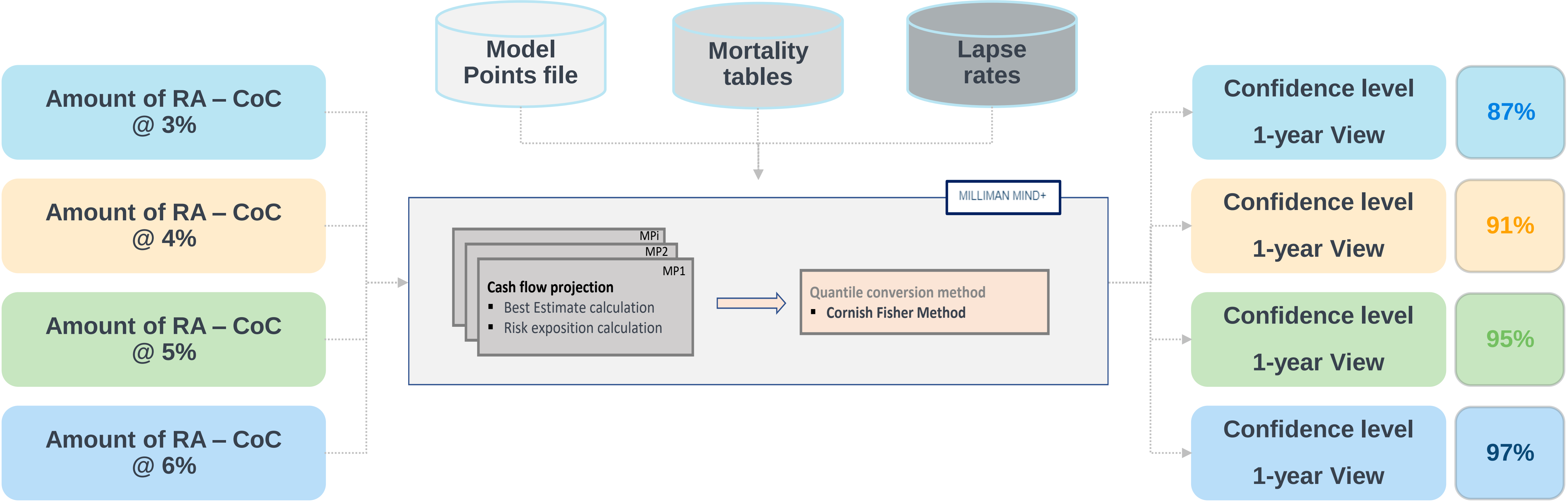
Cost of capital	*Similar to SII Risk Margin computation*	• Initial capital is the SCR excluding non-relevant risks such as operational risk • Future locked-in capital amounts are projected using drivers • Different levels of CoC are considered
VaR	*Similar to SII SCR computation*	• Standard Formula shocks are adapted to different α confidence levels using Normal properties: $Shock_{\alpha}=Shock_{99,5\%} * \frac{N_{\alpha}(0,1)}{N_{99,5\%}(0,1)}$ • Reuse of the Standard Formula correlation matrix

Milliman

Case study

Illustration 1

- The company calculates the Risk Adjustment using a **cost of capital approach** (for different values of CoC) and wants to derive the equivalent confidence level in the **1-year distribution**:

