

Management Strategies in Multi-Year Enterprise Risk Management

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- Introduction: Increasing challenges on management strategy
- Model approach for measuring multi-year risk capital
- Capital allocation for strategic management
- Application
- Conclusion and outlook

- Increase of natural catastrophes
 - Resulting: Increase of claims and reinsurance premiums
- Negative developments on the capital markets
 - Resulting: completely altered risk situation for insurance industry
- This led to a substantial decrease in total corporate capital resources in insurance industry.
- Requirement for a higher level of transparency of the risk situation from management, regulators (Solvency II for European Union member countries), rating agencies, ...

- 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 asset allocation has become a major task for management 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***.

Classical Turnover Orientation

Return =
$$\frac{\text{Profit / Loss (statut. balance sheet)}}{\text{Premium}}$$

- Profit Premium-Ratio
- ...

Value and Risk Oriented

Economic Result

Risk Capital

Solvency II

- Return on Risk Adj. Capital (RoRAC)
- EVA (Economic Value Added) = Expected result beyond capital costs

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Multi-year view in internal models

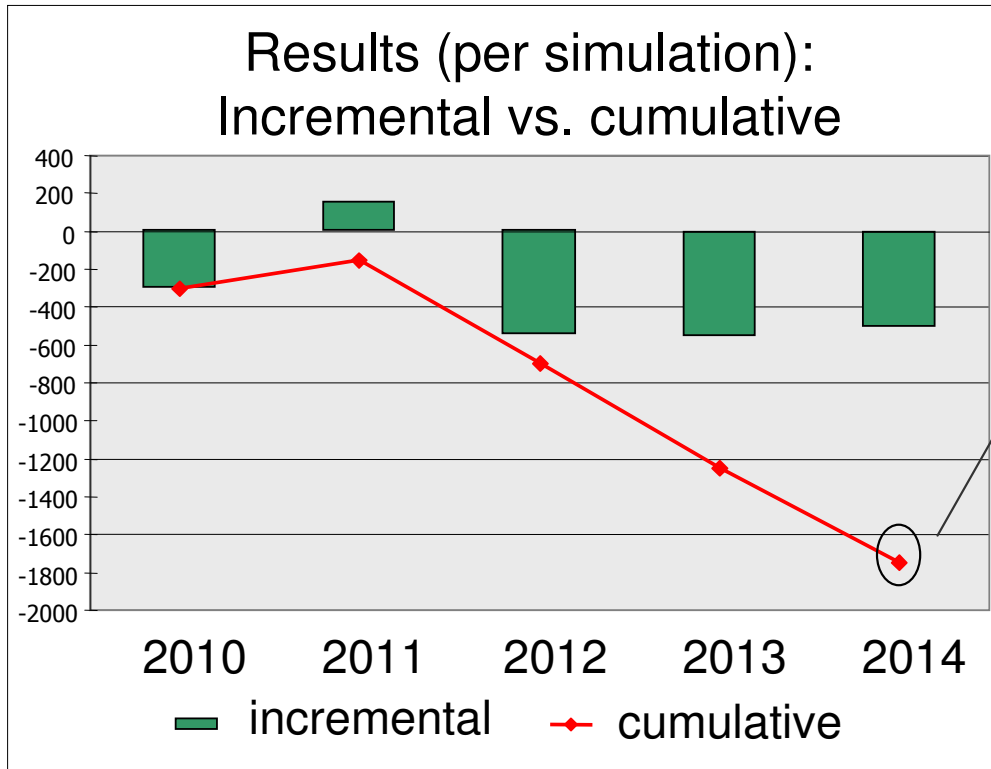
Internal models can be used as a base for strategic decisions in value and risk based management.

- Using an internal risk model the individual risk situation of the insurer can be modelled more exactly than using the standard formula form Solvency II, which is often not adequate.
- Internal models allow the quantification of risk and return of all lines of business and all asset classes. Moreover they can give a more detailed view of the risk and return situation e.g. of special risk types such as private or industrial business. This should be done in a **multi-year view**.

