Management Strategies in Multi-Year Enterprise Risk Management

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About the speaker

- **Dr. Anselm Reichenbachs**
- Risk Management

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Overview

- Introduction: Increasing challenges on management strategy
- Model approach for measuring multi-year risk capital
- Development of multi-year risk capital
- Management strategies
- Conclusion and outlook

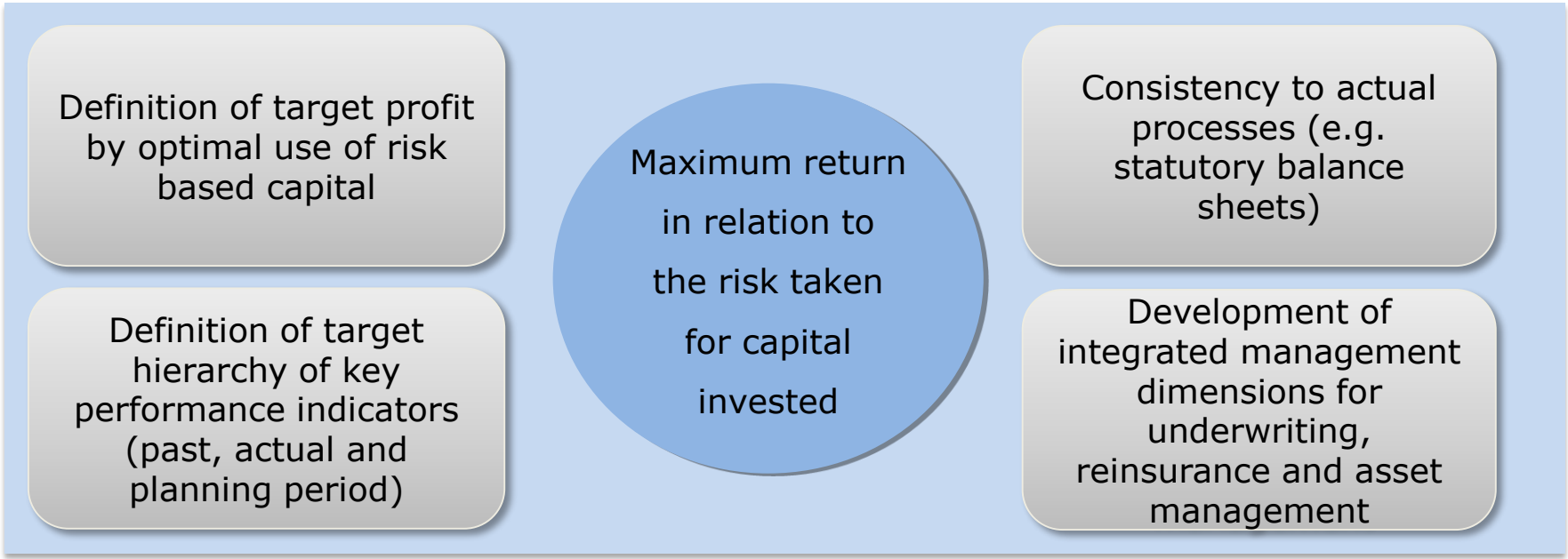
Increasing challenges on management strategy

- Long-lasting period of interest rates
  - Resulting: completely altered risk situation for insurance industry
- Increase of natural catastrophes
  - Resulting: Increase of claims and reinsurance premiums
- Changes in customer behaviour
- Fundamental changes in regulatory requirements
- Consequence: Substantial decrease in economic capital resources; Requirement for a higher level of transparency of the risk situation from management

