



Risk Management in an Insurance Company

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24.4.2026

What are we going to discuss today?



1. **Why?** (*Motivation – why is it good to manage risks?*)
2. **What?** (*Which risks are we managing?*)
3. **How?** (*And how can we do that?*)

Why?

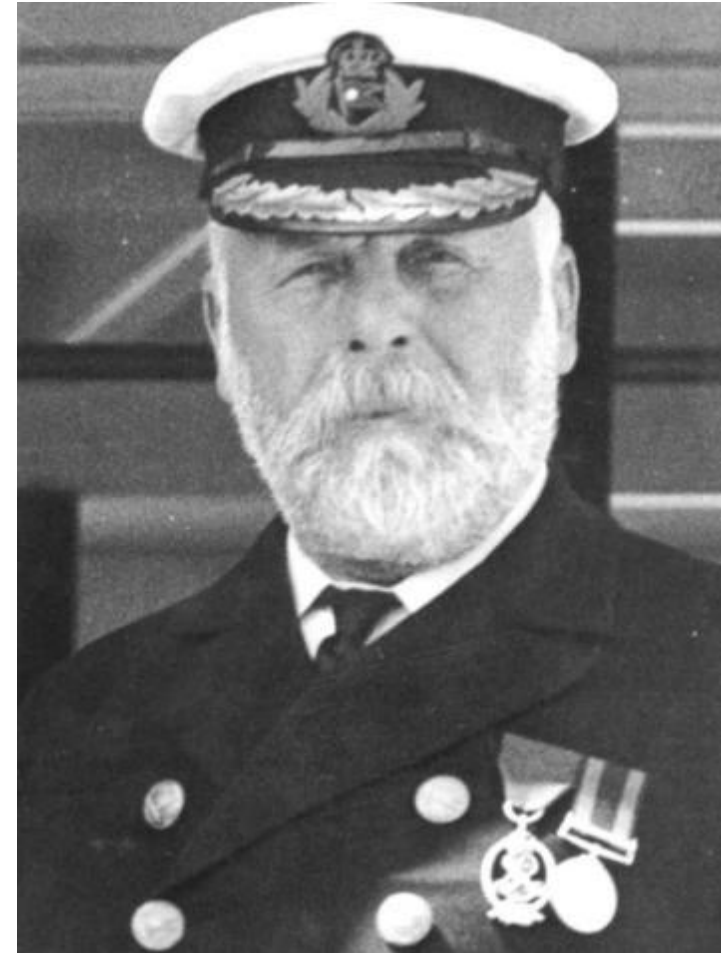
Motivation – why is it good to manage risks?

Why is it good to manage risks?

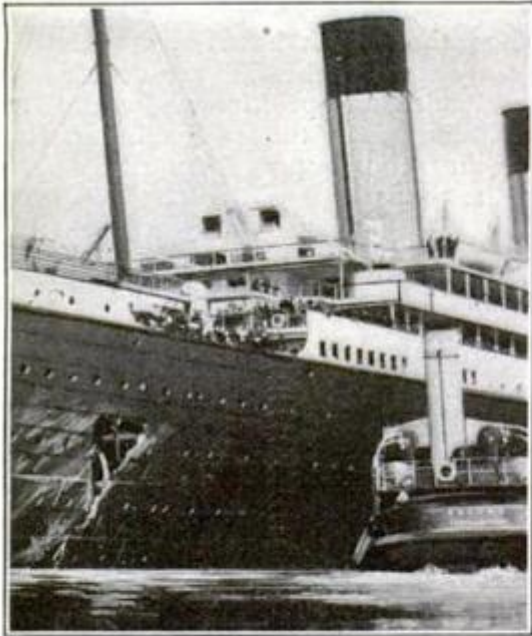
"When any one asks me how I can best describe my experiences of nearly forty years at sea I merely say uneventful. Of course, there have been Winter gales and storms and fog and the like, but in all my experience I have never been in an accident of any sort worth speaking about. I have seen but one vessel in distress in all my years at sea...,,

"I will go a bit further, I will say that I cannot imagine any condition which could cause a ship to founder. **I cannot conceive of any vital disaster happening to this vessel. Modern shipbuilding has gone beyond that.,,**

Edward John Smith
Captain of RMS Adriatic, 1907



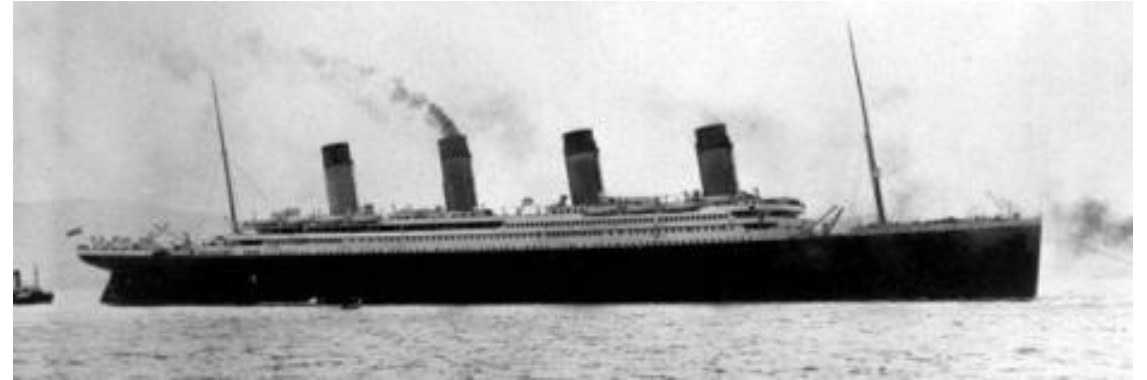
Why is it good to manage risks?



The Hole in the "Olympic," the Damage Below the Waterline being Much Greater Than That Above



The Bow of the "Hawke," the Damage being so Great That the Ram Has Been Mashed Flat

