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Business Risk Review Leader
Risk Management

- Graduate of The Johns Hopkins University
- Thirty plus years experience in the insurance and reinsurance industry handling large individual risks as well as large treaty contracts
- Rejoined the Swiss Re Group as part of the GE Insurance Solutions acquisition, assuming first the role of Head of Americas Insurance & Reinsurance Risk Management, then Business Risk Review Leader
- Prior to the acquisition, held role of Corporate Underwriting Risk Leader; responsible for review and decision of CEO level referrals for insurance, reinsurance and life business, sign off on all underwriter LoA's, underwriting audit (both internal and external)
- 2006 – Present: Swiss Re
- 1996 – 2006: GE Insurance Solutions
- 1986 – 1996: Swiss Reinsurance America Corporation – Vice President of Global & National Accounts
- Started my underwriting career at Liberty Mutual. Pursued and secured positions in facultative reinsurance in the States and then Bermuda underwriting large risks and international business

Swiss Re's Enterprise Risk Management in the context of Solvency II and the Swiss Solvency Test (SST)

Swiss Re



Presentation to ASSAL-OECD-IAIS Conference

29 April 2009

Robert Peduto, Head Business Risk Review



Agenda

- **Motivation and elements of European Solvency regimes**
- ERM framework of Swiss Re
- Summary

Recent events accelerated the development of Enterprise Risk Management in the (re)insurance industry

1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009

Solvency I regime

P&C:

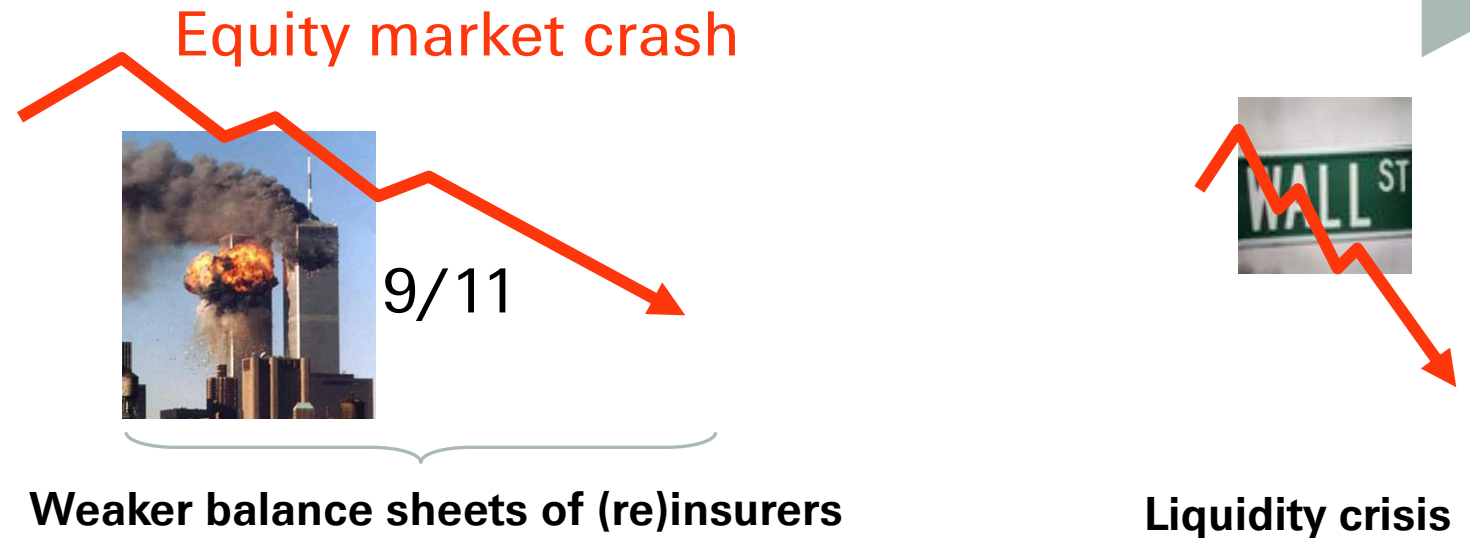
Max of

- % of net claims (avg of past 3 years)
- % of net premiums

Life:

Sum of

- % of net reserves
- % of unit linked
- % of sum assured



Weaker balance sheets of (re)insurers

Liquidity crisis

General change in risk perception in light of experienced loss accumulation potential

Most prominent reactions

Solvency II/SST¹

S&P's ERM²

¹ Swiss Solvency Test

² Standard & Poor's Enterprise Risk Management

The comprehensive concept of Solvency II will improve the risk culture in different ways



Three pillar approach to Solvency II

Quantitative requirements

Pillar I

- Consideration of entire risk landscape and individual exposure
- Greater integration of risk models

