Solvency II

QIS5

*connectedthinking

PricewaterhouseCoopers

Overview over QIS5 structure

Opjectives for QIS5

- To provide detailed information on the quantitative impact on solvency by the introduction of level 2 implementing measures
- Compare the results with the situation under Solvency I
- To check that the technical specifications are aligned with the principles and calibration targets in the level 1 Directive
- To encourage insures, reinsures and supervisors to prepare the introduction of Solvency II and to identify areas where
  - Internal processes , procedures and infrastructure may need to be enhanced
  - Improvement of data collection process
- Starting point for an ongoing dialogue between supervisors and (re)insurance to prepare for the new supervisory system

“Important days”

15th April 2010	Publishing of the Call of Advice by the Commission
20 May 2010	End of consultation period
1 July 2010	Final call for advice including the QIS5 technical specifications
August to 31 October	QIS5 exercise
End of April 2011	CEIOPS publish the report on the QIS5 results

Purpose of the QIS5 report

The report from CEIOPS on QIS5 results should address the following questions

- Which items on insurers‘ balance sheet are the most impacted?
- What is the relationship between the Solvency II requirements and those of Solvency I?
- What is the overall impact on available capital?
- What is the effective impact on capital surplus and on the solvency ratio ?
- Will insurers need to raise additional capital?
- Will they be able to release “free” capital?
- What is the impact on insurance groups?
- High-level comparison of QIS4 and QIS5

QIS5 valuation

- The reporting date to be used should be end December 2009
- Mark to market should be used
- When mark to market is not possible mark to model shall be used

- CEIOPS expects undertakings to:
  - Identify assets and liabilities marked to market and marked to model
  - Assess assets and liabilities where an existing market value was not considered appropriate for the purpose of an economic valuation, so that a valuation model was used and disclose the impact
  - Give where relevant, the characteristics of the model used and the nature of input used when marking to model shall be transparently documented and disclosed
  - Assess differences between economic values obtained and accounting figures (in aggregate, by category of assets and liabilities)

QIS5 vs. IFRS

- The economic value of **goodwill** for solvency purpose is nil
- The IFRS on **Intangible** assets is considered to be a good proxy, if fair value is not possible they should be set to nil
- **Property, plant and equipment** that are not measured at economic values shall be re-measured at fair value. IFRS model could be considered as a reasonable proxy
- **Inventories** shall be valued at the net realizable value
- **Investment properties** that are measured at cost in financial statements shall be re-measured at fair value
- **Finance lease** shall be valued at fair value
- **Deferred Tax Assets/liabilities** shall be valued at amount expected to be recovered
- **Cash and cash equivalents** shall be valued at an amount not less then the amount payable on demand

QIS5 vs. IFRS

- **Provisions** shall be valued at the amount recognized is the best estimate of the expenditure required to settle the present obligation
- **Contingent liabilities** shall be valued based on a probability-weighted average of future cash flows required to settle the contingent liability, discounted at the relevant risk-free rate term structure

Segmentation of Technical Provisions (TP)

- Obligations are required to be segmented as a minimum by line of business in order to calculate TP
- Insurance undertakers should further segment prescribed lines of business into more homogenous groups according to the risk profile of the obligations
- The purpose of the segmentation is to achieve an accurate valuation of TP
- The segmentation should reflect the nature of the risk underlying the contract (substance) rather then the legal form of the contract (form)
- The segmentation should be applied to both components of the TP (best estimate and risk margin)

Segmentation of non-life insurance

- Accident
- Sickness
- Workers' compensation
- Motor TPL
- Motor other
- Marine, aviation and transport (MAT)
- Fire and other damage
- General liability – Third party liability
- Credit and surety ship
- Legal expenses
- Assistance
- Miscellaneous non-life insurance

- The segmentation should be applied both to gross premium provisions and gross claim provisions

Segmentation of non-proportional reinsurance

- Property business
- Casualty business
- Marine, aviation and transport

- The segmentation should be applied both to gross premium provisions and gross claim provisions

Segmentation of life insurance obligations

Life insurance business shall be segmented into 16 lines of business:

1. Contracts with profit participation clauses
2. Contract where policyholder bears the investment risk
3. Other contracts without profit participations clauses
4. Accepted reinsurance

which should be further segmented into:

a) Contracts where the mail risk driver is death

b) Contract where the mail risk driver is survival

c) Contracts where the mail risk driver is disability/morbidity risk

d) Savings contracts, i.e. contracts that resemble financial products providing no or negligible insurance protection relative to aggregated risk profile

Segmentation of health insurance obligations

Health insurance business shall be segmented into:

- Health insurance obligations pursued on a similar technical basis to that of life insurance (**SLT Health)**
- Health insurance obligations not pursued on a similar technical basis to that of non-life insurance (**Non-SLT Health)**

- SLT health obligations should be further segmented, as a minimum, according to the segmentation for life obligations
- Non-SLT health obligations should be further segmented, as a minimum according to the segmentation for non-life obligations (accident, sickness, workers compensation)

Unbundling insurance obligations

- Where a contract covers risk across non-life and life insurance, these contracts should be unbundled into their life and non-life parts
- Where a contract covers risk across different lines of business, these contracts should be unbundled into the appropriate lines of business
- A contract covering life insurance business should always be unbundled according to the top-level segmentation in life
- With regards to the second level of segmentation, unbundling should be applied to life insurance contracts where those contracts:
  - Cover combination of risk relating to different lines of business; and
  - Could be constructed as stand-alone contracts covering each of the different risks
- In case of cross-border activities the segmentation shall first be by country and then according to the requirements above

Best estimate (valuation)

Best estimate is calculated gross

The valuation of technical provisions is a process that includes

- collection and analysis of data
- selection of the appropriate actuarial and statistical methodologies for the calculation of the technical provisions
- determination of assumptions for valuation of TP
- modeling, parameterization the model and running the model (quantification of TP)
- assessment and appropriateness of estimations
- controls
- and documentation

The validation process should be carried out by a person who has knowladge of actuarial and financial mathematics and are able to demonstrate relevant experiance

Best estimate (methodologies)

Definition of “best estimate” and allowance for uncertainty

- Best estimate shall correspond to the probability weighted average of future cash-flows taking account of the time value of money, using the relevant risk-free rate term structure
- Therefore, the best estimate calculation shall allow for the uncertainty in future cash-flows
- Allowance for uncertainty does not suggest that additional margins should be included within the best estimate

Best estimate (methodologies)

Causes of uncertainty in the cash-flows that shall be taking into consideration may include the following

a) Fluctuation in the timing, frequency and severity of claim events
b) Fluctuation in the period taken to settle claims and/or expenses
c) Fluctuation in the amount of expenses
d) Changes in the value of an index/market value used to determine claim amounts
e) Change in both entity and portfolio-specific factors such as legal, social or economic environmental factors
f) Uncertainty in policyholder behavior
g) The exercise of discretionary future management actions. The allowance of these actions are subject to some requirements (see later)
h) Path dependency of cash-flows
i) Interdependency between two or more causes of uncertainty

Best estimate (valuation)

The valuation of BE shall meet the following requirements

a) The insurance undertaking shall be able to demonstrate the appropriateness, including the robustness of the techniques and assumptions used

b) The degree of judgment shall be assessed

c) To demonstrate that the valuation technique and the underlying assumptionsare realistic and reflects the uncertain nature of the cash-flows

d) The valuation technique shall be chosen on the basis of the nature of the liability being valued

e) The assumptions used shall be validated

f) The valuation technique and its results shall be capable of being audited

g) If policy data is grouped, it shall be demonstrated that the grouping process appropriately creates homogeneous risk groups that allows for the risk characteristics of the individual policies (claims or policy data)

h) The insurance undertaking shall ensure that their capabilities (e.g. actuarial expertise, IT systems) are commensurate with the actuarial and statistical techniques used

Best estimate (options and guarantees)

- Insurers are required to identify all contractual options and financial guarantees embedded in their contracts
- A contractual option is defined as a right to change the benefits
- A financial guarantee is present when there is the possibility to pass losses to the insurer or to receive additional benefits as a result of the evolution of financial variables (solely og in conjunction with non-financial variables)
- Non-financial guarantees such as reinstatement premiums, experience adjustments to future premiums should also be identified and valued
- The best estimate of options and guarantees should reflect both the intrinsic value and time value

Valuation can be done by using one or more of the following methodologies

- a stochastic approach using for instance a market-consistent asset model (includes both closed form and stochastic approaches)
- a series of deterministic projections with attributed probabilities; and
- a deterministic valuation based on expected cash-flows in case where this delivers a market-consistent valuation of the TP incl. the cost of options and guarantees

Best estimate (discounting)

- Currencies where the relevant risk-free interest rate term structures are provided in the spreadsheet included in the QIS5 package
- For the purposes of QIS5, participants shall identify the liabilities that may be discounted with the risk-free interest rate term structure that includes a 100% illiquidity premium by assessing that they meet all of the following criteria:
  1. the benefits of the contracts are retirement benefits in the form of annuities, and the only underwriting risk connected to the contracts are longevity risk and expense risk
  2. the contracts do not pay discretionary benefits
  3. the insurance undertaking does not bear any risk in case of any form of surrender
  4. the contracts are single premium policies, the premium has already been paid and no incoming cash-flows are allowed for in the TP of the contracts
- For the purposes of QIS5 participants shall identify the liabilities that shall be discounted with the risk-free interest rate term structure that does not incl. any illiquidity premium as:
  1. the contract is less the one year
- All liabilities not falling under one of the two shall be discounted with the risk-free interest rate term structure with a 50% illiquidity premium

Risk Margin

The risk margin calculation should be based on the assumption that the whole insurance portfolio is transferred to an empty reference undertaking. Consequently, the calculation of the risk margin should take the diversification between lines of business into account

The calculations shall be based on the assumption that a reference undertaking at time t = 0 will capitalize itself to the required level of eligible own funds i.e.

$EOF_{RU}(0) = SCR_{RU}(0)$,

where

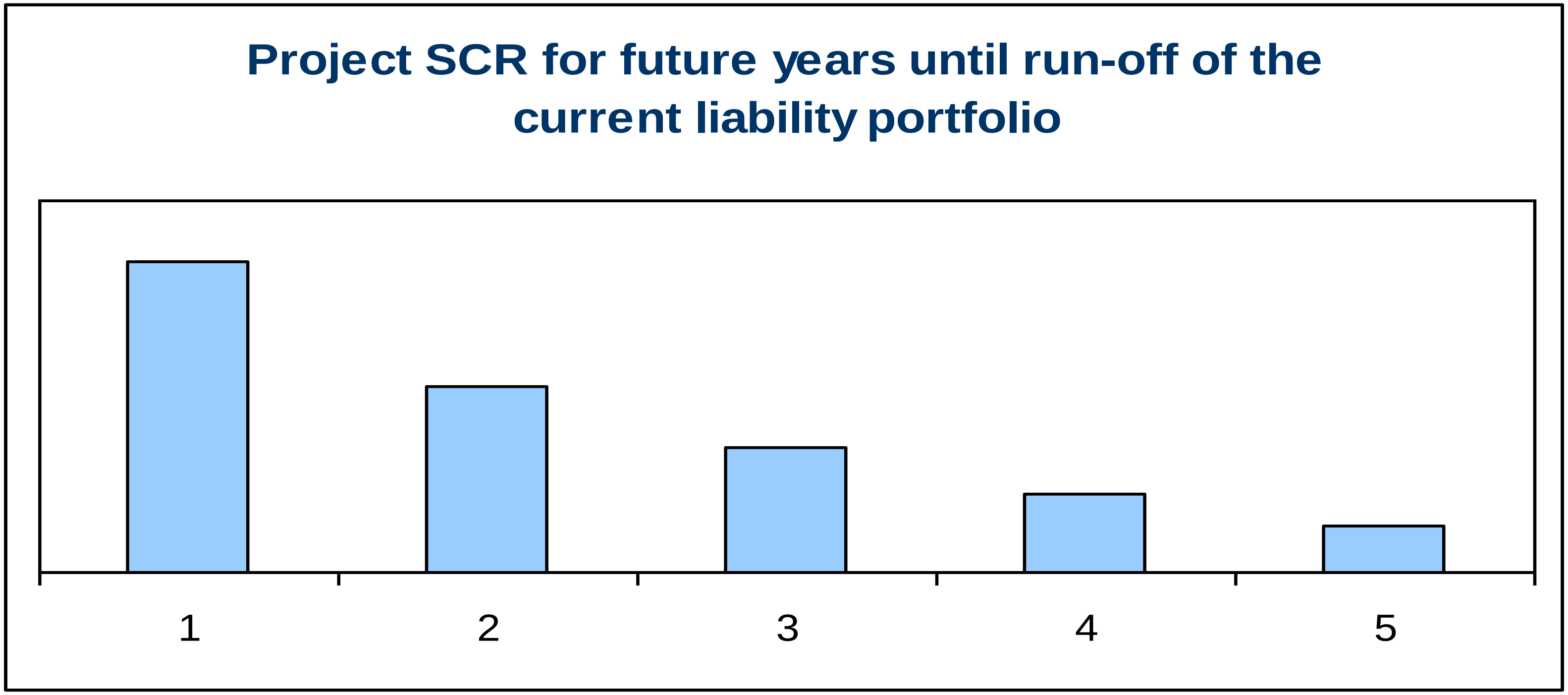
$EOF_{RU}(0)$ = *the amount of eligible own funds raised by the reference undertaking at time* $t = 0$ *(when the transfer takes place); and*