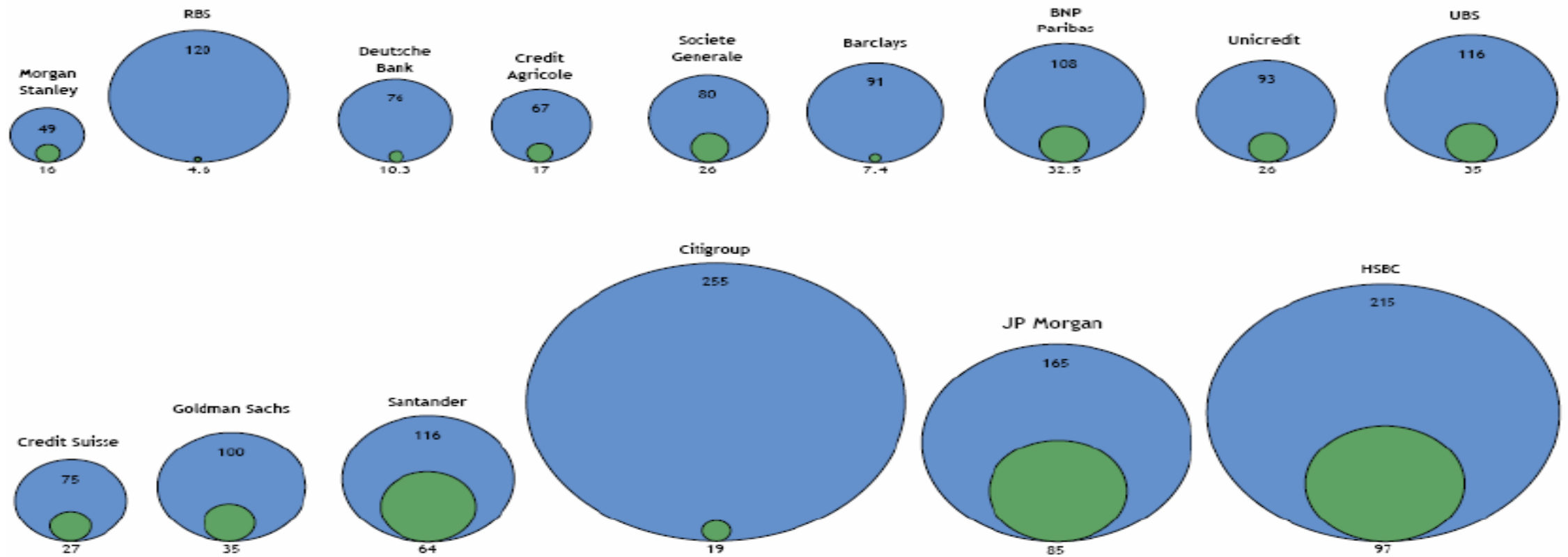


20.9.1911 – Collision of RMS Olympic and HMS Hawke

15.4.2012 – RMS Titanic sank

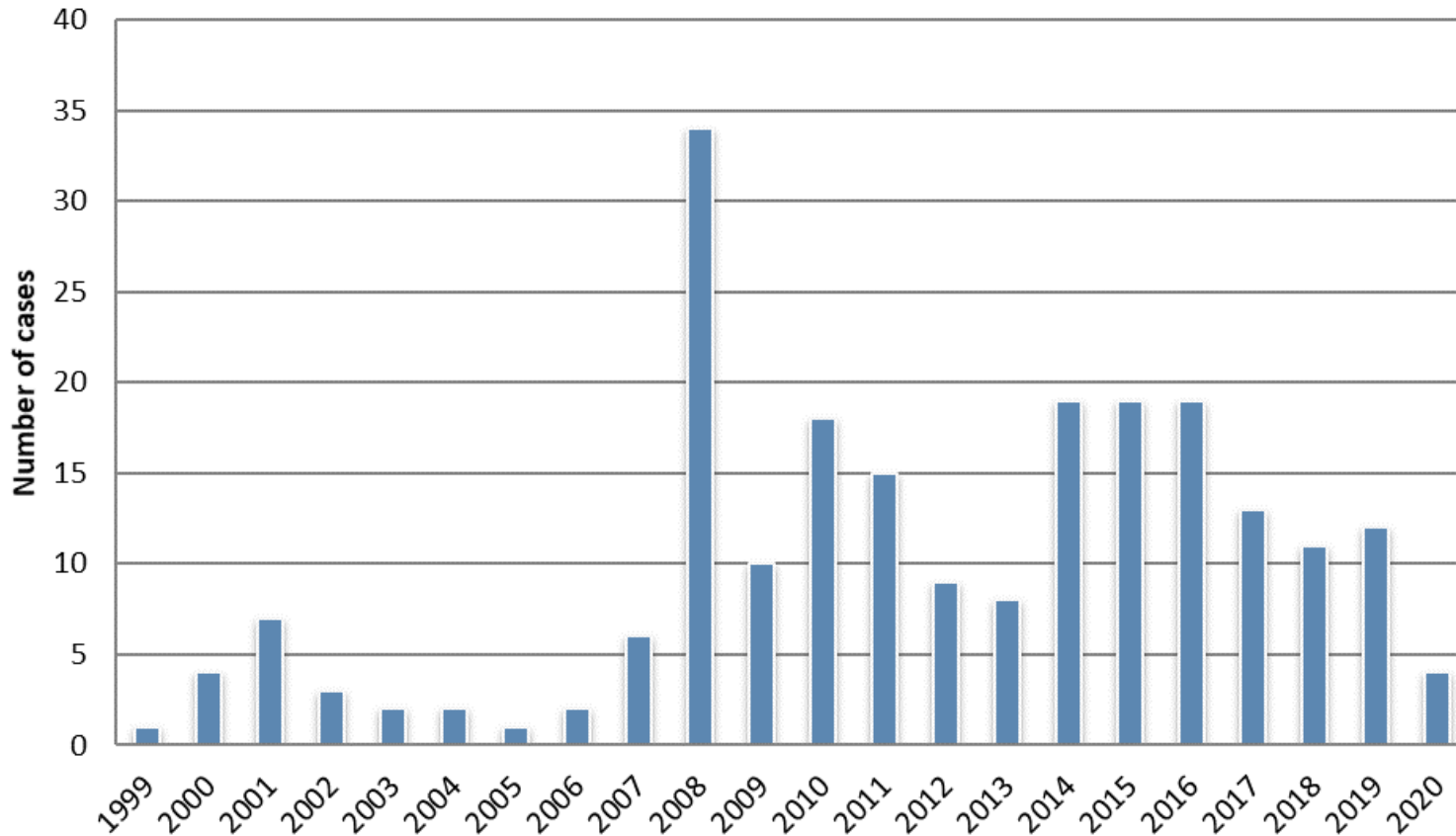
Financial sector - examples

- Market Value as of January 20th 2009, \$Bn
- Market Value as of Q2 2007, \$Bn



EIOPA database of insurance failures and near misses

Starting year of reported cases



Data from 1999 – 2020
219 cases from 31 EU countries

https://www.eiopa.europa.eu/publications/failures-and-near-misses-insurance_en

What is the task for risk management?
Is it an internal need or regulatory requirement?

DIRECTIVE 2009/138/EC (Solvency II)

Article 44

Risk management

1. Insurance and reinsurance undertakings shall have in place an effective risk-management system comprising **strategies, processes and reporting procedures** necessary to **identify, measure, monitor, manage and report**, on a continuous basis the risks, at an individual and at an aggregated level, to which they are or could be exposed, and their interdependencies.

That risk-management system shall be effective and well integrated into the organisational structure and in the decision-making processes of the insurance or reinsurance undertaking with proper consideration of the persons who effectively run the undertaking or have other key functions.

<https://eur-lex.europa.eu/>

**Society of actuaries (SOA)
Enterprise Risk Management (ERM) Fact Sheet**

Using the enterprise risk management framework can **increase an organization's and its shareholders' confidence that they will achieve their objectives**

Enterprise risk management offers a number of benefits:

- Aligns risk appetite and corporate strategy
- Links growth, risk and returns
- Improves risk responses
- Reduces operational surprises and losses
- Manages enterprise-wide risks
- Recognizes and acts upon opportunities
- Deploys resources effectively

<https://www.soa.org/globalassets/assets/files/newsroom/news-erm-fact-sheet.pdf>

What?

Which risks are we managing?

Risk map

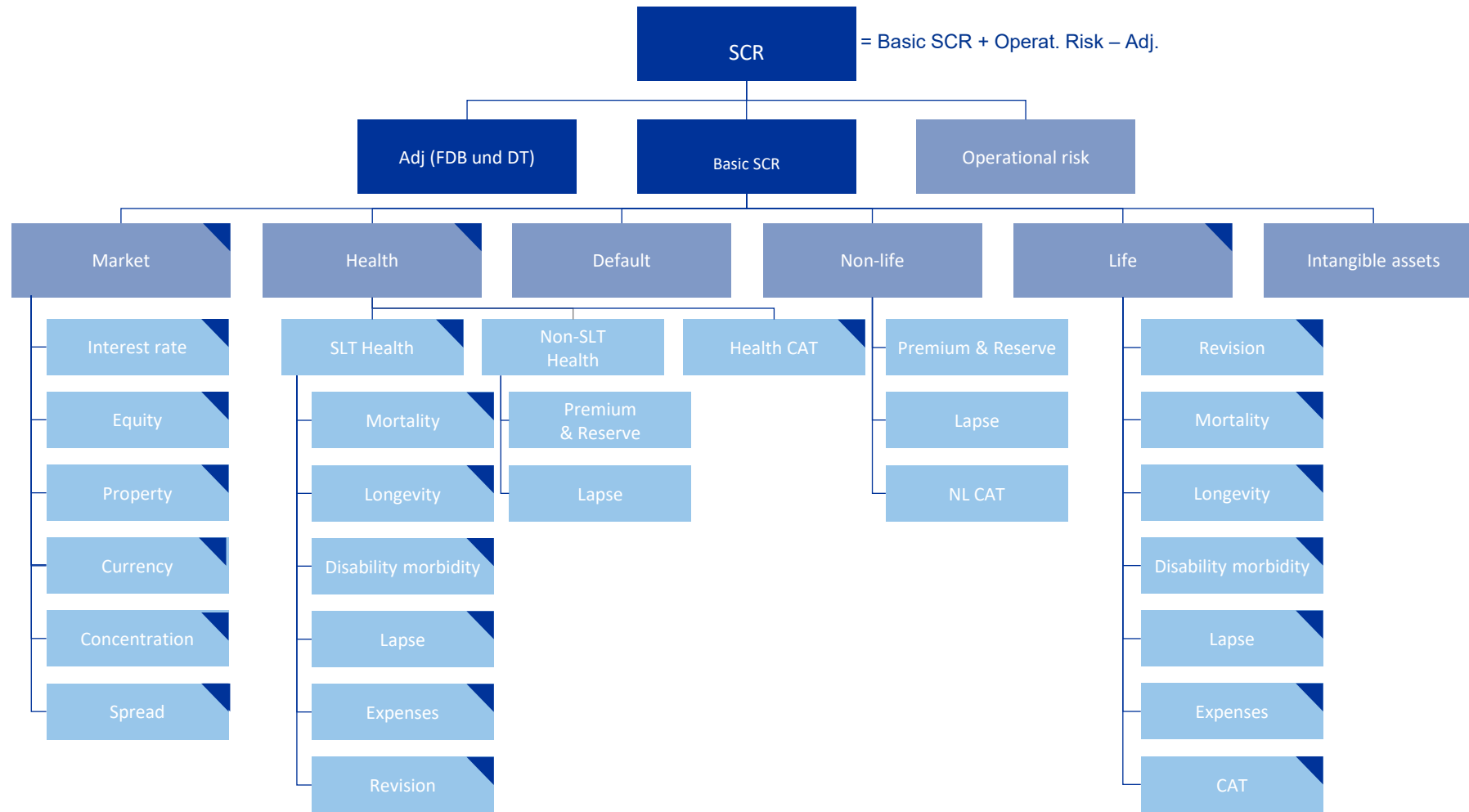
A risk map is an instrument that allows the identification of risk factors that may occur within an organization.

It also offers the possibility of quantifying these factors, that is, classifying the damage they could cause, the scale on which they will be divided, and the probability of their occurrence.

It is important to quantify required capital for each module as well as assessment of their overall aggregation (impact of diversification, ...).

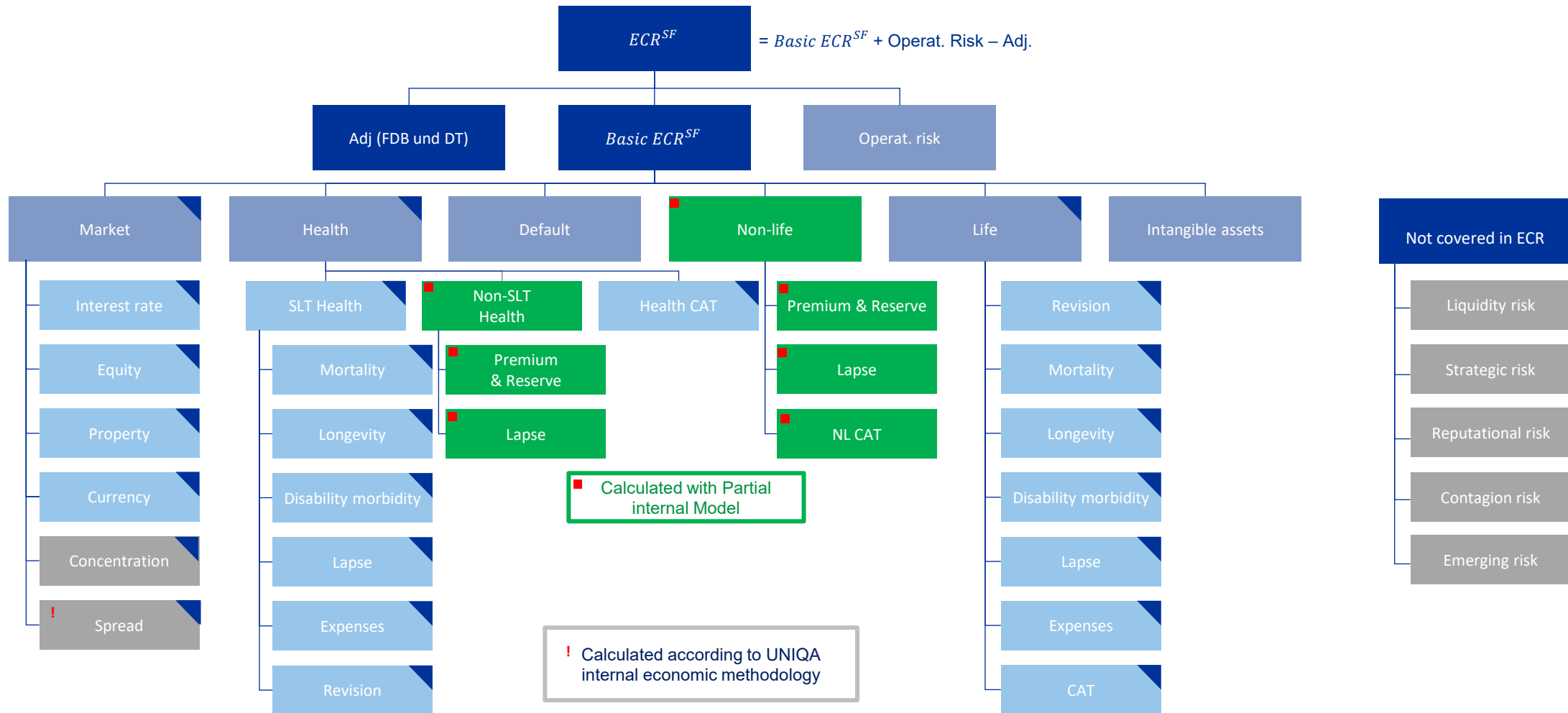
Risk map is individual for each insurance company !