Supervisory review

Pillar II

- Holistic risk management
- Governance and internal control

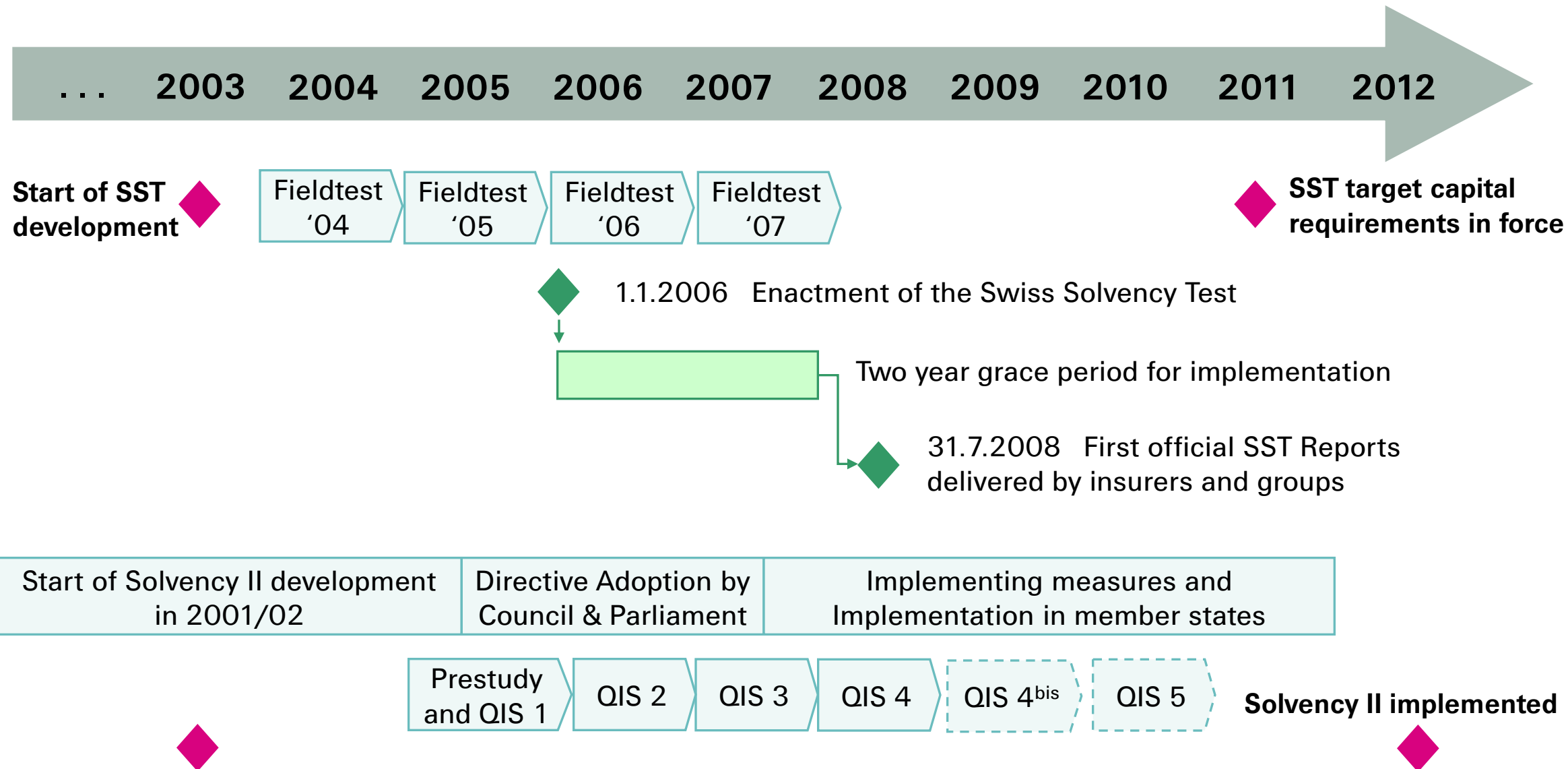
Market transparency

Pillar III

- Increased transparency improving stakeholder confidence by enforcing market discipline
- Increased comparability of risk exposures



Swiss Solvency Test (SST) preceded the European Solvency II





Regulators allow two options to implement pillar one requirements

Options for pillar one:

1. Application of a standard model defined by the regulator
2. Application of an internal model accepted by the regulator

All models have to follow important design principles:

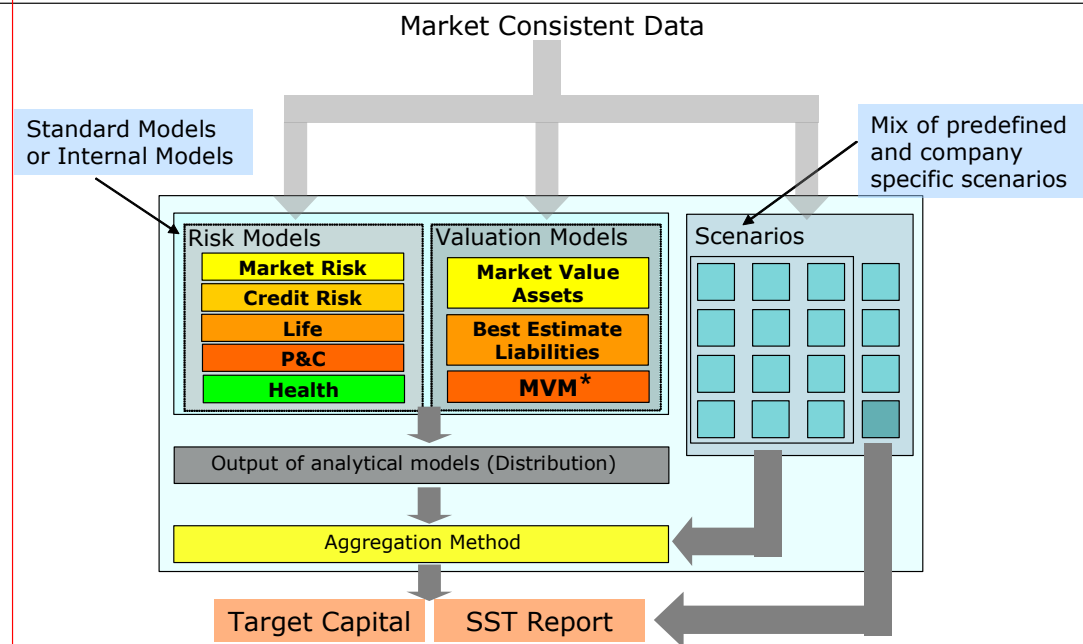
- Economic/market consistent valuation standards
- Appropriate risk factor and exposure models
- Aggregation has to consider dependencies between risks

Factors influencing the choices of companies:

- Cost and effort of application and development
- Individual company risk profile

Example: Design of the SST standard model

SST Standard Model



For the SST, reinsurance companies, groups and conglomerates must develop internal models since their risk profiles are considered too complex for the standard model

The example of the Swiss Solvency Test provided useful lessons for the implementation of Solvency II

- Effort for small and medium enterprises (SMEs) is not prohibitive
 - ▶ **After initial pushback, SMEs feedback was very positive**
- Lack of recognition under Solvency I of certain large risks
 - ▶ **Move to a risk-based system will lead to better risk management**
- No standard formula can capture all the risks of a company
 - ▶ **A principles-based approach is needed**
- SST only partially captures concentration risk and liquidity risk, and operational risk is outside its scope
 - ▶ **Companies need strong risk management and corporate governance in addition to SST**



Solvency II: Quantitative Impact Studies

	Timeline	Assessed topics	Participation
Pre-Study	2. Quarter 2005	<ul style="list-style-type: none"> ■ Life insurance companies are asked to deliver data on best estimate calculation for assets and liabilities as well as available stress test on balance sheets 	<ul style="list-style-type: none"> ■ Countries: 20 ■ Companies: 84
QIS 1	4. Quarter 2005	<ul style="list-style-type: none"> ■ Testing the level of prudence in technical provisions under several hypotheses ■ Testing the practicability of the calculation 	<ul style="list-style-type: none"> ■ Countries: 19 ■ Companies: 312 (incl SR)
QIS 2	2. Quarter 2006	<ul style="list-style-type: none"> ■ Technical provision (extended analysis) ■ Calculation of SCR and MCR (proposed methodology for the standard formula) 	<ul style="list-style-type: none"> ■ Countries: 23 ■ Companies: 514 (incl SR)
QIS 3	2. Quarter 2007	<ul style="list-style-type: none"> ■ Practicability of Framework and impact on balance sheet ■ Calibration SCR & MCR ■ Standard formulae for groups 	<ul style="list-style-type: none"> ■ Countries: 28 ■ Companies: 1027 (incl SR)
QIS 4	2. Quarter 2008	<ul style="list-style-type: none"> ■ Geographical diversification in P&C ■ Calibration of SCR and MCR ■ Comparison of Internal Model with Standard Formula ■ Capital adequacy at Solo and Group level 	<ul style="list-style-type: none"> ■ Countries: 30 ■ Companies: 1412 (incl. SR)



