



Joint Colloquium of the IACA, PBSS and IAAHS Sections of the International Actuarial Association

Westin Copley Place Hotel, Boston, U.S.A. – 4-7 May 2008

Solvency 2 – Overview Standard Model and General Issues

Andreas Sanner / Maryellen Coggins



AGENDA

- Solvency 2 – An Overview
- Standardformula – Calculating the SCR
- Calculating the MCR

AGENDA

- **Solvency 2 – An Overview**
- Standardformula – Calculating the SCR
- Calculating the MCR

Three-Pillar-Approach based on Draft Directive

Solvency II

Pillar I

Quantitative Requirements

- Valuation of assets & liabilities
- Investments
- Own funds
- Technical provisions
- Capital rules (MCR & SCR)

Pillar II

Supervisory Review

- Main objective of supervision
- Supervisory review process
- Supervisory intervention incl. capital add-on
- System of governance

Pillar III

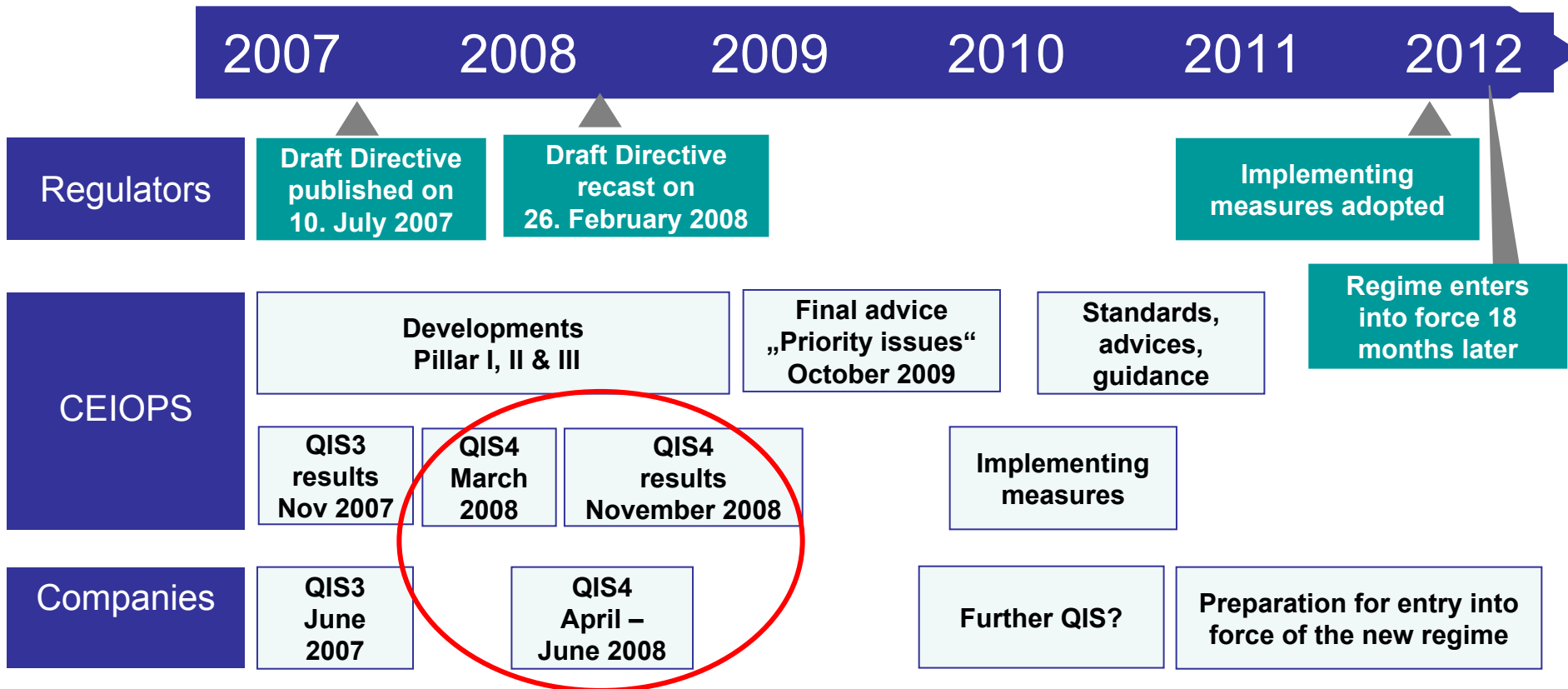
Disclosure

- Information to be provided for supervisory purposes
- Public disclosure – annual solvency and financial condition report
- Market discipline

