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Risk Based Solvency

CAE Spring 2006 Meeting

Sabine Betz
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Deloitte – Actuarial & Insurance Solutions



Agenda

- **Current „old fashioned“ Solvency Regulations**
- **New „state of the art“ Solvency Regulations**
 - **Common Features**
 - **EU – Solvency II**
 - **UK – ICAS**
 - **Germany – GDV Model**
 - **France – Standard Model**
 - **Switzerland – SST**
- **Internal Models – How to derive an internal Model**

Definition

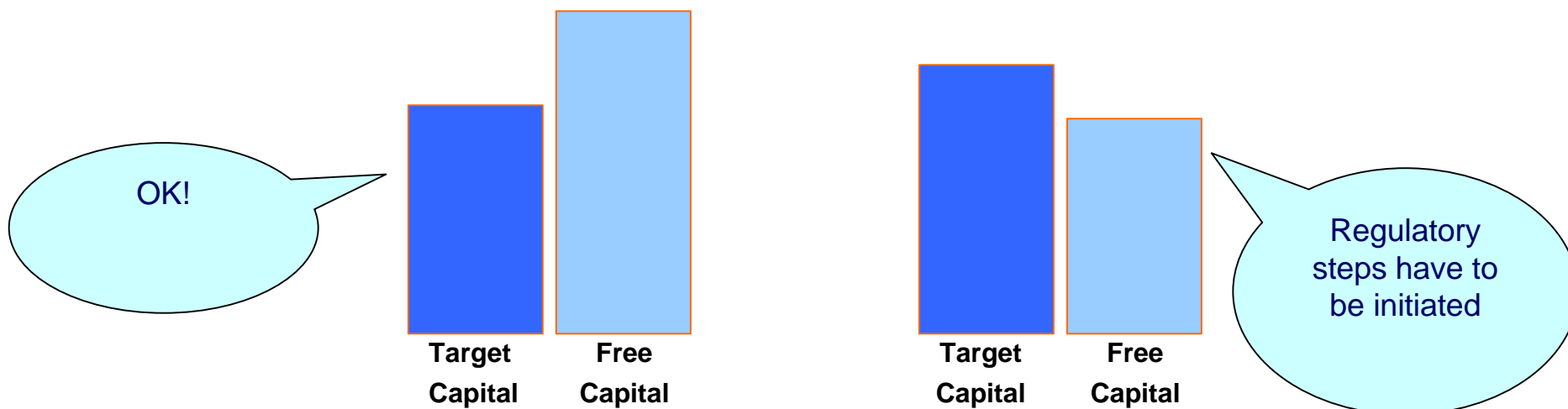
Solvency:

The financial ability to pay debts when they become due. The solvency of a company tells an investor whether a company can pay its debts.

Source: www.investordictionary.com

How can we check, if the company is able to pay its debts?

-> Compare “Free Capital” with a calculated “Target Capital” solvency amount.



How to calculate the Target Capital solvency amount?

-> Easy former approach:

The higher the premium income, the higher the solvency amount

The higher the incurred losses, the higher the solvency amount

Solvency Capital:

Traditional Calculation (simplified version):

$$S = \text{Max}(a\% \cdot \text{Incurred}; b\% \cdot \text{Premium})$$

Problems

- > Formula doesn't properly reflect the risks which are attached to insurance companies (e.g. no asset risk)
- > No allowance for interdependencies between risks
- > Insurance companies not "forced" to analyse and quantify their risks
- > Regulatory arbitrage between insurers and banks

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Risk Based Solvency

Common Features:

Creation of a risk-adequate Solvency calculation

Capital need should depend on specific risk-situation of the company.

All relevant risks should be included.