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Three pillars of risk management at Swiss Re mirror the three pillars of Solvency II

Quantitative risk management

- Sound valuation and risk measurement
- Quantitative risk limit monitoring system
- Reliable capital adequacy framework

Risk governance

- Clearly defined responsibilities for risk taking and risk management
- Sound and well documented:
 - risk management policies and guidelines
 - operating, reporting, limit monitoring, and control procedures
- Regulatory compliance
- Internal and external audits of processes and figures

Risk transparency

- Internal
 - Risk reporting
 - Peer reviews
 - Independent internal validation
- External
 - Financial and risk disclosure
 - External validation



Economic Value Management (EVM) framework and internal models have a long history at Swiss Re

EVM

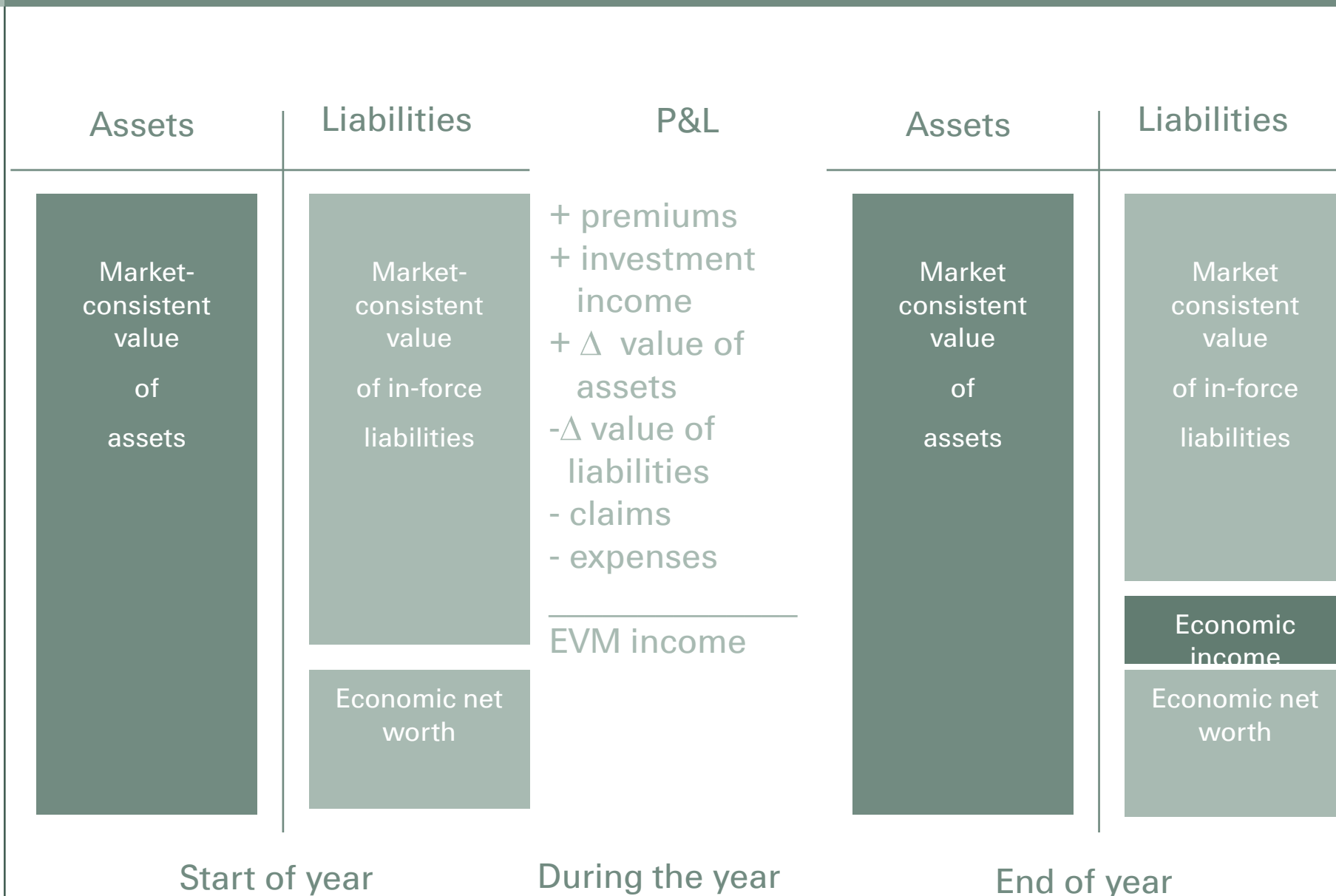
- 1999-2001: Development of EVM framework
- 2001: outstanding review of EVM framework by the Wharton School and approval by Executive Committee
- 2002: implementation of EVM framework
- 2004: first full EVM report
- 2008: public disclosure of EVM figures

Internal model

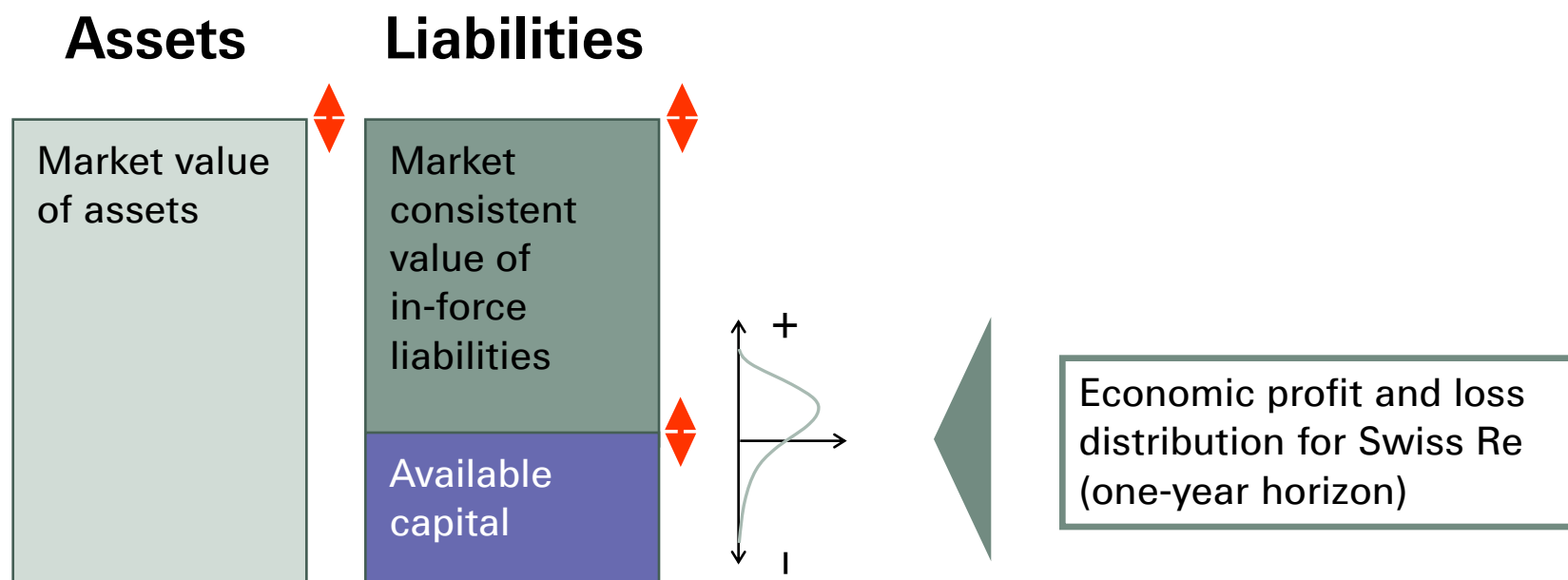
- 1994: first internal model
- 1996: first risk report for Swiss Re Zurich
- 1998: first model review by Swiss Federal Institute of Technology
- 1999: first full Group Risk Report
- 2002: second model review by Swiss Federal Institute of Technology
- 2004: first public disclosure of risk figures
- 2008: inclusion of group effects