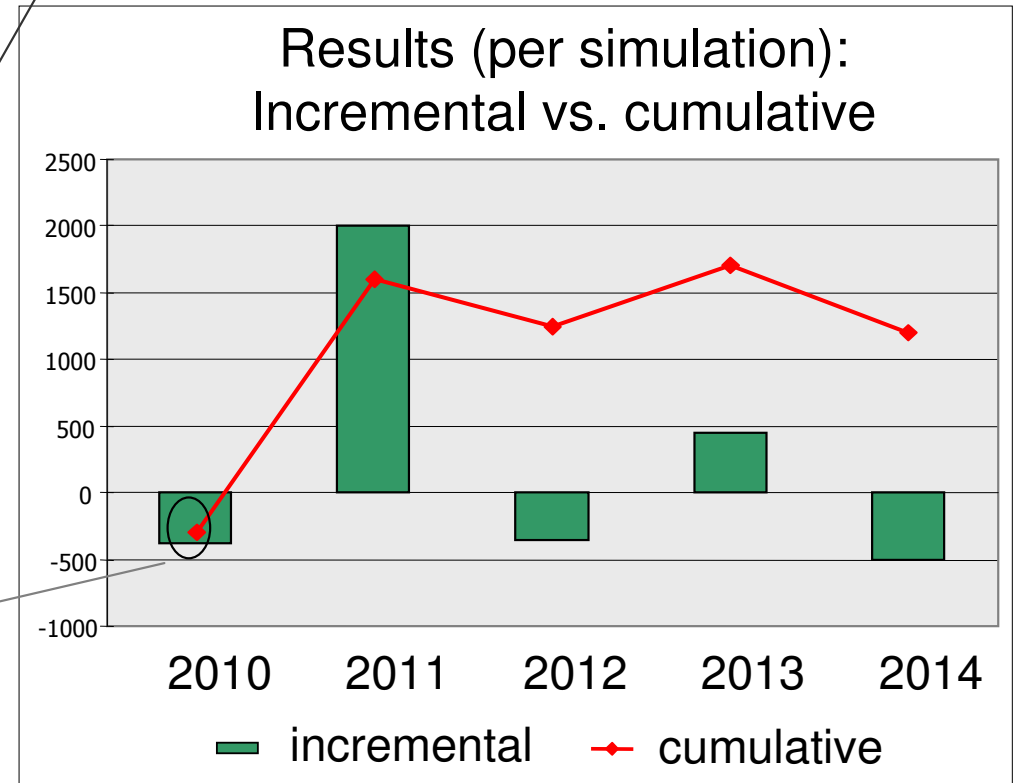
Defining multi-year risk capital helps management to answer the essential question in order to decide for the “best” strategy:

- 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?

