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## Consultation Paper No. 77

**Draft CEIOPS' Advice for  
Level 2 Implementing Measures on  
Solvency II:  
SCR standard formula  
Article 109 j  
Simplified calculations in the standard  
formula**

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# 1. Introduction

- 1.1. In its letter of 19 July 2007, the European Commission requested CEIOPS to provide final, fully consulted advice on Level 2 implementing measures by October 2009 and recommended CEIOPS to develop Level 3 guidance on certain areas to foster supervisory convergence. On 12 June 2009 the European Commission sent a letter with further guidance regarding the Solvency II project, including the list of implementing measures and timetable until implementation.<sup>1</sup>
- 1.2. This consultation paper aims at providing advice with regard to simplified methods and techniques to calculate technical provisions in order to ensure that actuarial and statistical methodologies are proportionate to the nature, scale and complexity of the risks, as requested in Article 85(h) of the Level 1 text.<sup>2</sup>
- 1.3. In view of the importance of the principle of proportionality with regard to the use of simplified methods, the paper first considers how an assessment of proportionality should be carried out in the context of the calculation of the Solvency Capital Requirement using the standard formula
- 1.4. The paper lists the simplifications used in QIS4 and evaluates their appropriateness in the light of the advices given on implementing measures.
- 1.5. As the typology for health insurance has been changed, new simplifications (in line with those that apply for life insurance) have been introduced.

## 2. Extract from Level 1 Text

### Legal basis for the implementing measure

- 2.1. Reference for the advice presented in this paper is Article 109 (j) of the Level 1 text:

Article 109 - Implementing measures

*In order to ensure that the same treatment is applied to all insurance and reinsurance undertakings calculating the Solvency Capital Requirement on the basis of the standard formula, or to take account of market developments, the Commission shall adopt implementing measures laying down the following:*

*"(j) the simplified calculations provided for specific sub-modules and risk modules, as well as criteria that insurance and reinsurance undertakings, including captive insurance and reinsurance undertakings, shall be required to meet in order to be entitled to use each of these simplifications, as set in article 108"*

Article 108 - Simplifications in the standard formula

*Insurance and reinsurance undertakings may use a simplified calculation for a specific submodule or risk module where the nature, scale and complexity of the risks they face justifies it and where it would be disproportionate to require*

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<sup>1</sup> See <http://www.ceiops.eu/content/view/5/5/>

<sup>2</sup> Text adopted by the European Parliament on 22 April 2009.

*all insurance and reinsurance undertakings to apply the standardized calculation.*

*Simplified calculations shall be calibrated in accordance with Article 101 (3).*

#### Article 101 - Calculation of the Solvency Capital Requirement

*"(3) The Solvency Capital Requirement shall be calibrated so as to ensure that all quantifiable risks to which an insurance and reinsurance undertaking is exposed are taken into account. It shall cover existing business, as well as the new business expected to be written over the next twelve months. With respect to existing business, it shall cover unexpected losses only.*

*It shall correspond to the Value-at-Risk of the basic own funds of an insurance or reinsurance undertaking subject to confidence level of 99.5% over a one-year period.*

### **Other relevant Level 1 text - Recitals**

2.2. The following Recitals explicitly refer to the principle of proportionality:

*(14) [...] In order to ensure the effectiveness of the supervision all actions taken by the supervisory authorities should be proportionate to the nature and the complexity of the risks inherent to the business of an insurance or reinsurance undertaking, regardless of the importance of the undertaking concerned for the over-all financial stability for the market.*

*(14a) The new solvency regime should not be too burdensome for small and medium-sized insurance undertakings. One of the tools to achieve this objective is a proper application of the proportionality principle. This principle should apply both to the requirements on the insurance and reinsurance undertakings and on the exercise of supervisory powers.*

*(14b) In particular, the new solvency regime should not be too burdensome for insurance undertakings who specialise in providing specific types of insurance or providing services to specific customer segments, and it should recognise that specialising in this way can be a valuable tool for efficiently and effectively managing risk. [...]*

*(14c) The new solvency regime should also take account of the specific nature of captive insurance and reinsurance undertakings. As those undertakings only cover risks associated with the industrial or commercial group to which they belong, appropriate approaches should thus be provided in line with the principle of proportionality to reflect the nature, scale and complexity of their business.*

*(92) [...] In accordance with the principle of proportionality, as set out in that Article, this Directive does not go beyond what is necessary in order to achieve those objectives.*

2.3. The following Recital explicitly refers to the valuation of the Solvency Capital Requirement under the standard formula using simplified approaches:

*(39) In order to reflect the specific situation of small and medium sized undertakings, simplified approaches to the calculation of the Solvency Capital Requirement in accordance with the standard formula should be provided for.*

2.4. With regard to the principle of proportionality, Article 28 stipulates that this is fundamental to all requirements in the Level1 text:

Article 28 - General principles of supervision

"[...]