Economic income measures change in economic net worth over a 1-year period



Economic income forms the basis for risk measurement



- Available capital is the total capital exposed to risk and is broadly equal to the difference between the market value of assets and the market-consistent value of in-force liabilities
- Risk is quantified by modelling the change in available capital for Swiss Re over a one-year horizon

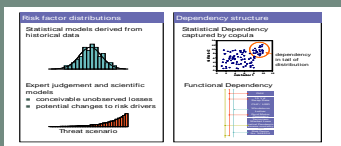


Swiss Re's approach of risk modelling relies on separating risk factors and exposures and uses simulation techniques

Risk factors and dependencies

Distribution for each relevant risk factor

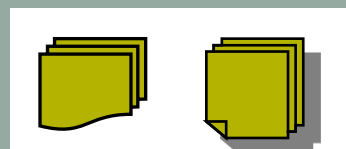
Dependency structure among risk factors



External world in which Swiss Re operates

Exposures

Exposures describing how economic values of assets and liabilities respond to realisations of risk factors



Swiss Re's link to the external world

Change in value of assets and liabilities

Exposures are combined with risk factor realisations to obtain the change in value of assets and liabilities per realisation

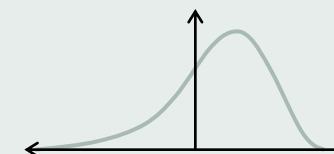
€, £, \$, ¥

Impact of external world on Swiss Re's portfolios

Evaluation

Economic profit or loss for each set of risk factor simulations collected as a distribution

Economic profit & loss distribution



This calculation is performed for 1'000'000 **joint** realisations of all risk factors



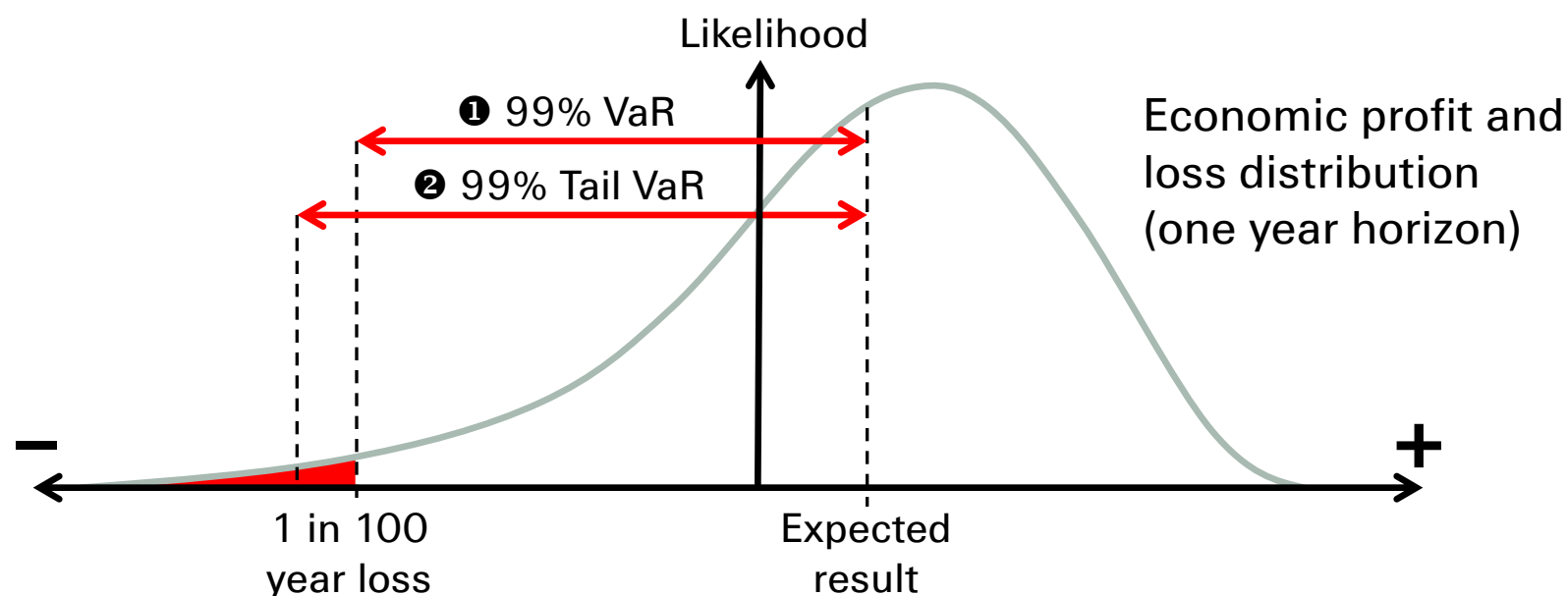
Various risk measures can be used to articulate internal capital adequacy measures

① Value at Risk (VaR)

99% VaR represents the difference between the expected result and an adverse result with a frequency of once in one hundred years

② Tail VaR (expected shortfall)

99% shortfall represents the difference between the expected result and the average adverse result with a frequency of less than once in one hundred years





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Swiss Re's risk governance is articulated in a series of documents

Risk governance documentation pyramid



Risk strategy

- **Risk attitude**
Swiss Re actively takes risk in both insurance and financial markets, provided that these risks can be adequately controlled. Non-core, including operational, risks are limited based on cost-benefit considerations
- **Risk tolerance**
Overall risk is limited mainly to ensure that Swiss Re *is able to continue to operate following an extreme loss event*
- **Risk appetite**
The central goal in risk taking is to maximise shareholder value added, measured according to Economic Value Management