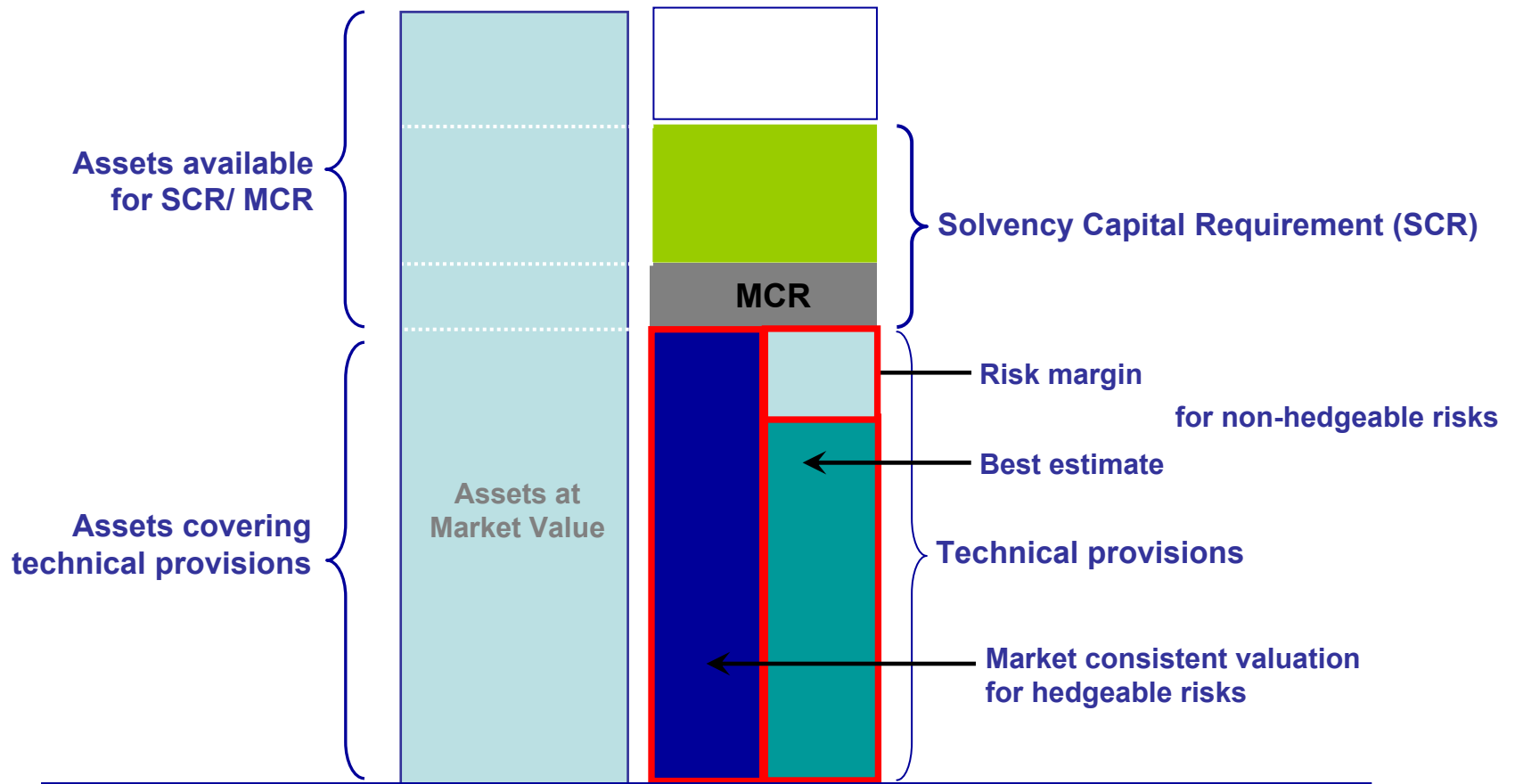
Solo & group issues

Political landscape – time scales

It is intended that Solvency II comes into force in 2012



Solvency II – Quantitative Requirements



Valuation of Technical Provisions (non-hedgeable)

Current Exit Value: The amount the insurer would expect to pay at the reporting date to transfer its remaining contractual rights and obligations immediately to another entity.