$SCR_{RU}(0)$ = *the SCR at time* $t = 0$ *as calculated for the reference undertaking*

The cost of providing this amount of eligible own funds equals the Cost-of Capital rate times the amount

Risk margin

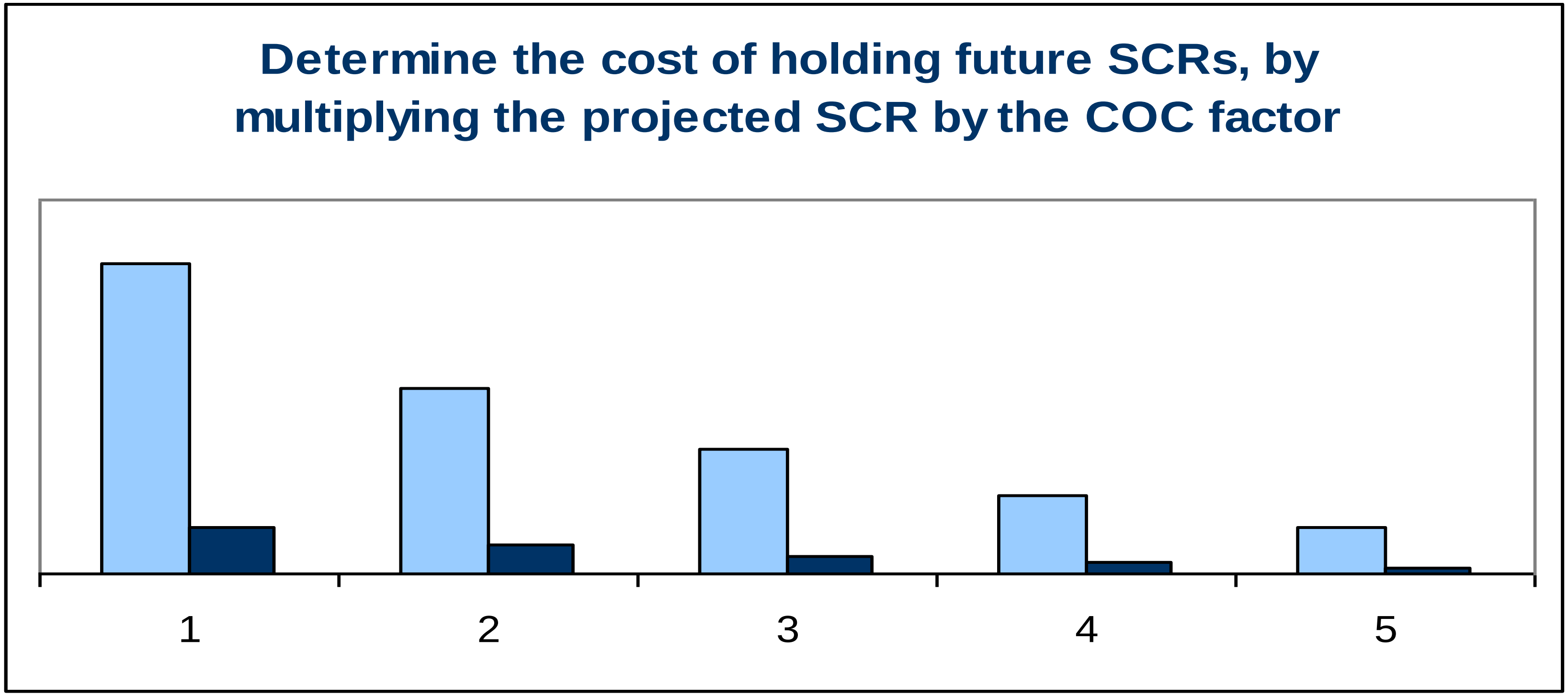
Risk margin – Step 1



Risk margin

Risk margin – Step 2

Current CoC factor is 6 per cent

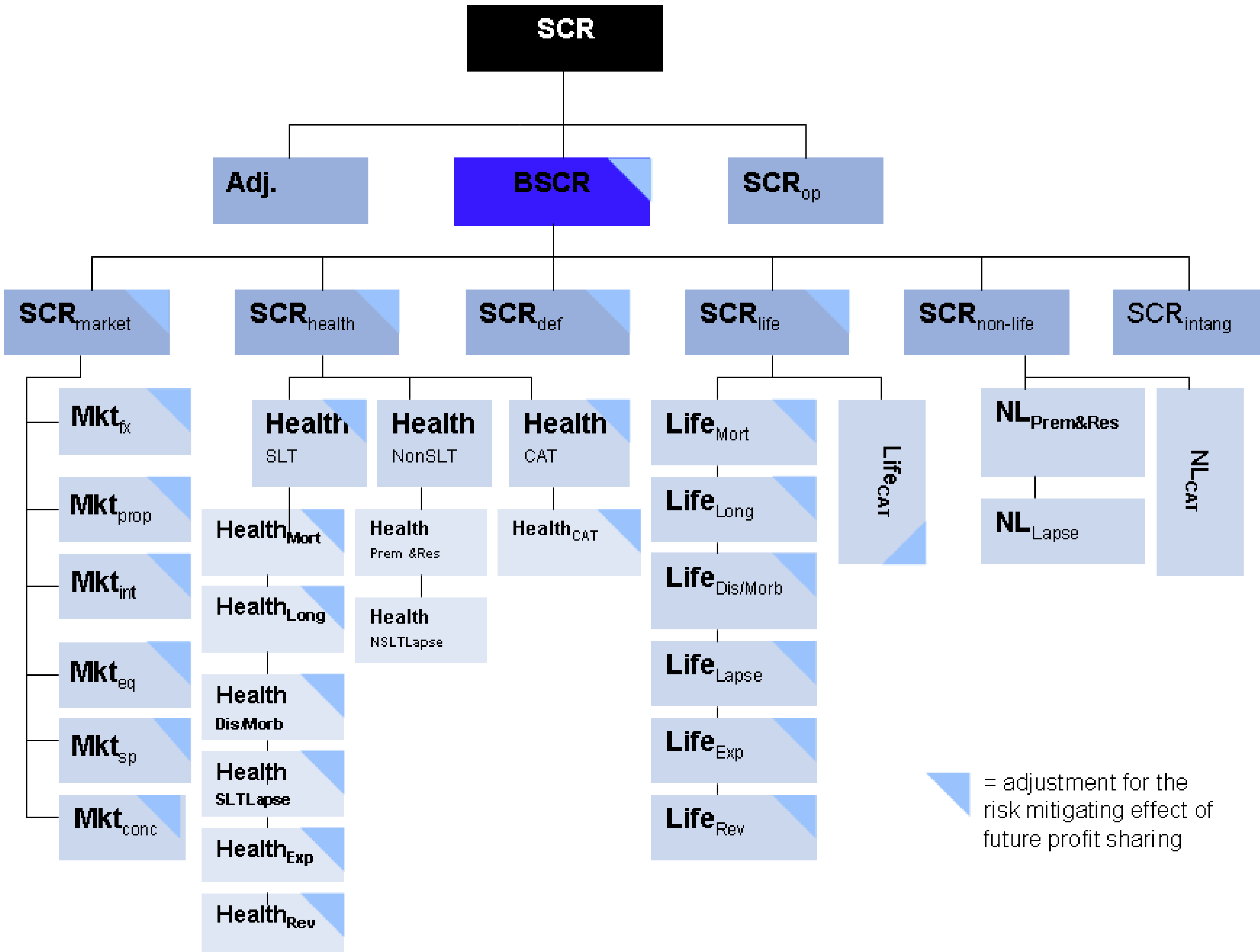


Risk Margin (hierarchy of simplifications)

The following hierarchy should be applied for calculation risk margin:

1. make a full calculation of all future SCRs without simplifications
2. approximate the individual risk or sub-risks within some or all modules and sub-modules to be used for the calculation of future SCRs
3. approximate the whole SCR for each future year e.g. by using a proportional approach
4. estimate the future SCRs ”at once” e.g. by using an approximation based on the duration approach
5. approximate the risk margin by calculating it as a percentage of the best estimate

SCR – Standard model



SCR calculation structure

Additive aggregation of BSCR and operational Risk minus adjustment

$$SCR = BSCR + SCRop - Adj$$

Where SCR_{op} = Operational risk

BSCR = Basic Solvency Capital Requirement

Adj = Adjustment for the risk absorbing effects of future profit sharing and deferred taxes

The parameters and assumptions used in the calculation of SCR are intended to reflect a VaR risk measure (calibrated to a confidence level of 99,5%) and a time horizon of one year

SCR calculation structure – BSCR

$$Basic\ SCR = \sqrt{\sum_{ij} Corr_{ij} \times SCR_i \times SCR_j} + SCR_{Intangibles}$$

where

$Corr_{i,j}$ = the cells of the correlation matrix CorrSCR

SCR_i, SCR_j = Capital charges for the individual SCR risks according to the rows and columns of the correlation matrix CorrSCR

$SCR_{intangible}$ = the capital requirement for intangible asset risk

CorrSCR	SCR_{mkt}	SCR_{def}	SCR_{life}	SCR_{health}	SCR_{nl}
SCR_{mkt}	1	0.25	0.25	0.25	0.25
SCR_{def}	0.25	1	0.25	0.25	0.5
SCR_{life}	0.25	0.25	1	0.25	0
SCR_{health}	0.25	0.25	0.25	1	0
SCR_{nl}	0.25	0.5	0	0	1

SCR (proportionality)

The undertaking is responsible to determine the SCR by using appropriate methods selecting from the following list, taking into account the nature, scale and complexity of the risks:

1. full internal model
2. standard formula and partial internal model
3. standard formula with undertaking-specific parameters
4. standard formula
5. simplification

The undertaking shall be able to explain what methods are used and why

Future discretionary benefits

CEIOPS' advice on Article 86(a) distinguishes between guaranteed and discretionary benefits as follows:

- Guaranteed benefits: The cash flows take into account only those liabilities to policyholders or beneficiaries to which they are entitled at the valuation date
- Conditional discretionary benefits: This is a liability based on declaration of future benefits influenced by legal or contractual declarations and performance of the undertaking/fund:
  - the performance of a specified pool of contracts or specified type of contract
  - (un)realised investment return on a specified pool of assets held by insurer
  - the profit or loss of the company, fund or other entity that issues the contract
- Pure discretionary benefit: This represents the liability based on the declaration of future benefits which are in discretion of the management

- Both conditional an pure discretionary benefits could potentially be considered to be loss-absorbing and undertakings should consider the extent to which this is the case

SCR Operational risk

Operational risk – SCR_{op}
Definition

Operational risk is the risk of loss arising from inadequate or failed **internal processes**, or from **personnel and systems**, or from **external events** (Article 13(33) of the Level 1 text). Operational risk shall include **legal risks**, and exclude risks arising from *strategic decisions*, as well as *reputation risks* (Article 101(4)(f) of the Level 1 text). The operational risk module is designed to address operational risks to the extent that these have not been explicitly covered in other risk modules