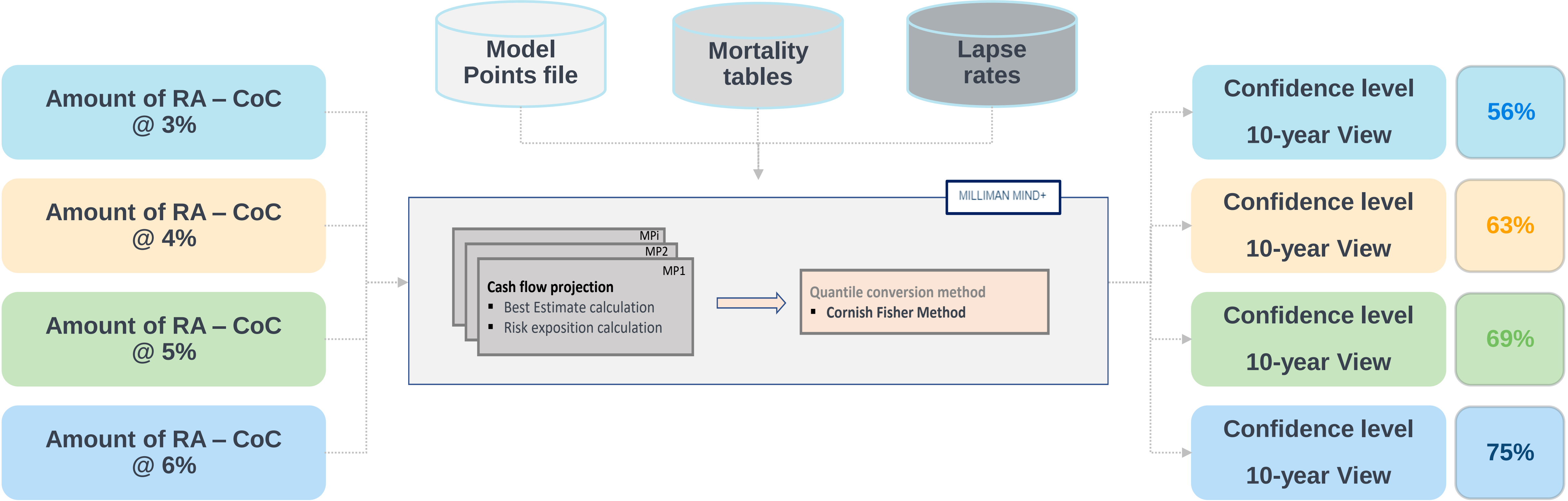


Milliman

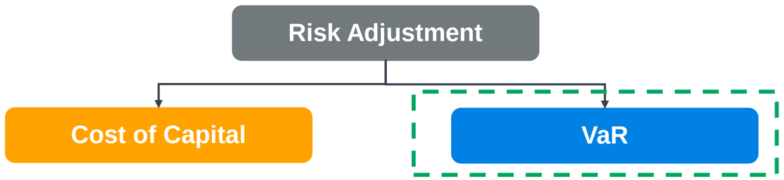
Case study

Illustration 2

- The company calculates the Risk Adjustment using a **cost of capital approach** (for different values of CoC) and wants to derive the equivalent confidence level in the **10-year distribution**:



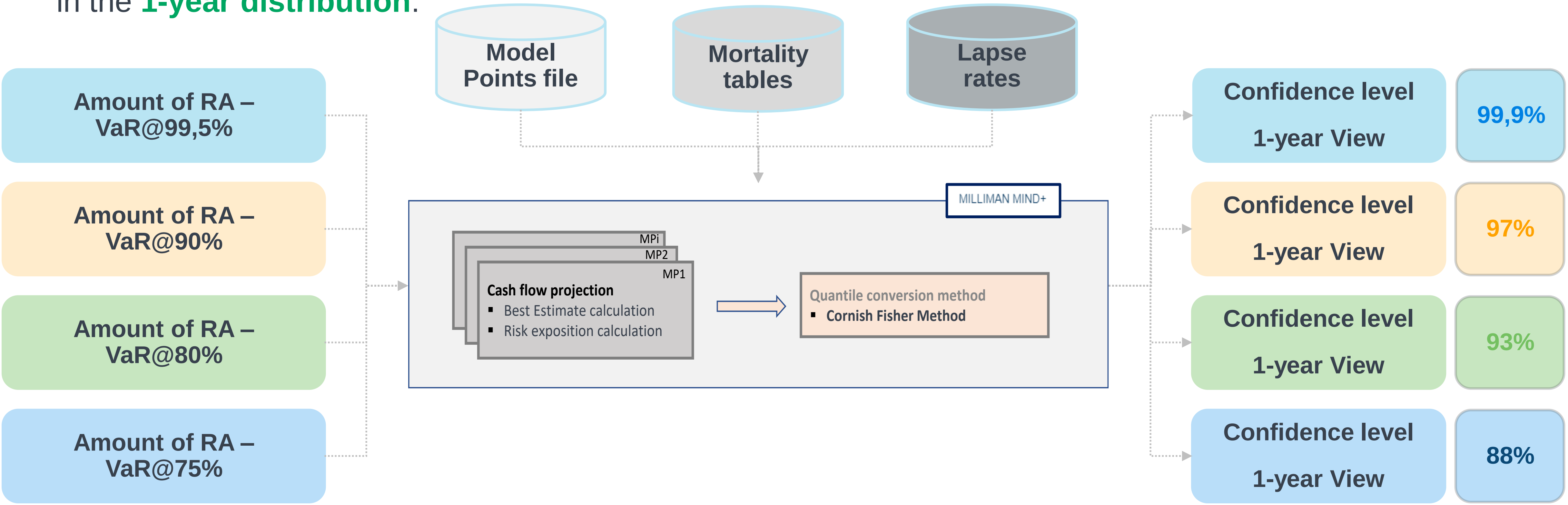
Milliman

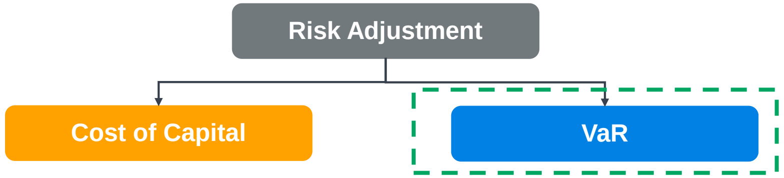


Case study

Illustration 3

- The company calculates the Risk Adjustment using a **VaR approach** (based on Standard Formula calibration adjusted with Gaussian conversion method) and wants to derive the equivalent confidence level in the **1-year distribution**:

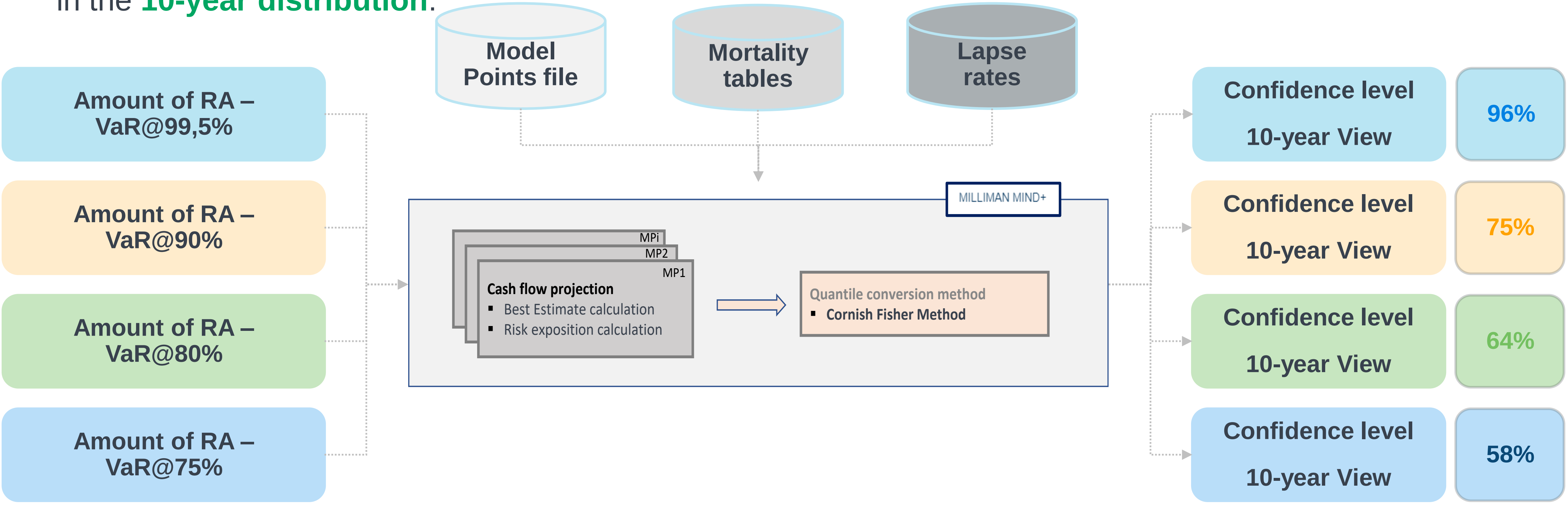




Case study

Illustration 4

- The company calculates the Risk Adjustment using a **VaR approach** (based on Standard Formula calibration adjusted with Gaussian conversion method) and wants to derive the equivalent confidence level in the **10-year distribution**:



Milliman

Case study

Main strengths of the approach

Main strengths of the approach

- ***Direct*** *derivation of the equivalent confidence level thanks to a Closed-Form approach*
- *Possibility to use* ***any metrics*** *to calculate the Risk Adjustment → reuse of internal KPIs*
- *Possibility to keep a 1-year view of the risk from a* ***calculation*** *point of view but to derive a* ***multiyear*** *equivalent confidence level*
- *Possibility to exclude conservatism / approximations included in the Standard Formula framework*

Questions?

Disclaimer

This presentation presents information of a general nature. It is not intended to guide or determine any specific individual situation and Milliman recommends that users of this presentation will seek explanation and/or amplification of any part of the presentation that they consider not to be clear. Neither the presenter nor the presenter's employer shall have any responsibility or liability to any person or entity with respect to damages alleged to have been caused directly or indirectly by the content of this presentation. All persons who choose to rely in any way on the contents of this presentation do so entirely at their own risk.

The contents of this presentation are confidential and must not be modified, copied, quoted, distributed or shown to any other parties without Milliman's prior written consent.