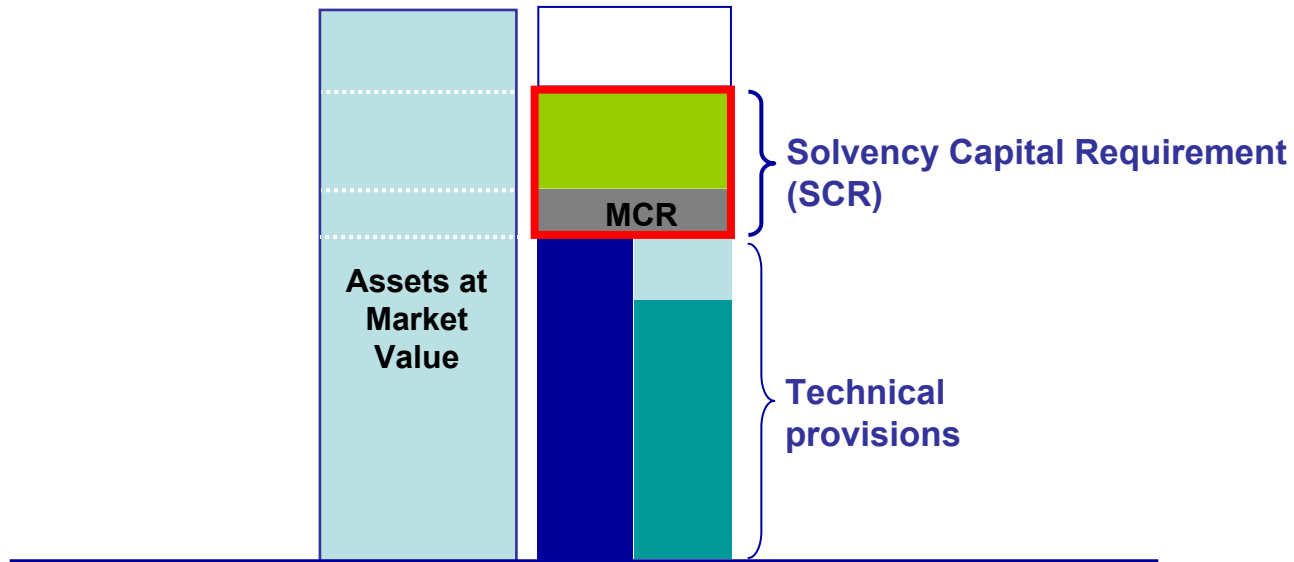
$$\text{Current Exit Value} = \text{Best Estimate} + \text{Risk Margin}$$

Best Estimate: Discounted future cash flows arising from an insurance policy taking into account time value of option and guarantees (Risk free interest: Euro area yield curve published by the ECB)

Risk Margin: Cost of providing an amount of eligible own funds equal to the SCR necessary to support (re-) insurance obligations over lifetime (taking into account operational risk, underwriting risk and counterparty default risk with respect to ceded reinsurance).

Agenda

- Solvency 2 – An Overview
- **Standardformula – Calculating the SCR**
- Calculating the MCR