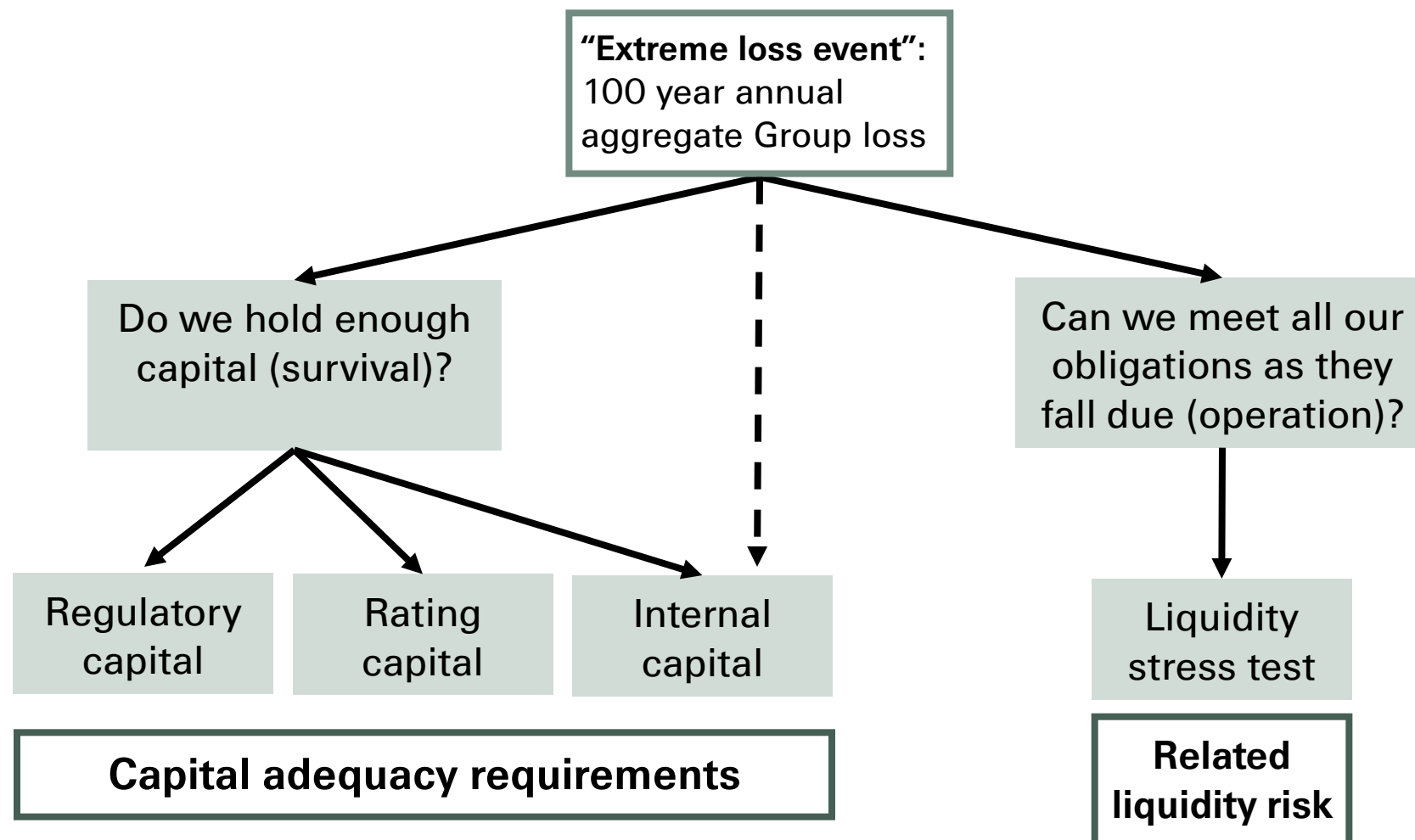


Swiss Re's risk tolerance defines two distinct requirements

Capital adequacy versus liquidity risk

Risk tolerance definition of the Board:

"To be able to continue to operate following an extreme loss event."





Funding liquidity stress tests

Scenarios driven by stress events

Swiss Re considers a number of different scenarios and key assumptions

Assumption	Insurance loss	Financial market crisis	Extreme loss
Event description	Atlantic hurricane and operational failure	market crash and banking crisis	combined insurance and financial market loss
Time horizon	90 days	90 days	90 days and 1 year
Loss amount	200-year period plus operational loss	credit and financial market aggregate stress loss	99%, 1 year aggregate shortfall
Ratings downgrade	none	downgrade	significant downgrade
Asset sales	not considered	not considered	allowed for over 1 year subject to haircuts
External funding	only on secured basis subject to haircuts		
Intragroup funding	only if contractually provided for or with unregulated entities		
Funding from new reinsurance business	no impact	decrease	significant decrease
Commitments	normal conditions	stressed conditions	stressed conditions
Discretionary funding pipeline	continued	continued	discontinued

Liquidity is integrated into relevant management processes at Swiss Re

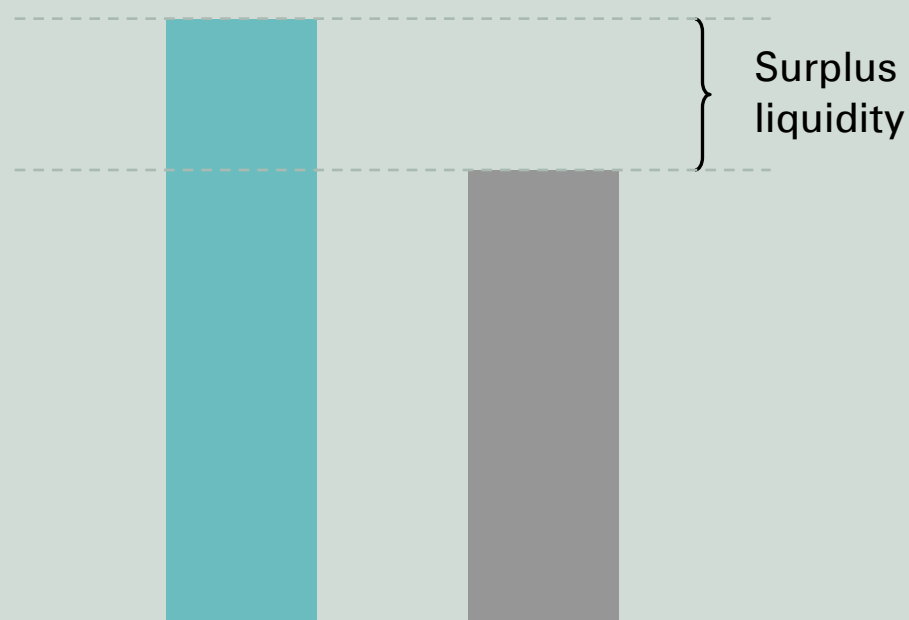


Liquidity risk measured comparing stressed requirements and sources

Measured under normal and stressed conditions

Measuring funding liquidity risk

Illustrative



- sources of cash and collateral
- requirements of cash and collateral

Measures used

- **Net funding liquidity**
Defined as the difference between sources of cash and collateral and requirements of cash and collateral
- **Funding liquidity ratio**
Defined as the ratio of sources to requirements of cash and collateral
- These measures are determined
 - both in normal and stressed operating conditions, and
 - over predetermined future time intervals (90 days, one year)
 - for key legal entity groupings within which funds are freely transferable