For the purpose of the calculation, reference to technical provision is to be understood as technical provisions excluding the risk margin, to avoid circularity issues

Operational risk – SCR_{op}
Calculation

TP_{life}	*Total life insurance technical provisions (gross of reinsurance), with a floor equal to zero. This would also include unit-linked business and life like obligations on non-life contracts such as annuities*
$TP_{SLT\ Health}$	Technical provisions corresponding to health insurance (gross of reinsurance) that correspond to Health SLT with a floor equal to zero
$TP_{life\text{-}ul}$	*Total life insurance technical provisions for unit-linked business (gross of reinsurance), with a floor equal to zero*
TP_{nl}	*Total non-life insurance technical provisions (gross of reinsurance), with a floor equal to zero (excluding life like obligations of non-life contracts such as annuities).*
$TP_{Non\text{-}SLT\ Health}$	Technical provisions corresponding to health insurance that correspond to Health non SLT (gross of reinsurance), with a floor equal to zero

Operational risk – SCR_{op}

Calculation

$Earn_{life}$	*Total earned life premium (gross of reinsurance), including unit-linked business.*
$Earn_{HealthSLT}$	Total earned premiums corresponding to health insurance that correspond to Health SLT (gross of reinsurance)
$Earn_{life\text{-}ul}$	*Total earned life premium for unit-linked business (gross of reinsurance)*
$Earn_{nl}$	*Total earned non-life premium (gross of reinsurance)*
$Earn_{Non\text{-}SLT\ Hea}$	Total earned premiums corresponding to health that correspond to Health non SLT (gross of reinsurance)
Exp_{ul}	*Amount of annual expenses (gross of reinsurance) incurred in respect of unit-linked business. Administrative expenses should be used (excluding acquisition expenses); the calculation should be based on the latest past years expenses and not on future projected expenses*

Operational risk – SCR_{op}
Calculation

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

where

Op_{lnul} = *Basic operational risk charge for all business other than unit-linked business (gross of reinsurance)*

is determined as follows:

$$Op_{lnul} = \max(Oppremiums ; Opprovisions)$$

where

Oppremiums = $0{,}04 * (Earn_{life} + Earn_{SLT\ Health} – Earn_{life\text{-}ul}) + 0{,}03 * (Earn_{non\text{-}life} + Earn_{Non\ SLT\ Health}) + Max(0;0{,}04 * (\Delta earn_{life} – \Delta Earn_{life\text{-}ul})) + Max(0;0{,}03 * \Delta Earn_{non\text{-}life})$

Opprovisions = $0{,}0045*(TP_{life} + TP_{SLT\ Health} – TP_{life\text{-}ul}) + 0{,}030*(TP_{non\text{-}life} + TP_{Non\ SLT\ Health}) + Max(0;0{,}045 * (\Delta TP_{life} – \Delta TP_{life\text{-}ul})) + Max(0{,}0{,}03 * \Delta TP_{non\text{-}life}))$

where Δ = change in earned premiums/technical provisions from year t-1 to t (+10%)

SCR intangible assets

Intangible asset risk – SCR_{Intang}

Calculation

In the case of intangible assets, Article 75 of the Level 1 text allows them to be taken into account at their fair value under certain requirements

Intangible assets are exposed to a twofold set of risks:

- Market risks
- Internal risk

$$SCR_{Intang} = factorIA*fair\_value\_intangible\_assets$$

where

$$factorIA = 80\%$$

SCR market risk

Market risk

Market risk arises from the level or volatility of market prices of financial instruments.

- Liquidity risk should be captured under Pillar 2 risk management

- Assets which are allocated to policies where the policyholders bear the investment risk are excluded from the module only to the extent that the risk is passed on to policyholders

Market risk

General considerations where a delta-NAV approach is used

- The change in net asset value shall be based on a balance sheet that does not include the risk margin of the technical provisions
- The impact of hedging instruments shall be allowed for as part of the scenarios
- The revaluation of technical provisions should allow for any relevant adverse changes in option take-up behavior of policyholders in this scenario
- In order to properly assess the market risk inherent in collective investment funds, it will be necessary to examine their economic substance. Wherever possible, this should be achieved by applying a look-through approach in order to assess the risks applying to the assets underlying the investment vehicle. Each of the underlying assets would then be subjected to the relevant sub-module stresses and capital charges calculated accordingly
- The same look-through approach shall also be applied for other indirect exposures

Market risk

General considerations where a delta-NAV approach is used

- The above recommendations can be applied to both passive and actively managed funds, except for investments in funds that track a well-diversified index including only listed equity from developed markets
- Where a collective investment scheme is not sufficiently transparent to allow a reasonable best effort allocation, reference should be made to the investment mandate of the scheme
- As a third choice to the look-through and mandate-based methods, participants should consider the collective investment scheme as an equity investment and apply the global equity risk charge (if the assets within the collective investment scheme are predominately listed in the EEA or OECD) or other equity charge (if the assets within the collective investment scheme are predominately unlisted)

Market risk – SCR_{mkt}

Calculation

$$SCR_{mkt} = \max\left(\sqrt{\sum_{rxc} CorrMktUP_{r,c} \bullet Mkt_{up,r} \bullet Mkt_{up,c}}, \sqrt{\sum_{rxc} CorrMktDown_{r,c} \bullet Mkt_{down,r} \bullet Mkt_{down,c}}\right)$$

Where:

$CorrMktUP/DOWN_{r,c}$ = the cells in the correlation matrix's CorrMkt

CorrMkt	**Mkt_{int}**	**Mkt_{eq}**	**Mkt_{prop}**	**Mkt_{sp}**	**Mkt_{conc}**	**Mkt_{fx}**
Mkt_{int}	1					
Mkt_{eq}	0,5	1				
Mkt_{prop}	0.5	0.75	1			
Mkt_{sp}	0.5	0.75	0.5	1		
Mkt_{conc}	0	0	0	0	1	
Mkt_{fx}	0.25	0.25	0.25	0.25	0	1

Market risk – SCR_{mkt}

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

CorrMkt	**Mkt_{int}**	**Mkt_{eq}**	**Mkt_{prop}**	**Mkt_{sp}**	**Mkt_{conc}**	**Mkt_{fx}**
Mkt_{int}	1					
Mkt_{eq}	0,5	1				
Mkt_{prop}	0.5	0.75	1			
Mkt_{sp}	0.5	0.75	0.5	1		
Mkt_{conc}	0	0	0	0	1	
Mkt_{fx}	0.25	0.25	0.25	0.25	0	1

SCR interest rate risk

Interest rate risk – Mkt_{int}
Introduction

- Interest rate risk exists for all assets and liabilities for which the net asset value is sensitive to changes in the term structure of interest rates or interest rate volatility. This applies to both real and nominal term structures

- Assets sensitive to interest rate movements will include fixed-income investments, financing instruments (for example loan capital), policy loans, interest rate derivatives and any insurance assets

- The discounted value of future liability cash-flows will be sensitive to a change in the rate at which those cash-flows are discounted

- Assets which are ‘index linked’ such as nominal bonds should have the same stress applied to them as non index linked assets

Interest rate risk – Mkt_{int}

Calculations

Mkt_{int}^{Up} = Capital charge for interest rate risk after upward shocks

Mkt_{int}^{Down} = Capital charge for interest rate risk after downward shocks

$nMkt_{int}^{Up}$ = Capital charge for interest rate risk after upward shock including the risk absorbing effect of future profit sharing

$nMkt_{int}^{Down}$ = Capital charge for interest rate risk after downward shock including the risk absorbing effect of future profit sharing

$$\text{Mkt}_{int}^{Up} = \max(\Delta\text{NAV}|_{up\&downvol}, \Delta\text{NAV}|_{up\&upvol})$$

$$\text{Mkt}_{int}^{Down} = \max(\Delta\text{NAV}|_{down\&downvol}, \Delta\text{NAV}|_{down\&upvol})$$

Where $\Delta\text{NAV}|_{up\&upvol}$, $\Delta NAV|u_{p\&downvol}$, $\Delta NAV|_{down\&upvol}$, $\Delta NAV|_{down\&downvol}$ *are the changes in the net value of asset and liabilities due to re-valuing all interest rate sensitive instruments using altered term structures with an up or down volatility stress and a correlation between interest rate level and volatility shock of 0*

Interest rate risk – Mkt_{int}

Calculations

Maturity t (years)	*relative change $s^{up}(t)$*	*relative change $s^{down}(t)$*
0.25	70%	-75%
0.5	70%	-75%
1	70%	-75%
2	70%	-65%
3	64%	-56%
4	59%	-50%
5	55%	-46%
6	52%	-42%
7	49%	-39%
8	47%	-36%
9	44%	-33%
10	42%	-31%
11	39%	-30%
12	37%	-29%
13	35%	-28%
14	34%	-28%
15	33%	-27%
16	31%	-28%
17	30%	-28%
18	29%	-28%
19	27%	-29%
20	26%	-29%
21	26%	-29%
22	26%	-30%
23	26%	-30%
24	26%	-30%
25	26%	-30%
30	25%	-30%

For example, the "stressed" 15-year interest rate R1(15) in the upward stress scenario is determined as

$R_i(15) = R_0(15)*(1+0,33)$

where $R_0(15)$ is the 15-year interest rate based on the current term structure

Where an undertaking is exposed to interest rate movements in more than one currency, the capital charge for interest rate risk should be calculated based on the same relative change on all relevant yield curves

Maturities greater than 30 years a stress of +25%/-30% should be maintained

Interest rate risk – Mkt_{int}

Calculations

- Irrespective of the above stress factors, the absolute change of interest rates in the downward scenario should at **least be one percentage point** for non-index-linked bonds. Where the **unstressed rate is lower than 1%,** the shocked rate in the **downward scenario should be assumed to be 0%.** This constraint does not apply to index linked bonds (i.e. those which contain no material inflation risk)
- Implied current levels of interest rate volatility should be stressed by an **additive 12 percentage points** in the upwards direction, and **3 percentage points** in the downward direction
- The scenarios for interest rate risk should be calculated under the condition that the assumptions on future bonus rates remain unchanged before and after the shocks being tested

Interest rate risk – Mkt_{int}
Observations and simplification

- NOT a parallel shift in the interest rate structure
- Up and down stress factors are not the same
- ALM will implicit reduce the interest rate risk

Simplifications: shocks are parallel yield stress at all durations of
- Downward shock - 40%
- Upward shock + 55 %

was allowed in the QIS4

Meaning that the average duration of the portfolio is assumed to be between 5 and 7 years

SCR equity risk

Equity risk – Mkt_{eq}
Introduction

- Equity risk comes from the volatility of the market prices for equities
- For the calculation of the risk capital charge, hedging and risk transfer mechanisms should be taken into account. However, as a general rule, hedging instruments should only be allowed with the average protection level over the next year. For example, where an equity option provides protection for the next six months, as a simplification, undertakings should assume that the option only covers half of the current exposure
- Participants should not assume to purchase additional hedging instruments (for example, as part of a rolling hedging programme) beyond those in force at the balance sheet date within the standard formula SCR
- For the “standard” approach, a symmetric adjustment mechanism applies, as set out in Article 106. This mechanism is required to operate such that the equity shock lies within a band of 10% either side of the underlying standard equity stress

Equity risk – Mkt_{eq}
Calculations – First step

Calculations: Stressed marked value for all equities allocated to index i

$$Mkt_{eq,i} = \text{Max}\,(0, \Delta NAV \mid \text{Equity shock}_i)$$

Where

the equity shock are a decrease in the value of the index of

	Global	Other
Equity shock$_i$	30%	40%

- "Other" including emerging markets, not-listed equities and alternative investments
- All direct and indirect exposures has to be included
- The stresses above take account of a YE09 symmetric adjuster to equity of **-9%, so changing them from their base level of 39% and 49%**

Equity risk – Mkt_{eq}
Calculations

•The equity level shock is 22% for strategic participations

•Alternative investments should cover all types of equity type risk like hedge funds, derivatives, managed futures, investments in SPVs etc., which can not be allocated to spread risk or classical equity type risk, either directly, or through a look through test