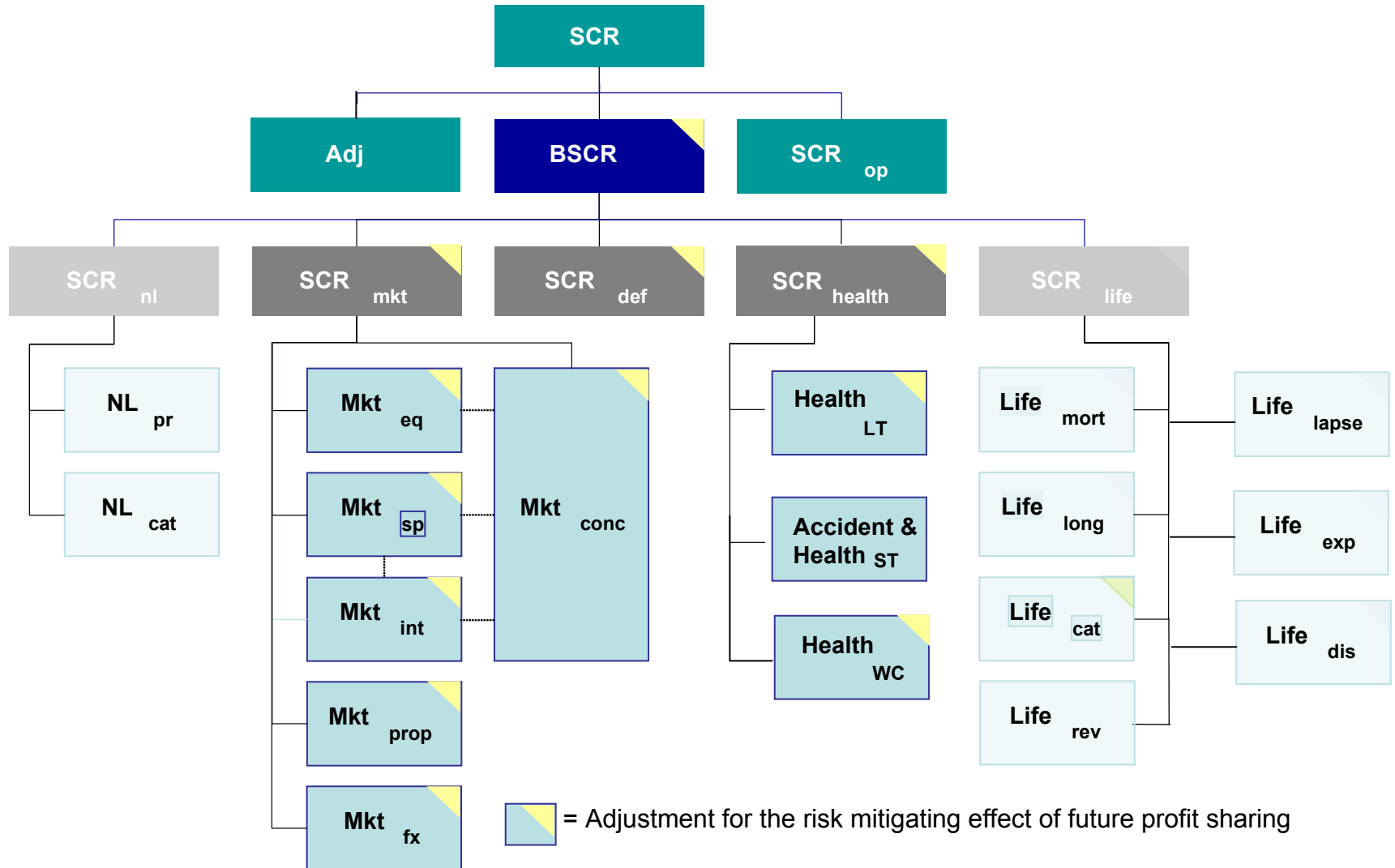


Solvency Capital Requirement – Level 1 Requirements

Guidelines regarding the SCR fixed in the **Draft Directive**:

- Calculation by **Standard Formula** or an **Internal Model**
- Presumption of **going concern**
- Coverage of unexpected losses and calibration so that all quantifiable risks are taken into account
- Correspondence to the **Value at Risk** (99,5%) over a one-year time horizon
- Coverage of at least the following risks:
 - Underwriting risk (Health, Non-Life, Life)
 - Market risk
 - Credit risk
 - Operational risk
- Recognition of **Risk mitigation** techniques