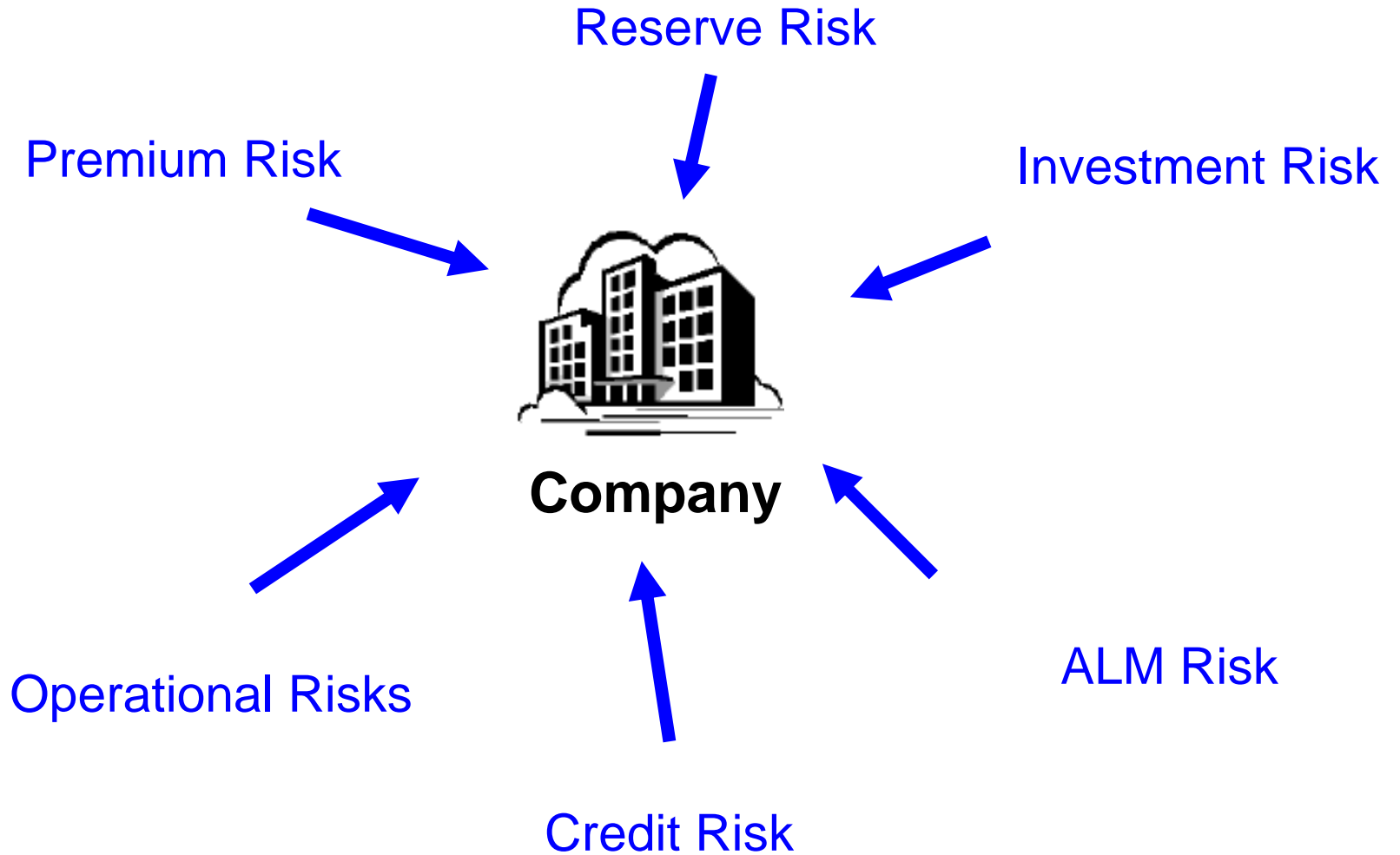
Regulator's aim is to encourage the companies to do more risk management

Fair Value Basis

Additional Risk Margin (Minimum Capital)

Two Models: Standard Approach and Internal Model

Risk Categories



Risk Based Solvency

Question:

How much capital do I need at the beginning of the year in order to be able to cover the liabilities at the end of the year n with $(1-\alpha)\%$ security?

Risk Based Solvency

Basic Elements defined Regulator:

Time Frame: one year or more?

Security Level: 99%, 99,5%,...???

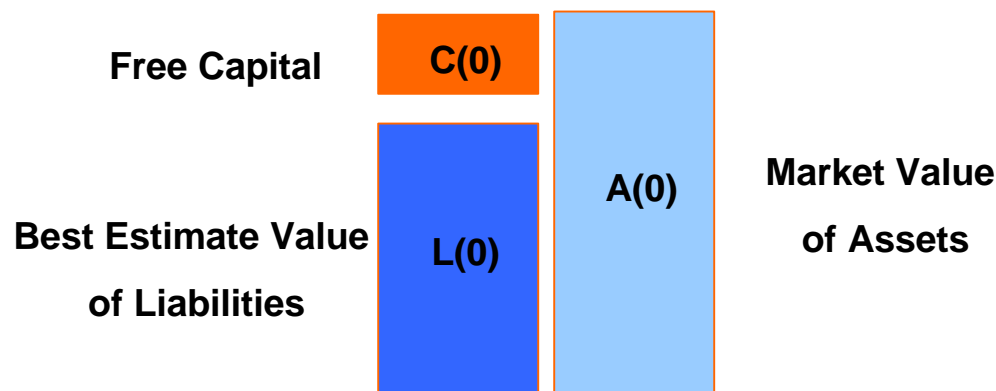
Risk Measure: VaR, TVaR (Expected Shortfall)?