Equity risk – Mkt_{eq}
Calculations – Second step

Calculation of the total capital charge for equity risk are then

$$Mkt_{eqLEV} = \sqrt{\sum_{rxc} CorrIndex_{r,c} \cdot Mkt_{LEVr} \cdot Mkt_{LEVc}}$$

Where the correlation matrix are:

CorrIndex	Global	Other
Global	1	
Other	0.75	1

Equity risk – Mkt_{eq}
Calculations – Second step

- The capital charge $Mkt_{eq,VOL}$ is determined as the immediate effect on the net value of asset and liabilities expected in the event of the stress scenario equity volatility *shock taking account of all the participant's individual direct and indirect exposures to equity prices*

- Implied current levels of equity volatility should be stressed by an additive 10 percentage points in the upwards direction, and 3 percentage points in the downward direction

:

$$Mkt_{eq} = \sqrt{\sum_{rxc} CorrIndex_{r,c} \cdot Mkt_r \cdot Mkt_c}$$

CorrIndex	Level	Volatility
Global	1	
Other	0.75	1

SCR property risk

Property risk – Mkt_{prop}
Introduction/Calculation

- Property risk comes from the volatility in the market prices on property

- Property risk are calculated as a stress scenario approach

$$Mkt_{prop} = \mathrm{Max}(0, \Delta NAV \mid \text{property shock})$$

- The property shock is the immediate effect on the net value of asset and liabilities expected in the event of a **25% fall in real estate benchmarks**, taking account of all the participant's individual direct and indirect exposures to property prices. The property shock takes account of the specific investment policy including e.g. hedging arrangements, gearing etc

Property risk – Mkt_{prop}
Observations

The following investments shall be treated as property and their risks considered accordingly in the property risk sub-module:

- land buildings and immovable-property rights
- direct or indirect participations in real estate companies that generate periodic income or which are otherwise intended for investment purposes an investment in a company
- property investment for the own use of the insurance undertaking

Otherwise, the following investments shall be treated as equity and their risks considered accordingly in the equity risk sub-module:

- an investment in a company engaged in real estate management
- an investment in a company engaged in real estate project development or similar activities
- an investment in a company which took out loans from institutions outside the scope of the insurance group in order to leverage its investments in properties

- Collective real estate investment vehicles should be treated like other collective investment vehicles with a look-through approach

SCR currency risk

Currency risk – Mkt_{fx}
Introduction

- Currency risk comes from the volatility of the currency rates
- The local currency is the currency in which the undertaking prepares its local regulatory accounts. All other currencies are referred to as foreign currencies. A foreign currency is relevant for the scenario calculations if the amount of basic own funds depends on the exchange rate between the foreign currency and the local currency
- For each relevant foreign currency C, the currency position should include any investment in foreign instruments where the currency risk is not hedged. This is because the stresses for interest rate, equity, spread and property risks have not been designed to incorporate currency risk. Note that the look-through approach for funds

Currency risk – Mkt_{fx}

Calculation

The size of the shock for certain non euro but pegged currencies is as follows:

- Danish krone against any of EUR, Lithuanian litas or Estonian kroon = ±*2.25%*
- Estonian Kroon against EUR or Lithuanian litas = ±0%
- Latvian lats against any of EUR, Lithuanian litas or Estonian kroon = ±1%
- Lithuanian litas against EUR or Estonian kroon = ±0%
- Latvian lats against Danish Krone = ±3.5%

SCR spread risk

Spread risk – Mkt_{sp}

Introduction

- Spread risk is the part of risk that reflects the change in value of net assets due to a move in the yield on an asset relative to the risk-free term structure. The spread risk sub-module should address changes in both level and volatility of spreads
- The counterparty default risk module shall cover risk-mitigating contracts, such as reinsurance arrangements, securitisations and derivatives, and receivables from intermediaries, as well as any other credit exposures which are not covered in the spread risk sub-module

The spread risk sub-module should cover the credit risk of:

- credit derivatives
- other credit risky investments (e.g. debt securities, loans to, loan guaranteed by mortgages, deposits with credit institutions)

Spread risk – Mkt_{sp}
Introduction

- No capital charge shall apply for the purposes of this sub-module to borrowings by or demonstrably guaranteed by national government of an OECD or EEA state, issued in the currency of the government, or issued by a multilateral development bank as listed in Annex VI

The spread risk module therefore applies to at least the following classes of bonds:

- Investment grade corporate bonds
- High yields corporate bonds
- Subordinated debt
- Hybrid debt

Spread risk – Mkt_{sp}
Introduction

Furthermore, the spread risk module is applicable to all types of asset-backed securities as well as to all the tranches of structured credit products such collateralised debt obligations. This class of securities includes transactions of schemes whereby the credit risk associated with an exposure or pool of exposures is tranched, having the following characteristics:

- payment in the transaction or scheme are dependent upon the performance of the exposure or pool of exposures; and
- the subordination of tranches determines the distribution of losses during the ongoing life of the transaction or scheme

- The spread risk sub-module will further cover in particular credit derivatives, for example (but not limited to) credit default swaps, total return swaps and credit linked notes

Spread risiko – Mkt_{sp}

Calculations

MV_i	=	the credit risk exposure i as determined by reference to market values (exposure at default)
$rating_i$	=	for corporate bonds, the external rating of credit risk exposure i
$duration_i$	=	for corporate bonds, the duration of credit risk exposure i
$attach_i$	=	for structured credit products, the attachment point of the tranche held
$detach_i$	=	for structured credit products, the detachment point of the tranche held
$tenure_i$	=	for structured credit products, the average tenure of the assets securitised
$ratingdist_i$	=	for structured credit products, a vector of the rating distribution in the asset pool securitised

In cases where there is no readily-available market value of credit risk exposure i, alternative approaches consistent with relevant market information might be adopted to determine MV_i. In cases where several ratings are available for a given credit exposure, generally the **second-best rating** should be applied

Spread risiko – Mkt_{sp}
Calculations

The capital charge for spread risk is determined as follows:

$$Mkt_{sp} = Mkt_{sp}^{bonds} + Mkt_{sp}^{struct} + Mkt_{sp}^{cd} + Mkt_{sp}^{re}$$

where:

Mkt_{sp}^{bonds}	=	the capital charge for spread risk of bonds
Mkt_{sp}^{struct}	=	the capital charge for spread risk of structured credit products
Mkt_{sp}^{cd}	=	the capital charge for credit derivatives
Mkt_{sp}^{re}	=	the capital charge for spread risk of mortgage loans

Spread risiko – Mkt_{sp}

Calculations

The capital charge for spread risk of bonds is determined as follows:

$$Mkt_{sp}^{bonds} = \max\begin{pmatrix} \sum_i MV_i \bullet duration_i \bullet F^{up}(rating_i) - \Delta IlliquidLiabs^{Up} \\ \sum_i MV_i \bullet duration_i \bullet F^{down}(rating_i) - \Delta IlliquidLiabs^{Down} \end{pmatrix} + \Delta Liab_{ul}$$

$F^{up/down}(rating_i)$ = a function of the rating class of the credit risk exposure which is calibrated to deliver a shock consistent with VaR 99.5% following a widening/narrowing of credit spreads

$\Delta IlliquidLiabs^{up/down}$ = Change in value of liabilities to which an illiquidity premium is applied following a widening/narrowing of credit spreads

$\Delta Liab_{ul}$ = The overall impact on the liability side for policies where the policyholders bear the investment risk with embedded options and guarantees of the stressed scenario, with a minimum value of 0

Spread risiko – Mkt_{sp}

Calculations

To determine the spread risk capital charge for bonds, the following factors F^{up} and F^{down} shall be used

Spread risk factors for bonds

	F^{up}	F^{down}	Duration Floor	Duration Cap
AAA	1,0%	-0,4%	1	--
AA	1,5%	-1,0%	1	--
A	2,6%	-1,7%	1	--
BBB	4,5%	-3,0%	1	7
BB	8,4%	-6,3%	1	5
B or lower	16,2%	-8,6%	1	3,5
Unrated	5,0%	-3,3%	1	7

For example, for a AAA-rated bond with a duration of 5 years a loss in value of 5% would be assumed under the widening of spreads scenario

Spread risiko – Mkt_{sp}
Calculations

The capital charge for spread risk of structured credit products is determined as follows:

$$Mkt_{sp}^{struct} = \sum_i MV_i \frac{\max\left(G\left(ratingdist_i, tenure_i\right) \bullet \left(1 - R\left(ratingdist_i\right)\right) - attach_i ; 0\right)}{detach_i - attach_i}$$

G(ratingdist$_i$,tenure$_i$) = a function of the rating class and tenure of the credit risk exposure within a securitised asset pool which is calibrated to deliver a shock consistent with VaR 99.5%

R(ratingdist$_i$) = a function of the rating class of the credit risk exposure within a securitised asset pool which is calibrated to deliver a shock consistent with VaR 99.5%

- When calculating Mkt_{sp}^{struct}, *a cap of 100% of* MV_i *and a floor of 10% of* MV_i *are applied*

Spread risiko – Mkt_{sp}

Calculations

G(ratingdist$_i$, tenure$_i$)	AAA	AA	A	BBB	BB	B	CCC or lower	Unrated
0-1.9 years	0.8%	1.6%	4.7%	8.1%	20.9%	41.5%	65.9%	9.7%
2-3.9 years	1.6%	3.1%	8.1%	14.7%	34.1%	59.7%	83.3%	17.6%
4-5.9 years	2.3%	5.0%	10.9%	20.2%	43.0%	68.2%	88.4%	24.2%
6-7.9 years	3.5%	7.4%	14.0%	25.2%	50.4%	73.3%	90.7%	30.2%
8+ years	4.7%	9.7%	17.1%	30.2%	56.2%	77.1%	91.9%	36.2%

R(ratingdist$_i$)	AAA	AA	A	BBB	BB	B	CCC or lower	Unrated
Recovery rate	50%	45%	40%	35%	30%	25%	20%	35%

Spread risiko – Mkt_{sp}

Calculations

•If a look-through on the level of securitised assets is not possible, the same stress as for the "equity, other" (of 49%) category should be applied to the structured product for which the look-through is not possible

•For credit derivatives, the capital charge Mkt_{sp}^{cd} *is determined, after netting with offsetting corporate bond exposures, as the change in the value of the derivative (i.e. as the decrease in the asset or the increase in the liability) that would occur following*

- *a widening of credit spreads by 600% if overall this is more onerous, or (*
- *a narrowing of credit spreads by 75% if this is more onerous.*

A notional capital charge should then be calculated for each event. The capital charge should then be the higher of these two notional changes

Spread risiko – Mkt_{sp}
Calculations

The capital charge for the spread risk of exposures secured by real estate is determined as follows:

$$Mkt_{sp}^{re} = 8\% \bullet \sum_i \left(RW_i^{sec} \bullet Secured_i + RW_i^{unsec} \bullet \max\left(Exposure_i - Secured_i ; 0 \right) \right)$$

$Exposure_i$	=	the total mortgage exposure to borrower *i*
$Secured_i$	=	the fully and completely secured part of the exposure to borrower *i*, calculated as the part of the exposure covered by real estate collateral after application of the haircut
RW_i^{sec}	=	the risk weight associated with the fully and completely secured part of the exposure to borrower *i*
RW_i^{unsec}	=	the risk weight associated with the unsecured part of to exposure to borrower *i*

Spread risiko – Mkt_{sp}
Calculations

- The haircut to be applied to the value of real estate collateral is 25% for residential real estate and 50% for commercial real estate. Therefore, the fully and completely secured part of the exposure is equal to 75% of the value of residential real estate collateral, and 50% of the value of commercial real estate collateral
- For **residential property a risk weight of 35%**
- For **commercial property a risk weight of 100%**
- Fully and completely secured exposures receive a risk weight of 0% if these exposures are guaranteed by an OECD or EEA government

Spread risiko – Mkt_{sp}

Calculations

The following simplification may be used provided :

,

$$Mkt_{sp}^{bonds} = MV^{bonds} \cdot \sum_i \%MV_i^{bonds} \bullet F(rating_i, duration) + \Delta Liab_{ul}$$

MV^{bonds} = Total market value of non-government bond portfolio

$\%MV_i^{bonds}$ = *Proportion of non-government bond portfolio held at rating i*

