Approaches to evaluate Risk Adjustment under IFRS 17

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Agenda

1. Background
2. Problematic
3. Methods
4. Use case
5. Results
6. Discussion
7. Conclusion

1. Background

Key points about IFRS 17	• Replaces an interim standard – IFRS 4 • Introduces a single IFRS accounting model for all types of insurance contracts • Aligns as much as possible insurance accounting with the general IFRS accounting of other industries • Provides useful information about profitability of insurance contracts • Reflects economics and risks in a timely manner (Ex: time value of money…) • IFRS 17 introduces a new system of profit reporting

1. Background

IFRS 17 introduces a new system of profit reporting

Total IFRS 17 insurance liability

=

CSM

The **contractual service margin** is the profit that the business expects to make after paying out all claims and expenses and providing for the risk adjustment.

+

RA

The **risk adjustment** reflects uncertain premiums & claims at best estimate. It is a buffer in case experience changes for the worst. Any release of the risk adjustment is a profit.

+

Present value of expected cash flows : **BEL**

This is all the **expected premiums** from the policy, **claims & expenses** to be paid out, valued at today’s terms.

IFRS 17
INCOME STATEMENT

- CSM amortization
- Risk adjustment release
- Experience variance
  - Expected claims and benefits
  - (-)Claims and benefits paid
- Onerous contracts
- INSURANCE SERVICE RESULT

- Investment income
- Insurance finance expenses
- NET FINANCIAL RESULT

- OPERATING PROFIT
- Finance costs
- Income tax expense

- PROFIT FOR THE PERIOD

2. Problematic

Risk Adjustment for non-financial risks (B86-88) **:**

- Compensation for bearing uncertainty
- Makes entity indifferent between :
  - Range of possible outcomes
  - Fixed cash flows with same expected value

No estimation techniques prescribed by the Standard

The Standard identifies some quantitative principles

Experts' judgment are allowed explicitly

3. Methods
3.1 Cost of Capital (CoC)

Evaluates the cost of holding capital to cover the related risks over the lifetime of the business.

The adjustment for risk is then given by the formula below:

$$\mathrm{RA} = CoC \times \sum_{t \geq 0} \frac{SCR_t}{(1 + r_{t+1})^{t+1}}$$

Need to adapt the Solvency 2 (S2) Risk Margin calculations

Underwriting SCR representing 99.5% percentil of BE S2 distribution

+

- Solvency 2 methodology
- Captures the distribution and temporality of risk

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- Complex financial communication
- Requires defining cost of capital parameters
- Results may be volatile (several parameters to consider)

3. Methods
3.2 Deviation of technical risks

Inspired from the CoC Approch and follows the same principles

Need to calibrate the central best estimate law of each risks factor then to calculate the deviation to a given level of confidence.

$$\boldsymbol{Deviation^{\alpha}} = \boldsymbol{BE^{\alpha}} - \boldsymbol{BE}$$

$\boldsymbol{BE^{\alpha}}$ = the best estimate calculated with risk factor law under confidence level $\boldsymbol{\alpha}$.

The adjustment for risk is then given by the formula below:

$$\boldsymbol{RA_{\alpha}} = CoC \times \sum_{t \geq 0} \frac{\boldsymbol{Deviation_t^{\alpha}}}{(1 + r_{t+1})^{t+1}}$$

+

- Better fit the inherent risk of the business
- Captures the distribution and temporality of risk

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- Complex financial communication
- Need to redo the entire S2 capital cost calculation in an IFRS 17 environment

3. Methods

3.3 VaR Variance-Covariance

Assumptions :

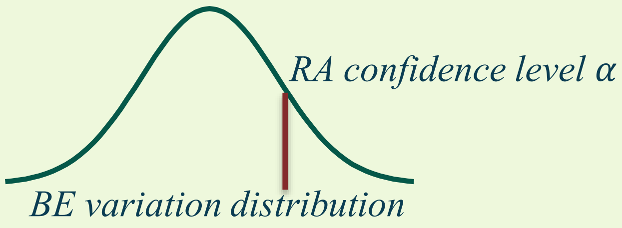
- Supposes that risk factors variations and BE variations have normal distribution ($\boldsymbol{\Delta}$)
- Expert judgment is needed to define the shocks for each risk factor and the *varcov* matrix ($\boldsymbol{\Sigma}$)
- Need to define a relationship between BE variations and risk factors variations ($\mathbf{B}$)
- Example : $BE\text{ Variation} = \boldsymbol{\beta}_1 * VarMortalityVar + \boldsymbol{\beta}_2 * VarCosts + \boldsymbol{\beta}_3 * VarLapses + \cdots$
  Where β_i sensitivitie parameter that needs to be calibrated at each closing period