Defining multi-year results



Risk capital



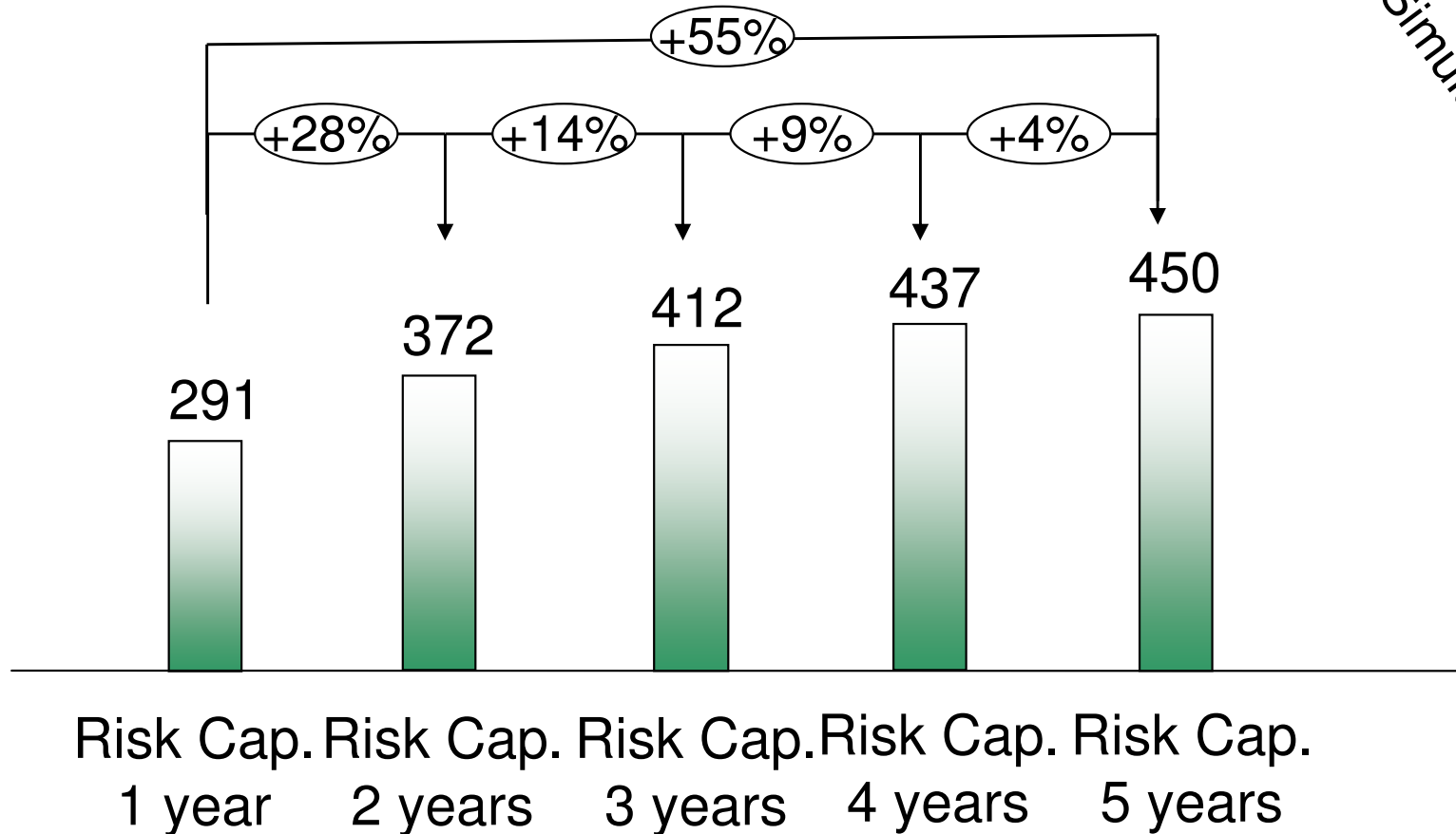
Risk capital

Definition of multi-year risk capital

- This amount needs to be provided at $t=0$ in the simulation path to allow the insurance company to cover all losses incurred over the entire period simulated (n years) without external capital supply in this simulation path.

Risk Capital (multi-year view) In Million €

Data from Simulation Study



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In the context of enterprise risk management a capital allocation method is needed in order

- to set risk limitations for different segments and
- to quantify the effect of management strategies on risk-adjusted performance indicators, defined per segment.
- **Problem:** Generally there is no known allocation method (including coherent allocation methods) giving “right” incentives for each portfolio structure and each managerial problem (see example in the paper).

- In the paper we show under which conditions special allocation principles can be used successfully for risk-adjusted performance management in the following sense:
- Increasing the segment-level *EVA* leads to an increase of *EVA* for the company, so that this allocation method gives the “right” incentives for the segment.
- We consider
 - strategies in existing LoBs,
 - inclusion of a new segment,
 - hiving off a segment/subsegment,
 - effects of reinsurance contracts.

Remark₁

A company with n segments refers to the tail value at risk at a confidence level of $1-\alpha$ for risk quantification and uses the TVaR capital allocation principle. Segment i may select strategy k with return $R_i^k: A \rightarrow \mathbb{R}$, $k \in \{1, \dots, m\}$ (where $L_i^k = -R_i^k$), where the following applies to all of k :

$$(1) \quad T \equiv \{a \in A: L_1 + \dots + L_i^k + \dots + L_n \geq \text{VaR}_\alpha(L_1 + \dots + L_i^k + \dots + L_n)\},$$

that is, T is independent of k . Given the $k^{\max} \in \{1, \dots, m\}$ strategy, where

$$(2) \quad \text{EVA}(R_i^{k^{\max}}) = \max_{k \in \{1, \dots, m\}} \text{EVA}(R_i^k),$$

the following applies:

$$(3) \quad \text{EVA}(R_1 + \dots + R_i^{k^{\max}} + \dots + R_n) = \max_{k \in \{1, \dots, m\}} \text{EVA}(R_1 + \dots + R_i^k + \dots + R_n).$$