F = Defined as in the standard calculation

duration = Average duration of non-government bond portfolio, weighted with the market value of the bonds

SCR concentration risk

Concentration risk – Mkt_{conc}
Introduction

- Concentration risk sub-module extends to assets considered in equity, interest rate, spread risk and property risk sub-modules within the market risk module, and excludes assets covered by the counterparty default risk module in order to avoid any overlap between both elements of the standard calculation of the SCR
- An appropriate assessment of concentration risks needs to consider both the direct and indirect exposures derived from the investments included in the scope of this sub-module
- Government bonds are exempted from the application of this sub-module

Concentration risk – Mkt_{conc}
Calculations

•Risk exposures in assets need to be grouped according to the counterparties involved

E_i = Net exposure at default to counterparty i

$Assets_{xl}$ = Amount of total assets considered in this sub-module according the paragraphs contained in this advice in the item 'Assets covered by concentration risk sub-module'. Government bonds should be included in this amount, notwithstanding the exemption specified above

$rating_i$ = External rating of the counterparty i

•When calculating the net exposures, financial mitigation techniques shall be considered in this sub-module

•Exposures via investment funds need to be considered on a look-through basis

Concentration risk – Mkt_{conc}
Calculations

Calculations are made in 3 steps:

1. Excess exposure
2. Risk concentration per counterparty
3. Aggregation

First step

Excess exposure:

$$XS_i = \max(0\ ;\ E_i / Assets_{xl} - CT)$$

Where CT depends on the rating

Rating^i	AAA-AA	A	BBB	BB or lower
CT	3%	3%	1,5%	1,5%

Concentration risk – Mkt_{conc}
Calculations

<u>Second step</u>

Concentration risk per counterparty *i* is calculated as:

$$Conc_i = Asset_{xl} \bullet XS_i \bullet g + \Delta Liab_{ul}$$

where XS_i is expressed with reference to the unit (i.e. an excess of exposure i above the threshold of 8%, delivers XS_i = 0.08) and the parameter g , depending on the credit rating of the counterparty, is determined as follows *:*

$Rating_i$	Credit Quality Step	*G*
AAA- AA	1	0,12
A	2	0,21
BBB	3	0,27
BB or lower (unrated)	4 -6, -	0,73

Concentration risk – Mkt_{conc}

Calculations

Last step

- The total capital requirement is now calculated as

$$Mkt_{conc} = \sqrt{\sum_i Conc_i^2}$$

Concentration risk – Mkt_{conc}

Calculations special cases

Investments in a single UCITS *i are exempted from the concentration risk sub-module if the maximum share of the UCITS assets which are invested in a single body does not exceed*

$$CT_{UCITS,i} = CT \cdot \frac{Assets_{xl}}{MW_{UCITS,i}},$$

where

$CT_{UCITS,i}$	=	concentration threshold for UCITS i
MWUCITS,i	=	*market value of the undertaking's investment in UCITS i*
CT	=	*concentration threshold of the sub-module, as defined above*
Assetsxl	=	*comparative measure of the sub-module*

A look-through approach should be applied to all UCITS which are not exempted from the sub-module

Concentration risk – Mkt_{conc}

Calculations special cases

In order to provide mortgage covered bonds and public sector covered bonds with a treatment in concentration risk sub-module according their specific risk features, the threshold applicable shall be **15 per cent** when all the following requirements are met:

- the asset has a AA credit quality
- the portfolio of mortgages backing the asset is diversified into a sufficiently high number of borrowers
- there is no evidence of high correlation or connection among the default of one or few borrowers
- the covered bond meets the requirements defined in Article 22(4) of the UCITS directive 85/611/EEC

SCR Counterparty default risk

Counterparty default risk – SCR_{def}
Introduction

- The Counterparty default risk module reflects possible losses due to unexpected default, or deterioration in the credit standing, of the counterparties and debtors of (re-) insurance undertakings over the next twelve months
- Items to be covered by the module
  - risk-mitigation contracts
  - any exposure not covered in the Spread risk module
  - risks derived from **concentration** in cash at a bank
  - risks covered by the Counterparty default risk module should not be covered by other sub-modules within the Market risk module
- The counterparty default risk module should cover the overall counterparty risk exposure of the insurer concerned to that counterparty irrespective of the legal form of the underlying contractual obligations

Counterparty default risk – SCR_{def}
Introduction

- Two types of exposures to be covered by the module and calculated separately
- Type 1 exposures: exposures which may not be diversified and counterparty is likely to be rated
  - reinsurance arrangements
  - securitisations and derivatives
  - other risk mitigating contracts
  - cash at bank
  - deposit with ceding institutions, provided the number of counterparties does not exceed a certain threshold
  - capital, initial funds, letters of credit and other commitments received which have been called up but still unpaid, if the number of counterparties does not exceed a certain threshold
  - guarantees, letters of credit, letters of comfort and other commitments which the undertaking has provided, and which depend on the credit standing of a counterparty

Counterparty default risk – SCR_{def}
Introduction

- Type 2 exposures: exposures which are usually diversified and counterparty is likely to be unrated
  - receivables from intermediaries
  - policyholder debtors
  - deposits with ceding institutions, if the number of counterparties exceeds a certain threshold
  - capital, initial funds, letters of credit and other commitments received which have been called up but still unpaid, if the number of counterparties exceeds a certain threshold
- Calculation of the aggregated SCR_{def}

$$SCR_{def} = \sqrt{SCR_{def,1}^2 + 1.5 \cdot SCR_{def,1} \cdot SCR_{def,2} + SCR_{def,2}^2}$$

where

$SCR_{def,1}$ = Capital requirement for counterparty default risk from type 1

$SCR_{def,2}$ = Capital requirement for counterparty default risk from type 2

Non-life

Non life risk module – non life underwriting risks

Underwriting risk relates to the uncertainty in results of the insurer's underwriting, including

- Amount and timing of the eventual claim settlements
- Volume of business to be written and the premium rates at which it will be written
- Premium rates which would be necessary to cover the liabilities created by the business written
- Decisions made by policyholders regarding renewal etc

Calculation

The capital charge for non-life underwriting risk is derived in two stages

Non life risk module – non life underwriting risks

Calculation of the SCR_{nl} – step 1

The capital charge for non-life underwriting risk is derived by combining the capital charges for the non-life sub-risks using a correlation matrix

$$SCR_{nl} = \sqrt{\sum CorrNL1^{rxcl} * NL_r * NL_c}$$

CorrNL1	$NL_{pr+lapse}$	*NL_CAT*
$NL_{pr+lapse}$	1	
NL_CAT	0.25	1

$$SCR_{nl} = \sqrt{\sum CorrNL2^{rxcl} * NL_r * NL_c}$$

CorrNL2	NL_{pr}	NL_{lapse}
NL_{pr}	1	
NL_{lapse}	0	1

NL_{pr} – premium and reserve risk

Calculation

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

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

Where

- V – volume measure
- σ – standard deviation of the underlying risk driver
- ρ(σ) – a function of the standard deviation, assuming a lognormal distribution of the underlying risk; ρ(σ) ≈ 3* σ
- $N_{0.995}$ – 99.5% quantile of the standard normal distribution

NL_{pr} – premium and reserve risk

The volume measure V and the standard deviation σ of the combined ratio for the overall non-life insurance portfolio are determined in two steps and done for each LoB as defined below:

LoB number	
1	Motor, third-party liability
2	Motor, other classes
3	Marine, aviation, transport (MAT)
4	Fire and other property damage
5	Third-party liability
6	Credit and suretyship
7	Legal expenses
8	Assistance
9	Miscellaneous
10	Non-proportional reinsurance – property
11	Non-proportional reinsurance – casualty
12	Non-proportional reinsurance – MAT

NL_{pr} – premium and reserve risk

Calculation – first step

Calculation of the volume measures and standard deviations for both premium risk and reserve risk per LoB, namely:

- $V_{(prem,lob)}$ = volume measure for premium risk
- $V_{(res,lob)}$ = volume measure for reserve risk
- $\sigma_{(prem,lob)}$ = standard deviation for premium risk
- $\sigma_{(res,lob)}$ = standard deviation for reserve risk

NL_{pr} – premium and reserve risk

Calculation – first step

$V_{(prem,lob)}$ = volume measure for premium risk

= max $(P_{lob}^{t,written}; P_{lob}^{t,earned}; P_{lob}^{t-1,written}) + C_{lob}^{PP}$

C_{lob}^{PP} =Expected present value of net claims and expense payments which relate to claims incurred after the following year and covered by existing contracts for each LoBs

Note, insurer can commit to no growth/restriction of premium.

$V_{(res,lob)}$ = volume measure for reserve risk

= net provision for claims outstanding in each LoB exclude risk margins

$= PCO_{lob}$

NL_{pr} – premium and reserve risk

Calculation – first step: volume measure and standard deviation per LoB

$\sigma_{(res,lob)}$ = standard deviation for reserve risk

$\sigma_{(prem,lob)}$ = standard deviation for premium risk

$$= \sqrt{c_{lob} \cdot \sigma^2_{(U,prem,lob)} + (1 - c_{lob}) \cdot \sigma^2_{(M,prem,lob)}}$$

Where:

c_{lob} = credibility factor for LoB

$\sigma_{(M,prem,lob)}$ = market-wide estimate of the standard deviation for premium risk

Long tailed business

N_{lob}	5	6	7	8	9	10	11	12	13	14	≥15
C	34%	43%	51%	59%	67%	74%	81%	87%	92%	96%	100%

Short tailed business

N_{lob}	5	6	7	8	9	≥10
C	34%	51%	67%	81%	92%	100%

NL_{pr} – premium and reserve risk

Calculation – first step: volume measure and standard deviation per LoB

$\sigma_{(res,lob)}$ = standard deviation for reserve risk

$\sigma_{(prem,lob)}$ = standard deviation for premium risk

$$= \sqrt{c_{lob} \cdot \sigma^2_{(U,prem,lob)} + (1 - c_{lob}) \cdot \sigma^2_{(M,prem,lob)}}$$

Where:

c_{lob} = credibility factor for LoB

$\sigma_{(M,prem,lob)}$ = market-wide estimate of the standard deviation for premium risk

$\sigma_{(U,prem,lob)}$ = undertaking-specific estimate of the standard deviation for premium risk (based on internal data)

$$\sigma_{(U,prem,lob)} = \sqrt{\frac{1}{(n_{lob} - 1) \bullet V_{(prem,lob)}} \bullet \sum_y P^y_{lob} \bullet \left(LR^y_{lob} - \mu_{lob}\right)^2}$$

LoB number	
1	Motor, third-party liability
2	Motor, other classes
3	Marine, aviation, transport (MAT)
4	Fire and other property damage
5	Third-party liability
6	Credit and suretyship
7	Legal expenses
8	Assistance
9	Miscellaneous
10	Non-proportional reinsurance – property
11	Non-proportional reinsurance – casualty
12	Non-proportional reinsurance – MAT

LOB	1	2	3	4	5	6	7	8	9	10	11	12
$\sigma_{(res,lob)}$	9,5%	10%	14%	11%	15,5%	20%	9%	11%	15%	20%	20%	20%
$\sigma_{(M,prem,lob)}$	10%	8,5%	18%	12,5%	15%	21,5%	6,5%	5%	13%	17,5%	17%	16%

NL_{pr} – premium and reserve risk

Calculation – second step: overall volume measures and standard deviation

Calculation of the overall volume measures and standard deviations for both premium risk and reserve risk

$$\sigma = \sqrt{\frac{1}{V^2} \cdot \left(\sum_{rxc} CorrLob^{rxc} \cdot a_r \cdot a_c \cdot V_r \cdot V_c \right)}$$

Geografic diversification included here

$CorrLob_{pr}$=	1	2	3	4	5	6	7	8	9	10	11	12
1: M (3rd party)	1											
2: M (other)	0,5	1										
3: MAT	0,5	0,25	1									
4: Fire	0,25	0,25	0,25	1								
5: 3rd party liab	0,5	0,25	0,25	0,25	1							
6: credit	0,25	0,25	0,25	0,25	0,5	1						
7: legal exp.	0,5	0,5	0,25	0,25	0,5	0,5	1					
8: assistance	0,25	0,5	0,5	0,5	0,25	0,25	0,25	1				
9: misc.	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	1			
10: reins. (prop)	0,25	0,25	0,25	0,5	0,25	0,25	0,25	0,5	0,25	1		
[illegible]												
12: reins. (MAT)	0,25	0,25	0,5	0,5	0,25	0,25	0,25	0,25	0,5	0,25	0,25	1

NL_{Lapse} – Lapse risk

•When assessing technical provisions, assumptions need to be made about the take up rate of options / guarantees etc that form part of future premiums.