Paradigm shift in insurance industry

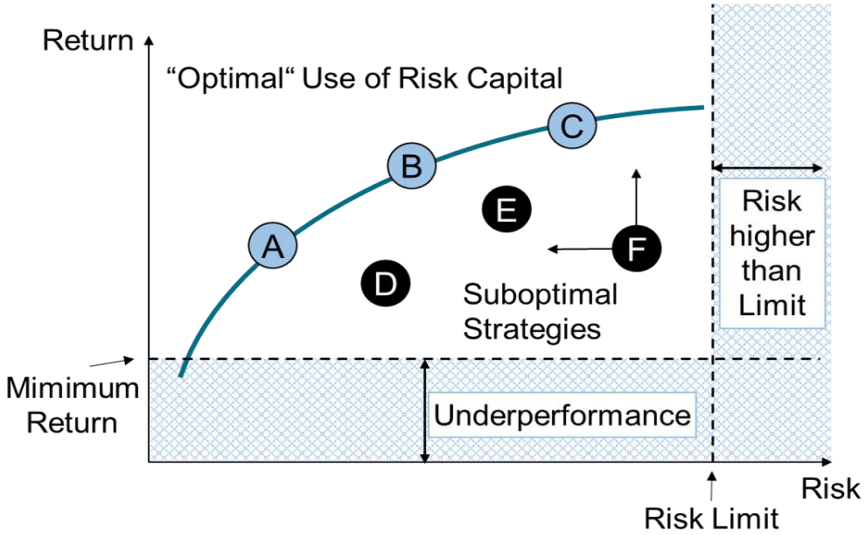
- Paradigm shift to modern management techniques such as ***value and risk based management***.
  - In this context a suitable structure in insurance portfolio together with an adequate reinsurance structure and asset allocation has become a major task for management. It is directed towards maximum return in relation to the risk taken for capital invested.
- This requires a strategic management which should follow a ***multi-year view***.

Dimensions of value and risk based management



Dimensions of value and risk based management

Return-Risk-Chart



Target Function

- Maximise economic results subject to defined restrictions

Defined Restrictions

- Attain minimum return
- Attain requirements on solvency ratio and on risk capital limitation
- Attain sustainable dividend payments (in lower return periods)

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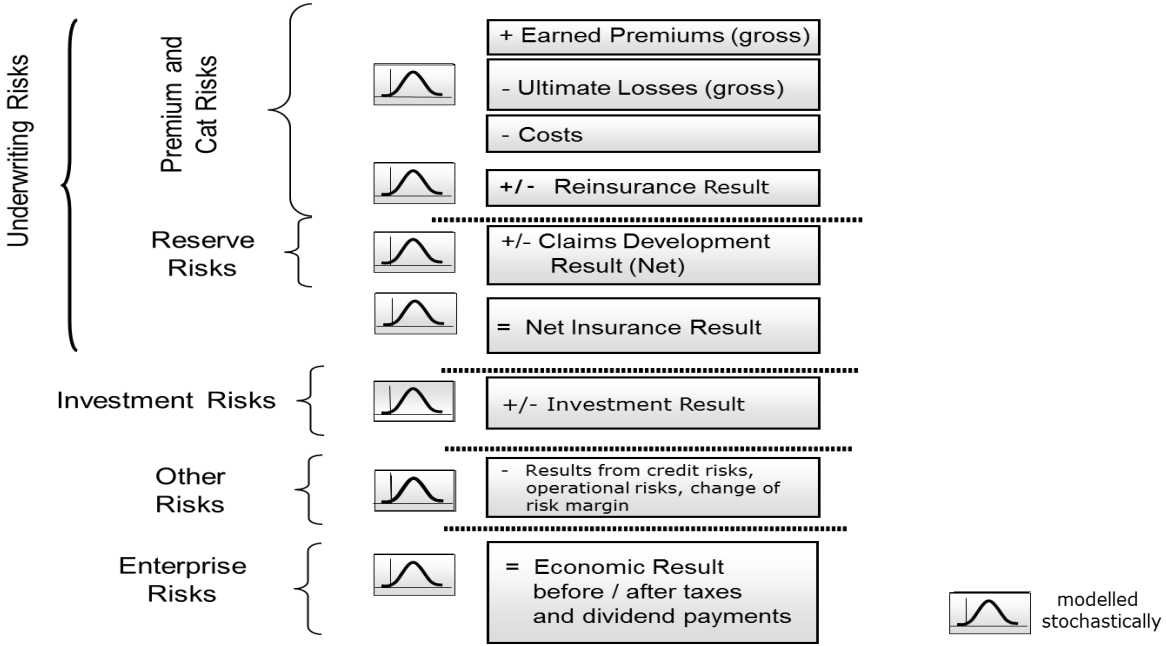
Multy-year view in internal models

Internal models can be used as a base for strategic decisions in value and risk based management.