(see Remark 1 in the paper)

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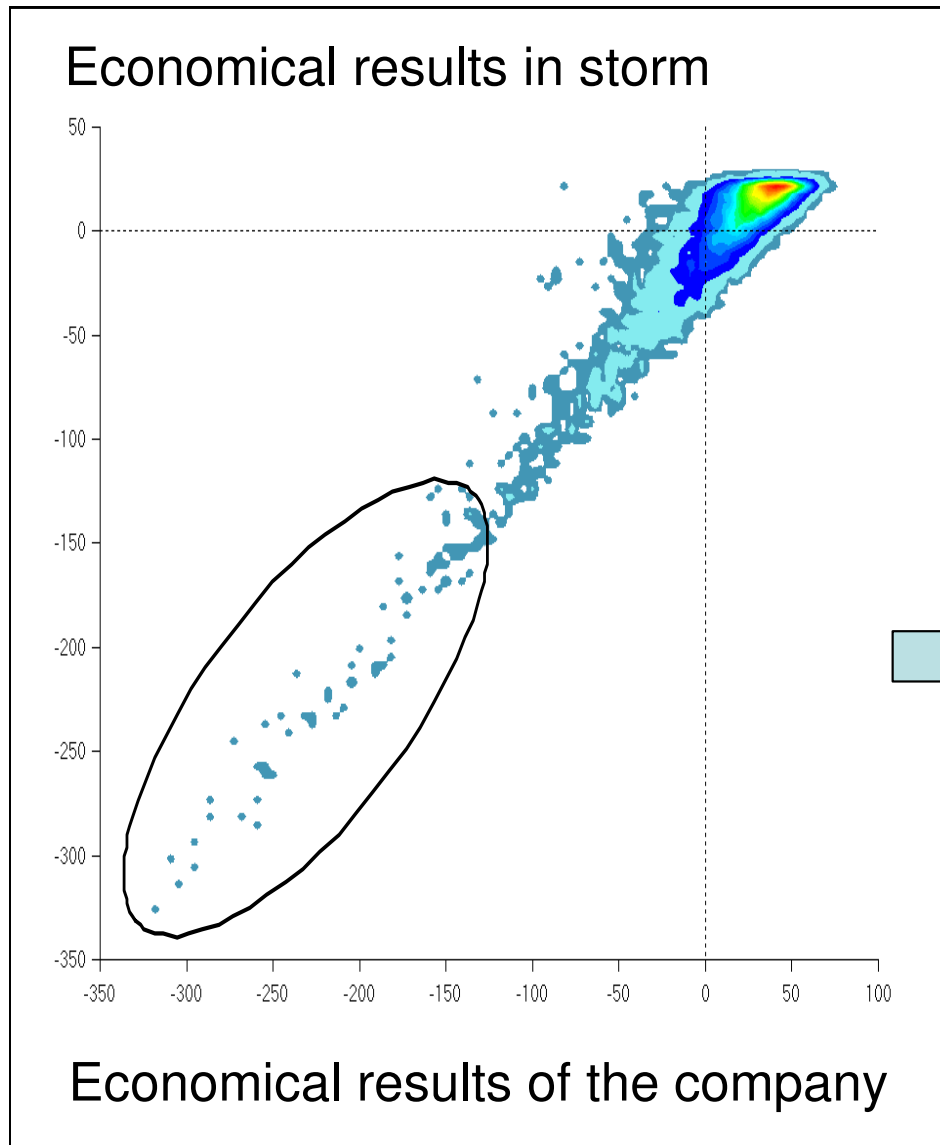
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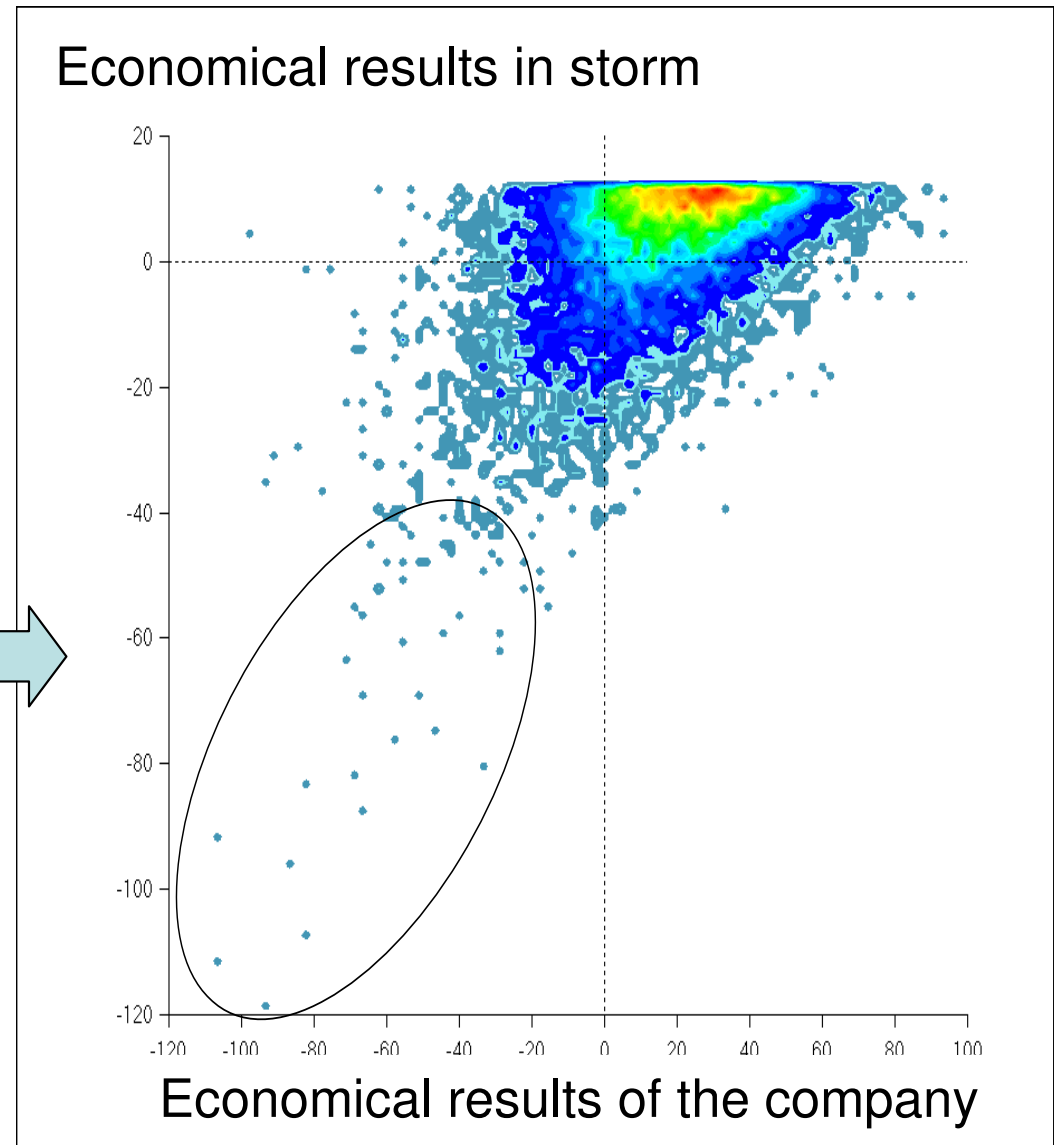
- In the paper we studied the effects of different management strategies with regard to the realisation of the best of a given set of possible strategies for the risk and return situation of the company (application to a German non-life insurance company).