*3. Member States shall ensure that the requirements laid down in this Directive are applied in a manner which is proportionate to the nature, complexity and scale of the risks inherent in the business of an insurance or reinsurance undertaking.*

*3a. The Commission shall ensure implementing measures include the principle of proportionality, thus ensuring the proportionate application of the Directive, in particular to very small insurance undertakings."*

## 3. Advice

### 3.1 Previous advice

- 3.1 In its advice to the European Commission on the Principle of Proportionality in the Solvency II Framework Directive Proposal (CEIOPS–DOC–24/08, May 2008), CEIOPS analysed the interpretation of the proportionality principle as well as its application to the SCR standard formula.

### 3.2 Specification of simplified methods on Level 2

- 3.2 Article 109 (j) of the Level 1 text states that:

*"In order to ensure that the same treatment is applied to all insurance and reinsurance undertakings calculating the Solvency Capital Requirement on the basis of the standard formula, or to take account of market developments, the Commission shall adopt implementing measures laying down the following:*

*"(j) the simplified calculations provided for specific sub-modules and risk modules, as well as criteria that insurance and reinsurance undertakings, including captive insurance and reinsurance undertakings, shall be required to meet in order to be entitled to use each of these simplifications, as set in article 108"*

- 3.3 It is therefore necessary to consider:
- the circumstances under which simplified calculations could be used by the insurance and reinsurance undertakings; and
  - the simplified calculations per sub-module and risk module.
- 3.4 This Draft Advice is based in particular on the simplifications of the SCR tested in QIS4 and the experience and feedback gained in the exercise.

### 3.3 Proportionality

- 3.5 According to Article 108, *"...insurance and reinsurance undertakings may use a simplified calculation for a specific sub-module or risk module where the nature, scale and complexity of the risks they face justifies it and where it would be disproportionate to require all insurance and reinsurance undertakings to apply the standardized calculation"*.
- 3.6 This section develops considerations on the assessment of the proportionality of use of specific simplified calculations relative to the nature, scale and complexity of the risks faced by the undertaking and underlying the SCR sub-module or module for which the simplified calculation is contemplated.
- 3.7 A thorough presentation on these issues in the context of simplified methods and techniques to calculate technical provisions (Article 85 h) has been developed by CEIOPS in its CP 45.
- 3.8 It is important to note that the main concepts used to assess the nature, scale and complexity of risks in the context of the calculation of the technical provisions, are the same that are used in the context of the calculation of the SCR, but they should be adapted according to the purpose of the calculation

and the scope the risks which clearly differ. The best estimate of insurance obligations describes an average situation whereas the SCR captures extreme outcomes of the future. Moreover, in the context of the calculation of the SCR, the scope of the risks considered are those which have an impact on the level of the own funds of the undertaking, while the technical provisions only take into account risks that affect the undertaking's insurance obligations.

3.9 Two steps will be considered below:

- 1) Assessing the nature, scale and complexity of the risks
- 2) Assessing whether the application of the simplification is proportionate in this context

### ***Step 1: Assessing the nature, scale and complexity of the risks***

3.10 In elaborating the assessment of the nature, scale and complexity of the risks faced by an undertaking and underlying a specific sub module or module where a simplified calculation could be applied, this section analyses:

- the scope of risks to be considered;
- the interpretation of the three indicators "nature", "scale" and "complexity"; and
- the combination of the three indicators in an overall assessment.

#### *a) Which risks?*

3.11 For an assessment of nature, scale and complexity it is important to clarify the scope of risks which shall be included in the analysis. We note that this scope will depend on the purpose and context of the assessment: as mentioned above, in the context of the calculation of the SCR, the scope of the assessment is relative to the risk underlying the sub-module or module considered, insofar as it impacts the level of the own funds of the insurer.

3.12 Therefore the assessment of the proportionality of the use of SCR simplifications is not performed by an undertaking once and for all the SCR sub-modules and modules, but on a sub-module by sub-module basis, and should be repeated for each instance where the undertaking would consider using another simplified calculation for another sub-module/module.