- Using an internal risk model the individual risk situation of the insurer can be modelled more exactly than using the standard formula from Solvency II, which is often not adequate.

- If an insurer wants to use the internal model for solvency purposes in pillar one, it has to be approved by the national supervisor. For own risk and solvency assessment (pillar 2) internal models can be used without approval. In each case internal models should pass the “use test”.

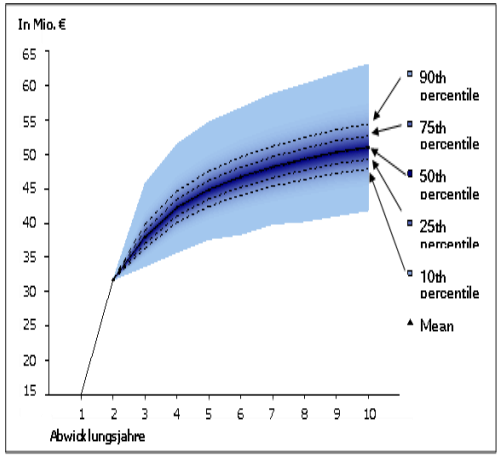
Random variable of economic results (simplified)

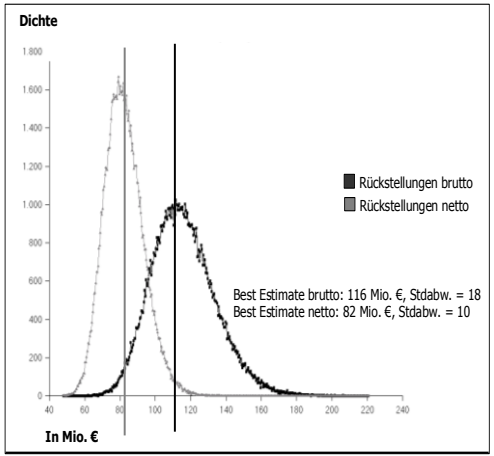


Stochastic Modeling in Internal Models

For modelling the economic results we use different approaches:

- Statistical methods for modelling large and attritional claims of future accident years
- Results of meteorological models, event loss tabels for modelling catastrophe claims (earthquakes, storm, flood, hail)
- Stochastic reserving methods (ultimate, one-year, multi-year)
- Approaches for modelling dependency structures
- Simulation techniques, etc.





Multi-year models

Management rules and management strategies in multi-year models:

Different rules in different scenarios are needed

- Management rules: Increase of reinsurance premiums in simulations/scenarios with preceding years of high claim losses
- Management strategies in simulations with high claim losses, in order to improve results and to avoid negative excess capital: This can be the case for example after scenarios with natural catastrophes or with negative developments at the capital markets. Possible strategies could be:
  - Stop expansion in building
  - Introduction of deductibles in building (to limit the effect of storm events)
  - Higher reinsurance protection
  - Change in asset allocation (lower risk profile)

Multi-year models

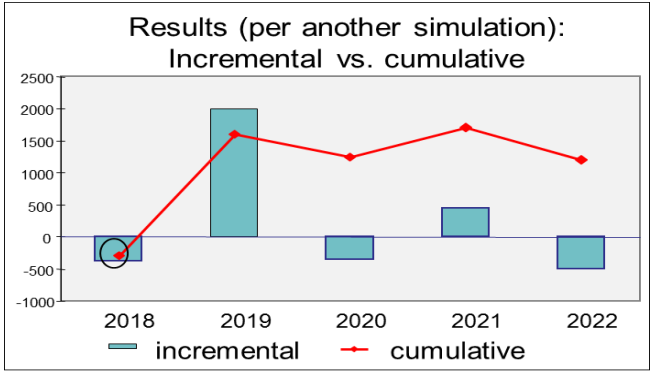
Defining multi-year risk capital helps management to answer the essential question in order to decide for the “best” strategy:

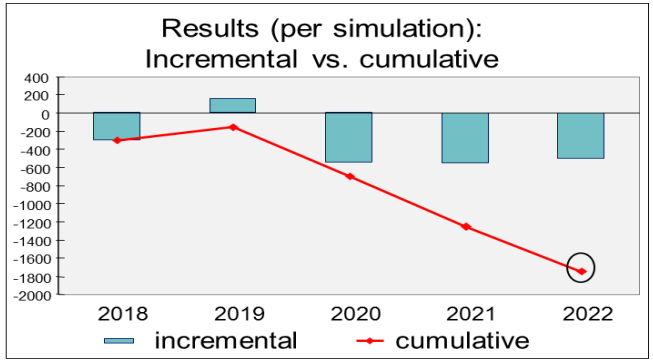
- How many years of catastrophe events or adverse capital market developments can the company withstand at a certain confidence level without needing external capital resources?

- How much risk capital the company will need to be able to survive the next five years – taking five future underwriting years into account – without external capital supply?

Multi-year models

- Stochastic process $X_t = -\mathrm{EcRes}_t$ describes economic loss (net of taxes and dividends) per year t.
- For stochastic process $X = (X_1, \ldots, X_n)$, we define:
  - $\mathrm{MaxLoss}_n(X) = \max_{1 \le t \le n} \{\mathrm{CumLoss}_t(X)\}$ where (for $1 \le t \le n$)
  - $\mathrm{CumLoss}_t(X) = \mathrm{CumLoss}_{t-1}(X) + X_t$, starting with $\mathrm{CumLoss}_1(X) = X_1$





Multi-year risk capital

- We use two very commonly used risk measures Value at Risk (VaR) und Tail Value at Risk (TVaR) to define multi-year risk capital:

- $\mathrm{VaR}_{\alpha(n)}(X) = \mathrm{VaR}_{\alpha(n)}\left(\mathrm{MaxLoss}_n(X)\right) = \mathrm{VaR}_{\alpha(n)}\left(\max_{1\le t\le n} \mathrm{CumLoss}_t(X)\right)$

- $\mathrm{TVaR}_{\alpha(n)}(X) = \mathrm{TVaR}_{\alpha(n)}\left(\mathrm{MaxLoss}_n(X)\right) = \mathrm{TVaR}_{\alpha(n)}\left(\max_{1\le t\le n} \mathrm{CumLoss}_t(X)\right)$

- The confidence level $\alpha(n)$ may decrease with increasing values of n.

- The company can cover its multi-year risk capital with its own net asset value NAV_0 at $t = 0$ if the following is true: $\mathrm{NAV}_0 \geq \rho_{\alpha(n)}\left(\mathrm{MaxLoss}_n(X)\right) = \mathrm{RC}_n$.