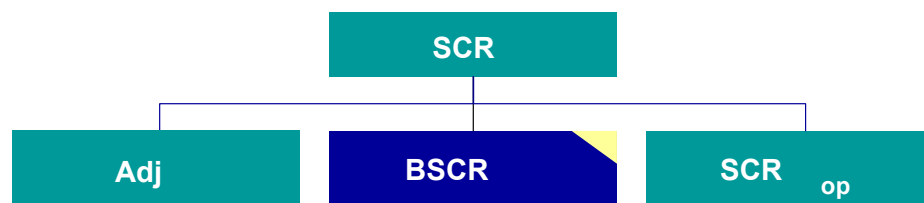
Standard formula modules



SCR calculation structure

Additive aggregation of BSCR and operational Risk

$$SCR = BSCR - Adj + SCR_{op}$$



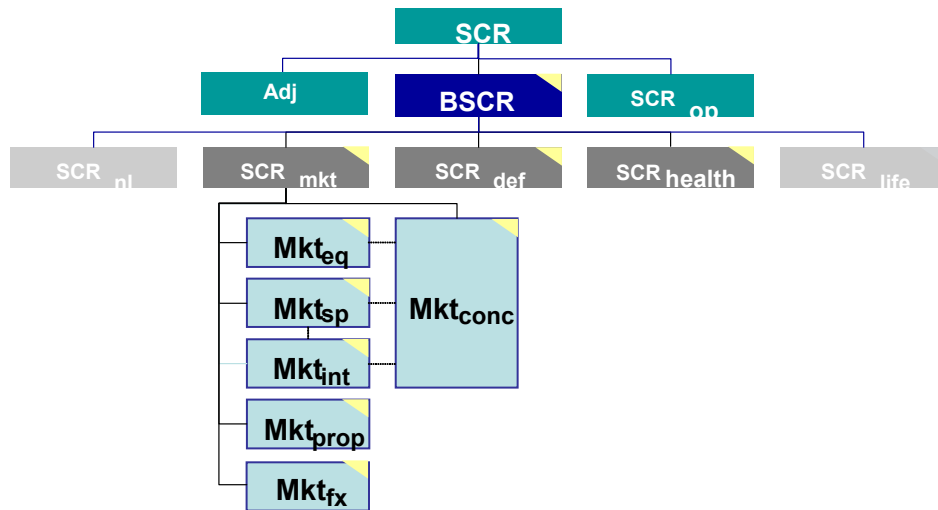
Operational risk: risk of loss arising from inadequate or failed internal processes, people, systems or external events

$$SCR_{op} = \min \{ 0.30 \times BSCR; Op_{nlul} \} + 0.25 \times Exp_{ul}$$

where

$$OP_{nlul} = \max \left\{ \begin{array}{l} 0.03 \cdot (Earn_{life} - Earn_{life-ul}) + 0.02 \cdot Earn_{nl} + 0.02 \cdot Earn_h; \\ 0.003 \cdot (TP_{life} - TP_{life-ul}) + 0.02 \cdot TP_{nl} + 0.002 \cdot TP_h \end{array} \right\}$$

SCR calculation structure – Market Risk Module



Risks taken into account:

- Equity Risk
- Spread Risk
- Interest Rate Risk
- Property Risk
- Currency Risk
- Market Risk Concentration

Determination of the individual SCRs via various shock scenarios

Correspondence to a VaR of 99,5%

Combination of the individual SCR risks via a correlation matrix

CorrMkt	Mkt _{int}	Mkt _{eq}	Mkt _{prop}	Mkt _{sp}	Mkt _{conc}	Mkt _{fx}
Mkt _{int}	1					
Mkt _{eq}	0	1				
Mkt _{prop}	0.5	0.75	1			
Mkt _{sp}	0.25	0.25	0.25	1		
Mkt _{conc}	0	0	0	0	1	
Mkt _{fx}	0.25	0.25	0.25	0.25	0	1

SCR calculation structure – Counterparty Default Risk Module

The main inputs of the counterparty default risk module:

- estimated loss-given-default (LGD) of an exposure
- the probability of default of the counterparty