Kind of Model: Factor-Model, Stochastic Model?

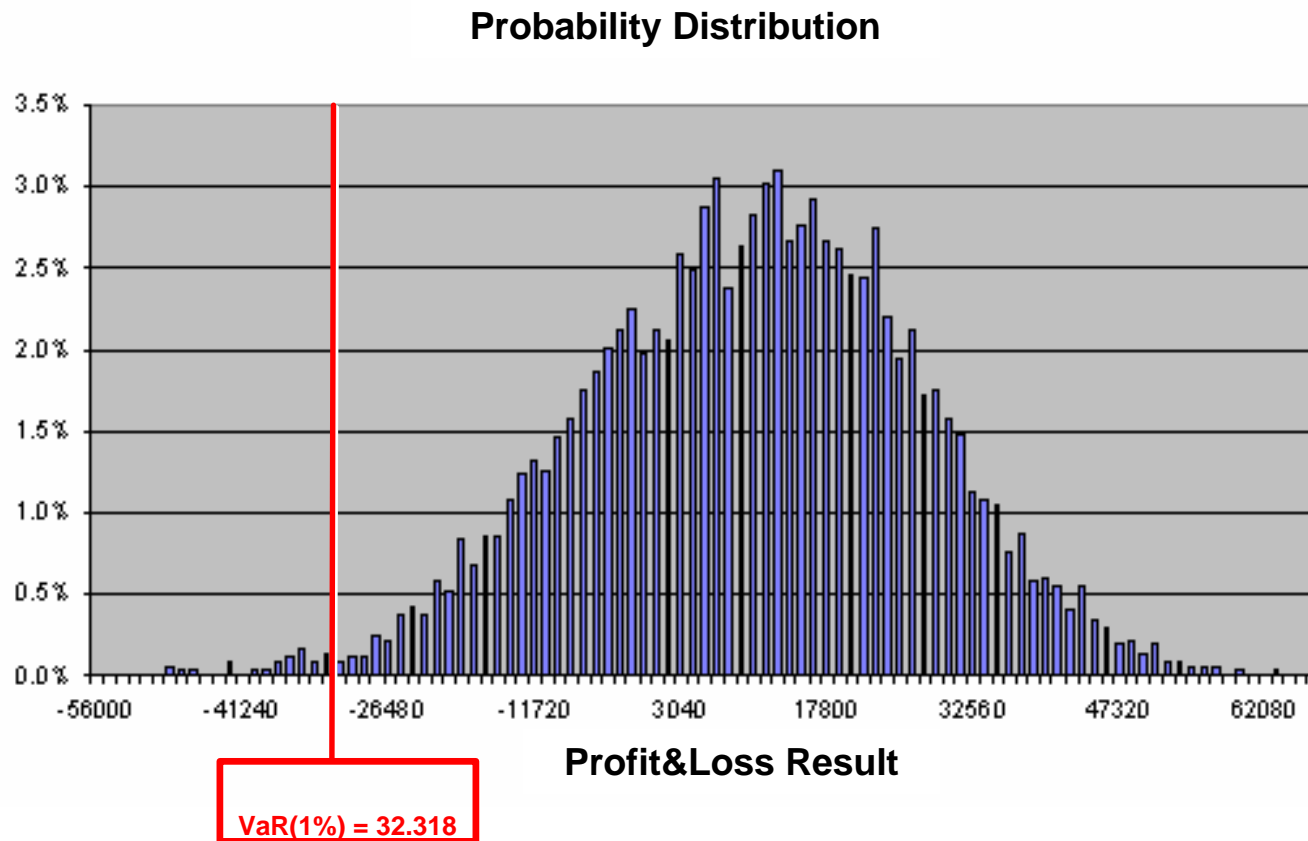
Free Capital

Modelling of Assets A and Liabilities L at Market Value/Best Estimate Value at time 0 and at time T

- the Difference $A-L$ is the **Free Capital C**
- The discounted change in the Free Capital is the P&L result, this has to be modelled