Risk map – Solvency II Standard formula (standard model)



Key:  Allowance for the risk absorbing effect of Future Discretionary Benefits (FDB)

Risk map example – UNIQA



Key: Allowance for the risk absorbing effect of Future Discretionary Benefits (FDB)

Main Trends in Insurance Risks, Identification of New Risks (Emerging Risks)

Demography, social and political risks

- Individual coverage, aging, cross-dependencies, ...
- Concentration of wealth, migration, Shifting geopolitical landscape, local conflicts, terrorism, ...

Climate changes

- Variability, still high uncertainty in predictions even if models are improving
- Physical risk and transition risk

Rapid development in technologies

- Faster innovations bring risks (cyber risk, hacking, loss of data, ...)
- Complexity of the technologies and therefore related risks, critical infrastructure failures
- AI, nanotechnologies, biotechnologies, data science, autonomous vehicles, robots

Higher correlation of risks

- The dependencies among risks are fast growing – epidemics, information technologies

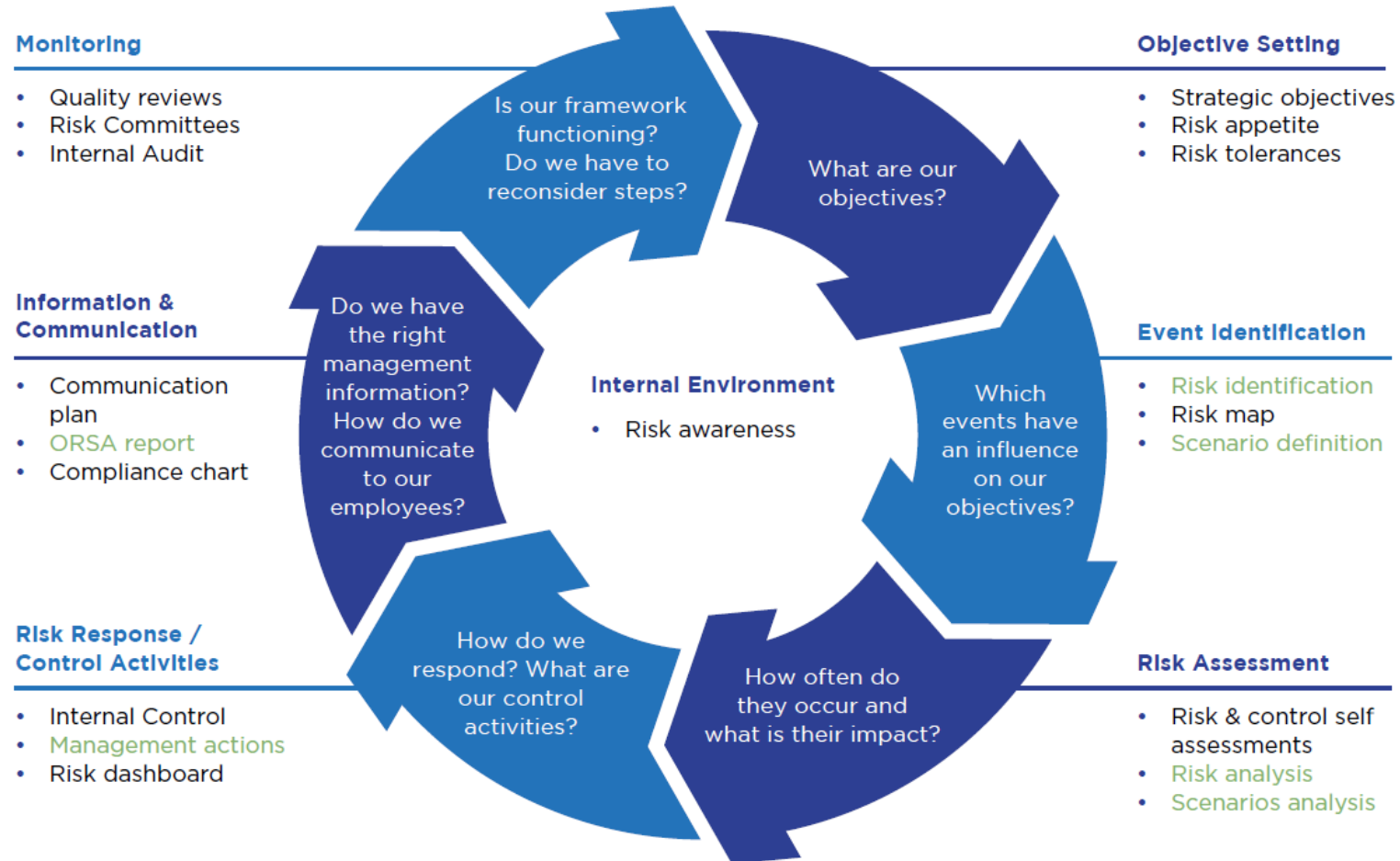
Legal and Regulatory uncertainty

- Rapid, varied regulatory change drives up compliance costs
- regulatory volatility affects not only compliance costs but also insurers' ability to innovate

How?

And how can we manage risks?

Process chain of risk management



<https://thecroforum.org/orsa-stress-and-scenario-testing-best-practice-for-assessing-risks/>

Risk Management

Risk identification, description, measurement

Methods for lowering the risks (risk mitigation)

Definition of risk appetite

Risk monitoring and prediction

Communication, impact in the insurance company

Measurement of Risks – Factor based Approach

- Typical for solvency I
 - Even in Solvency II still appears
 - example for operational risks
- ✓ Easy and simple
- Is the calibration in line with your risk profile?

COMMISSION DELEGATED REGULATION (EU) 2015/35

Article 204

1. The capital requirement for the operational risk module shall be equal to the following:

$$SCR_{Operational} = \min(0,3 \cdot BSCR; Op) + 0,25 \cdot Exp_{ul}$$

where:

- (a) *BSCR* denotes the Basic Solvency Capital Requirement;
- (b) *Op* denotes the basic capital requirement for operational risk charge;
- (c) *Exp_{ul}* denotes the amount of expenses incurred during the previous 12 months in respect of life insurance contracts where the investment risk is borne by policy holders.

Measurement of Risks – Scenario (Shock) based Approach

- Predefined stress factors are applied to exposures or assumptions
- Loss in the basic own funds = best estimate assets – liabilities is calculated
- Multiple scenarios can be defined for one risk and scenario with highest impact is considered
- Common in Solvency II standard formula
 - Example for spread risk

COMMISSION DELEGATED REGULATION (EU) 2015/35

3. Bonds or loans for which a credit assessment by a nominated ECAI is available shall be assigned a risk factor $stress_i$ depending on the credit quality step and the modified duration dur_i of the bond or loan i according to the following table.

Credit quality step		0		1		2		3		4		5 and 6	
Duration (dur_i)	$stress_i$	a_i	b_i	a_i	b_i	a_i	b_i	a_i	b_i	a_i	b_i	a_i	b_i
up to 5	$b_i \cdot dur_i$	—	0,9 %	—	1,1 %	—	1,4 %	—	2,5 %	—	4,5 %	—	7,5 %
More than 5 and up to 10	$a_i + b_i \cdot (dur_i - 5)$	4,5 %	0,5 %	5,5 %	0,6 %	7,0 %	0,7 %	12,5 %	1,5 %	22,5 %	2,5 %	37,5 %	4,2 %
More than 10 and up to 15	$a_i + b_i \cdot (dur_i - 10)$	7,0 %	0,5 %	8,5 %	0,5 %	10,5 %	0,5 %	20,0 %	1,0 %	35,0 %	1,8 %	58,5 %	0,5 %
More than 15 and up to 20	$a_i + b_i \cdot (dur_i - 15)$	9,5 %	0,5 %	11 %	0,5 %	13,0 %	0,5 %	25,0 %	1,0 %	44,0 %	0,5 %	61,0 %	0,5 %
More than 20	$\min[a_i + b_i \cdot (dur_i - 20); 1]$	12,0 %	0,5 %	13,5 %	0,5 %	15,5 %	0,5 %	30,0 %	0,5 %	46,6 %	0,5 %	63,5 %	0,5 %

Measurement of Risks – value-at-risk, tail value-at-risk (VaR, TVaR)