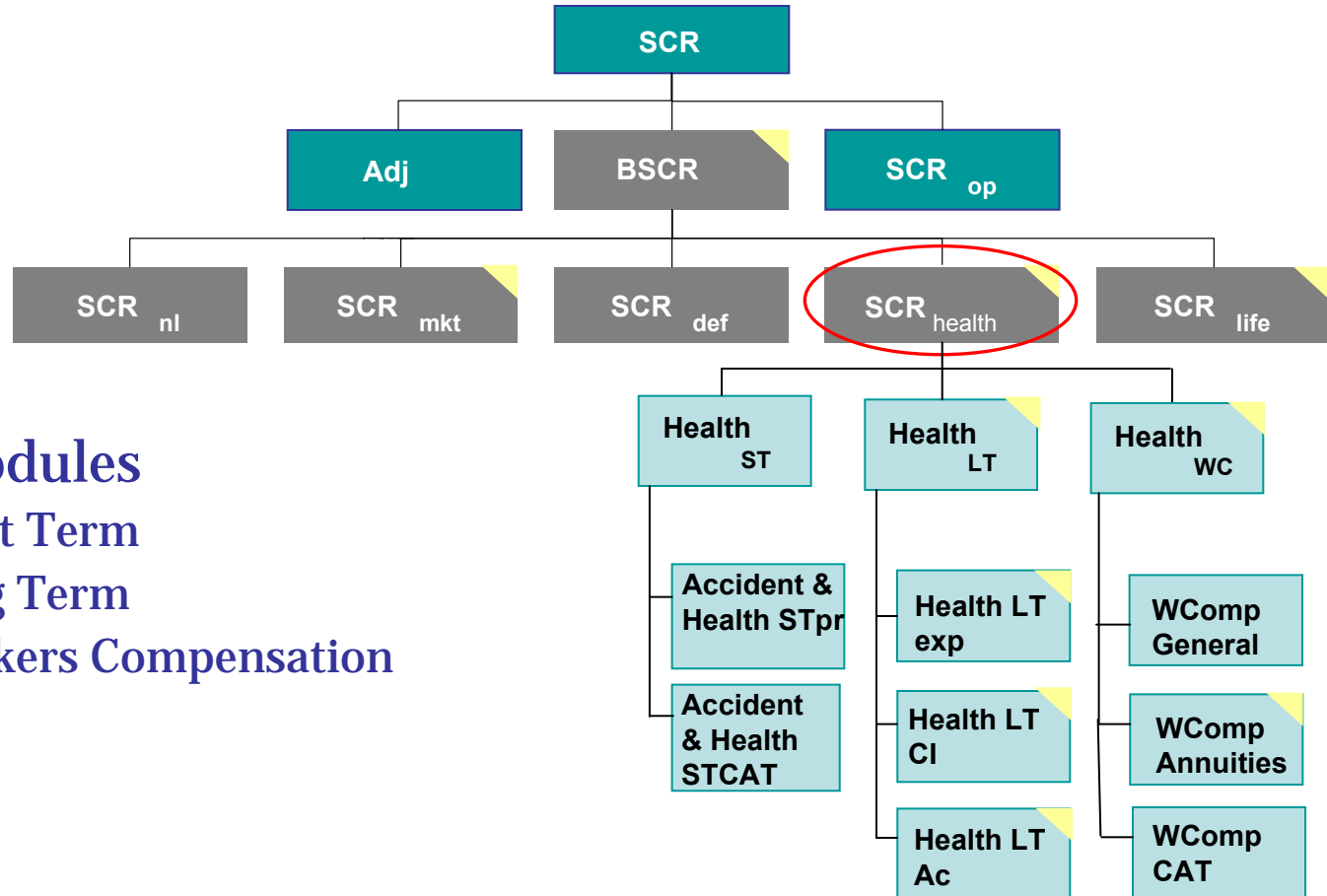
$$\text{LGD} = 50\% * \max(\text{Recov.} + \text{SCR}^{\text{gross}}_{\text{U/W}} - \text{SCR}^{\text{net}}_{\text{U/W}} - \text{Coll.}; 0)$$

Recov. = best estimate of recoverables from reinsurance contracts

Coll. = Collateral covering the loss in relation to the counterparty

The probability of default is estimated by using external rankings.

SCR calculation structure – Health Module



Submodules

- Short Term
- Long Term
- Workers Compensation

Health module

Coverage of underwriting risk for all health and workers' compensation guarantees

Calculation of the capital charge for health underwriting risk via combining the capital charges for the health sub-modules using a correlation matrix

$$SCR_{health} = \sqrt{\sum_{rxc} CorrHealth^{rxc} \cdot Health_r \cdot Health_c}$$

$CorrHealth^{rxc}$ = the cells of the correlation matrix $CorrHealth$
 $Health_r, Health_c$ = Capital charges for individual health underwriting sub-modules according to the rows and columns of correlation matrix $CorrHealth$

Health module – SCR_{health} long term module

- Underwriting risk in health insurance that is practised on a similar technical basis to that of life assurance (which exists mainly in Germany and Austria)
- Health long-term underwriting risk is split into three components:
Expense risk, Claim/mortality/cancellation risk
Epidemic/accumulation risk Calculation
- Recognition of Risk absorbing effects of future profit sharing

$$SCR_{\text{healthLT}} = \sqrt{\sum_{rxc} \text{CorrHealLT}^{rxc} \bullet \text{Health}_r \bullet \text{Health}_c}$$

Health module – health_{exp} expense risk and health_{ac} epidemic/ accumulation risk

Expense risk arise if the expenses anticipated in the pricing of a product are insufficient to cover the actual costs accruing in the accounting year

$$\text{Health}_{\text{exp}} = \lambda_{\text{exp}} \cdot \sigma_{\text{hexp}} \cdot P_{\text{ay}}$$

where

- λ_{exp} is the expense risk factor which is set to deliver a health expense risk charge consistent with a VaR 99.5% standard, $\lambda_{\text{exp}} = 2,58$;
- σ_{hexp} is the weighted standard deviation of the expense result and
- P_{ay} denotes the gross premium earned for the accounting year