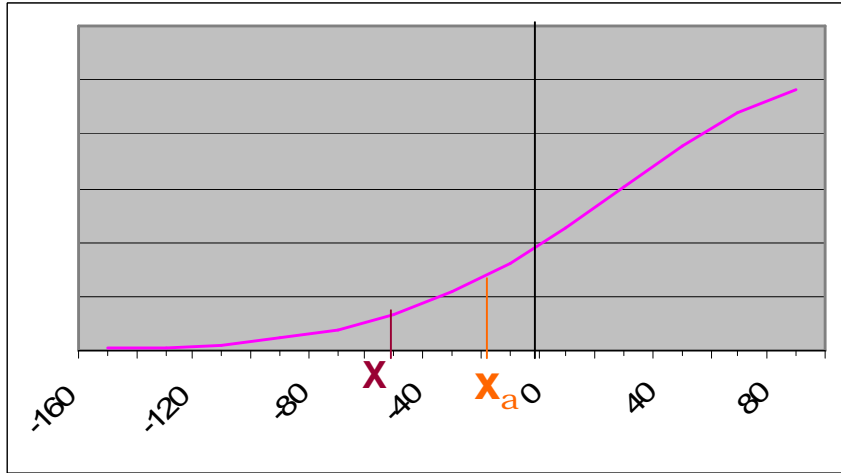
Target Capital:



Common Risk Measures

- Value at Risk (VaR):
 - Intuitive concept, closely related to the expression „probability of ruin“
- Tail-Value at Risk (TVaR) or Expected Shortfall:
 - Meets welcome mathematical characteristics (sub-additive, monoton, positive homogenous, translations-invariant)
 - Takes into account extend of „bad losses“

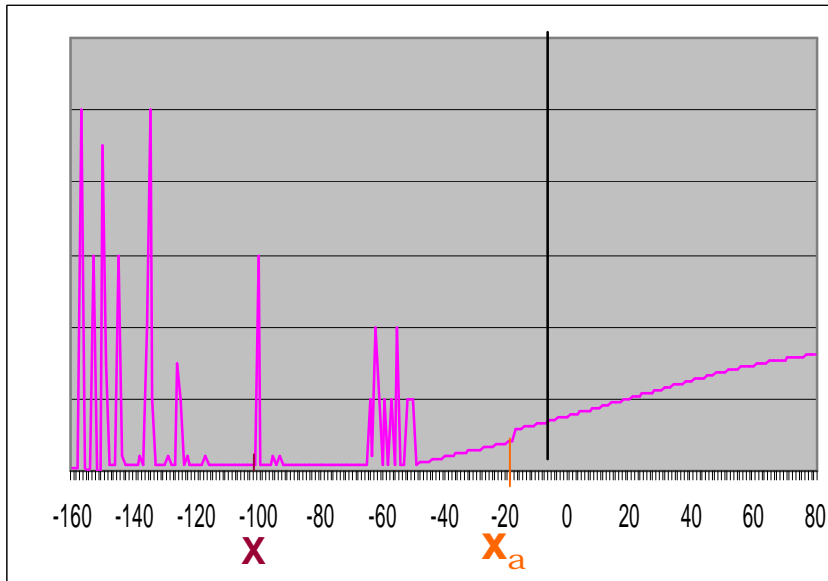
VaR and Expected Shortfall



Example 1

$$\text{VaR} = X_{\alpha} = 20$$

$$\text{ES} = X = 50$$



Example 2

$$\text{VaR} = X_{\alpha} = 20$$

$$\text{ES} = X = 100$$

Same VaR,
but different ES

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Solvency II

- Project started in 2001
- Intends to harmonise the solvency regulations throughout Europe
- Implementation expected for 2010
- Three pillar Basel approach:
 - Quantitative Requirements
 - Regulations for risk management processes
 - Public reporting leading to market discipline
- Calculation of minimum capital level and target capital

Solvency II

- Standard model for target capital calculation expected to be factor model
- Internal models allowed and encouraged
- Risk measure VaR preferred (but under discussion currently)
- Currently ongoing discussion about Risk Margin:
 - Included in “Best Estimate” Reserves, e.g. 75% percentile
 - Cost of Capital Approach

Solvency II

- Quantitative Impact Studies (QIS)
 - QIS 1: Insurance technical reserves: analysis of best estimate reserve and reserve ranges
 - QIS 1 results recently published
 - QIS 2: Comparison of local statutory balance sheet with market consistent balance sheet, calculation of target capital, minimum capital and free capital
 - QIS 2 performed in May 06 – July 06

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UK - Solvency

- Pre January 2005: Required Minimum Margin (RMM) Calculation (roughly equal to the higher of 16% net written premium and 23% net ultimate claims)
- Post January 2005: New Individual Capital Adequacy Standards (ICAS) with three pillar Basel approach