#### *b) Nature and complexity*

3.13 Nature and complexity of risks are closely related, and for the purposes of an assessment of proportionality could best be characterised together. Indeed, complexity could be seen as an integral part of the nature of risks, which is a broader concept.<sup>3</sup>

3.14 As the assumption behind each SCR sub-module/module is that the underlying risk can be mathematically modelled, in mathematical terms, the nature of the risks underlying a sub-module/module could be described by a probability distribution of a random variable representing the impact of the underlying risk on the own funds of the undertaking.

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<sup>3</sup> I.e. whether or not a risk is complex can be seen as a property of the risk which is part of its nature.

- 3.15 The complexity of risks can be described in general terms as the quality of being intricate (i.e. of being “entwined” in such a way that it is difficult to separate them) and compounded (i.e. comprising a number of different sub-risks or characteristics).
- 3.16 For example, in the non-life underwriting risk module, insurance travel business typically has relatively stable and narrow ranges for expected future claims, so would tend to be rather predictable. In contrast, credit insurance business would often be “fat tailed”, i.e. there would be the risk of occasional large (outlier) losses occurring, leading to a higher degree of complexity and uncertainty of the risks. Another example in non-life insurance is catastrophe (re)insurance covering losses from hurricanes where there is very considerable uncertainty over expected losses, i.e. how many hurricanes occur, how severe they are and whether they hit heavily insured areas.
- 3.17 In market risk, the nature and complexity of the risks would for example be impacted by the nature of the financial assets held by the insurer: The complexity of sophisticated derivatives widely differ from the simplicity of plain bonds.
- 3.18 When assessing the nature and complexity of the risks, additional information in relation to the circumstances of the particular context in which the risk may unfold should be taken into account. This could include, for example, any risk mitigation instruments (such as reinsurance or derivatives) applied, and their impact on the underlying risk profile.
- 3.19 The degree of complexity and/or uncertainty of the risks is associated with the level of calculation sophistication and/or level of expertise needed to carry out the calculation. In general, the more complex the risk, the more difficult it will be to model it and predict potential future profit / losses. For example, where losses are the result of interaction of a number of different factors, the degree of complexity of the modelling would be expected to also increase.
- 3.20 Therefore, to appropriately analyse and quantify more complex and/or less predictable risks, more sophisticated and elaborated tools will generally be required which means that a particular simplification may or may not be applied.

### c) *Scale*

- 3.21 Assigning a scale introduces a distinction between “small” and “large” risks. The undertaking may use a measurement of scale to identify where the use of a simplified calculation is likely to be appropriate, provided this is also commensurate with the nature and complexity of the risks.
- 3.22 Related to this, a measurement of scale may also be used to introduce a distinction between material and non-material risks. Introducing materiality in this context would provide a threshold or cut-off point below which it would be regarded as justifiable to omit (or not explicitly recognise) certain risks.<sup>4</sup>
- 3.23 Different interpretations of “scale” may be applied when considering risks, depending on the type of assessment to be made. For example, the

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<sup>4</sup> We note that materiality is also important where the uncertainty (or degree of model error) in the measurement is concerned. This will be considered in step 2 of the proportionality assessment process.

undertaking may interpret the scale of a risk as the degree to which the undertaking is vulnerable to the risk. Following this option, in assessing the scale of a risk one should consider both the likelihood of the risk being realised and the impact of that risk when realised. The scale of the risk would increase as either the likelihood or the (potential) impact of the risk increases:

$$\text{Scale} = \text{vulnerability to risk} = \text{likelihood} \times \text{impact}$$

- 3.24 Related to this, the scale of a risk may be defined in terms of the SCR, so that it would relate to the vulnerability of the undertaking under a "worst case" scenario:

$$\text{Scale} = \text{SCR} = \text{vulnerability to risk under "worst case" scenario}$$