Typical for investment risks,
common in banking

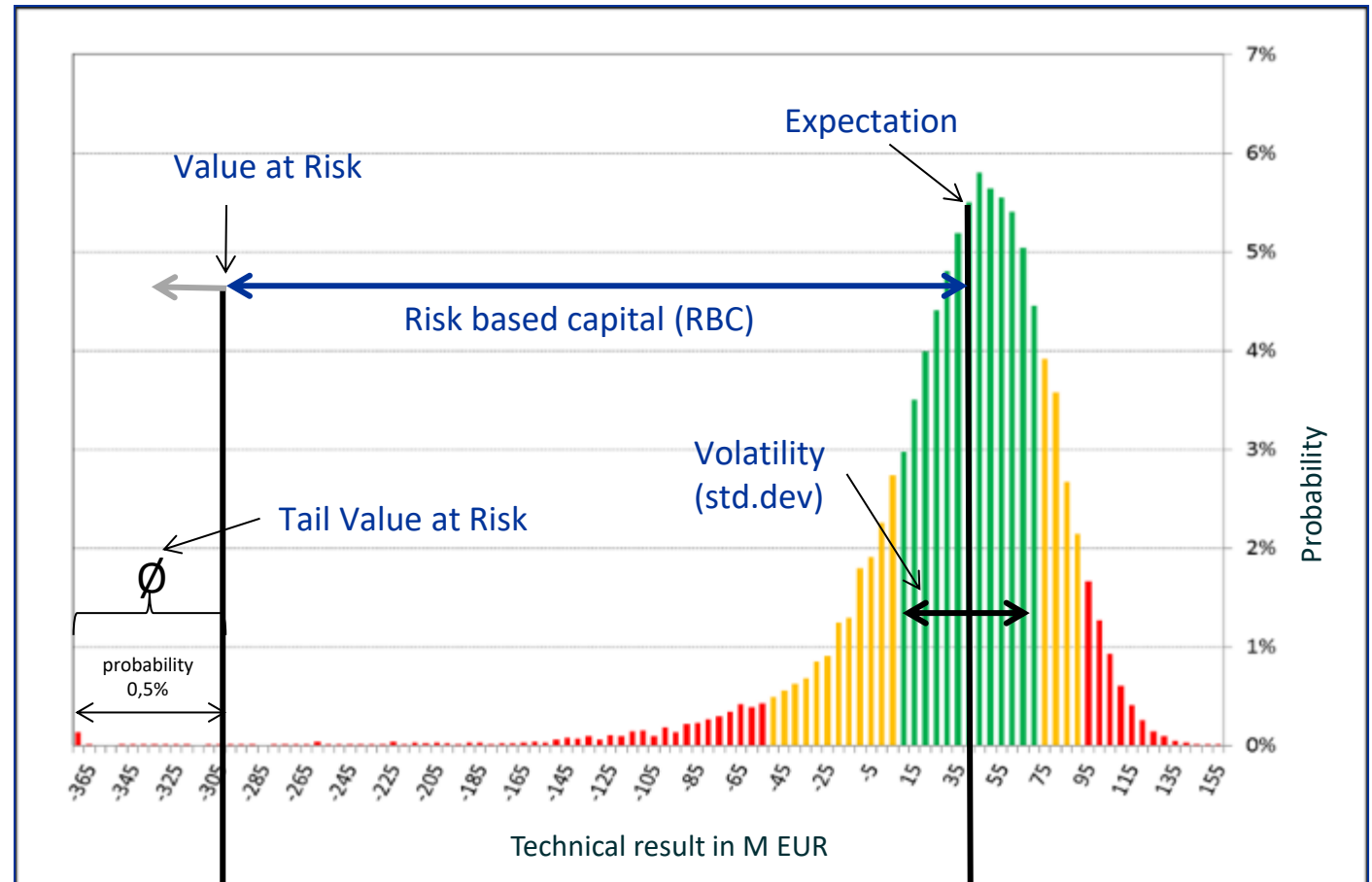
Different time horizon used

- In investment usually days
- In insurance usually 1 year

Determination of quantile

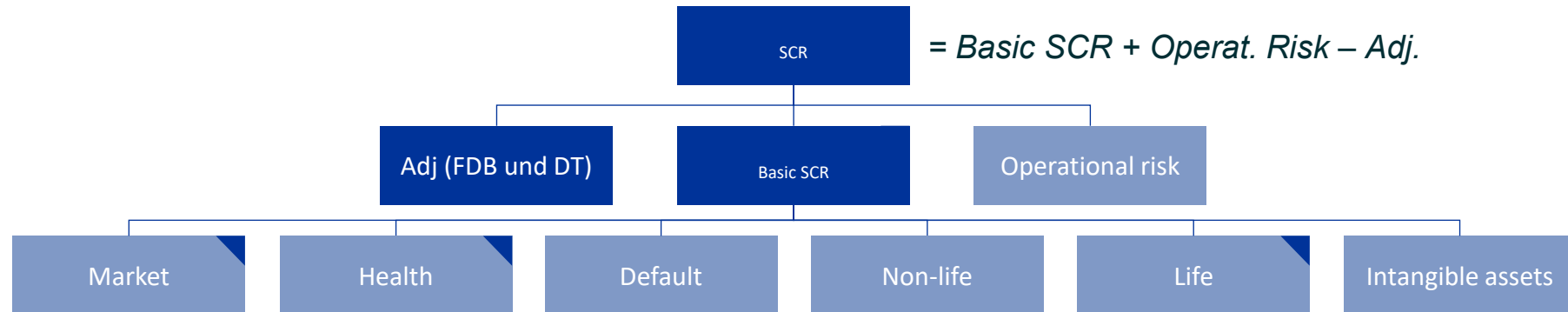
- Solvency II SCR = VaR(99.5%)

VaR is not subaditive !



Risks aggregation and diversification effects

Example of Solvency II Standard formula

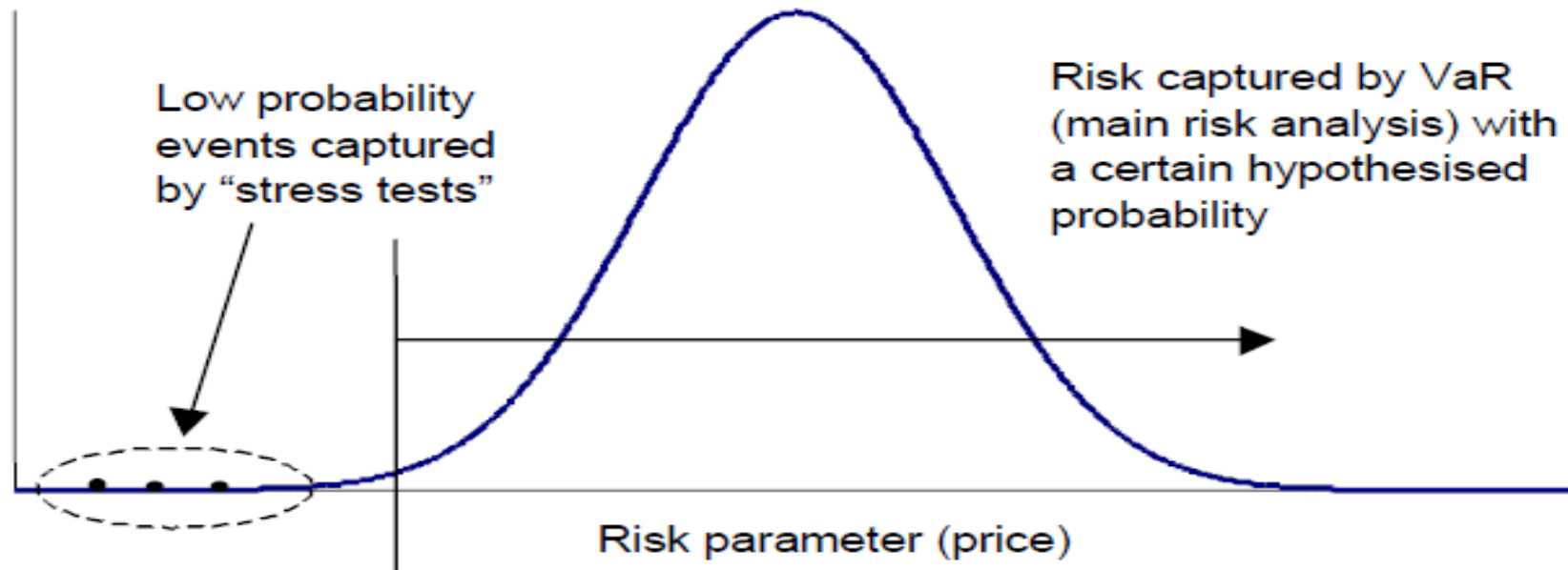


$$BasicSCR = \sqrt{\sum_{i,j} Corr_{i,j} SCR_i SCR_j} + SCR_{intangible}$$

	Market	Default	Life	Health	Non Life
Market	1	0.25	0.25	0.25	0.25
Default	0.25	1	0.25	0.25	0.5
Life	0.25	0.25	1	0.25	0
Health	0.25	0.25	0.25	1	0
Non Life	0.25	0.5	0	0	1

Stress testing vs Value at Risk approach

Stress tests capturing exceptional but plausible events



Measurement of Risks – Sensitivity, scenario and stress testing

Applied both on assets as well as liabilities

Sensitivity tests (Sensitivities)

- ▲ Impact of changes on single risk factors. The change is usually not extreme and can have either a positive or negative impact
- ▲ Mandatory e.g. in IFRS (accounting standards) – it needs to be disclosed also sensitivities of the capital to interest rate shifts, equity/index shock...