UK - Solvency

- Three capital amounts:
 - MCR: Minimum Capital Requirement
= pre January 2005 calculation
 - ECR: Enhanced Capital Requirement
= Factor model, which includes premium-, reserve- and asset risks
 - ICA: Individual Capital Assessment
= assess the own capital needs (could be internal model)

- FSA reviews these numbers and gives an Individual Capital Guidance

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Germany – GDV Model

- Four main risk categories: premium&reserve risk, investment risk, operational risk, reinsurance default risk
- Factor model with company specific factors
- No minimum capital requirement
- Factors for premium&reserve risk are derived from the net combined ratios per line of business and multiplied with net premiums
- Correlations between LoBs defined by the regulator
- Risks aggregated with “Square-Root-Formula” similar to Risk Based Capital approach

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France – Standard Model

- Six risk categories: underwriting risk, market risk, credit risk, concentration risk, operational risk, cat risk
- Factor model
- Minimum capital requirement as percentage of target capital (still discussed)
- Factors for premium&reserve risk are multiplied with premiums and reserves
- Diversification between risks still discussed
- Risks aggregated with “Square-Root-Formula” similar to Risk Based Capital approach
- Cat risk evaluated with extreme scenario

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Switzerland - Swiss Solvency Test

Key Elements:

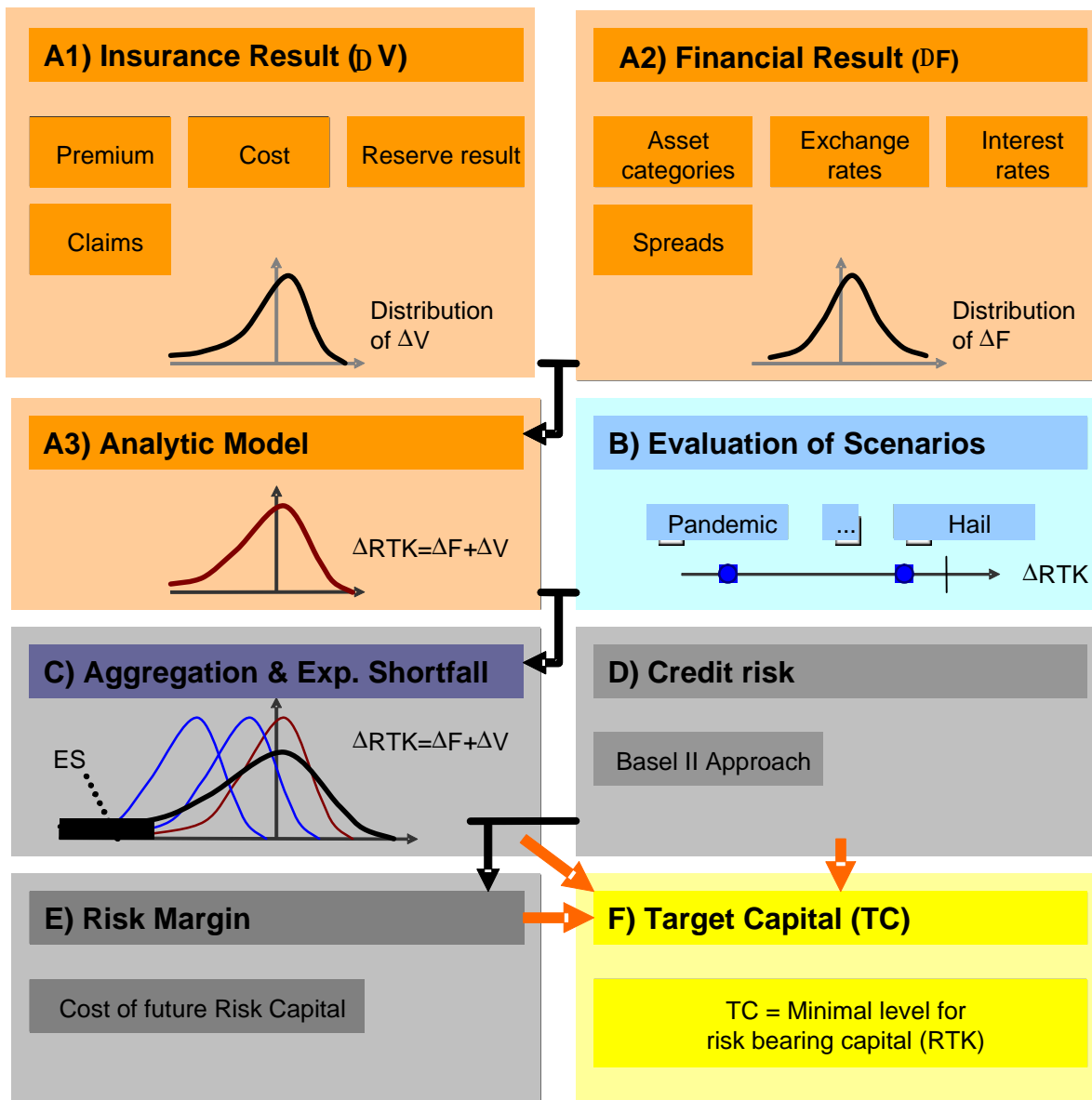
- Minimal Solvency = “old calculation” is last step before insolvency
- Calculation of Target Capital necessary, Target Capital = Risk Based Solvency Amount
- Regulator offers standard model for the calculation of the target capital
- Standard model is already stochastic model
- No factor model
- Explicit Scenarios have to be evaluated
- Partially predefined distributions and parameters for standard model