Three pillars of risk management at Swiss Re mirror the three pillars of Solvency II



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Risk governance

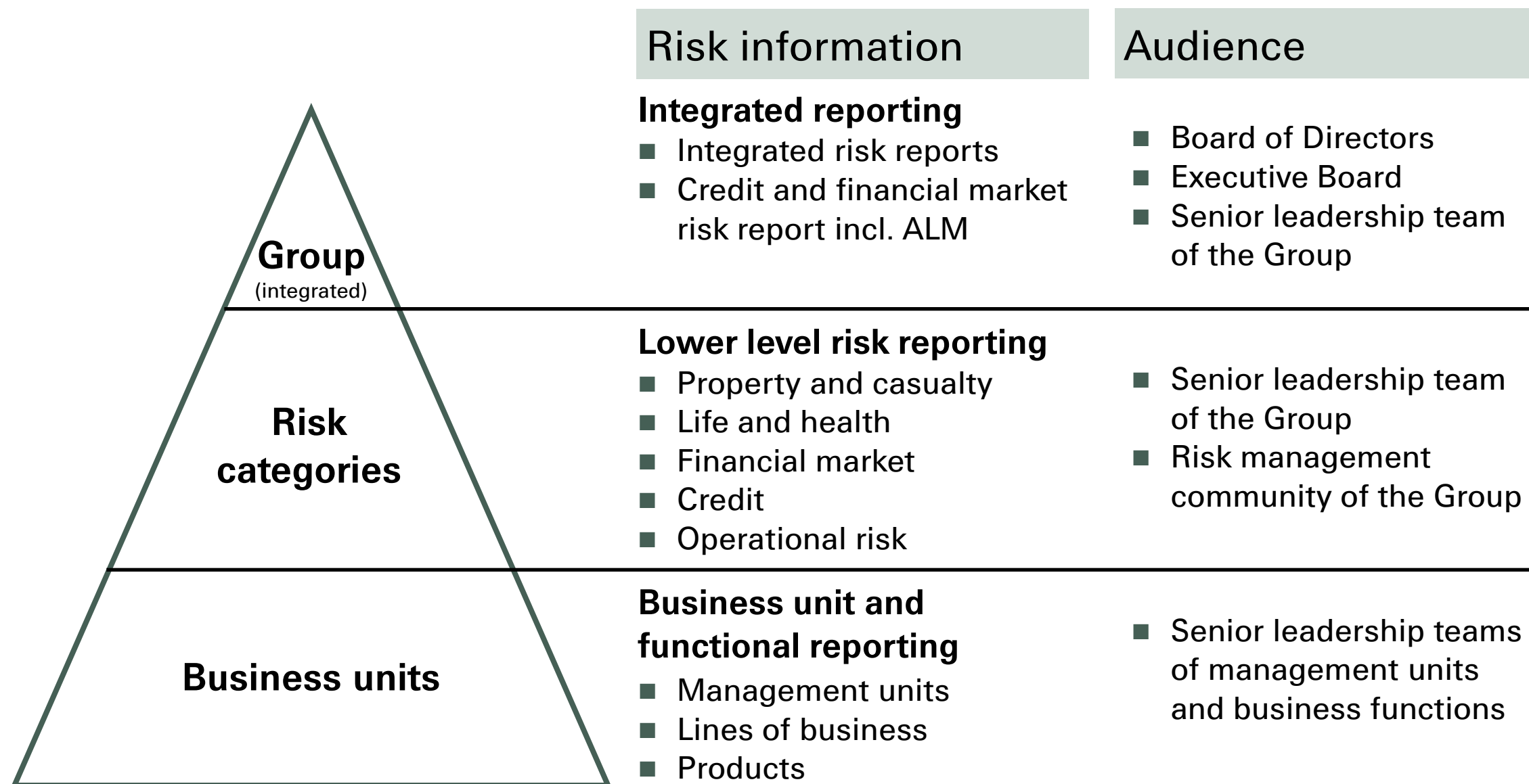
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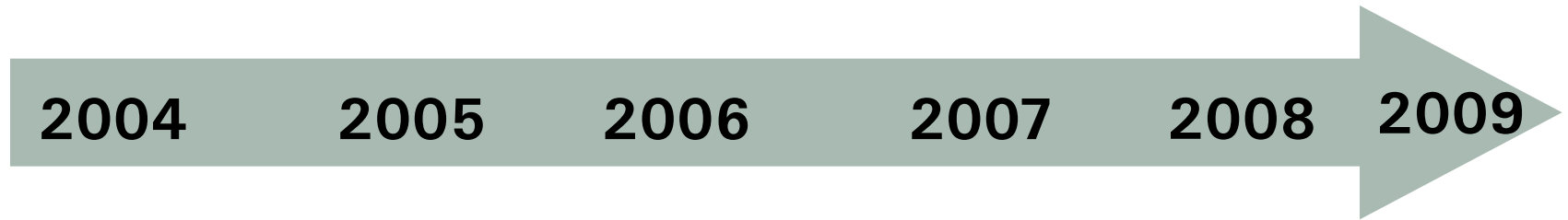
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Internal management information needs to be tailored to the recipient



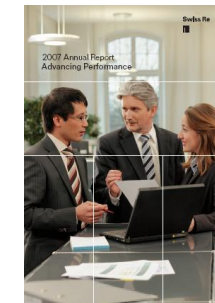
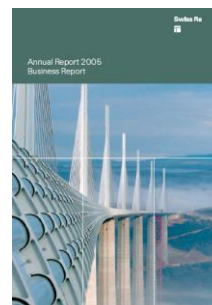
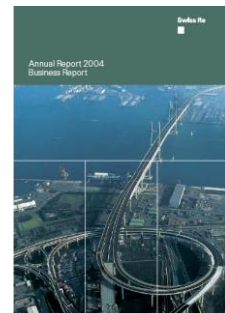
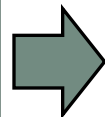
Swiss Re's external risk dialogue started in 2004 and is now integral part of our regular disclosure



Investor Days



Annual Reports





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Summary

- Enterprise Risk Management is about much more than just quantification and also includes
 - risk governance
 - transparency and communication
- To consider its different nature, the assessment of funding liquidity risk is consistent but separate from the capital adequacy model
- Swiss Re has been using an integrated approach to Risk Management for more than a decade which is deeply embedded in its steering processes

▶ Swiss Re welcomes and supports regulatory frameworks that are better aligned with the actual risks of the insurance business and their management



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Appendix



Separation of risk factors and exposure supports business steering

Dependence structure

	e.g. LoB	Property	Equity investment	Liability	Life	Credit
	Risk factor					
	DAX					
	10 Y € Swap Rate					
	CHF / USD					
	Windstorm Lothar					
	Ford Motor Company					
	Terrorism Market Loss					
	Lethal Pandemic					
	Risk Factor No 348'534					

Ideally suited for ...