Scenario

- ▲ Change of generally more than one input parameter. The change can have either a positive or negative impact. Scenarios may be linked or inspired by historic events

Stress tests

- ▲ Impact of changes on several risk factors. The change is extreme with a negative impact.
- ▲ Regulatory requirement as well as internally defined
- ▲ Focus on market risk (common for banks, but analogically applied on insurers)
- ▲ Insurance specific stresses – e.g. lapse mass stress in the standard model

Reverse stress tests

- ▲ Definition of a scenario that gives a predefined negative result (insolvency or default)

Different approaches lead to different results

Internal model



Standard formula

Pillar I

Rating model

Pillar II

**Ekonomic vs regulatory
view**

Management of Risks

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Risk mitigation - Asset Liability Management (ALM)

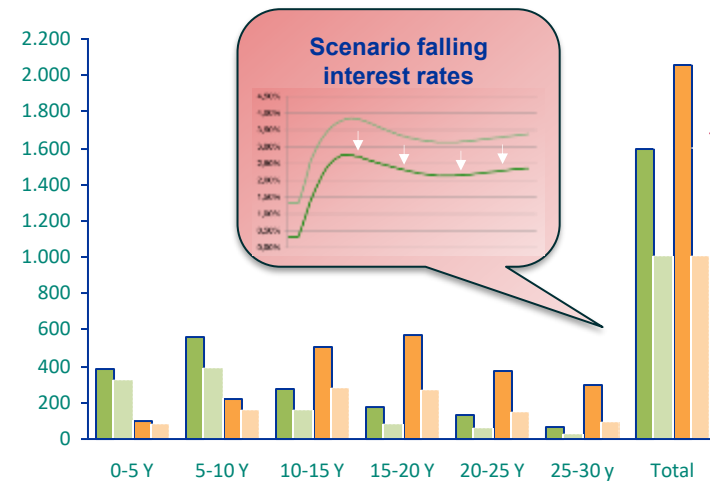
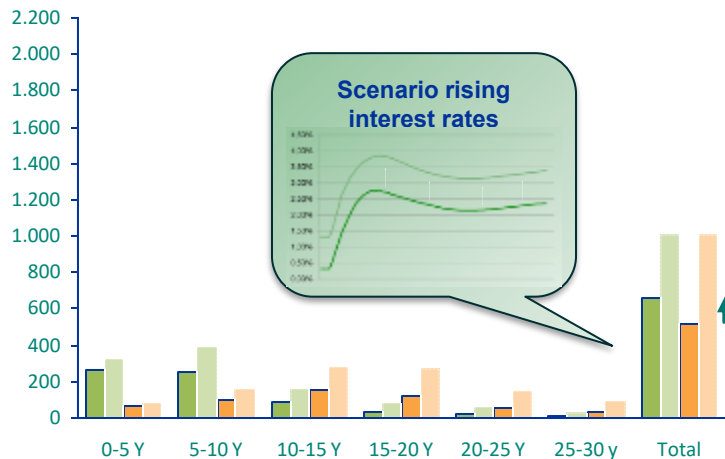
Focus on market risks (interest rate, currency)

Investment products need to be considered

During the calculation, both assets and liabilities need to be considered and consistent assumptions need to be used

Different results if statutory accounting, IFRS or Solvency II technical provisions are used

The availability of financial instruments to match long term life insurance liabilities is limited



■ Discounted CF Assets ■ Discounted CF Assets before ■ Discounted CF Liabilities ■ Discounted CF Liabilities before

Risk mitigation - Diversification

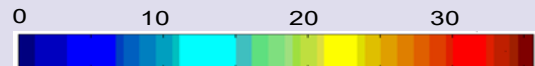
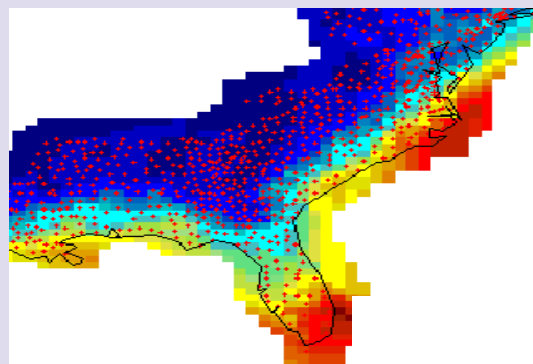
Geographical diversification – monitor and diversify underwritten risks in one region/country
– use potential within the own insurance group, with the reinsurer

Diversification among risks themselves

– insuring risks negatively correlated, typical for life insurance (annuities vs life risk policies)

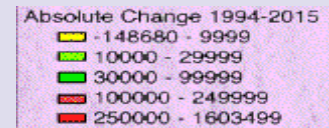
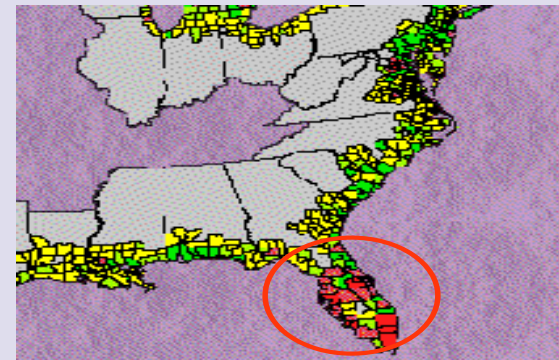
Increasing concentration of property in the area exposed to NAT CAT

Observed Hurricanes in the US in the last 110 years



Source: Swiss Re's Nat Cat team

Projected population change 1994-2015



Source: National Oceanic and Atmospheric Administration (NOAA).

Risk mitigation – risk transfer, hedging

Selling of the risks

- Reinsurance of the underwriting risks (coinsurance, third party reinsurance, captive reinsurance)
- Financial market tools (catastrophic bonds, mortality derivatives, ...) – still limited market
- Investment risks – derivatives reducing credit, FX, interest rate risks

Risk transfer can create or increase another risks

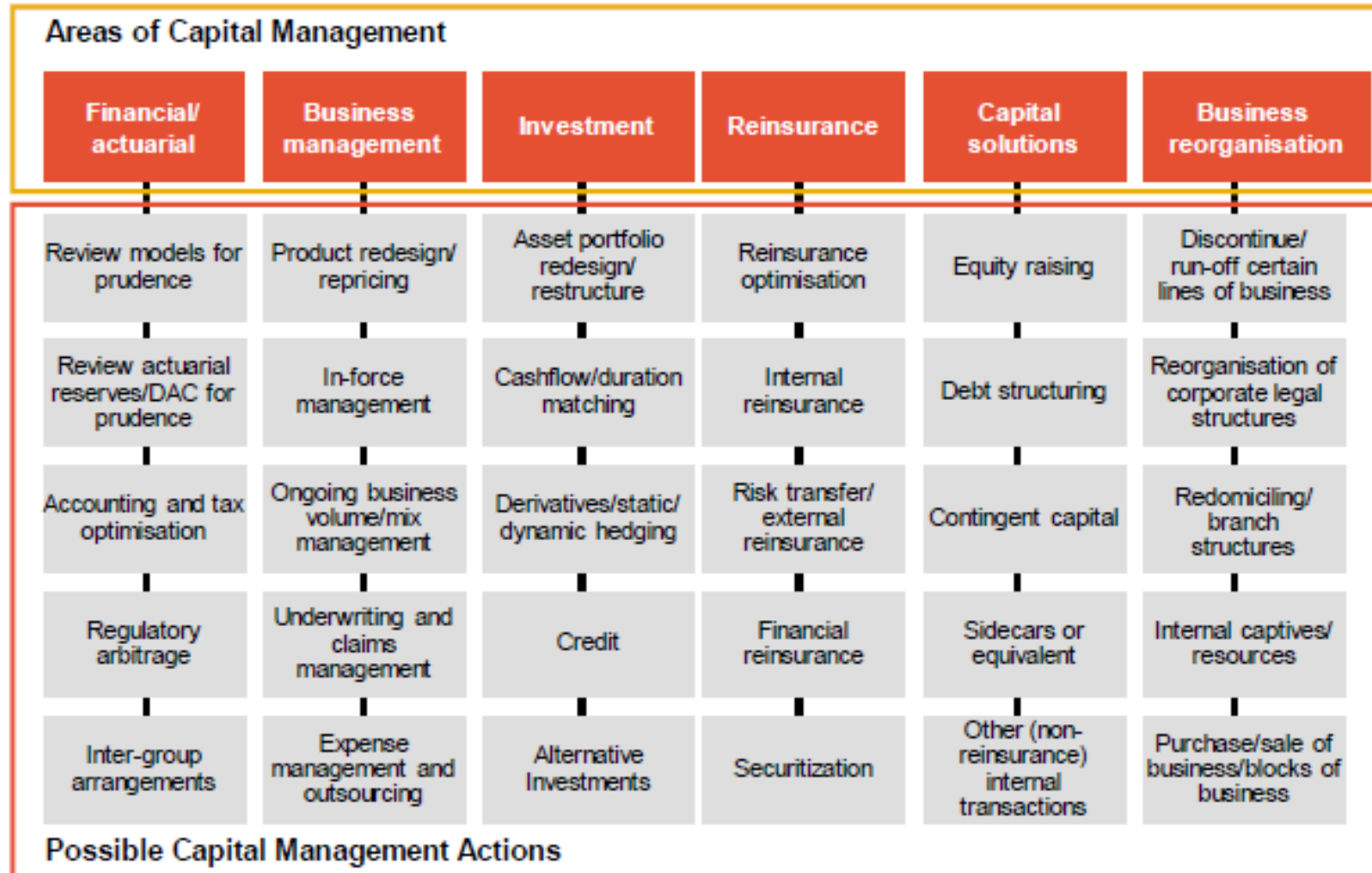
- ***By reinsuring underwriting risks with a reinsurer, credit risk of that reinsurer is born***
- ***Similarly, when contracting a derivative.***

Risk mitigation - lowering of the accepted risk

Active internal risk management

- Underwriting limits
- Proper reflection of risks in pricing
- Investment limits for asset managers (for individual risks as well as portfolio as a whole)
- Limits on reinsurance counterparties
- Relevant definition of internal processes
- Internal control system
- process automatization
- lessons learned from mistakes or past losses

Capital management toolbox



Increasing Time — Costs — Complexity

Hedgeable / Non-hedgeable risk – can we mitigate all risks?