- 3.25 Such interpretations of "scale" would seem adequate for the determination of regulatory capital requirements, which are intended to define the amount of capital resources which the undertaking needs to hold to be protected against the realisation of the risk.
- 3.26 To measure the scale of risks, further than introducing an absolute quantification of the risks the undertaking will also need to establish a benchmark or reference volume which leads to a relative rather than an absolute assessment. In this way, risks may be considered "small" or "large" relative to the established benchmark. Such a benchmark may be defined, for example, in terms of a volume measure like the total of an asset class or sub-class, when assessing market risk. In many cases the SCR itself can provide a volume measure. Depending on the situation, the overall SCR, the Basic SCR, module or sub-module capital requirements can be used to define appropriate benchmarks.
- 3.27 For the examples described above, introducing a benchmark volume would lead to the following relative assessments of scale:

$$\text{Scale} = \text{likelihood} \times (\text{relative}) \text{ impact}$$

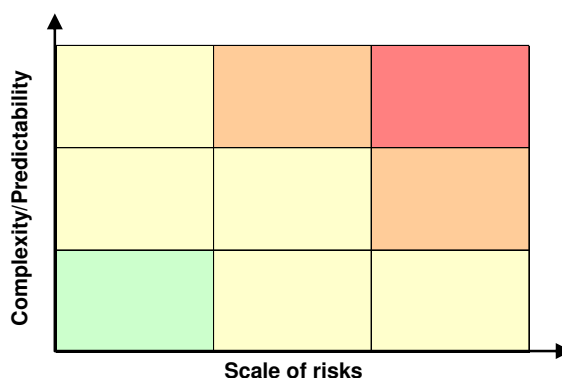
$$\text{Scale} = \text{SCR} / \text{volume measure}$$

- 3.28 Considering the various options to define "scale" as described above, we note that it would not seem feasible to define a universal metric for "scale" that will apply in all cases. Considering this, specifying the content and structure of a "scale" criterion in Level 2 would be considered to be excessive. This does not preclude the possibility to set up additional criteria and/or guidance (on Level 2 or 3, respectively) concerning the definition and application of "scale" to support the principles-based proportionality assessment framework outlined in this sub-section.
- 3.29 Following this principles-based framework, (re)insurance undertakings would be expected to use an interpretation of scale which is best suited to their specific circumstances and to their risk profile. Whatever interpretation of "scale" for risks or obligations is followed, this should lead to an objective and reliable assessment.

#### *d) Combination of the three indicators and overall assessment*

- 3.30 It can be concluded from the discussions above that the three indicators - nature, scale and complexity - are strongly interrelated, and in assessing the risks the focus should be on the combination of all three factors. This overall assessment of proportionality would ideally be more qualitative than quantitative, and cannot be reduced to a simple formulaic aggregation of isolated assessments of each of the indicators.
- 3.31 In terms of nature and complexity, the assessment should seek to identify the main qualities and characteristics of the risks, and should lead to an evaluation of the degree of their complexity and predictability. In combination with the "scale" criterion, the undertaking may use such an assessment as a "filter" to decide whether the use of simplified methods would be likely to be appropriate. For this purpose, it may be helpful to broadly categorise the risks according to the two dimensions "scale" and "complexity/predictability":

*Figure 1: Risk matrix for proportionality assessment*



- 3.32 An assessment of nature, scale and complexity may thus provide a useful basis for the second step of the proportionality process where it is decided whether a specific simplified calculation would be proportionate to the underlying risks.

***Step 2: Assessment of whether the application of a particular simplification is proportionate***

- 3.33 The second step of the proportionality assessment process concerns the assessment whether a specific simplified calculation can be regarded as proportionate to the nature, scale and complexity of the risks as analysed in the first step.
- 3.34 To carry out this assessment, the undertaking has to analyse whether the simplified calculation in question takes into account the properties and characteristics of risks identified in the first step in a proportionate way, and also has due regard to the scale of the risks.
- 3.35 Ultimately, when a decision needs to be taken whether a given simplified calculation can be regarded as proportionate, the supervisory objective underlying the calculation of the capital requirement would need to be considered.

- 3.36 This means that a given simplified calculation should be seen as proportionate if the resulting estimate is not expected to diverge materially from the “true” calculation which is given by the non simplified calculation method, i.e. if the model error implied by the change of method is immaterial.
- 3.37 Introducing materiality in this context would serve as a threshold below which it would be regarded as justifiable to potentially misstate (i.e. measure incorrectly) the risks in the calculation of the SCR.<sup>5</sup>
- 3.38 In the following, this second step of the proportionality assessment process is explored further, considering:
- How materiality should be interpreted in this context;
  - How an assessment of the estimation uncertainty in the valuation may be carried out in practice.