Notations :

$\Delta \sim N(0, B\Sigma B')$

$RA_\alpha = VaR_\alpha(\Delta) = \zeta_\alpha * \sigma_\Delta$

$\zeta_\alpha = \Phi_\alpha^{-1} N(0,1);\ \sigma_\Delta = \sqrt{B\Sigma B'}$



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- Easy financial communication
- Low operational impact

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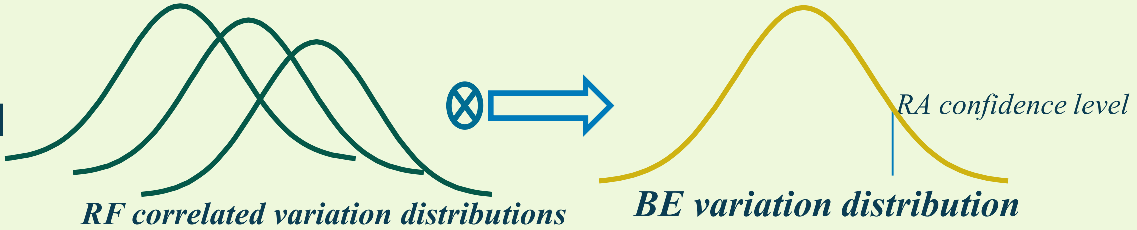
- Not applicable to risks with extreme losses
- Linear sensitivity factors to be improved

3. Methods
3.4 Monte-Carlo simulations VaR

Performing BE variations under a range of different scenarios of correlated risks factors ($\boldsymbol{\Delta}$)
Supposes that risk factors variations have multivariate-normal distribution (RF)
Expert judgment is needed to define the shocks for each risk factor and the *varcov* matrix ($\boldsymbol{\Sigma}$)
Need to define a relationship between BE variations and risk factors variations ($\mathbf{B}$)

1- N simulations of risk factors variations $RF \sim \boldsymbol{N}(\mathbf{0}, \boldsymbol{\Sigma})$
2- Estimation of the BE variations for each simulated scenario of variations in risk factors : $\boldsymbol{\Delta}$ = B*RF
3. Estimation of the Risk Adjustment value:

$$RA_\alpha = Quantile_\alpha(\Delta)$$



- Easy financial communication
- Easy to apply

- Not adapted to risks with extreme losses
- Linear sensitivity factors can be improved