- ... assessing overall risk
- ... determining contributions to overall risk
- ... analysis of drivers of risk
- ... accumulation control
- ... as-if analysis of portfolio changes (no recalibration)

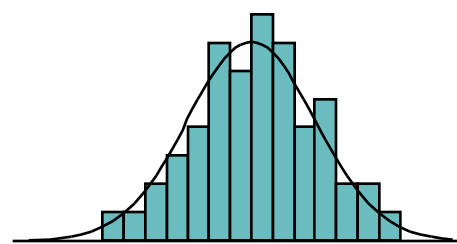
→ enables more accurate and targeted risk management



Modelling risk factors requires statistical analysis and expert judgement

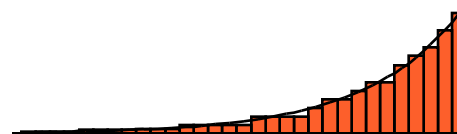
Risk factor distributions

Statistical models derived from historical data



Expert judgement and scientific models

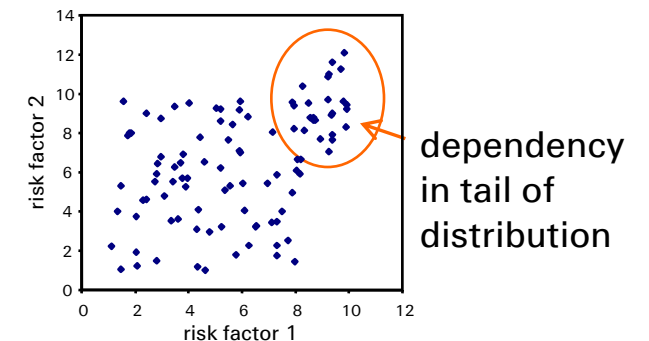
- conceivable losses
- potential changes to risk drivers