•Typically, the inclusion of these future premiums will lead to a reduction in technical provisions, assuming that business is written on profitable terms.

•If actual take up rates were lower than expected, there would be a reduction in own funds compared to what was expected.

NL_{Lapse} – Lapse risk

The capital requirement for lapse risk should be calculated where the undertaking allows for future premiums in the calculation of technical provisions due to the existence of unilateral renewal options available to the policyholder.

$$Non\_Life_{lapse} = \max(Lapse_{down}; Lapse_{up})$$

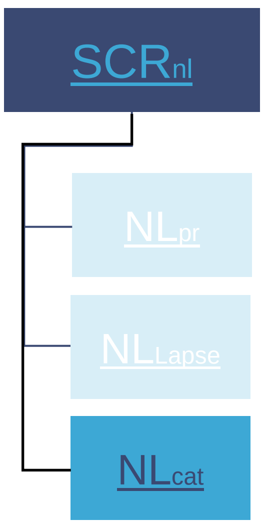
The capital requirement for the risk of a permanent decrease/ increase of lapse rates by 50% should be calculated as follows:

$$Lapse_{down} = \Delta NAV \mid lapseshock_{down}$$

$$Lapse_{up} = \Delta NAV \mid lapseshock_{up}$$

As for life underwriting risk, the amount is calculated at a total portfolio level and is not split by line of business

NL_{cat} – CAT risk
Introduction



CAT risks: extreme or irregular events not sufficiently captured by the charges for premium and reserve risk

Method 1: Standardised scenarios

Method 2: Factor based method

- Undertakings shall apply the factor based method in two cases:
  - When a standardized scenario is not relevant and a partial internal model is not proportionate
  - For the Miscellaneous line of business.

NL_{cat} – CAT Risk

Method 1: Catastrophe Standardised Scenarios

- NL_CAT_{NatCat} = Catastrophe capital charge for natural catastrophes net of risk mitigation
- $NL\_CAT_{Man\ made}$ = Catastrophe capital charge for man made net of risk mitigation

$$NL\_CAT = \sqrt{(NL\_CAT_{NatCat})^2 + (NL\_CAT_{Manmade})^2}$$

	Nat Cat	Man made
Nat cat	1	0
Man Made	0	1

NL_{cat} – CAT Risk

Calculating the natural Catastrophe Risk NL_CAT_{NatCat}

$$NL\_CAT_{NatCat} = \sqrt{\sum_{n\_peril,i,j} Corr_{i,j} * CAT_{n\_peril,i} * CAT_{n\_peril,j}}$$

$$CAT_{n\_peril} = \sqrt{\sum_{countries,i,j} Corr_{i,j} * CAT_{countries,i} * CAT_{countries,j}}$$

The correlation for windstorm between Denmark, Sweden and Norway is 0,5

	Windstorm	*Earthquake*	*Flood*	*Hail*
Windstorm	1			
Earthquake	0	1		
Flood	0.25	0	1	
Hail	0.25	0	0	1

NL$_{cat}$ – CAT Risk

Country	Windstorm	Earthquake	Flood	Hail
AT	complete	june	complete	june
BE	complete	june	complete	june
BG	n/a	complete	june	n/a
CR	n/a	complete	n/a	n/a
CY	n/a	complete	n/a	n/a
CZ	june	june	complete	n/a
CH	complete	june	june	june
DK	complete	n/a	n/a	n/a
EE	n/a	n/a	n/a	n/a
FI	n/a	n/a	n/a	n/a
FR	complete	june	june	june
DE	complete	june	complete	june
HE	n/a	june	n/a	n/a
HU	complete	june	complete	n/a
IS	june	n/a	n/a	n/a
IE	complete	n/a	n/a	n/a
IT	n/a	june	june	june
LV	n/a	n/a	n/a	n/a
LT	n/a	n/a	n/a	n/a
LU	complete	n/a	n/a	june
MT	n/a	n/a	n/a	n/a
NL	complete	n/a	n/a	june
NO	complete	n/a	n/a	n/a
PO	june	n/a	june	n/a
PT	n/a	complete	n/a	n/a
RO	n/a	complete	june	n/a
SK	june	complete	complete	n/a
SI	n/a	complete	june	n/a
ES	june	n/a	n/a	n/a
SE	complete	n/a	n/a	n/a
UK	complete	n/a	complete	n/a

*n/a = this means that the peril is not considered to be material compared to other perils for this particular member state.
*June: these countries will be complete by June. The CTF has already estimated the 1 in 200 LDR for all countries, so part of the process is already complete.

NL_{cat} – CAT Risk

Method 2: Factor Method

- The capital charge for the non-life CAT risk is determined as follows using the table on the next slide:

$$\sqrt{\left(\sum_{t \neq 3,4,10,12} (c_t \times P_t)^2 + (c_3 \times P_3 + c_{12} \times P_{12})^2 + (c_4 \times P_4 + c_{10} \times P_{10})^2 \right)}$$

NL_{cat} – CAT Risk

Events	Lines of business affected	Factor ct
Storm	Fire and property; Motor, other classes	175%
Flood	Fire and property; Motor, other classes	113%
Earthquake	Fire and property; Motor, other classes	120%
Hail	Motor, other classes	30%
Major fires, explosions	Fire and property	175%
Major MAT disaster	MAT	100%
Major motor vehicle liability disasters	Motor vehicle liability	40%
Major third party liability disaster	Third party liability	85%
Credit	Credit	139%
Miscellaneous	Miscellaneous	40%
NPL Property	NPL Property	250%
NPL MAT	NPL MAT	250%
NPL Casualty	NPL Casualty	250%

SCR life risk

Life risk – SCR_{life}
Introduction

- The life underwriting risk stresses are based on a delta-NAV
- The revaluation should allow for any relevant adverse changes in option take-up behaviour of policyholders in this scenario
- Where risk mitigation techniques, the scenarios required for the calculation of the life underwriting risk module will incorporate their effect
- This module is intended to cover underwriting risk for all life guarantees and is split into two sub-modules: life underwriting risk (excluding catastrophe risk) and catastrophe risk
- $Life_{UL/C}$ = Capital charge for life insurance obligations (excluding obligations stemming from catastrophe risk)
- $Life_{CAT}$ = Capital charge for life insurance obligations catastrophe risk
- SCR_{Life} = Capital charge for life underwriting risk

Life risk – SCR_{life}
Calculation method

$$SCR_{Life} = \sqrt{\sum_{rxc} CorrUL_{r,c} \bullet Life_r \bullet Life_c}$$

$CorrUL$	$Life_{UL/C}$	$Life_{CAT}$
$Life_{UL/C}$	1	
$Life_{CAT}$	0.25	1

Life risk – SCR_{life}
Calculation method

Correlation matrix - $CorrLife_{r,c}$

CorrLife	$Life_{mort}$	$Life_{long}$	$Life_{dis}$	$Life_{lapse}$	$Life_{exp}$	$Life_{rev}$	$Life_{CAT}$
$Life_{mort}$	1						
$Life_{long}$	´-0,25	1					
$Life_{dis}$	0.25	0	1				
$Life_{lapse}$	0	0.25	0	1			
$Life_{exp}$	0.25	0.25	0.5	0.5	1		
$Life_{rev}$	0	0.25	0	0	0.25	1	

Life risk – SCR_{life}
Calculation method

$$SCR_{life} = \sqrt{\left(\Sigma_{rxc}\ CorrLife^{rxc} \bullet Life_r \bullet Life_c \right)}$$

Where:

- SCR_{life} = Capital for life risk
- $CorrLife_{r,c}$ = The cells in the correlation matrix CorrLife
- $Life_r$, $Life_c$ = Capital requirement from the individuel sub-risks

Life risk – $Life_{mort}$

Scenario approach – $Life_{mort}$

Capital charge for mortality risk are the result of a mortality scenario, defined as follows:

$$Life_{mort}=\Sigma(\Delta NAV/mortshock)$$

ΔNAV are the change in the assets minus liabilities

Mortshock are a permanent 15% increase in the mortality rates for each age

Two options (chose one and apply to all calculations):

Option 1: Contracts where the death and survival benefits are contingent on the life of the same insured person should not be unbundled

Option 2: All contracts are unbundled

Life risk – $Life_{mort}$

Simple approach – $Life_{mort}$

Simplification when

- No significant change in the capital at risk over the policy term of the contract
- General criteria for simplifications are followed

- Mortality capital requirement = (Total capital at risk) * q(firm-specific) * n * 0.10 *(Projected Mortality Increase)

- Where
  - n = modified duration of liability cash-folws
  - q = expected deaths over the next year weighted by sum assured
  - Projected Mortality Increase = $1,1^{((n-1)/2)}$

Life risk – $Life_{long}$

Scenario approach – $Life_{long}$

Capital charge for longevity risk are the result of a longevity scenario, defined as follows:

$Life_{long}$ = Σi(Δ NAV | longevity shock)

Where

- i = each policy where the payment of benefits is contingent on longevity risk
- Δ *NAV* = The change in the net value of assets minus liabilitie*s*
- Longevity shock = A (permanent) 25% decrease in mortality rates for each age

Life risk – Life$_{long}$

Simple approach – Life$_{long}$

Simplification when

- No significant change in the capital at risk over the policy term of the contract
- General criteria for simplifications are followed

- Longevity capital requirement = 25% * q(firm-specific) * n * (best estimate provision for contracts subject to longevity risk) * (Projected Mortality Increase)

- Where
  - n = modified duration of liability cash-folws
  - q = expected deaths over the next year weighted by sum assured
  - Projected Mortality Increase = $1,1^{((n-1)/2)}$

Life risk – Life_{dis}

Scenario approach - Life_{dis}

$\text{Life}_{dis,trend} = \Sigma_i(\Delta\ NAV \mid dis\textit{shock})$

Where:

- i = each contract where the payments are dependent on the disability risk
- Δ *NAV* = Change in assets minus liabilities
- disshock= A (permanent) 50% increase in the disability rates for the next year, together with a (permanent) 25% increase (over best estimate) in disability rates for each age in following years + where applicable, a permanent decrease of 20% in disability recovery rates

Life risk – $Life_{dis}$

Simple approach – $Life_{dis}$

Simplification when

- No significant change in the capital at risk over the policy term of the contract
- General criteria for simplifications are followed
- Disability capital requirement = (total disability capital at risk)$_1$ * i(firm-specific)$_1$ * 0,50 + (total disability capital at risk)$_2$ * i(firm-specific)$_2$ * 0,25 * (Projected Disability Increase) * (n-1) + 20% * t * (Projected Disability Increase) * n * (BE provisions for contracts subject to disability claims),
  - n = modified duration of liability cash-folws
  - i_1,$i2_q$ = expected movements from healthy to sig over the first and second years respectively weighted by sum assured or annual payment
  - Projected Disability Increase = $1{,}1^{((n-1)/2)}$
  - t = Expected termination rate (sick to healthy/dead) over the next year

Life risk – $\text{Life}_{\text{lapse}}$

Introduction

- The revaluation of technical provisions should allow for relevant adverse changes in option take-up behavior of policyholders under the specified scenario
- In relation to the policyholder options that the lapse sub-module covers, a comprehensive approach should be taken. Ideally, the module should take account of all legal or contractual policyholder options which can significantly change the value of the future cash-flows. This includes options to fully or partly terminate, decrease, restrict or suspend the insurance cover as well as options which allow the full or partial establishment, renewal, increase, extension or resumption of insurance cover

Life risk – $\text{Life}_{\text{lapse}}$

Scenario approach - $\text{Life}_{\text{lapse}}$

$\text{Life}_{\text{lapse}} = \max(\text{Lapse}_{\text{down}}; \text{Lapse}_{\text{up}}; \text{Lapse}_{\text{mass}})$