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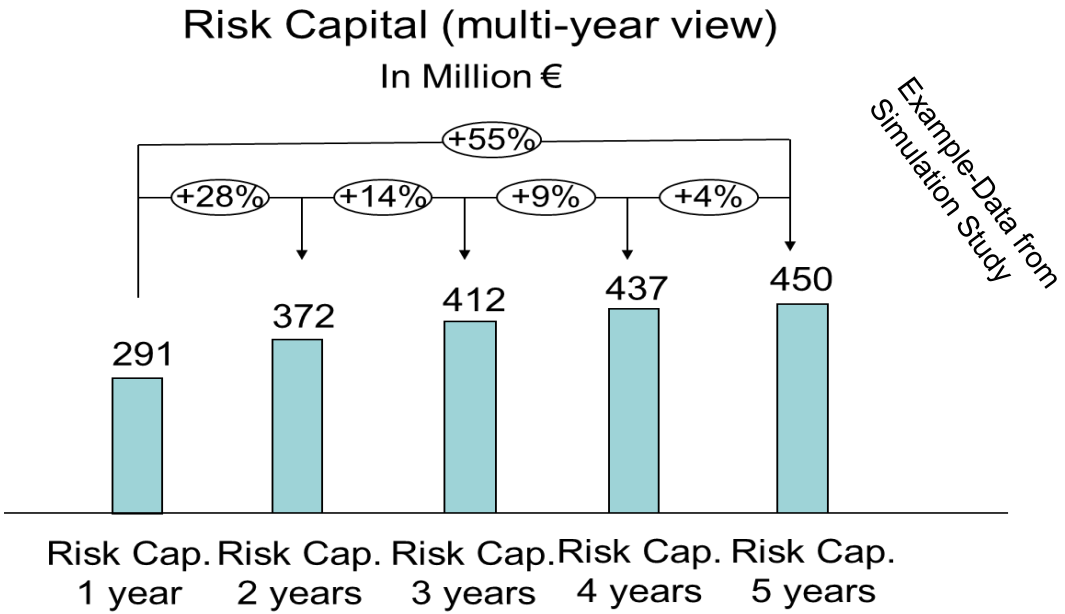
Multi-year risk capital (company)



We use TVaR 99.8% for quantifying one-year and multi-year risk capital.

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Management strategies

- We studied the effects of different management strategies with regard to the realisation of the best of a given set of possible strategies in order to improve the return and risk situation of the company.

- We analysed the effects of
  - reinsurance structures,
  - introduction of different amounts of deductibles,
  - growths in special LoBs with positive returns and good diversification,
  - change of asset allocation,
  - different dependency structures,
  - different capital allocation methods.

Management strategies (example data)

	Actual Strategy			
Million Euros	**Return Mean E(*EcRes*)**	**Risk Capital Standalone $TVaR_{99.8}(-EcRes)$**	**Allocation TVaR-Principle**	**EVA**
Storm	**11,3**	**300**	**270**	**-10,3**
Flood	**2,1**	**50**	**10**	**1,3**
Hail	**2,8**	**40**	**9**	**2,1**
All other LoB	**2,5**	**44**	**1**	**2,4**
Investment	**5,3**	**45**	**1**	**5,2**
Company	**24,0**	**478**	**291**	**0,7**
Diversification			**187 (39%)**	
Risk Capital (five years)			**450**	

- Return on Risk Adjusted Capital (RoRAC)
- EVA (Economic Value Added) = Expected economic result beyond capital costs (8%)
- TVaR 99.8% for quantifiying one-year and five-years risk capital
- TVaR-Allocation = $\mathrm{E}[L_i | L \geq VaR_{99.8}(L)]$ for loss L_i of segment i.

Management strategies (example data)