Epidemic /accumulation risk concerns the risks arising from the outbreaks of major epidemics

$$\text{Health}_{\text{ac}} = \lambda_{\text{ac}} \cdot \text{claims}_{\text{ay}} \cdot (P_{\text{ay}} / MP_{\text{ay}})$$

where

- λ_{ac} is the Health_{ac} risk factor; $\lambda_{\text{ac}} = 6,5\%$
- $\text{Claims}_{\text{ay}}$ is the claims expenditure for the accounting year in the health insurance market
- P_{ay} is the gross premium earned for the accounting year

Health module – health_{cl} claim/ mortality/ cancellation risk

Claim risk or per capita loss risk arising in cases where the actual per capita loss is greater than the loss assumed in the pricing of the product

Mortality risk arising when the actual funds from technical provisions becoming available due to death are lower than those assumed in the pricing of the product

Cancellation risk arising when the actual funds from technical provisions becoming available due to cancellations are lower than those assumed in the pricing of the product

$$\mathbf{Health}_{cl} = \lambda_{cl} \cdot \sigma_{hcl} \cdot P_{ay}$$

where λ_{cl} is the Health_{cl} factor which is set to deliver a health claim/mortality/cancellation risk charge consistent with a VaR 99.5% standard;

$$\lambda_{cl} = 2,58$$

Health module – SCR_{health} short term module

Premium and reserve risk and catastrophe risk of short term health and accident lines of business

$$\mathbf{SCR}_{ST} = (\mathbf{SCR}_{PR}^2 + \mathbf{SCR}_{CAT}^2)^{1/2} \text{ where}$$

SCR_{PR}²: Premium and Reserve Risk

- The calculation is computed as set in Non-Life Insurance (NLpr)

$$NL_{pr} = \rho(\sigma) \cdot V$$

$$\text{where } \rho(\sigma) = \frac{\exp[N_{0.995} \cdot \sqrt{\log(\sigma^2 + 1)}]}{\sqrt{\sigma^2 + 1}} - 1$$

SCR_{CAT}²: Catastrophe Risk

- The calculation is computed as set in Non-Life Insurance (NLcat)
 - Calculation via scenario based approach **or**
 - Calculation via weighted combination of written premium for the individual lines of business “short term health” and “accident & others”

Health module – workers compensation module

This module is concerned with underwriting risk in workers' compensation line of business

Submodules

- Capital Charge from Premium and Reserve Risk ($WComp_{\text{General}}$)
- Capital Charge from Liabilities paid in form of annuities ($WComp_{\text{Annuities}}$)
- Capital Charge for catastrophe Risk ($WComp_{\text{CAT}}$)

Combination of the capital charges via a correlation matrix

$$WComp = \sqrt{\sum_{r \times c} CorrWComp^{r \times c} \cdot WComp_r \cdot WComp_c}$$

where

- $CorrWComp^{r \times c}$ = the cells of the correlation matrix $CorrWComp$
- $WComp_r$
 $WComp_c$ = Capital charges for individual workers' compensation underwriting sub-risks according to the rows and columns of correlation matrix $CorrWComp$

CorrWComp=	$WComp_{\text{General}}$	$WComp_{\text{Ann}}$	$WComp_{\text{Cat}}$
$WComp_{\text{General}}$	1		
$WComp_{\text{Annuities}}$	0.5	1	
$WComp_{\text{Cat}}$	0	0	1

Results from QIS3 (mostly Germany)

Average Ratio of available capital to SCR (solvency ratio) of 405%
(175% - 600%)