$\mathit{Life}_{\text{lapse}}$	=	*Capital requirement for lapse risk*
$\mathit{Lapse}_{\text{down}}$	=	*Capital requirement for the risk of a permanent decrease of the rates of lapsation*
$\mathit{Lapse}_{\text{up}}$	=	*Capital requirement for the risk of a permanent increase of the rates of lapsation*
$\mathit{Lapse}_{\text{mass}}$	=	*Capital requirement for the risk of a mass lapse event*

- Capital requirements for the three sub-risks should be calculated based on a policy-by-policy comparison of surrender value and best estimate provision

Life risk – $\text{Life}_{\text{lapse}}$

Scenario approach - $\text{Life}_{\text{lapse}}$

$\text{Lapse}_{\text{down}} = \Delta\, NAV \mid \text{lapses}hock_{\text{down}}$

- $\Delta\, NAV$ = Change in assets minus liabilities

$Lapseshock_{\text{down}}$ = Reduction of 50% in the assumed option take-up rates in all future years for all policies without a positive surrender strain or otherwise adversely affected by such risk. Affected by the reduction are options to fully or partly terminate, decrease, restrict or suspend the insurance cover. Where an option allows the full or partial establishment, renewal, increase, extension or resumption of insurance cover, the 50% reduction should be applied to the rate that the option is not taken up. The shock should not change the rate to which the reduction is applied to by more than 20% in absolute terms

Life risk – $\text{Life}_{\text{lapse}}$

Scenario approach - $\text{Life}_{\text{lapse}}$

$\text{Lapse}_{\text{up}} = \Delta\, NAV \mid \text{lapse}\,shock_{\text{up}}$

- $\Delta\, NAV$ = Change in assets minus liabilities

$Lapseshock_{\text{up}}$ = Increase of 50% in the assumed option take-up rates in all future years for all policies with a positive surrender strain or otherwise adversely affected by such risk. Affected by the increase are options to fully or partly terminate, decrease, restrict or suspend the insurance cover. Where an option allows the full or partial establishment, renewal, increase, extension or resumption of insurance cover, the 50% increase should be applied to the rate that the option is not taken up. The shocked rate should not exceed 100%.

Life risk – $Life_{lapse}$

Scenario approach - $Life_{lapse}$

$Lapse_{mass}$

- The capital requirement for the risk of a mass lapse event $Lapse_{mass}$ *should be defined as 30% of the sum of surrender strains over the policies where the surrender strain is positive*

- For non-retail business, the capital requirement for the risk of a mass lapse event $Lapse_{mass}$ *should be defined as 70% of the sum of surrender strains over the policies where the surrender strain is positive*

Life risk – $Life_{lapse}$

Simple approach – $Life_{lapse}$

Simplification when

- No significant change in the capital at risk over the policy term of the contract
- General criteria for simplifications are followed

$Lapse_{down} = 50\% * l_{down} * n_{down} * S_{down}$

$Lapse_{up} = 50\% * l_{up} * n_{up} * S_{up}$

where

l_{down}; l_{up} = estimate of the average rate of lapsation of the policies with a negative/positive surrender strain

n_{down} ; n_{up} = average period (in years), weighted by surrender strains, over which the policy with a negative/positive surrender strain runs off

S_{down} ; S_{up} = sum of negative/positive surrender strains

Life risk – Life_{exp}

Scenario approach

$\text{Life}_{exp} = (\Delta\ NAV \mid \text{exp}shock)$

Where:

- $\Delta\ NAV$ = Change in assets minus liabilities
- *Expshock* = Increase of 10% in future expenses compared to best estimate anticipations, and increase by 1% per annum of the expense inflation rate compared to anticipations

Life risk – $Life_{exp}$

Simple approach – $Life_{exp}$

Simplification when

- No significant change in the capital at risk over the policy term of the contract
- General criteria for simplifications are followed

$Life_{exp}$ = (renewal expenses in the 12 months prior to valuation date) * n(exp) * 10% + (renewal expenses in the 12 months prior to valuation date) * (1/k * $((1+k)^{n(exp)} – 1)$ -1/i * $((1+i)^{n(exp)} – 1)$)

where

n(exp) = average (in years) period over which the risk runs off, weighted by renewal expenses

i = Expected inflation rate (i.e. inflation assumption applied in calculation of best estimate)

k = Stressed inflation rate (i.e. i + 1%)

Life risk – Life_{rev}

Scenario approach

$\text{Life}_{rev} = (\Delta\ NAV \mid \text{rev shock})$

Where:

- $\Delta\ NAV$ = Change in assets minus liabilities
- *Revshock*= Increase of 3% in the annual amount payable for annuities exposed to revision risk. The impact should be assessed considering the remaining run-off period.
- Should only be applied to:
  - Annuities arising from non-life claims
  - Benefits that can be approximated by a life annuity arising from non-life claims

Life risk – Life_{CAT}
Scenario approach

$\text{Life}_{CAT} = (\Delta\ NAV \mid \text{life CATshock})$

- The capital requirement should be calculated as the change in net asset value (assets minus liabilities) following an absolute increase in the rate of policyholders dying over the following year of 1.5 per mille

- Catastrophe risk stems from extreme or irregular events whose effects are not sufficiently captured in the other life underwriting risk sub-modules. Examples could be a pandemic event or a nuclear explosion
- Catastrophe risk is mainly associated with products (such as term assurance, critical illness or endowment policies) in which a company guarantees to make a single or recurring & periodic series of payments when a policyholder dies

Life risk – Life$_{CAT}$
Simple approach

Calculation

$$Life_{CAT} = \sum_i 0.0015 \bullet Capital\_at\_Risk$$

where the subscript i denotes each policy where the payment of benefits (either lump sum or multiple payments) is contingent on either mortality or disability, and where Capital_at_Risk is determined as

$$Capital\_at\_Risk = \sum_i (SA_i + AB_i \bullet Annuity\_factor - TP_i)$$

TP = Best estimate provision (net of reinsurance) for each policy

SA = For each policy *i: where benefits are payable as a single lump sum, the Sum Assured (net of reinsurance) on death or disability. Otherwise, zero*

AB = For each policy *i: where benefits are not payable as a single lump sum, the Annualised amount of Benefit (net of reinsurance) payable on death or disability. Otherwise, zero*

Annuity_factor = Average annuity factor for the expected duration over which benefits may be payable in the event of a claim

Use of Undertaking Specific Parameters (USP)

Use of USP
General provisions

- The following parameters in the life, non-life and health underwriting modules used in the Standard formula may be replaced by USP
  - NL premium and reserve risk parameters, i.e. standard deviation of premium risk $\sigma_{prem,\ LoB}$ and standard deviation of reserve risk $\sigma_{res,\ LoB}$ per LoB
  - NSLT health premium and reserve risk parameters, i.e. standard deviation of premium risk $\sigma_{prem,\ LoB}$ and standard deviation of reserve risk $\sigma_{res,\ LoB}$ per LoB
  - SLT health revision risk, i.e. standard parameter of revision shock in Revision risk
  - Life revision risk in the Life underwriting risk module, i.e. standard parameter of revision shock in Revision risk
- Use of USP allowed, provided that supervisory **approval** received

Use of USP

Requirements for supervisory approval

- Standard formula parameters do not appropriately reflect the undertaking risk profile and implementation of USP leads to a more appropriate reflection of risks
- Data used for calibration of the USP including the qualitative adjustments made meet the data quality requirements (completeness, accuracy and appropriateness)
- No “cherry-picking”
- The undertaking provides the results for at least two of the methods included below
- Calibration of the USP has followed the standardised methods and meets the following criteria
  - Risks covered by the USP are conceptually the same as those covered by the Standard formula
  - The assumptions underlying the standard formula parameters and the USP are equivalent
  - The standardised methodology provided should enable robust and reliable estimation of the USP
  - Data used in the USP meets the data quality requirements

Use of USP

Requirements on data used for calibration of USP

- Link to former (CEIOPS) CP 43 for definition of data quality
- Data used for the calibration of USP parameters should meet the following criteria
  - Compliance with the CEIOPS' Advice on data quality
  - Relevant internal and external data (incl. pooled data, see next slide) may be used
  - Data used should be consistent with the underlying assumptions of the standardised methodology
  - Data used by the undertaking can be easily integrated in the proposed standardised methodology
  - The estimation error resulting of using the data shall not imply that data is inappropriate
  - Data is consistent with the expected conditions in the following year
  - All adjustments to data must be documented and should only be done to make the data more relevant and appropriate
  - Any bias in the data should be taken into account and its impact analysed

Use of USP

Requirements on data used for calibration of USP (cont.)

- If criteria on data quality not met but it's expected that undertaking will be in line with them when Solvency 2 enter into force, calculations might be carried out with additional qualitative explanation on the conditions neglected
- Examples of unsatisfactory data quality
  - Low claim frequency due to small portfolio
  - Data stemming from a time point before significant change in conditions
  - New business and no suitable external data
  - No reliable data collection process
- Limitation with respect to availability of best estimate data in the format required to estimate the USP
  - Examples: BE not calculated in the past, BE not discounted in line with the S2 requirements, degree of rigour and consistency lower than under S2 expected
  - Where no BE has been calculated in the past and not possible BE to be reproduced by the history, justification of the data used should be done by the undertaking
  - Estimations can be done on an underwriting year basis if no historical data on accident year basis and results of both approaches not materially different

Use of USP

Additional requirements on pooled data used for calibration of USP

- Governance of pooling mechanism and data base established
- Pooling mechanism is transparent and auditable
- Data management shall ensure that data provided by different pool members are sufficiently comparable, e.g. collection, definition, assessment, adjustment
- Pool consists of undertakings which have similar risk profile
  - Undertakings have similar risk profile and nature of business
  - No inclusion of undertakings with different legal structure if this could compromise the degree of homogeneity in data
  - Pool data shall be based on data gross of reinsurance
  - Appropriate data adjustments may be needed to take account of the size of a particular undertaking

Use of USP
Standardised methods to calculate USP
Revision risk – introduction

- Relevant only for annuities
- Risk of the adverse variation of the annuity's amount due to unanticipated revision of the claims process
- USP shock only restricted to **workers' compensation** or to **annuities not subject to significant inflation risk** (due to assumption that number and severity of revisions are independent; this is not fulfilled when significant dependence on inflation)
- Consider only those policies for which revision is possible to occur during the next year (where legal or other eligibility restriction, exclusion of such policies from the scope)
- All those benefits that can be approximated to annuities (except of those which are fixed or known with certainty) are subject to revision risk
- Use of time series of annual amounts of individual annuities (**life assistance benefits**) in payment in consecutive years, during the time horizon in which they are subject to revision risk

Use of USP
Standardised methods to calculate USP
Revision risk - data

Input data

μ_X: historical average relative change of individual annuities (or life assistance benefits)

σ_X: historical standard deviation of relative change of individual annuities (or life assistance benefits), estimated by means of the standard estimator

E(N): estimate of percentage of individual annuities (or life assistance benefits) for which a revision process is possible to occur during the forthcoming year

σ_N: historical standard deviation of percentage of individual annuities (or life assistance benefits) for which a revision process occurred, estimated by means of the standard estimator

Use of USP
Standardised methods to calculate USP
Revision risk - calculation

- For each calendar year t identify the set of annuities exposed to revision risk during the whole year (annuities entered or exited the books during the period should be excluded)
- Statistical fitting to these sets of observations of a theoretical probability distribution to the relevant random variable ***Rev*** describing the one-year %-change in the annual amount of annuities at the portfolio level
- Validation of the goodness-of-fit and assumptions (particular attention to the distribution tails)
- Calculate mean and standard deviation of ***Rev***
- The size of the shock is than the difference between $VaR_{99,5\%}$ and the average of ***Rev*** divided by the average

Use of USP

Standardised methods to calculate USP

Revision risk – calculation (cont.)