- We analysed the effects of
 - introduction of different amounts of deductibles,
 - reinsurance structures,
 - growth in special LoBs and
 - change of asset allocation.

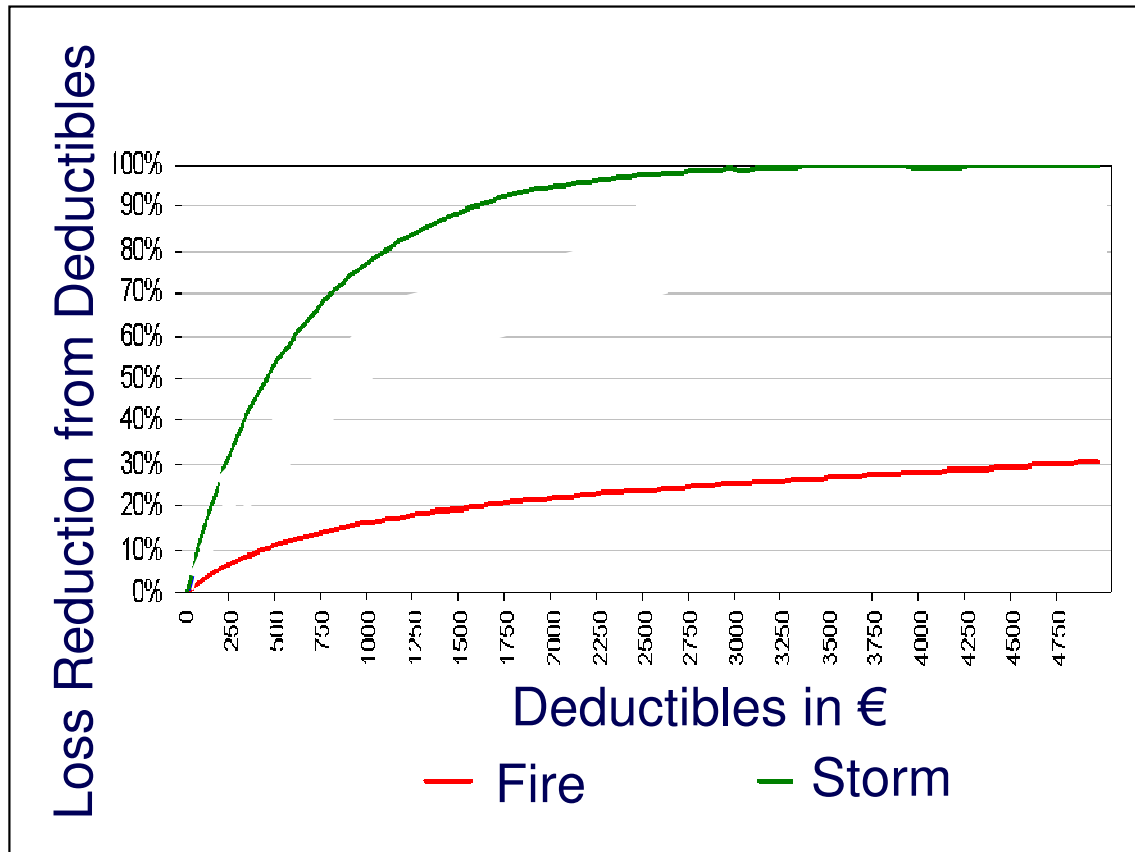
Management strategies (Reinsurance)



Before Reinsurance



After Deductibles and Reinsurance
in Storm



Introduction of deductibles in storm leads to a significant reduction in risk capital.

- The simulation study shows that the *TVaR* allocation principle using *TVAR* as risk measure **can be used for identifying risk dominating positions** in the portfolio, because it allocates the amount of risk capital to each segment as it contributes to the whole risk capital. In this context it should be used in practice.
- Moreover the *TVaR* allocation principle can **serve as an important base for strategic management decisions** in the following sense (under special assumptions): Increasing the segment-level *EVA* leads to an increase of *EVA* for the company.
- On the other hand negative allocated risk capital can cause a problem in practice in the context of risk limitation on segment level.
- So we we can conclude that generally we **neither have the “right” risk measure nor the “right” allocation method for all portfolio structures and problems**. This also holds for coherent risk measures and allocation methods.

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- In the context of strategic enterprise risk management a capital allocation method is needed
 - (1) for setting risk limitations for different segments, such as lines of business and investments,
 - (2) in order to quantify the effect of management strategies on risk adjusted performance indicators for those segments.
- We defined assumptions so that the *TVAR* capital allocation method may successfully be used for strategic risk adjusted performance management.