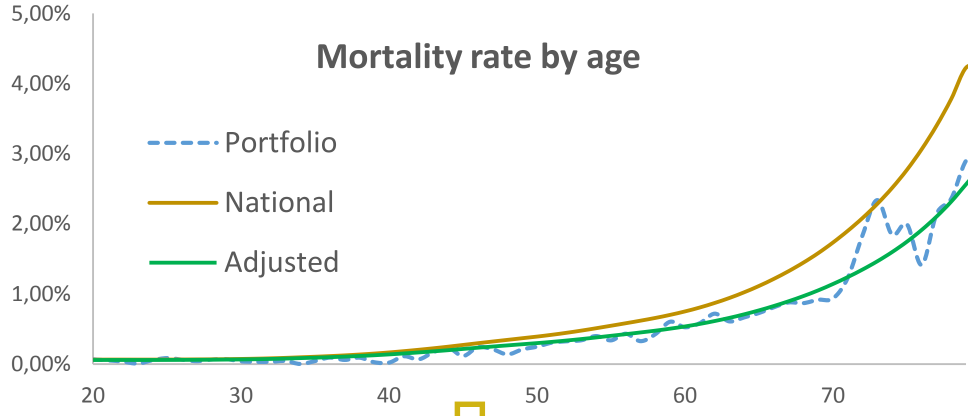
4. Use Case

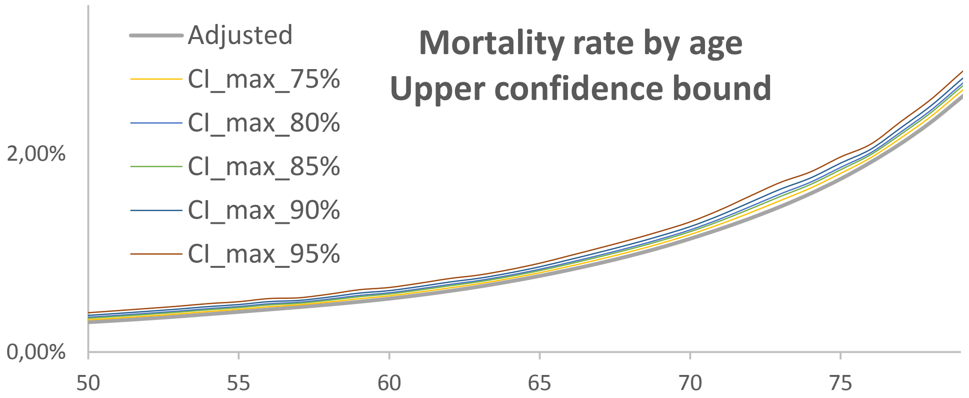
Assumptions

- Entity proposing an investment contracts with discretionary participation features
- Dataset of the policyholders features inspired by a real-life portfolio
- BE calculations made by a simplified ALM model with S2 assumption inputs
- Retained risks factors: mortality, costs and lapse risks

4. Use Case

Mortality Best Estimate law calibration





Steps

1. Estimation of the portfolio' mortality rate (Hoem estimator)

$$\hat{q}_x^{Portfolio} = \frac{Number\ of\ deaths_x}{Risk\ Exposure_x}$$

2. Calibration of the retained mortality model (Brass Model [1971])

$$Logit(q_x^{Brass}) = \alpha * Logit\left(q_x^{Reference}\right) + \beta + \epsilon_x$$

3. Performing the deviation to a given level of confidence (Confidence Interval metric; Kamega et Planchet [2010])

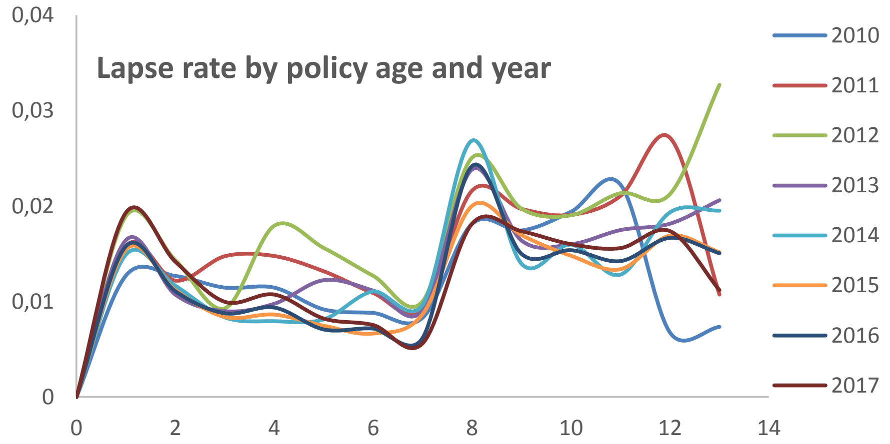
$$\left[q_x \pm \mu_{\alpha/2} * \sqrt{\frac{q_x(1-q_x)}{Risk\ Exposure_x}}\right]$$

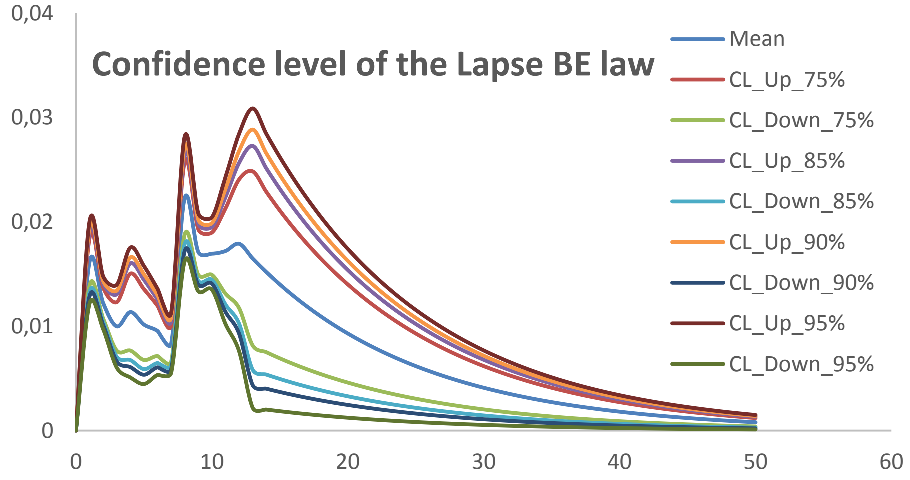
$$\text{and } \mu_{\alpha/2} : \frac{\alpha}{2}\ ordre\ quantile\ of\ N(0{,}1)\ distribution$$