... No, we can not and therefore it is good to know about all relevant risks and decide, how we are going to react

Management of Risks

Risk identification, description, measurement

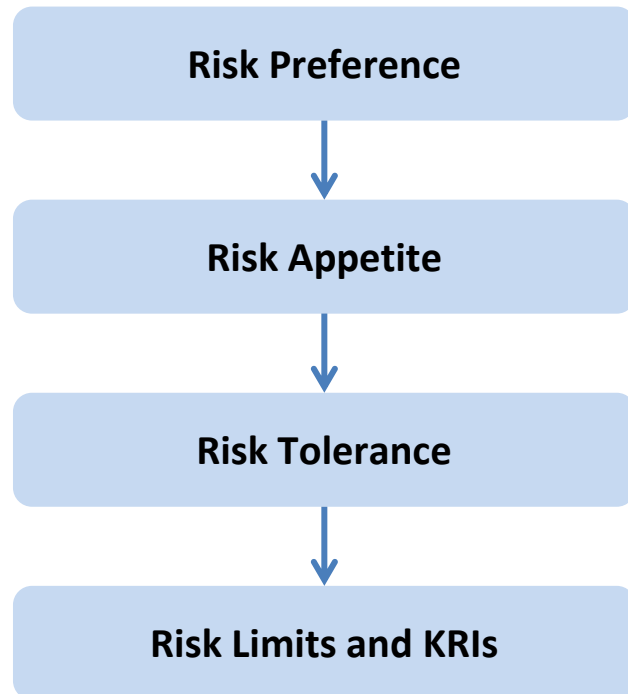
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Risk Appetite vs Risk Tolerance



Risk Preference qualitatively expresses the risk disposition and represents the general guidance for the risk selection

Risk Appetite is the level of consolidated risk a company accepts for a defined period of time.

Risk Tolerance is the level of risk a company is willing to take in a specific area of risk and is expressed in allocated capital. The granularity depends on Company decision

Risk Limits are operational limits which transform the risk tolerance (allocated capital) into operational limits. A risk limit must be specific.

Key Risk Indicators (KRIs) are defined as quantitative metrics that support the monitoring of operational risk scenarios by monitoring the key drivers of these risks.

- ✓ Time horizon – regular measurement and revision
- ✓ Escalation process for breaches needs to be defined

Risk Statement

Risk strategy and risk appetite: **Our risk strategy defines our risk appetite consistent with our business strategy.** It ensures that rewards are appropriate based on the risks taken and capital required, and that the delegated authorities are in line with our overall risk-bearing capacity and strategy. (Allianz Annual report)

We have formulated three key risk appetite statements for the areas of strategic challenges, a strong balance sheet and sound business performance. These are further detailed in nine sub-statements that are used for internal steering. We work systematically, aim for completeness and document what we do. Each risk analysis performed is shared with the responsible management. (NN Annual report)

In defining the level of risk, it is willing to take, the Group defines its own risk strategy within the Group Risk Appetite Framework (RAF) while complementing the overall business strategy. **The Group RAF defines the level of risk the Group is willing to take and ensures risk embedding into key business processes, to grant all risks are properly managed.** Soft and hard limits' thresholds set within the RAF aim to limit excessive risk taking and to maintain the solvency position at the desired level. Monitoring and escalation processes are clearly defined to adequately manage any risk tolerance breaches. *Generali Annual report*

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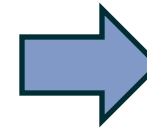
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Risk reporting - „Heat map“ or „Risk matrix“

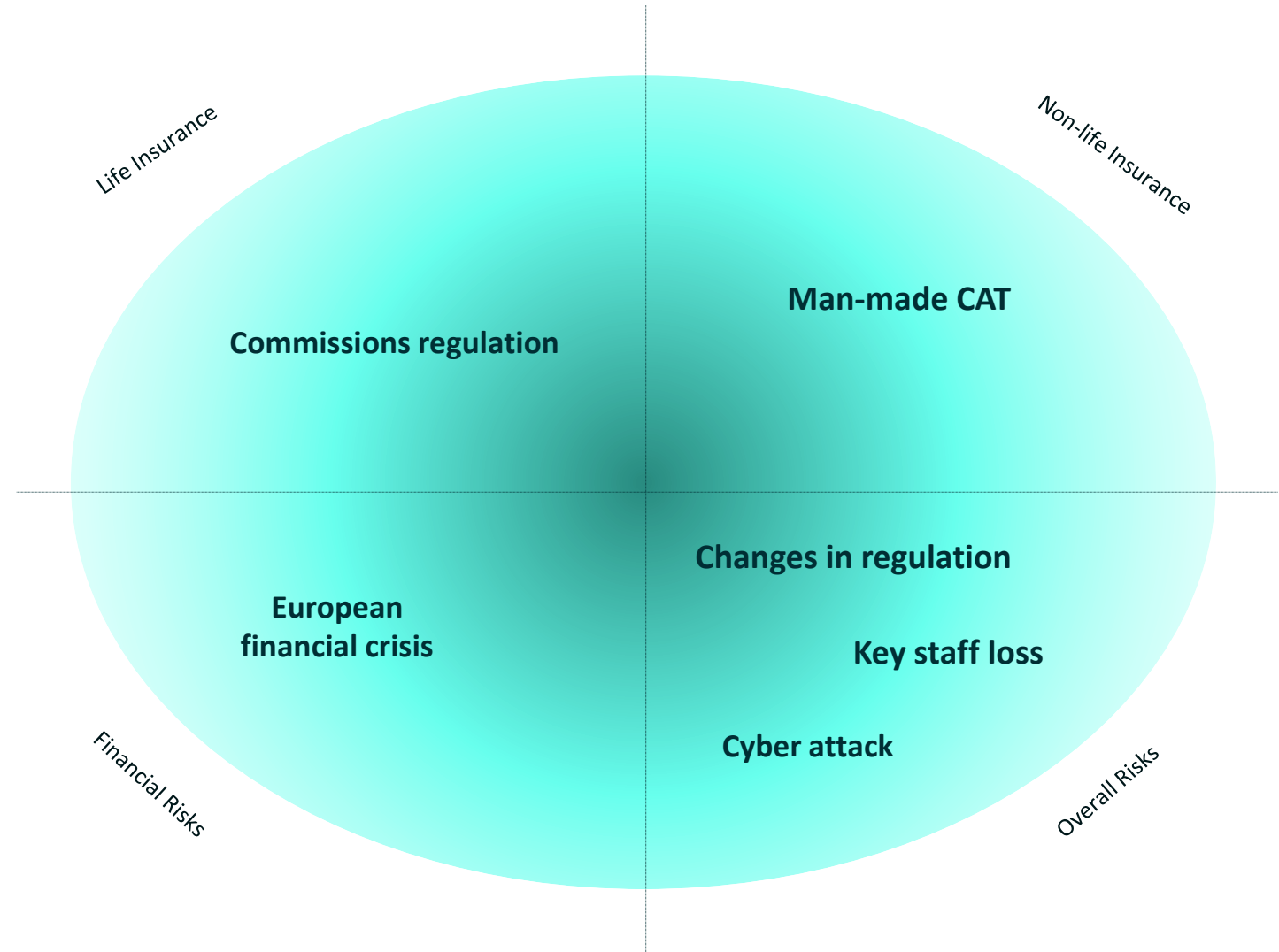
	Financial Impact	Operational Impact	Regulatory Impact	Probability
High	> 10.000.000 EUR	Critical business failure preventing core activities from being performed.	Requires an investigation by external authorities / supervisors	10% - 100%
Medium	EUR 1.000.000 - EUR 100.000	An impact on business resulting in reduced performance so targets are not met. The process is not threatened but could be subject to significant changed ways of operations.	Must be reported to supervisors and requires internal investigations.	5% - 10%
Low	< EUR 100.000	Some impact on business areas in terms of delay and systems quality but can be dealt with on the operational level.	Triggers an internal investigation.	<5%



		Overall Assessment Imp. Cat.		
		Low	Medium	High
Likelihood	High		Risk2	Risk3
	Medium			
	Low	Risk1		

Managing of Risks - Risk Radar

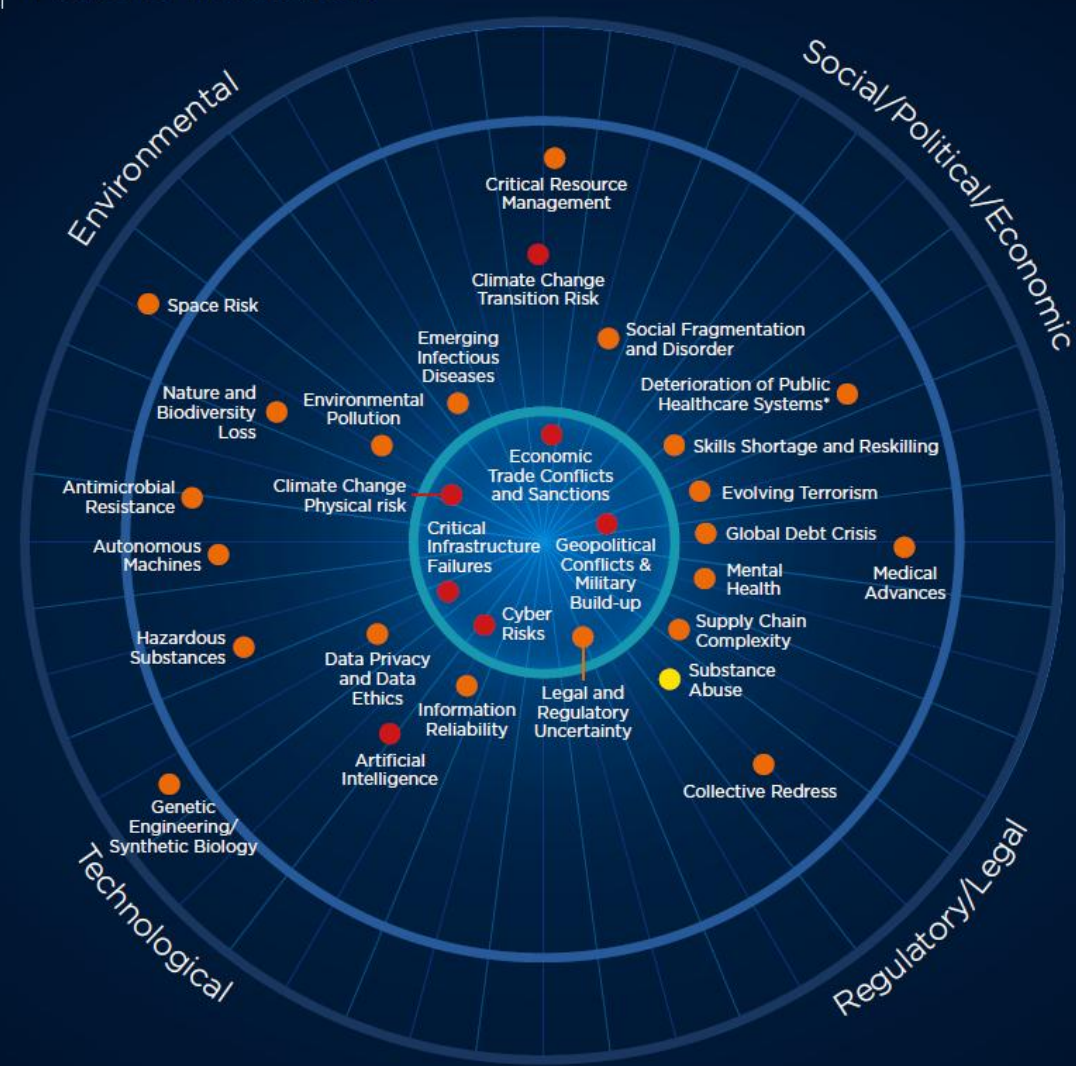
- Good tool e.g. for emerging risks
- Able to capture also shifts in time (comparison with previous period)
- More dimensions (distance from the centre, size of font, color, ...)
- Good basis for a discussion