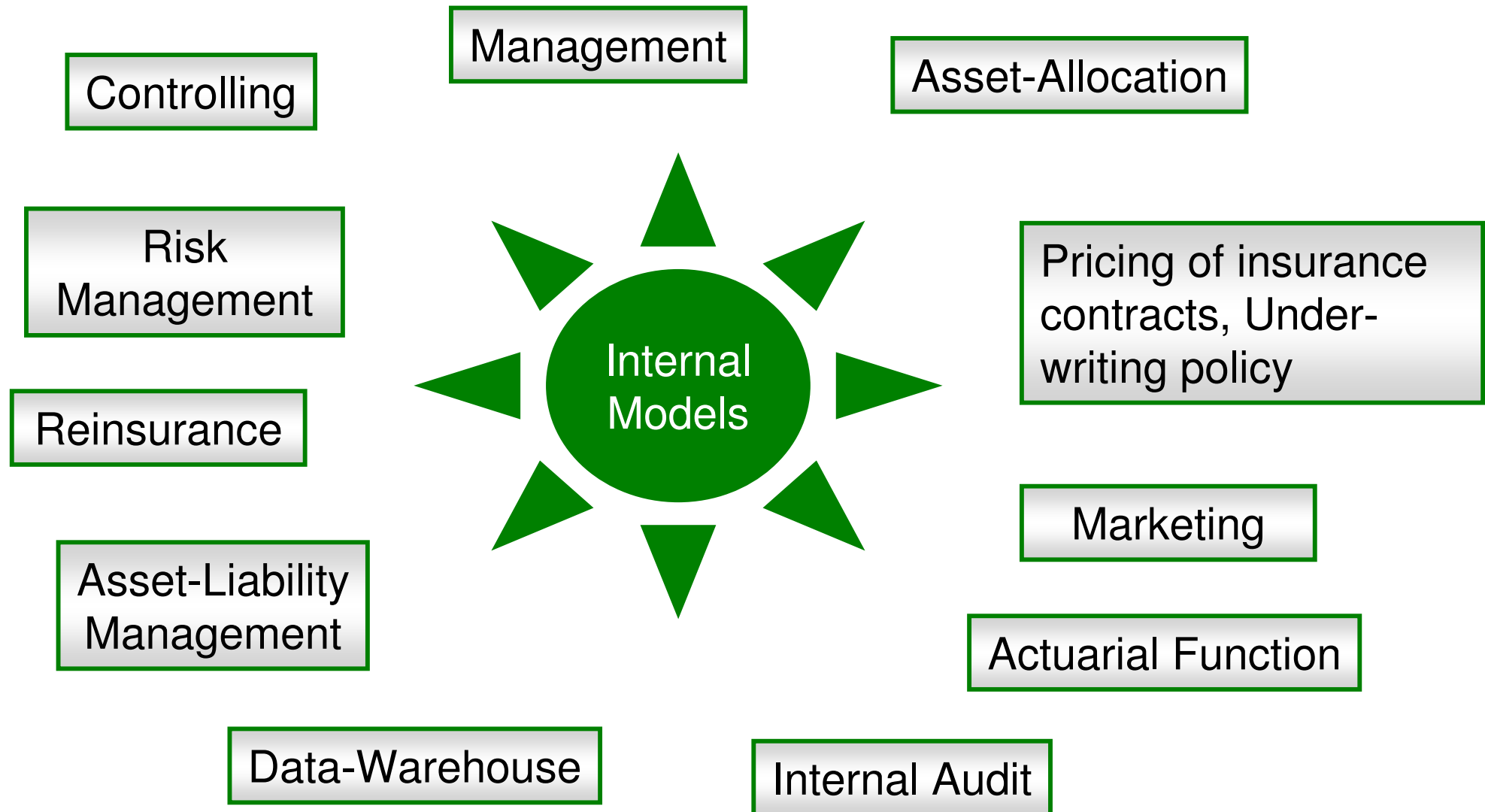
- Moreover risk and return profile of the company should be set taking future underwriting years into account.
 - This has led us to quantify the effect of strategies applied to a five-year period on risk and return positions. limitations for different segments, such as lines of business and investments.

- Contribution:
 - The study wants to give a **realistic and helpful idea of multi-year enterprise risk management processes** for strategic management of different business segments, such as different lines of business, re-insurance, investments, where capital allocation plays an important role.
 - Moreover the simulation study should give an idea of the **ORSA process**.
 - In addition to **practitioners, regulators** will also benefit from this paper's 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**.

- Future Research:
 - Extend the simulation model in various directions
 - Capital Allocation in multi-year context
 - Use the concept for strategic management on a group level

Central role of internal models in the company

Internal models play a central role in management processes of almost all company divisions.



Thank you very much
for your attention!

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