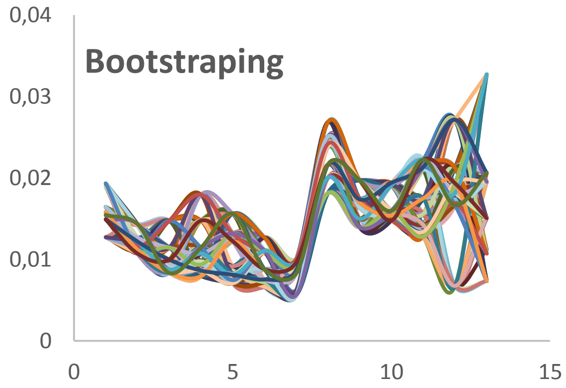
4. Evaluation of the BE variations

4. Use Case

Lapse Best Estimate law calibration







Steps

1. **Estimation of the portfolio' lapse rate by policy age and accounting exercise :**

$$\hat{\theta}^{Portfolio}_{Age,Year} = \frac{Surrender\ amount_{Age,Year}}{\text{Risk}\ Exposure_{Age,Year}}$$

2. **Use of the Bootstrap approach :**

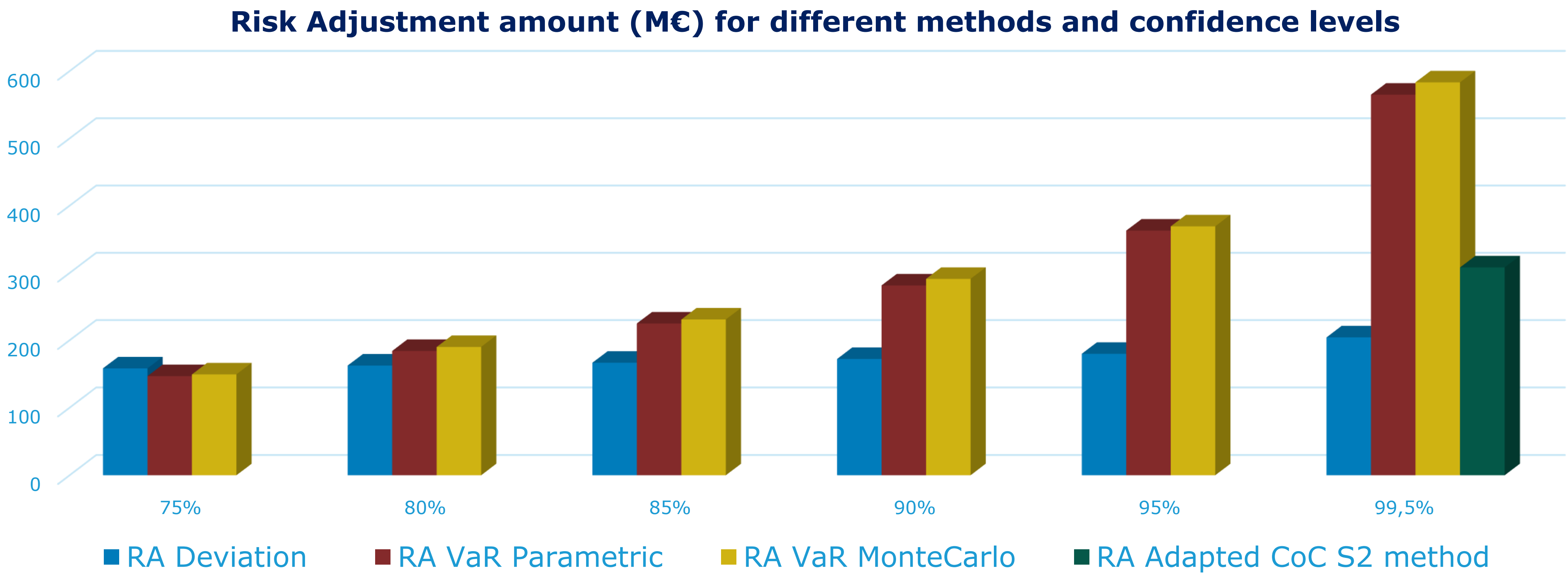
- BE Lapse' law is the average of the N re-sampling curves previously obtained; $\hat{\theta}_{Age} = \frac{1}{N}\sum_{i=1}^{N}\hat{\theta}_{i,\text{Age}}$
- Deviation to a given level of confidence is performed by the asymptotic confidence interval metric