Emerging Risk Radar 2025

Trends

-  Ageing and Health
-  Economic Development
-  Environment and Climate
-  Shifting Geopolitical Landscape
-  Technological Development
-  Demographic and Social Change



Key

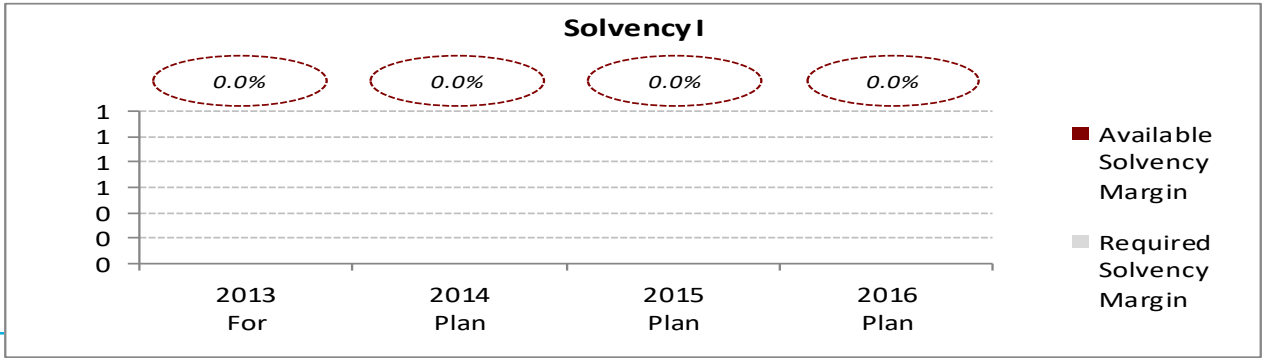
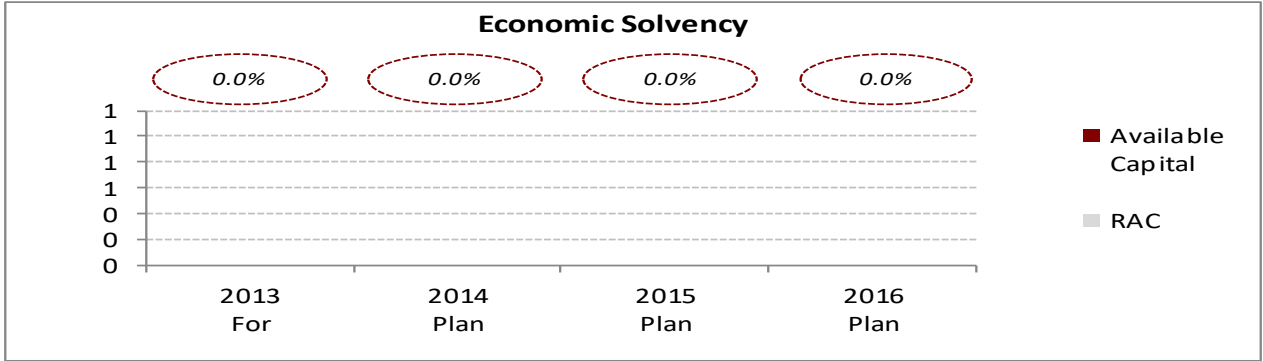
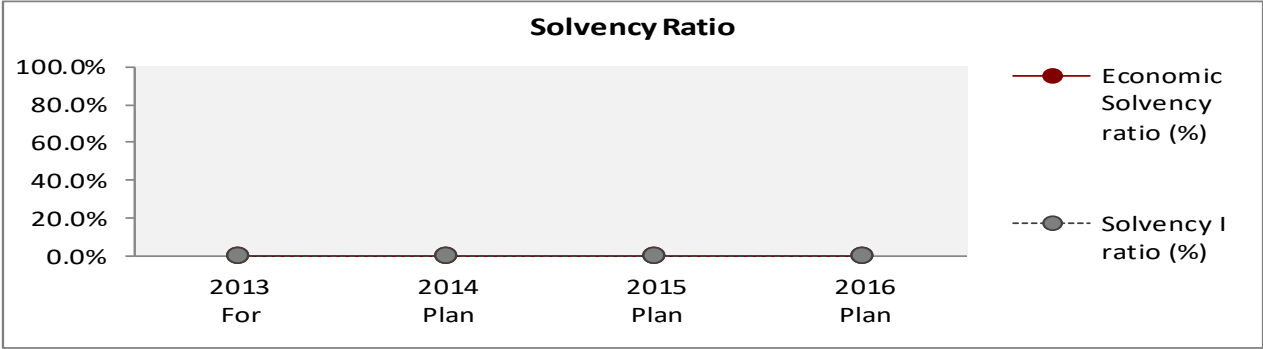
- Impact Assessment:
 Bullet colour corresponds to potential impact of risk
- Risk category: High
 - Risk category: Medium
 - Risk category: Small
- Time Horizon:
- Significant impacts already seen on the insurance sector
 - First significant potential impacts on the insurance sector expected within 1-5 years
 - First significant potential impacts on the insurance sector expected within 5-10 years
- * New risk in 2025

<https://thecroforum.org/category/publications/>

Projection of Risk Capital and Solvency Ratio

- Usually 3-5 years
- Linked to a business plan
- Prediction of solvency ratio (required capital) as information / target for top management
 - Granularity?
 - Volatility of the calculation?
 - Sensitivity to key assumptions
- Simplified estimates in the periods between more detailed calculations

€ Mln	2013 For	2014 Plan	2015 Plan	2016 Plan	CAGR 13-16
1st. Company					
Available Capital (after Dividend)					n.a.
of which PVFP Life /Reserve Adequacy P&C					n.a.
of which Subordinated Debt					n.a.
of which Dividend					n.a.
Risk Adjusted Capital detail:					
Equity					n.a.
Property					n.a.
Interest Rate - PC1 movement					n.a.
Interest Rate - PC2 movement					n.a.
Interest Rate - PC3 movement					n.a.
Implied Volatility risk - Equity					n.a.
Implied Volatility risk - Interest Rate					n.a.
Credit					n.a.
Concentration					n.a.
Currency					n.a.
Life UW - Mortality CAT					n.a.
Life UW - Mortality Trend/Uncertainty					n.a.
Life UW - Longevity					n.a.
Life UW - Morbidity / Disability					n.a.
Life UW - Lapse					n.a.
Life UW - Expenses					n.a.
Non Life UW - Pricing (no CAT)					n.a.
Non Life UW - CAT					n.a.
Non Life UW - Reserve					n.a.
Operational					n.a.
Diversification benefit (value)					n.a.
Non Linearity & Non Additivity adjustment					n.a.
Tax absorption after recoverability assessment					n.a.
Risk Adjusted Capital (RAC)					n.a.
Economic Solvency ratio (%)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	n.a.
Available Solvency Margin after dividend					n.a.
Required Solvency Margin					n.a.
Solvency I ratio (%)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	n.a.