*a) Materiality in the context of using a simplified calculation for the SCR*

- 3.39 In order to clarify the meaning of materiality for both undertakings and supervisors, CEIOPS proposes using as a reference the definition of materiality used in International Accounting Standards (IAS)<sup>6</sup> as CEIOPS considers that by using this definition undertakings should be familiar with this concept.<sup>7</sup> This definition states that:

*“Information is material if its omission or misstatement could influence the economic decisions of users taken on the basis of the financial statements. Materiality depends on the size of the item or error judged in the particular circumstances of its omission or misstatement. Thus, materiality provides a threshold or cut-off point rather than being a primary qualitative characteristic which information must have if it is to be useful”.*

- 3.40 In the context of a simplified calculation, this means that a misstatement of the value of a sub-module/module<sup>8</sup> is material if it could influence the decision-making or judgment of the intended user of the information contained in the calculation of the SCR.
- 3.41 In its calculation of the SCR with simplified calculation methods, the (re)insurance undertaking should address materiality consistent with the principle set out in the above. For this purpose the undertaking should define a concept on materiality which should lay down the criteria on basis of which a decision on the materiality of a potential misstatement of the SCR is made.
- 3.42 This materiality concept should be consistent with the undertaking’s approach to materiality in other areas of solvency assessment and reporting (e.g. technical provisions), and should be reflected in the undertaking’s own risk and solvency assessment (ORSA).
- 3.43 When determining how to address materiality, the undertaking should have regard to the purpose of the work and its intended users. For a qualitative or

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<sup>5</sup> Note that this is similar to the introduction of materiality to assess the scale of risks.

<sup>6</sup> Materiality is defined in the glossary of the [International Accounting Standards Board’s](#) “Framework for the Preparation and Presentation of Financial Statements”

<sup>7</sup> Cf. CEIOPS-CP-58-09, <http://www.ceiops.eu/content/view/14/18/>

<sup>8</sup> i.e. the degree of model error inherent in the measurement.

quantitative assessment of risk for solvency purposes – this should include the supervisory authority which uses the information when performing the SRP.

*b) Assessment of the estimation uncertainty in the calculation*

- 3.44 Regardless of what methods shall be applied for the calculation of the SCR, it is important that an assessment of their appropriateness should in general include an assessment of the model error implicit to the calculations.
- 3.45 Such an assessment may be carried out, for example, by:
- Sensitivity analysis in the framework of the applied simplification
  - Comparison with the results of the other method
- 3.46 In conducting such an assessment, the undertaking should consider the level and the implications of the uncertainty related to the application of the simplified calculation and be able to qualitatively describe the key risks and main sources of uncertainty in the valuation. Such consideration should be based on the assessment of the nature, scale and complexity of the risks carried out in Step 1 of the proportionality assessment process. In particular, where as a result of this first step of the proportionality assessment the undertaking has identified certain factors that indicate an increased level of complexity and/or unpredictability of the risks, the techniques described above should be used to assist the undertaking in quantitatively describing these sources of uncertainty and in deciding whether the simplified calculation considered would be appropriate to address the underlying risks.
- 3.47 We note that in practice an assessment of the model error will not be easy. A precise determination of the model error will generally not be possible, therefore the undertaking should not be required to quantify the degree of model error in precise quantitative terms, or to re-calculate the value of the capital charge using a the non simplified method in order to demonstrate that the difference between the result of the simplified method and the result of the non simplified method is immaterial. Instead, it would be sufficient for the undertaking to demonstrate that there is reasonable assurance that the model error implied by the application of the simplified method (and hence the difference between those two amounts) is immaterial.<sup>9</sup>

### **3.4 Simplifications in QIS4 under the standard formula**

*a) Application criteria:*

- 3.48 According to Article 108 of the Level 1 text, a simplified calculation may only be used where
- it is proportionate to the nature scale and complexity of the risks and
  - it would be disproportionate to require the application of the standardised calculation.
- 3.49 In general, the proportionality of a particular simplified calculation should be assessed in line with the analysis of proportionality laid out in section 3.3. It will be the undertaking's responsibility to make this assessment. In particular,

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<sup>9</sup> Cf. CEIOPS' Advice on Proportionality (annex), paragraph TS.II.A.36 of the QIS4 Technical Specifications.

the Level 1 text does not envisage an approval process for the use of simplifications to the standard formula.