$$\left[\,\theta \pm u_{\alpha/2} \times \sqrt{\sigma^2}\,\right];$$

$$\widehat{\sigma^2} = \frac{1}{N-1}\sum_{i=1}^{N}\left(\hat{\theta}_i - \hat{\theta}\right)^2 \ by\ policy\ age$$

3. **Evaluation of the BE impact**

5. Results



RA increase with confidence level

The Deviation of technical risks approach gives the lowest level

The results of quantile methods are close

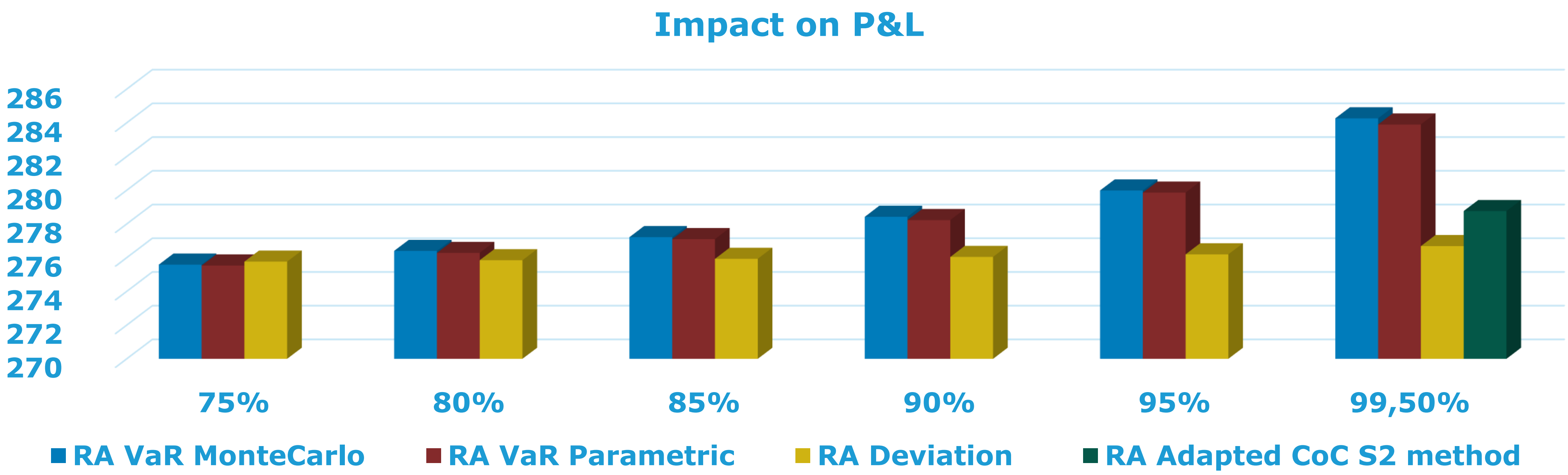
5. Results
Impact on P&L ?