- $$\mathrm{Re}\,v = \sum_{i=1}^{N} X_i$$

  $N|\Theta \sim \mathrm{NB}\,(a(\Theta),\, q(\Theta))$

  $X_i|\Theta \sim \mathrm{LN}(\mu(\Theta),\sigma(\Theta))$

  $\overline{\mathrm{Re}\,v} = \mu_X E(N)$ - the averege of the distribution,

  $VaR_{0.995}(\mathrm{Re}\,v) = f(\mu_X, \sigma_X, E(N), \sigma_N)$.

- $VaR_{99,5\%}$(Rev) is calculated using simulation
- Simulate one number n_j from NB(E(N); σ_N)
- Simulate n_j numbers for x_i from LN(μ_X; σ_X)
- Calculate Rev_j = sum(x_i) for i = 1 … n_j
- Repeat above steps 50.000 times and derive $VaR_{99,5\%}$(Rev)

Use of USP

Standardised methods to calculate USP
Revision risk – additional data requirements

- Goodness-of-fit and assumptions to the sets of observations are considered to be satisfactory
- Number of historical years and number of annuities within each year are sufficiently large
- Mix of types of annuities is comparable across the different years and representative for the current portfolio
- No structural changes in the environment which could lead to significant change in the behaviour of the revision risk drivers (e.g. change in legislation) in the past and in comparison with next year

Minimum Capital Requirement (MCR)

MCR
Introduction

- Requirements laid down in Article 129 of the Directive
- Calculated MCR is a combination of
  - Linear formula with a floor of 25% and a cap of 45%
  - Absolute floor

    a) 2.200.000 € for non-life insurance undertakings including captives and at least 3.200.000 for risks attributable to Motor vehicle liability, Aircraft liability, Liability for ships, General liability, Credit and Suretyship

    b) 3.200.000 € for life insurance undertakings including captives

    c) 3.200.000 € for reinsurance undertakings, except of reinsurance captives in which case MCR should be at least 1.000.000 €

    d) the sum of the amounts as set in a) and b) for “old composite undertakings” (Article 73(5))
- Calculation of notional Non-life and Life MCR for composite undertakings

MCR
Input required and derived figures

- MCR_A = linear formula component for non-life insurance – activities on NL technical basis
- MCR_B = linear formula component for non-life insurance – activities on Life technical basis
- MCR_C = linear formula component for Life insurance – activities on Life technical basis
- MCR_D = linear formula component for Life insurance – supplementary NL activities
- SCR = SCR for the undertaking
- AMCR = absolute floor of the MCR
- $MCR_{linear} = MCR_A + MCR_B + MCR_C + MCR_D$
- $MCR_{combined} = \min\{\max[MCR_{linear}; 0,25.SCR]; 0,45.SCR\}$
- $MCR = \max\{MCR_{combined}; AMCR\}$

MCR
Linear formula calculation

- General considerations
  - Items referred to in the linear formula should be allocated between the components $MCR_{A/B/C/D}$ without double counting
  - The technical provision (TP) net of reinsurance per LoB j is the difference between the gross TP and the reinsurance recoverables which should not include recoverables from finite reinsurance (TP_j)
  - Premiums net of reinsurance are the premiums written in each LoB over the last 12 months less the reinsurance premiums which should not include payments of reinsurance premiums for finite reinsurance (P_j)
  - The TP volume measure does not include risk margin

MCR
Linear formula calculation

- Calculation of MCR_A for NL business – activities on a NL technical basis

$MCR_A = \sum max(\alpha_j \,.\, TP_j;\, \beta_j \,.\, P_j)$ over all LoB j

j	LoB	αj	βj
A.1	Motor vehicle liability	12%	14%
A.2	Mother, other	15%	10%
A.3	MAT	21%	27%
A.4	Fire & other property damage	15%	18%
A.5	3rd party liability	19%	21%
A.6	Credit and suretyship	30%	33%
A.7	Legal expenses	11%	10%
A.8	Assistance	15%	6%
A.9	Miscellaneous	24%	19%
A.10	NP reins – property	30%	24%
A.11	NP reins – casualty	30%	22%
A.12	NP reins – MAT	30%	20%
A.13	Accident	21%	15%
A.14	Sickness	15%	12%
A.15	Workers compensation	15%	7%

MCR
Linear formula calculation

- Calculation of MCRB for NL business – activities technically similar to Life

  The approach used for the calculation of MCRC should be applied

- Calculation of MCRC for Life business – activities on a Life technical basis

$$MCR_C = \max\{\alpha_{C.1.1} \cdot TP_{C.1.1} + \alpha_{C.1.2} \cdot TP_{C.1.2};\ WP\_floor \cdot TP_{C.1.1}\} + \\ + \sum_{j \in \{C.2.1, C.2.2, C.3\}} \alpha_j \cdot TP_j + \alpha_{C.4} \cdot CAR.$$

where

CAR = Capital at risk

WP_floor = 1,9%

Index j	Segment	αj
	Contracts with profit participation clauses:	
C.1.1	TP for guaranteed benefits	6,1%
C.1.2	TP for future discretionary benefits	-11%
	Contracts where the policyholder bears the investment risk:	
C.2.1	TP for contracts w/o guarantees	0,6%
C.2.2	TP for contracts with guarantees	2,2%
	Contracts without profit participation clauses:	
C.3	TP for contracts w/o profit participation clauses	3,5%
	Capital at risk	
C.4	CAR for all contracts	0,1%

MCR
Linear formula calculation

- Calculation of MCR_D for Life business – activities on NL technical similar basis

  The approach used for the calculation of MCR_A should be applied

- Calculation of notional MCR (NMCR) of composite insurers
  - $NMCR_{linear\_NL} = MCR_A + MCR_B$
  - $NMCR_{linear\_life} = MCR_C + MCR_D$
  - $NSCR_{NL} = SCR.(NMCR_{linear\_NL}/MCR_{linear})$
  - $NSCR_{Life} = SCR.(NMCR_{linear\_Life}/MCR_{linear})$

  Notional combined NMCR
  - $NMCR_{combined\_NL} = \min\{\max[NMCR_{linear\_NL};0,25.NSCR_{NL}];0,45.NSCR_{NL}\}$
  - $NMCR_{combined\_Life} = \min\{\max[NMCR_{linear\_Life};0,25.NSCR_{Life}];0,45.NSCR_{Life}\}$

  Notional MCR of composite insurance undertakings
  - $NMCR_{NL} = \max\{NMCR_{combined\_NL}; AMCR_{NL}\}$
  - $NMCR_{Life} = \max\{NMCR_{combined\_Life}; AMCR_{Life}\}$

Own funds

Own funds
Introduction

- QIS5 specifications regarding own funds are designed for the purpose of QIS5 and do not necessary reflect the final implementation measures for Solvency 2
- Reconciliation reserve included in Tier 1 basic own funds

Own funds

Classification of own funds in Tiers – Tier 1 Basic own funds

- Tier 1 Basic own funds items

  Excess of assets over liabilities and subordinated liabilities

  - Paid up and called up common equity
  - Initial fund, members' contributions or equivalent for mutual undertakings less the items of the same held by the undertaking
  - Share premium account
  - Reserves, being
    - retained earnings
    - other reserves
    - reconciliation reserves
  - Surplus funds under Article 91(2)
  - Deferred tax assets that the undertaking shall not use within the following 12 months and which cannot be transferred to another entity
  - Other paid in capital instruments
    - preference shares
    - subordinated liabilities
    - subordinated mutual member accounts
  - The excess of assets over liabilities and subordinate liabilities should be reduced by adjustments in respect of reserves the use of which is restricted, participations in credit and financial institutions, ring fenced funds and deferred tax assets not to be used in the next 12 months

Own funds

Classification of own funds in Tiers – Tier 1 Basic own funds

- Criteria for classification in Tier 1 Basic own funds
  - Item is most deeply subordinated or if paid in capital instrument, senior only to the most deeply subordinated item in a winding up
  - Item will not cause or accelerate insolvency of the undertaking
  - Item is fully paid in and immediately available to absorb losses
  - Item absorbs losses at least when undertaking breaches the SCR
  - Item is undated or has a maturity of at least 10 years
  - Item is only repayable or redeemable at the option of the undertaking, subject to approval by the supervisory authority and includes no incentives to redeem/repay
  - Item provides for the suspension of the repayment/redemption if insurer breaches the SCR or would breach it if repaid/redeemed
  - Undertaking has full discretion over payment of coupon/dividend or similar
  - In the case of other paid in capital instrument, the item must provide for the cancellation of coupon/dividend if undertaking would breach SCR
  - Where undertaking exercises its discretion or is required to cancel a coupon/dividend payment, there must be no requirement or entitlement to settle that payment at a future date
  - Item must be free of any encumbrance and must not be connected to any transaction which could undermine the characteristics of the item

Own funds

Classification of own funds in Tiers – Tier 1 Basic own funds

- Participations/subsidiaries included in the scope of Group supervision
  - Participations in financial and credit institutions should be excluded from own funds
  - Related undertakings where investment is of strategic nature are subject to specific equity risk charge
  - Other related undertakings are subject to standard equity risk charge
- Participations/subsidiaries excluded from the scope of Group supervision or deducted from the own funds eligible for the Group solvency purposes
  - Financial and credit institutions should be excluded from own funds
  - Other related undertakings are subject to market risk charge

Own funds

Classification of own funds in Tiers – Tier 2 Basic own funds

- Tier 2 Basic own funds items
  - Following items excluded from Tier 1 provided that they meet the criteria as set below
    - Called up ordinary share capital
    - Other capital instruments
  - Criteria for classification of own funds in Tier 2
    - The item must rank after the claims of all policyholders, beneficiaries and non-subordinate creditors
    - Capital instruments that are called up but not paid up should meet the criteria for Tier 1
    - Item will not cause or accelerate the insolvency of the undertaking
    - Item is undated or has a maturity of at least 5 years
    - Item is only repayable or redeemable at the option of the undertaking , subject to approval by the supervisory authority and can include moderate incentive to redeem/repay
    - Item must provide for the suspension of repayment/redemption if the insurer breaches or would breach its SCR
    - Item must provide for the deferral of payments of interest or dividends or other similar payments if the undertaking breaches/would breach the SCR
    - Item should be free of any potential encumbrance and must not be connected with other transactions which could undermine its characteristics

Own funds

Classification of own funds in Tiers – Tier 3 Basic own funds

- Tier 3 Basic own funds items
  - Following items should be classified as Tier 3
    - Deferred tax assets that the undertaking shall not use within the following 12 months and which cannot be transferred to another entity
    - Other capital instruments including preference shares, subordinated mutual members accounts and subordinated liabilities
  - Items not classified as Tier 1 and Tier 2 shall be classified as Tier 3 provided that they meet the following criteria
    - The item must rank after the claims of all policyholders, beneficiaries and non-subordinate creditors
    - Item will not cause or accelerate the insolvency of the undertaking
    - Item is undated or has a maturity of at least 3 years
    - Item must provide for the suspension of repayment/redemption if the insurer breaches or would breach its SCR
    - Item must provide for the deferral of coupon or dividends if the undertaking breaches/would breach its MCR
    - Item should be free of any potential encumbrance and must not be connected with other transactions which could undermine its characteristics

Own funds

Classification of own funds in Tiers – Tier 2/3 Ancillary own funds

- Ancillary own funds = items of capital other than basic own funds which can be called up to absorb losses and have not been classified as basic own funds
- Tier 2 ancillary own funds
  - Unpaid share capital or initial fund that has not been called up
  - Letters of credit or guarantees
  - Other legally binding commitments received by insurance undertakings
- The amount of Tier 2 ancillary own funds for QIS5 purposes should be that which is currently recognised or approved for the Solvency 1 regime
- Tier 3 ancillary own funds
  - Arrangements currently eligible for the available solvency margin but which would constitute ancillary own funds under Solvency 2 and which would not be eligible as Tier 2 ancillary own funds

Own funds
Eligibility of own funds

- To meet the SCR
  - The proportion of the Tier 1 items must be at least 50% of the SCR
  - The amount of the Tier 3 items must be less than 15% of the SCR
- To meet the MCR
  - Only Tier 1 items and Tier 2 basic own funds items are eligible
  - At least 80% of the MCR shall be met by Tier 1 items
  - Tier 3 basic own funds items and ancillary own fund items are not eligible for the MCR
- In addition, other paid in instruments shall not be greater than 20% of the total Tier 1 own funds