	Actual Strategy			
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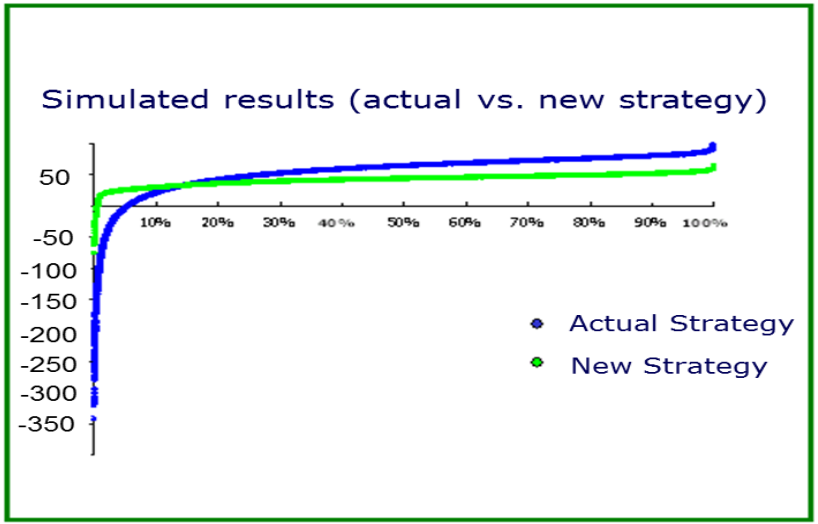
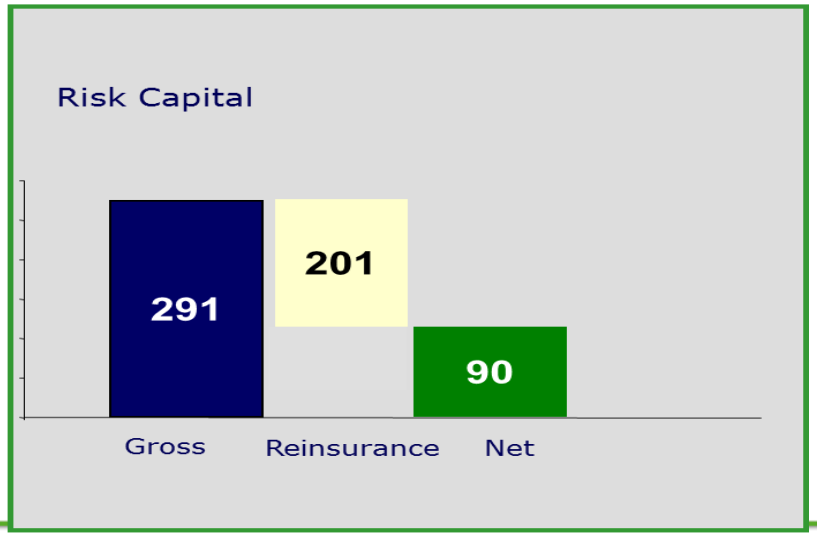
Storm	**11,3**	**300**	**270**	**-10,3**
Flood	**2,1**	**50**	**10**	**1,3**
Hail	**2,8**	**40**	**9**	**2,1**
All other LoB	**2,5**	**44**	**1**	**2,4**
Investment	**5,3**	**45**	**1**	**5,2**
Company	**24,0**	**478**	**291**	**0,7**
Diversification			**187 (39%)**	
Risk Capital (five years)			**450**	
	New Strategy			
Storm	**2,5**	**80**	**63**	**-2,5**
Flood	**2,1**	**50**	**12**	**1,2**
Hail	**2,8**	**40**	**9**	**2,1**
All other LoB	**2,9**	**49**	**3**	**2,7**
Investment	**5,3**	**45**	**3**	**5,1**
Company	**15,7**	**265**	**90**	**8,5**
Diversification			**175 (66%)**	
Risk Capital (five years)			**125**	

- Management discusses a risk-lowering strategy (the risk capital limit is 90 million in a one-year view)
- New Strategy: Introduction of deductibles in storm, extending reinsurance coverage in storm (event excess-of-loss contract); growth of 20% in fire
- Result: Better diversified portfolio (one-year view and five-years view); higher EVA whereas the return decreases