Management of Risks

Risk identification, description, measurement

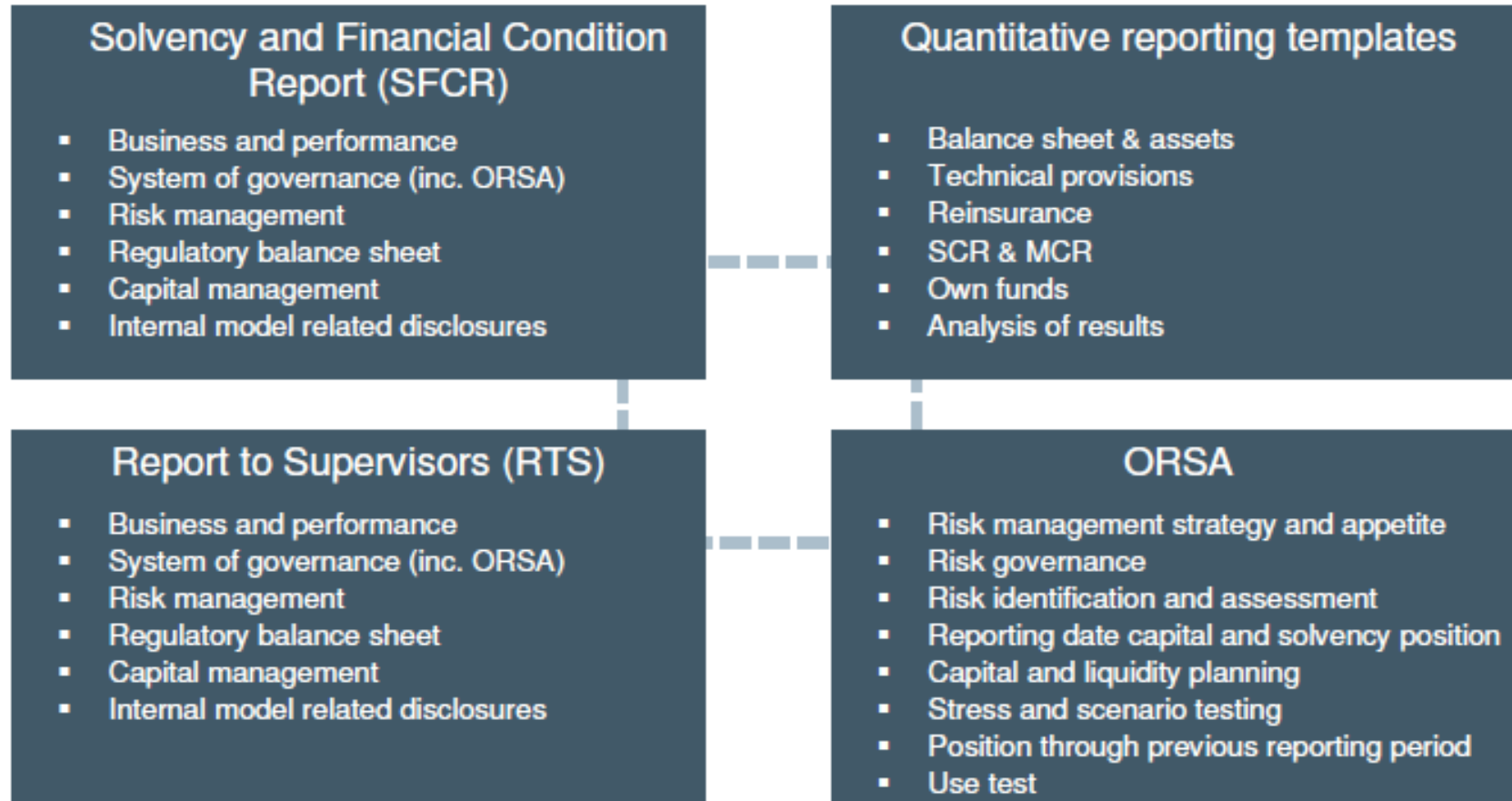
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Communication, impact in the insurance company – risk culture

Internal & External Communication

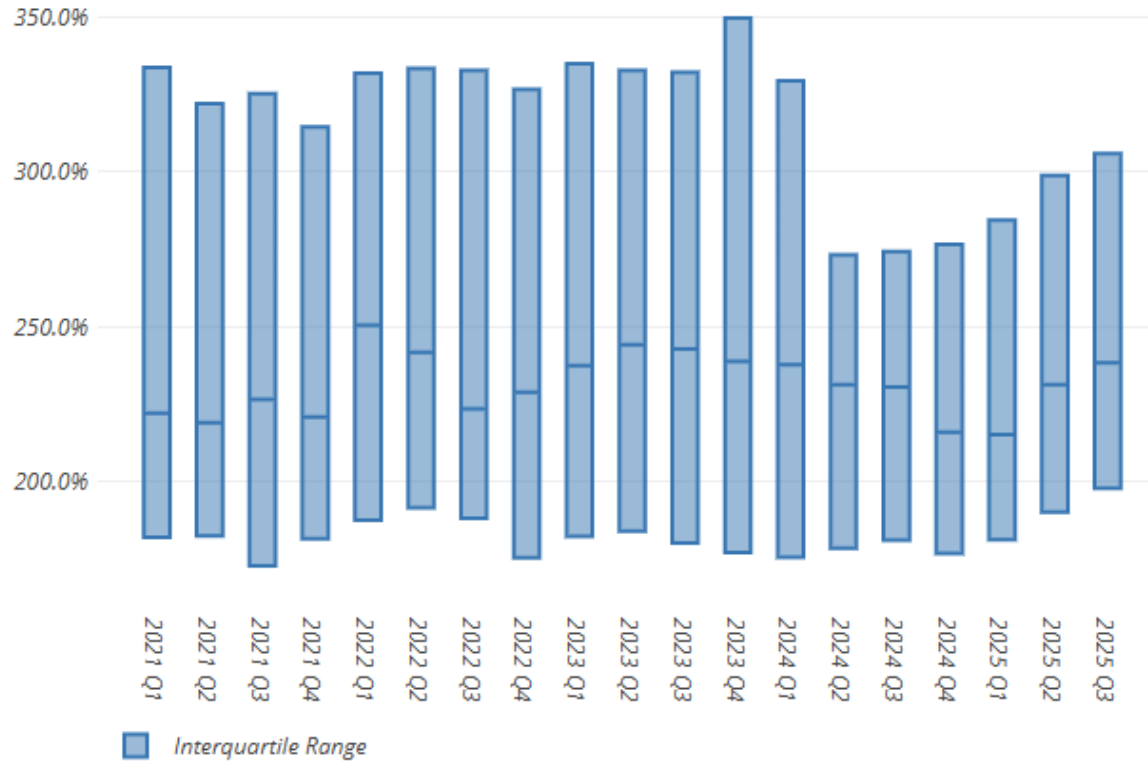


<https://www.actuaries.org.uk/documents/actuar-ys-role-orsa>

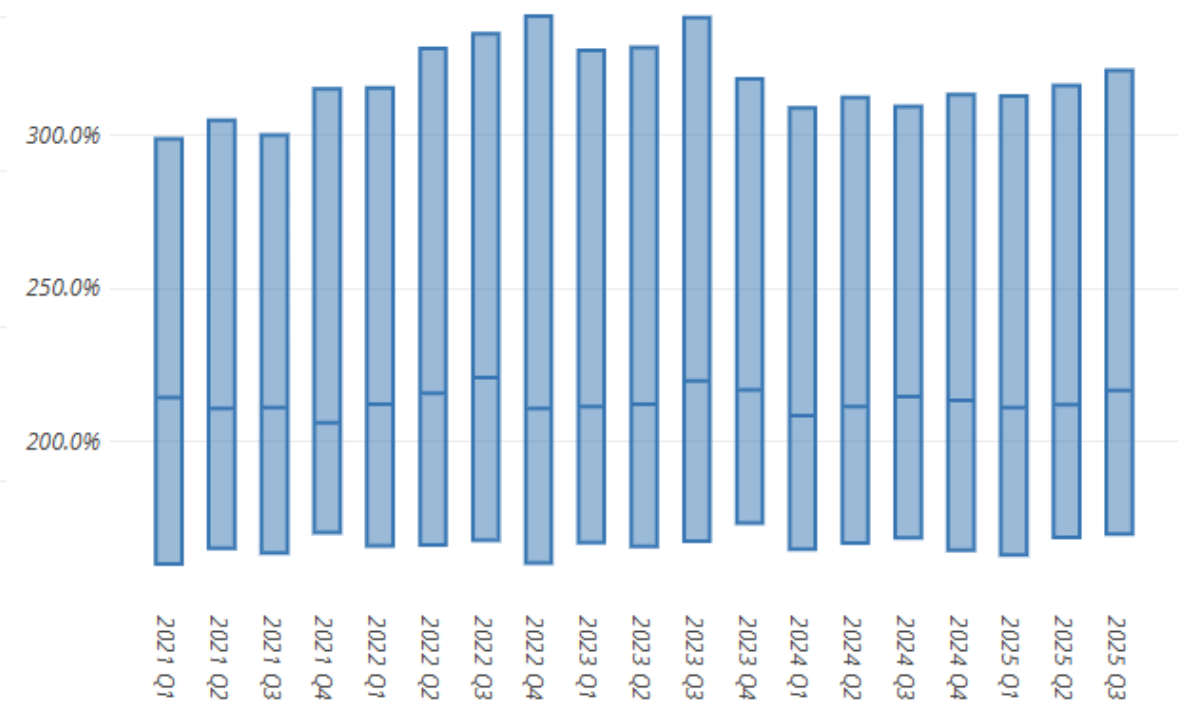
1. and 2. Towers Perrin analysis of CP 58, 3. Based on FSA presentation on informal industry consultation on QTR (Apr 2010), 4. GIRO working party template

Externí komunikace

Solvency Ratio Life



Solvency Ratio Non-Life



Note: Distribution of indicator (interquartile range, median).

https://www.eiopa.europa.eu/tools-and-data/insurance-risk-dashboard_en

„Risk Culture“

- ! Management of risks is a matter for the whole company, it is not just the risk management department (incl. e.g. risk based KPIs). It is about active work with risks, not just passive monitoring.
- ! Risk appetite needs to be applied already in the first line of defence, should be understandable and easily applicable
- ! Top management should find out information coming from risk management as useful and relevant and seek for them, i.e. it is task of the risk management department to provide such information

Three lines of defence



<https://www.generali.com/governance/internal-control-risk-management>

Není riskař jako riskař

Risk Management (řízení rizik)

„Hlídá celek a dlouhodobou stabilitu“

- dívá se na rizika napříč celou firmou (finance, IT, provoz, product, obchod)
- nastavuje pravidla, limity, procesy a kontroly
- hodnotí dopady i v extrémních scénářích (ORSA, stress testy)
- Provádí výpočty požadovaného kapitálu
- reportuje managementu a regulátorovi

Cíl: stabilní, solventní, finančně silná pojišťovna

Rizikové inženýrství (Risk Engineering)

„Dívá se na konkrétní riziko v praxi“

- zaměřuje se na konkrétní objekty, technologie a procesy
- posuzuje reálná fyzická a technická rizika (např. provoz, požár, zabezpečení)
- navrhuje praktická opatření ke snížení škod
- pracuje často přímo s (corpo) klienty, makléři nebo úpisem

Cíl: snížit pravděpodobnost a rozsah konkrétní škody

Links and information sources

Regulation – „Solvency II“

[EUR-Lex](#)

IAA Risk book

[IAA Risk Book – International Actuarial Association](#)

Swiss Re Sigma

[Sigma research | Swiss Re](#)

Reports of supervisors and EIOPA e.g.

https://www.eiopa.europa.eu/tools-and-data/insurance-risk-dashboard_en

https://www.cnb.cz/cs/financni_stabilita/zatezove_testy/

Professional associations

- Actuarial Association of Europe
- CRO Forum
- Česká společnost aktuárů
- Česká asociace pojišťoven