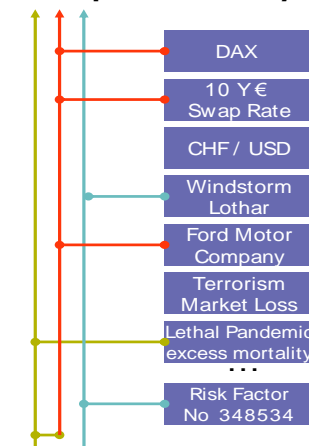
Threat scenario

Dependency structure

Statistical dependencies captured by copulas



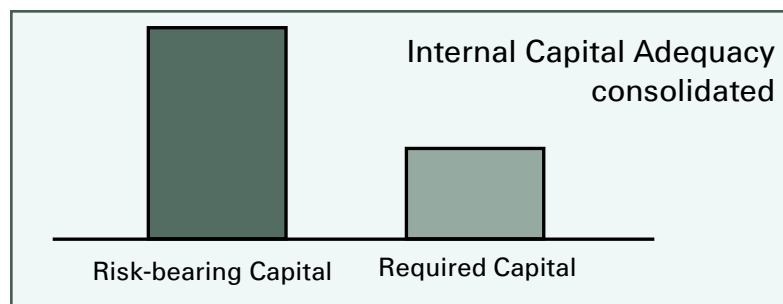
Functional dependency



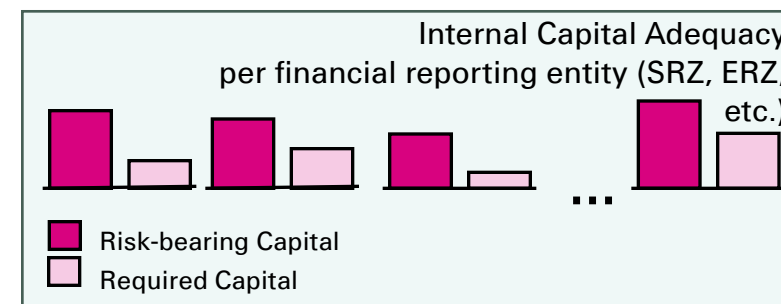


Looking at the consolidated view only ignores important group effects

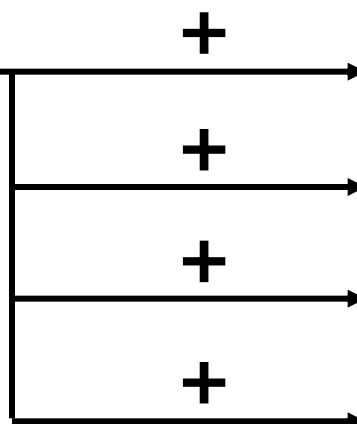
Swiss Re Group consolidated



Swiss Re Group as a network of legal entities



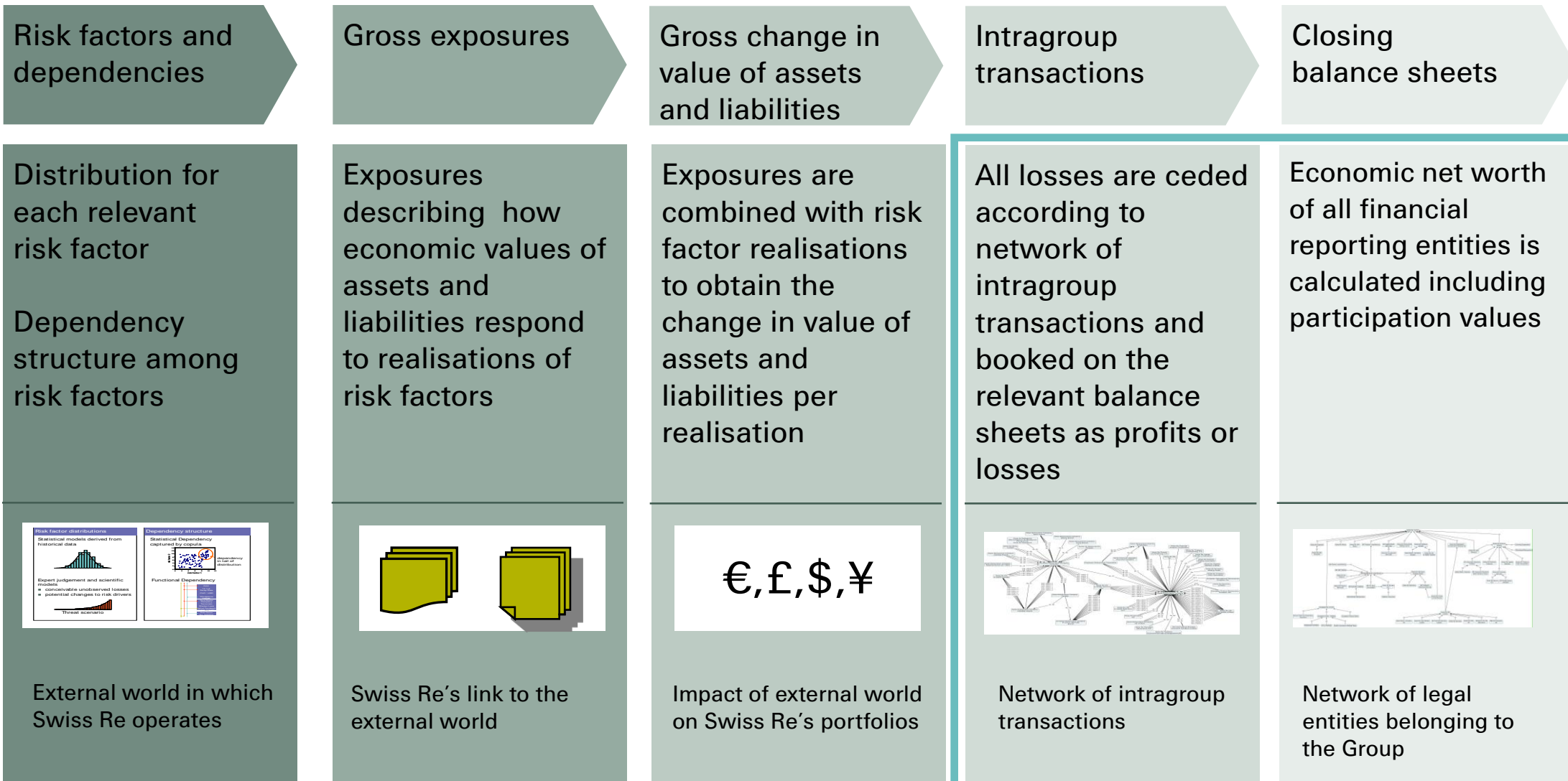
- Historically, most groups took a consolidated view to determine their capital adequacy
- This view is appropriate under the assumption that capital can be transferred freely
- In reality there is however the threat that local regulators will restrict capital flows between subsidiaries in times of distress to best protect the interests of their local policy holders



- Modelling of intragroup risk and capital transfer instruments
- Assessment of intragroup credit risk
- Consideration of limited liability towards subsidiaries
- Consideration of knock-on effects resulting from economic insolvencies



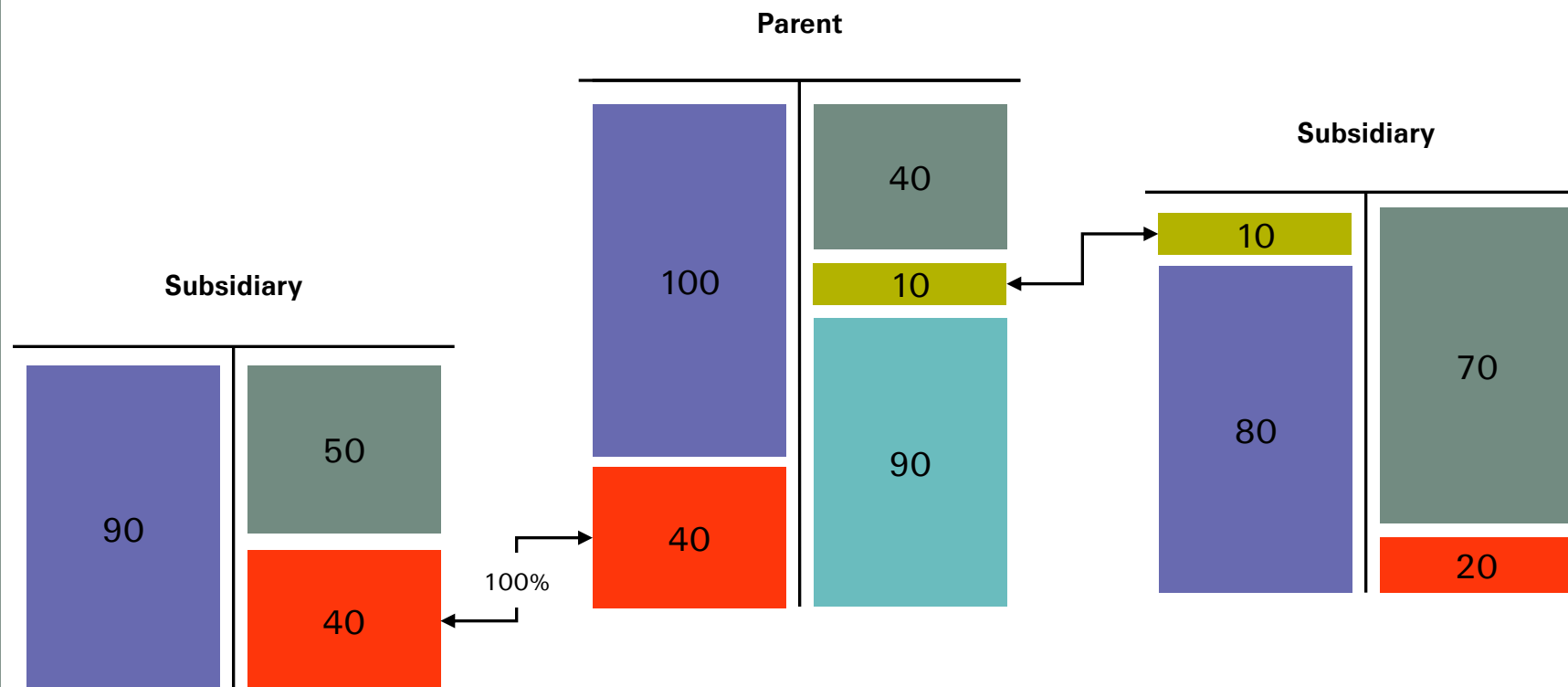
Group effects require extending the evaluation part of the simulation model



This calculation is performed for 1'000'000 **joint** realisations of all risk factors



Thus an internal model needs to reflect the impact of ownership **and** transaction relations



Ownership relation

Economic net worth of subsidiary appears as participation value in parents balance sheet

Transaction relation

Ceding risk to the parent is an asset to the subsidiary and a liability to the parent



Consistent limit framework

Limits fully aligned with the Group's overall risk tolerance

- Actual situation from all capital perspectives
- Risk tolerance criteria of the Board
- Risk appetite derived by optimisation procedures
- Group Risk Model as basis for limit setting