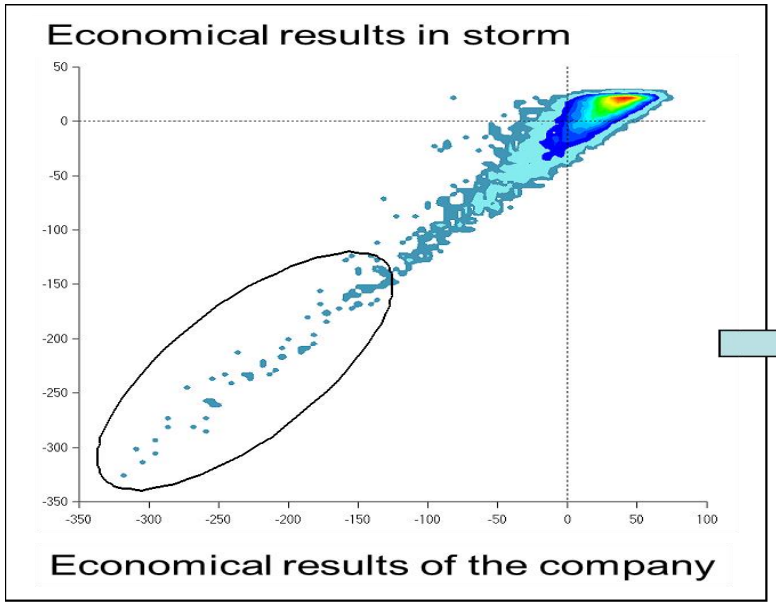
The effects of strategies

The effects of strategies (here: introduction of deductibles and reinsurance) can be shown in the percentile graph (reduction of risk, but also reduction of expected return).

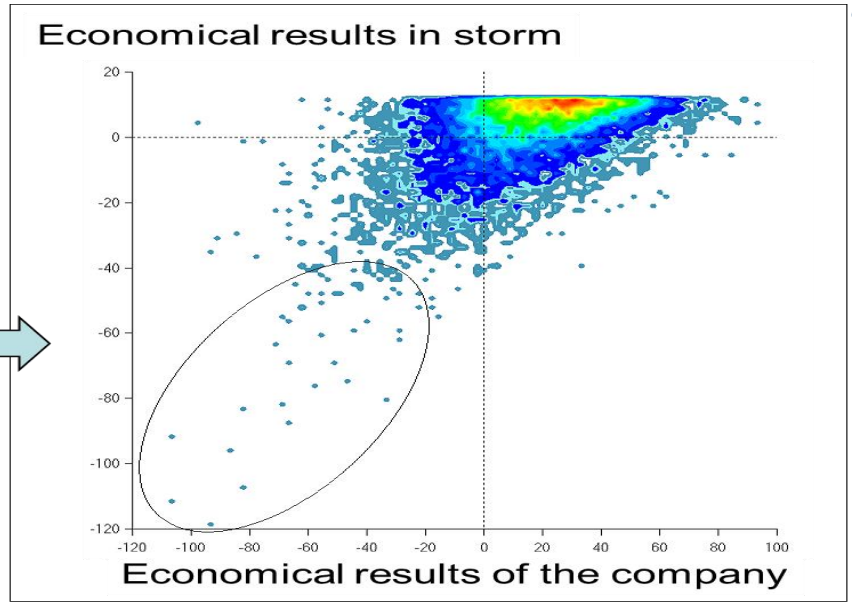




The effects of strategies (example data)

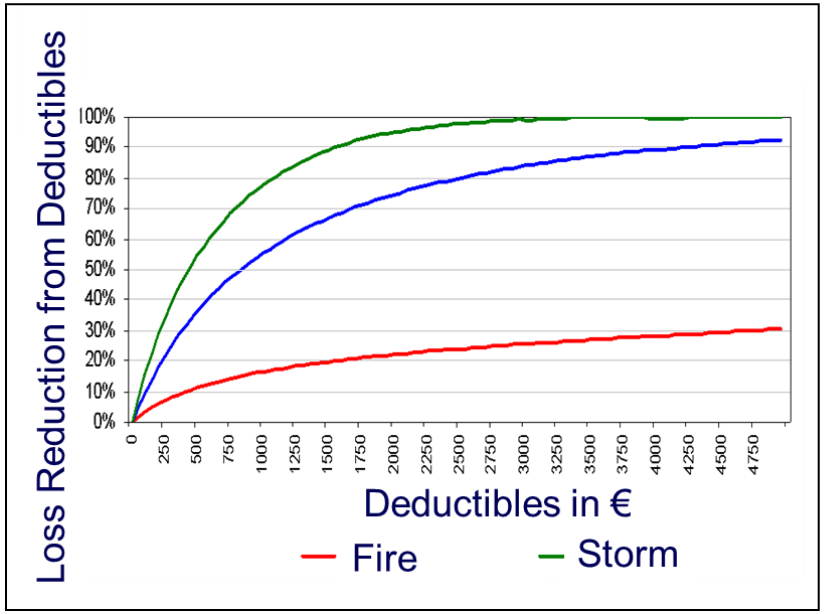


Actual Strategy



New Strategy (after deductibles and reinsurance)