Swiss Solvency Test

Key elements:

- Assets and liabilities are valued market-consistently
- Relevant risks are market-, credit- and insurance risks
- Risk is measured using the expected shortfall of change in risk bearing capital over one year
- In case of financial distress of an insurer, policyholders are protected by a risk margin
- Internal Models can be used
- Reinsurance can be fully taken into account
- The assumptions and internal models have to be documented in a SST report

Swiss Solvency Test - Overview



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Internal Models

Excerpt from the “White Paper of the Swiss Solvency Test”:

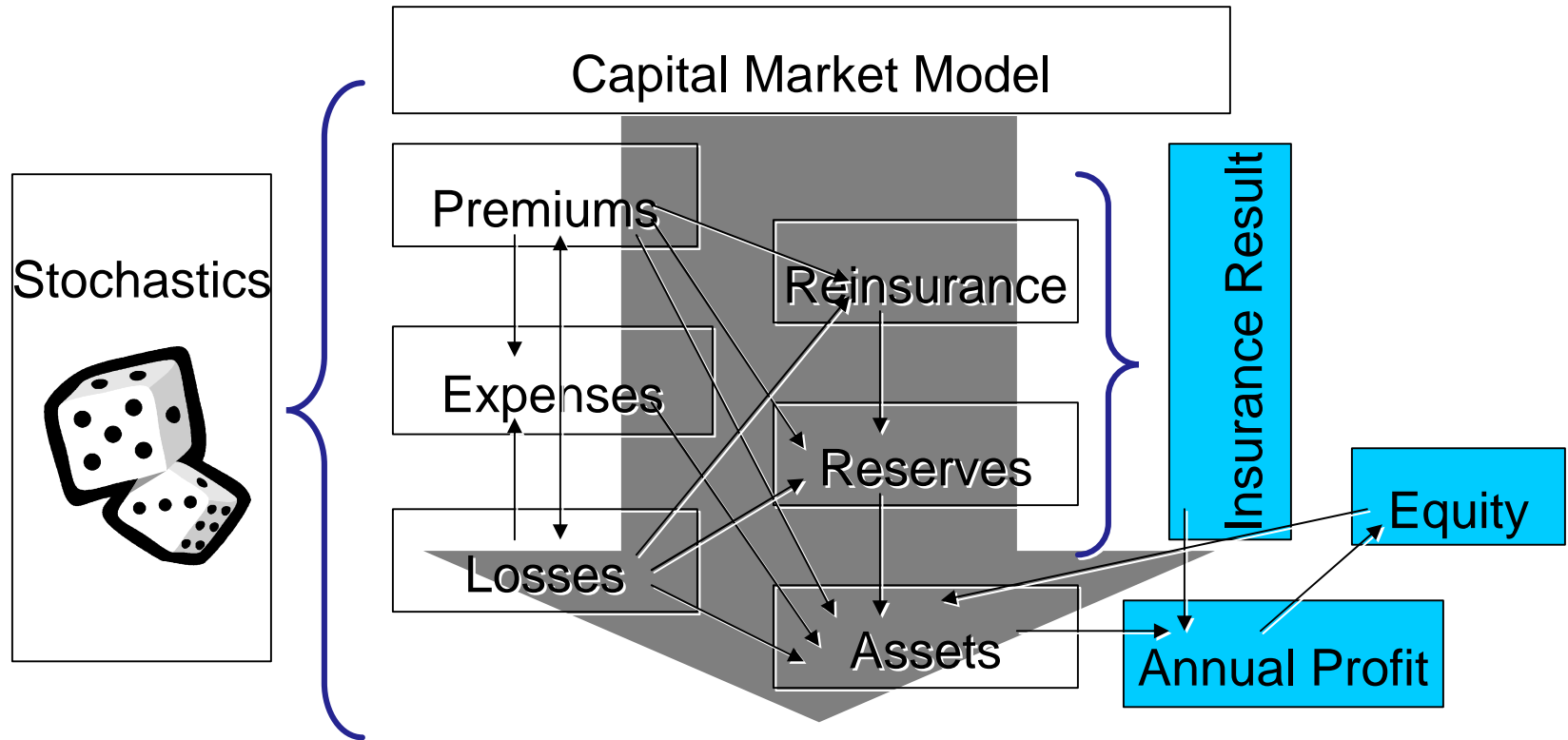
“It is an aim of the supervisory authority to encourage the use of internal models. These models need to satisfy quantitative, qualitative and organizational requirements. In particular, they must be deeply embedded into the insurer’s internal processes and may not be used exclusively to calculate target capital”