Assumptions :

- Impact on P&L noted $P\&L_i = R_i + \Delta RA$
- R_i : is the amount released from the CSM at time t_i (supposed equal to present value of future profits net of RA)

  $R_i = CSM_i * \gamma \; ; \; with\, \gamma = \frac{\sum_{i=2}^{50} MP_i/(1+r_i)^i}{\sum_{i=1}^{50} MP_i/(1+r_i)^i}$ and MP : Mathematical Provision
- ΔRA :Change in RA between time t_i and t_{i-1} (simplification : ΔRA = 10%*RA_i)

5. Results



The impact on the P&L depends not only on the method but also on the CSM release and the RA amortization

Increase of the P&L' impact if CSM release is less than the RA amortization

6. Discussion

Items to take in consideration:

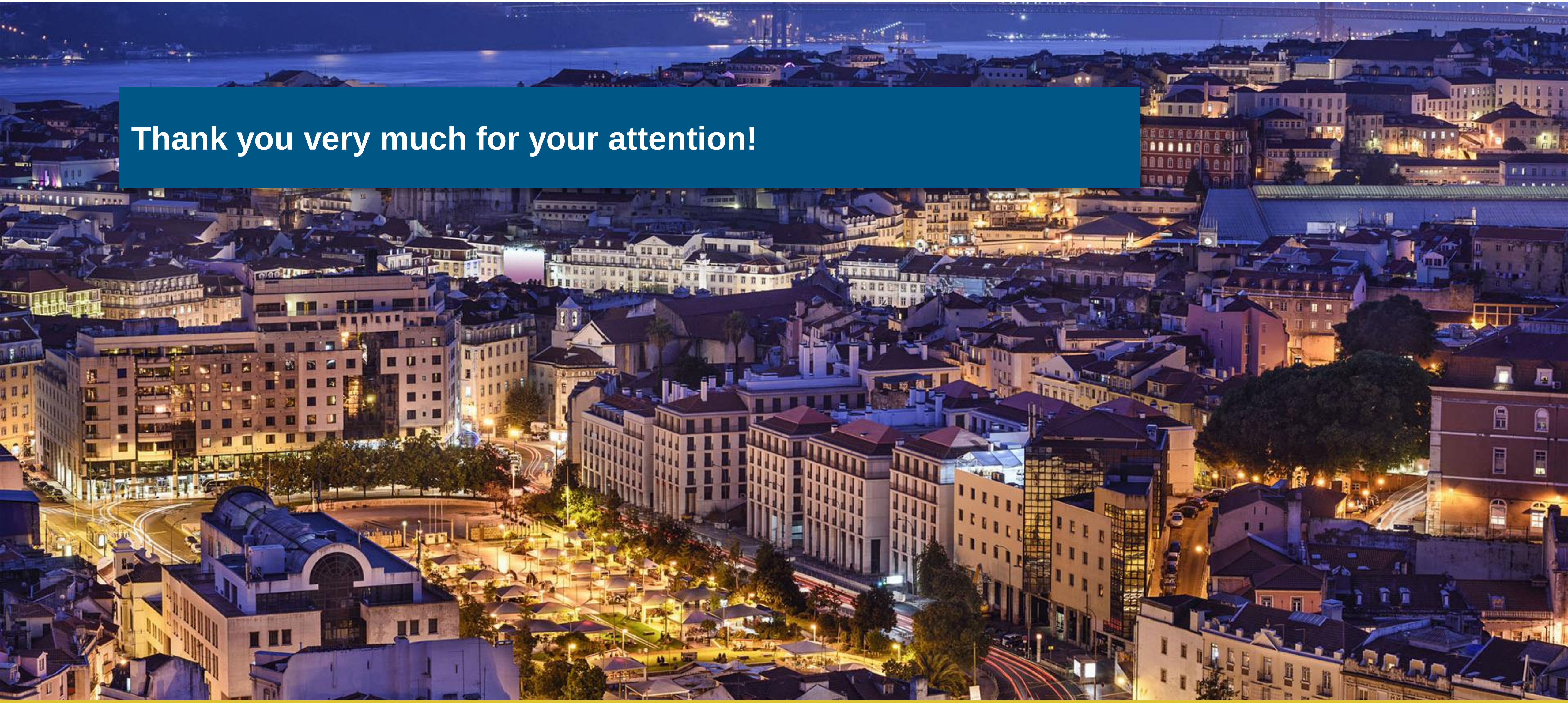
- Risks factors' scope
- Estimation techniques and back-testing
- Calibration of the risk factors’ chocs
- Risk aversion
- Granularity and diversification calculations
- Impact of the RA on P&L and AoC analysis

6. Conclusion

- Different approaches have been tested for different confidence levels
- Impact on P&L have been evaluated

Next steps :

- Internal calibration of the risk factors’ chocs and correlations to be performed
- Use of other estimation techniques ?
- Why not a Machine learning approach ?



Thank you very much for your attention!