- 3.50 In addition to the general definition of proportionality, the implementing measures could state proportionality requirements specific to certain simplifications. These specific requirements should reflect the (simplified) assumptions underlying the simplified calculation and restrict the likely estimation error that the calculation includes.
- 3.51 The specific proportionality requirements could be of a qualitative or a quantitative nature. For example, one of the conditions on the duration approach simplification to the interest rate sub-module of QIS4 was that the bond cash-flows were not interest rate sensitive. This requirement was necessary as the duration approach produces bad approximations, if cash-flows change with the interest rates. The requirement ensured that the simplification was proportionate to the nature of the risk.
- 3.52 An example of a quantitative proportionality requirement is the limitation of the size of the simplified calculation result. For instance, it could be required that a simplified calculation for a sub-module can only be used if the requirement obtained for the sub-module by means of the simplification does not exceed 10% of the Basic Solvency Capital Requirement. Such a requirement limits the estimation error introduced by the simplification by restricting its use to cases where the sub-module risk is of lower importance for the undertaking.
- 3.53 Simplification-specific proportionality requirements support the adequate application of the simplification. They help to ensure the comparability of the SCR across undertakings and markets and limit the estimation error introduced by the calculation.
- 3.54 A simplification should only be used if the standard calculation would be an undue burden. For example, if the standard calculation has already been made or can be made easily, then it is not disproportionate. This requirement is necessary to avoid cherry-picking situations. Because otherwise, an undertaking could make both the simplified and the standard calculation and choose the lower result to optimise its SCR. This would not be in line with the proportionality principle and is likely to undermine the significance of the SCR.

*b) Inventory of simplifications in the QIS4 specifications and in the additional consultation papers*

***Former Consultation Paper 54 and QIS4 simplification TS.VIII.C. Basic SCR calculation and the adjustment for risk absorbing effect of future profit sharing and deferred taxes***

*QIS4 Simplification*

- 3.55 TS.VIII.C.7. QIS4 Simplification

<p>When undertakings use the simplified method based on the profit sharing life insurance Italian system described in the in paragraph TS.II.D.76 to calculate the best estimate, they will apply the following formula to evaluate the adjustment for the risk absorbing effect of future profit sharing: <math>Adj = +0,1 \bullet FDB</math></p>
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*Consultation paper 54*

- 3.56 The simplification was taken into account for QIS purposes only. Under Solvency II, insurers should be able to analyse the risk-mitigating effect of profit sharing in a more sophisticated way. Therefore, the simplification should not be included in the Implementing Measures. CEIOPS' Advice on the adjustment for the loss-absorbing capacity of technical provisions and deferred taxes includes other simplifications.<sup>10</sup>

*Former consultation paper 47 and the relevant SCR market risk modules:*

Mkt<sub>int</sub> interest rate risk

*QIS4 simplification*

- 3.57 TS.IX.B.9. QIS4 simplification

In order to determine the interest rate scenario effect on the value of assets and liabilities, a simplified calculation may be used whereby changes in value are estimated as the yield curve change multiplied by the relevant modified duration separately for the assets and for the liabilities. The condition to be met for using this simplification is that the cash-flows of the item are not interest-rate sensitive, in particular the item has no embedded options.

This simplification may be used for assets, non-life technical provisions and other liabilities. This simplification should not be used for life technical provisions. The shocks are parallel yield stress, at all durations of:

Downward shock: - 40%

Upward shock: + 55 %

- 3.58 The simplification aimed at assisting undertakings whose systems do not allow for a term structure stress that is differentiated by maturity. As it is very likely that the relevant risk-free interest rate term structure according to Article 76(2) of the Level 1 text will not be flat, a differentiation by maturity will be an essential requirement under Solvency II. Therefore, the simplification should not be included in the Implementing Measures.

*Former Consultation paper 47*

- 3.59 Because of the reasons given under 3.56 no simplification for the interest rate risk module will be foreseen.

Mkt<sub>eq</sub> equity risk

*QIS4 simplification*

- 3.60 TS.IX.C.20 QIS4 Simplification

The determination of the capital charge Mkt<sub>eq,i</sub> with respect to an individual index i could be carried out by taking into account hedging and risk transfer mechanisms using a two step process.

The first step relates to the level of the individual equity. If there are hedging instruments for single equities they have to be taken into account at the level of the

<sup>10</sup> See final advice under CEIOPS-DOC-46/09 (October 2009), see <http://www.ceiops.eu//content/view/17/21/>.

single equity. The hedge reduces the stress with the change in market value of the instrument itself. The impact has to be determined by the company itself.