Internal Models

What is an internal model?

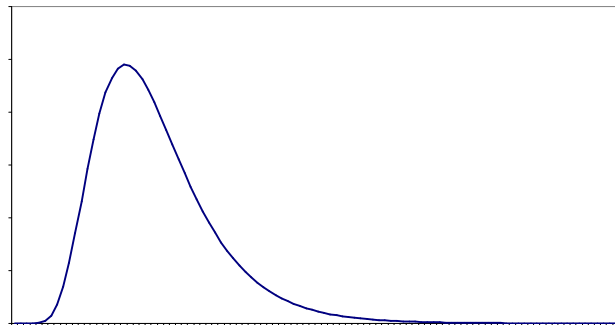
- Stochastic cash-flow model
- All relevant variables have to be modelled: premiums, losses, expenses, investment income, change in asset market value
- Results: Stochastic distributions of all major balance sheet and profit&loss account items

Internal Model - Overview



Example: Losses

- Four Components
 - Existing Reserves
 - Attritional Losses
 - Large Losses
 - Accumulated Losses
- Stochastic Distributions for all types of losses



Example: Assets

- Define Asset classes, e.g. Cash, Bonds with different durations, Shares, etc.
- Use Capital Market Model (e.g. TSM, Wilkie, Random Walk) in order to model investment returns and change in market value stochastically
- Define strategic asset allocation

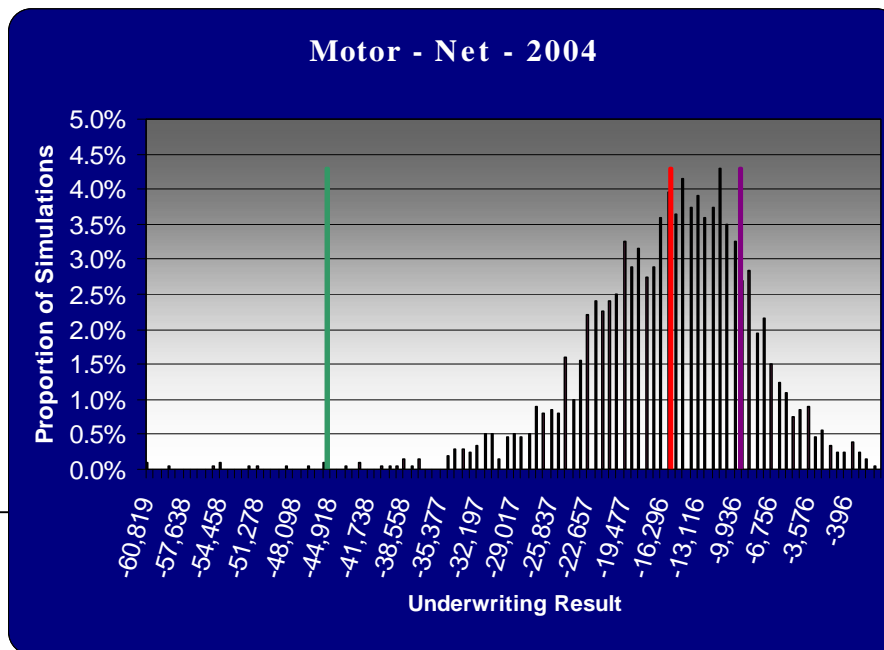
Aggregate distributions for Losses per LoB & Asset Result & Premiums & Expenses....