Management strategies (Introduction of deductibles)

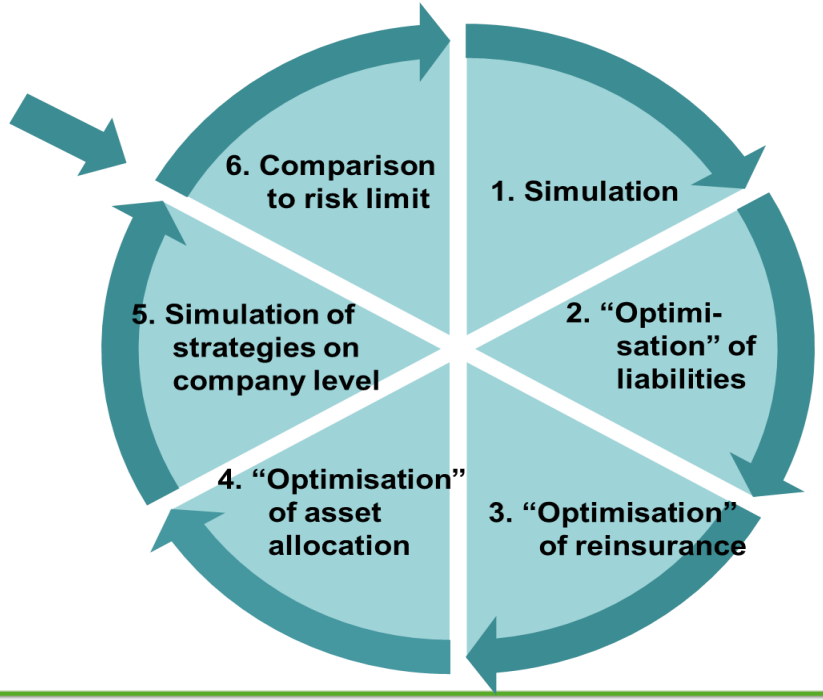


- We also analysed the effects of introduction of deductibles in storm, which leads to a significant reduction in risk capital.

Iterative Management Process

Management has to define:

I. Methods
II. Time Horizon
III. Risk Limitation
IV. Required Return



Management strategies

- The strategies and their impact need to be analysed at company level, where high diversification effects have a positive effect on total risk capital and economic value added (*EVA*).
- In the example portfolio presented in the case study the introduction of deductibles in storm line of business led to growing diversification effects in insurance results (between storm and the other lines of business). The same holds for special types of reinsurance contracts. The effects of these strategies always depend on the portfolio structure.
- Lowering multi-year risk capital and growing diversification effects offer the possibility of extending in lines of business where the return exceeds the capital costs and which show a high diversification towards the other lines of business in the portfolio.

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Conclusion and outlook

- With our multi-year model we can compare the effects of different management strategies. These results will influence various company processes such as **risk limitation, development of insurance products, pricing, reinsurance, asset management and marketing.**

- In this context future product development will be oriented towards goals such as **required risk capital and use of diversification potential.** Instruments such as deductibles for policyholders in storm insurance aimed towards reducing risk capital requirement are gaining in importance. In this context adequate capital allocation methods are needed.

Conclusion and outlook

- In addition to **practitioners, regulators** will also benefit from these results. Since the "**use test**" will play an important role for the approval of internal models, regulators will check if the internal model is used as a base for management decisions in enterprise risk management and in the **ORSA process**, whereby both should be based on a time horizon of several years

Thank you very much for your attention!

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