Technical provisions 7% lower than the current technical provisions on average

Average SCR is 2.7 times higher than the Solvency I capital requirement

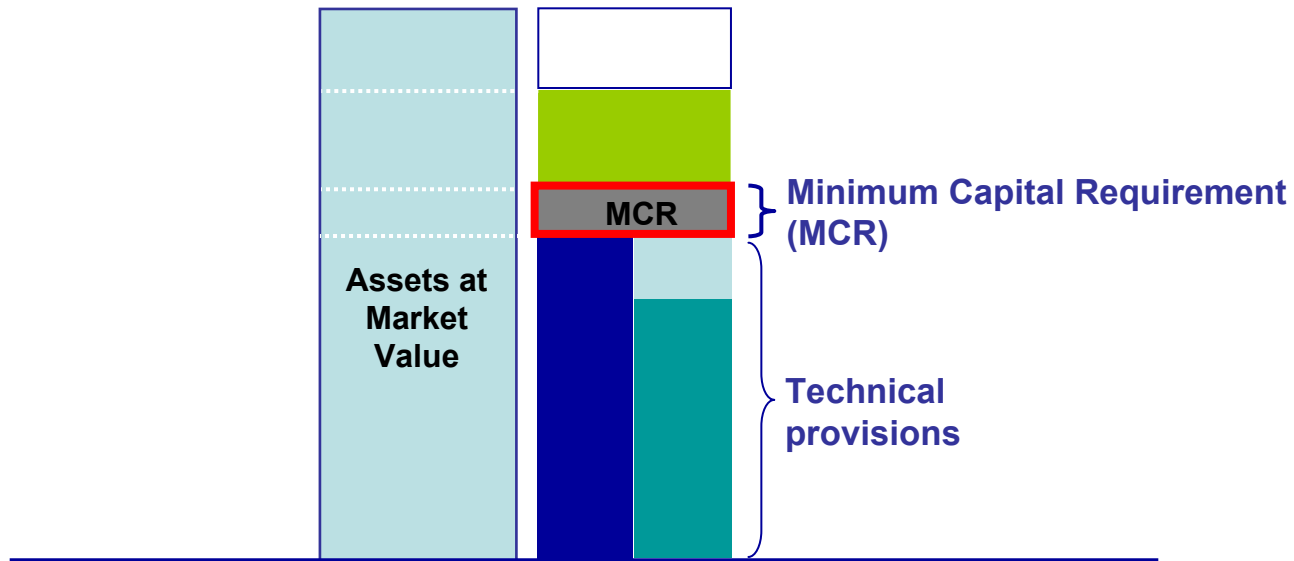
MCR negative for many health insurers

Deterministic approach more practical than a simulation approach

Average amount of person months was 2.8

Agenda

- Solvency 2 – An Overview
- Standardformula – Calculating the SCR
- **Calculating the MCR**



Minimum capital requirement – Level 1 Requirements

Breach of the MCR:

- Trigger to ultimate supervisory action
- If necessary withdraw of authorisation

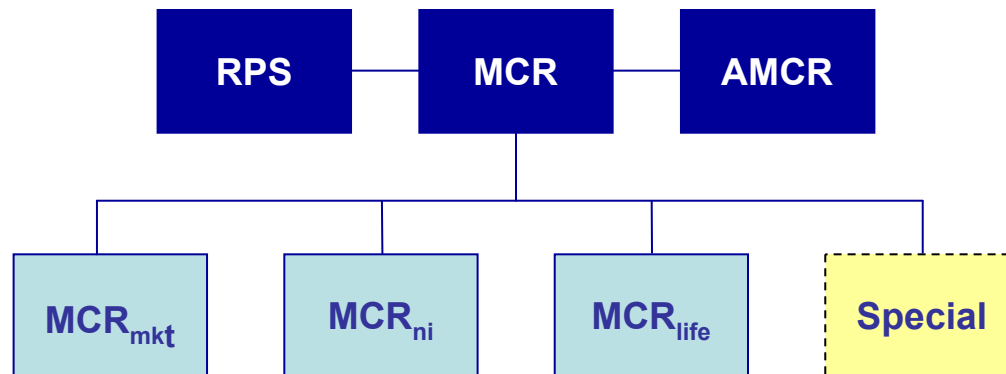
Calculation principles of MCR

- Absolute minimum calculated in a clear, simple and auditable manner
- Based on auditable data
- Risk measure: Value-at-Risk
- Time horizon: One year
- Confidence level: 80-90%
- Absolute floor: 1.000.000 EUR for non-life (re)insurer
2.000.000 EUR for life insurer
- Calculation at least quarterly and reporting to supervisor

Structure of MCR currently under discussion for Level 2

Modular approach (tested in QIS 3):

- Using a simplified version of standard formula
- Taking into account of the following risks:
 - non-life underwriting risk
 - life underwriting risk
 - market risk
- Calibrated to a one-year 90% VaR



Structure of MCR currently under discussion for Level 2

Linear approach (tested in QIS 4):

- Simplifies the modular approach and builds up on the margin over liabilities approach, but makes it more risk-sensitive by adding other volume measures
- Link to the SCR results by using a cap of 50% and a floor of 20% of the SCR (calculated using the standard formulae or an internal model)
- Calculation by using given formulas, given parameter and undertaking specific input data
- Input data for Non-Life: written premiums and technical provisions without risk margin
- Input data for Life: written premiums, technical provisions without risk margin split by non-with-profits and with-profits, provisions for discretionary bonuses, capital at risk, last year's net administrative expenses for unit-linked products.