E.g. with Simulation

- Run a large number (e.g. 20,000) of simulations
- Each simulation results in one possible balance sheet and P&L

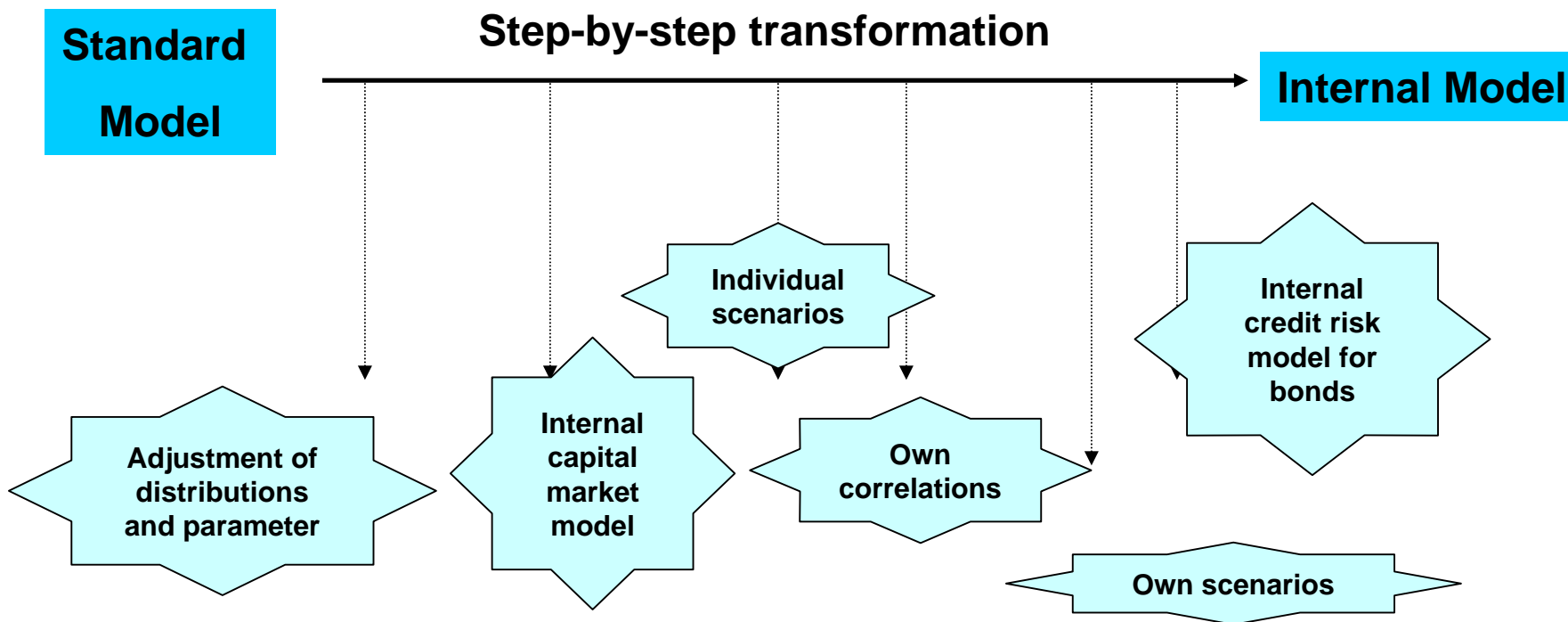
Results

- Statistical Data and Graphs



- Results
 - Separate for Lines of Business/Entities and individual Reinsurance Contracts etc.
 - Relevant Cash-Flows and P&L-Items on Market-Value resp. Fair Value
 - Distribution of P&L Result can be used as basis for Target Capital Calculation

Example – How to get from the standard to the internal model

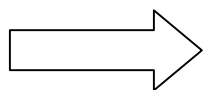


Advantages of Internal Model

- Standard-model contains conservative assumptions, which normally lead to higher solvency requirements
- Better insight into the company's real risk-situation
- Company-specific characteristics are accounted for
- Use of simulation approach simplifies a lot of calculations (Calculation of joint distribution, Correlation, etc.)
- Internal models are encouraged by the authorities

Advantages of Internal Model

- Internal models provide much more than “just” a calculation engine for the solvency amount:
 - Analysis/optimization of reinsurance structure
 - Analysis/optimization of strategic asset allocation
 - Allocation of risk based capital to business units or lines of business (performance measurement)



Adequate method for the assessment and the management of financial risks