The calculations within this first step would be carried out as follows:

For each index  $i$  the market value of individual equities allocated to  $i$  in the event of the stress scenario equity  $shock_i$  would be calculated, taking into account hedging instruments<sup>11</sup>. The "stressed" market values would be calculated as follows:

$$Equity\_stress_{i,j} = Equity_{i,j} * (1 - volafactor_i) + Hedge_{i,j} ,$$

Where:

$Equity_{i,j}$  = Market value of the equity  $j$  allocated to index  $i$

$Equity\_stress_{i,j}$  = Market value of equity $_{i,j}$  after stress

$Hedge_{i,j}$  = The change in Market value of hedges per individual equity $_{i,j}$  under stress

$volafactor_i$  = Prescribed volatility factor of the index  $i$

and where the volatility factors (consistent with the specification of the scenarios equity  $shock_i$ ) are determined as follows:

	<i>Global</i>	<i>Other</i>
$volafactor_i$	32%	45%

In a second step, hedging instruments for sub-portfolios e.g. indices or special funds would be taken into account. The risk mitigation would be reflected by the change in market value of the hedging instrument per index (which stands for the sub-portfolio). If there would be a global hedge for all equity positions in force, it would be allocated on a market value weighted basis to the relevant equity indices (excluding Alternative investments).

Within this second step, the changes in market value for all equities under index  $i$  would be aggregated to a capital charge taking into account hedging instruments for equity risk for the individual index  $i$  as follows:

$$ChangeInEquityValue_i = \sum_j (Equity_{i,j} - Equity\_stress_{i,j}) - Hedge_i$$

where

$ChangeInEquityValue_i$  = Risk capital charge for equity risk for index  $i$

$Hedge_i$  = The change in Market value of hedges per individual index  $i$  under stress

The overall value of equities under stress would be derived by combining the  $ChangeInEquityValue_i$  for the individual indices using a correlation matrix as described above to provide  $AggregateChangeInEquityValue$ . This should be converted into a

<sup>11</sup> Note that in the two level process of reflecting hedging, the instrument has to be taken into account on the relevant step: single equity or index.

revised stress test and this stress test should be applied to the liabilities:

$$\text{RevisedEquityStressTest} = 1 - \frac{\text{AggregateChangeInEquityValue}}{\text{PreStressEquityValue}}$$

where

PreStressEquityValue = Current market value of all investments in equities and hedges.

PostStressLiabilityValue = Change in the value of the liabilities following a change in the value of equities/hedges of RevisedEquityStressTest.

Finally, the capital charge ( $\text{Mkt}_{\text{eq},i}$ ) is calculated as change in the net asset value of the undertaking as follows:

$$\text{Mkteq},I = \max(\text{PostStressLiabilityValue} - \text{AggregateChangeInEquityValue}, 0).$$

*Former Consultation paper 47*

3.61 The calculation requested in this simplification is quite close to the standard calculation in case equity risk only affects the asset side. In this case it can rather be seen as guidance than as a simplification. There seems to be no need to transfer this approach to the Implementing Measures.

Mkt<sub>int</sub> Currency risk

QIS4 simplification

3.62 No simplification for the currency risk is allowed in QIS4 technical specifications.

*Consultation paper 47*

3.63 A scenario-based approach was used for the assessment of the currency risk capital charge in QIS4. Although this can be considered more complex than a factor-based approach, it is likely that for smaller undertakings the extent of any cross-currency holdings may be sufficiently limited as to make a scenario-based approach relatively simple in practice. Moreover, a scenario-based approach allows currency hedging programmes to be captured appropriately.

3.64 It was therefore proposed to retain a scenario-based approach, with some refinements to better capture more complex scenarios without adding excessive complexity to the standard formula methodology.

3.65 As the scenario-based approach is relatively simple in practice, no simplification is being proposed.

Mkt<sub>sp</sub> spread risk

QIS4 simplification

3.66 TS.IX.F.19. QIS4 simplification

The following simplification may be used provided:

(a) The average credit rating for long duration bonds (10 year and above) is not less than one rating below the credit rating for short duration bonds (5 years or below).

(b) The general criteria for simplifications are followed.

$$\text{For bonds: } \text{Mkt}_{sp}^{\text{bonds}} = \text{MV} * \text{Dur}^{\text{bonds}} * \sum (\%MV_i^{\text{bonds}} F(\text{rating}_i)) + \Delta\text{Liab}_{ul}$$

$$\text{For structured credit products: } \text{Mkt}_{sp}^{\text{struct}} = \text{MV} * \text{Dur}^{\text{struct}} * \sum (\%MV_i^{\text{struct}} G(\text{rating}_i))$$

$$\text{For credit derivatives: } \text{Mkt}_{sp}^{\text{cd}} = \sum (MV_i^{\text{cd}}) * \text{Dur}^{\text{cd}}$$

$$\text{Mkt}_{sp} = \text{Mkt}_{sp}^{\text{bonds}} + \text{Mkt}_{sp}^{\text{struct}} + \text{Mkt}_{sp}^{\text{cd}}$$

where:

MV = Total market value of non-government bond portfolio

$\text{Dur}^{\text{bonds}}$  = Modified duration of non-government bond portfolio

$\text{Dur}^{\text{struct}}$  = Modified duration of structured credit portfolio

$\text{Dur}^{\text{cd}}$  = Modified duration of credit derivatives portfolio

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

$\%MV_i^{\text{struct}}$  = Proportion of structured credit portfolio held at rating i

$\%MV_i^{\text{cd}}$  = Proportion of credit derivatives portfolio held at rating i

Where  $\Delta\text{Liab}_{ul}$  = 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 (sign convention: positive sign means losses). The stressed scenario is defined as a drop in value on the assets (except government bonds referred in TS.IX.F.3) used as the reference to the valuation of the liabilities by  $\text{MV} * \text{Dur}^{\text{bonds}} * \sum (\%MV_i^{\text{bonds}} F(\text{rating}_i))$

$F(\text{rating}_i)$ : as for non-simplified approach

$G(\text{rating}_i)$ : as for non-simplified approach

*Former Consultation paper 47*

3.67 In relation to bonds, the simplification appears to be reasonable and seems to provide a good approximation. In relation to structured products and credit derivatives, it is questionable whether the simplification is proportionate to the nature and complexity of the risks inherent in these investments. Undertakings should monitor these financial instruments very closely and be able to assess their risks with a higher degree of sophistication. Therefore, only a simplification for bonds should be kept for the Implementing Measures.

3.68 The design of the simplification should take into account the changes of the spread risk sub-module proposed in CEIOPS' Draft Advice on market risk calibration compared to QIS4. The resulting simplified calculation is defined as follows:

$$\text{Mkt}_{sp}^{\text{bonds}} = \text{MV}^{\text{bonds}} * \sum_i \%MV_i^{\text{bonds}} * F(\text{rating}_i, \text{maturity}) + \Delta\text{Liab}_{ul}$$

where:

- $MV^{bonds}$  = 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
- $maturity$  = Average maturity of non-government bond portfolio, weighted with the market value of the bonds

and where  $\Delta Liab_{ul}$  is the overall impact on the liability side for policies where the policyholders bears the investment risk and holds embedded options and guarantees under the stressed scenario, with a minimum value of 0 (sign convention: positive sign means losses). The stressed scenario is defined as a drop in value on the assets by  $MV \cdot \sum_i \%MV_i \cdot F(\text{rating}_i, \text{maturity})$ .

### **Question to stakeholders:**

- 3.69 Although a similar simplification was tested in QIS4, the results of the exercise and the feedback could not clarify whether, firstly, the simplification ensures a sufficiently high approximation quality and, secondly, the approximation will be needed when Solvency II is implemented. Therefore, CEIOPS would appreciate feedback on both of the following options:
- Option 1:** The standard formula includes a simplification for spread risk as defined above.
- Option 2:** The standard formula does not include a simplification for spread risk.
- 3.70 In case a different simplification for spread risk is preferred, the specification the calculation and rationale should be provided.

### Property risk

#### *QIS4 simplification*

- 3.71 No simplification for the property risk is allowed in QIS4 technical specifications.

#### *Consultation paper 47*

- 3.72 The capital charge for property risk is calculated based on the impact of a shock scenario on the net value of assets and liabilities. Although feedback from QIS4 indicated that some undertakings found a delta-NAV approach complicated, a shock to net asset value is less complex for property risk, as properties are only likely to be included in the undertaking's assets, making application of the stress scenario more straightforward. Therefore no simplification for property risk will be foreseen.

### Concentration risk

#### *QIS4 simplification*

- 3.73 No simplification for the concentration risk is allowed in QIS4 technical specifications.

*Consultation paper 47*

- 3.74 The process of calculation is already simple. The bulk of the analysis lies in the identification of all the exposures borne, directly or indirectly, explicit or hidden, by the undertaking. This analysis and identification of the exposures is necessary to achieve an appropriate risk management and to allow for a risk-oriented SCR. The simplicity of the calculation makes that no simplification is foreseen for the concentration sub-module.

**Former Consultation paper 28 and 51 and the SCRdef counterparty default risk**

- 3.75 Consultation paper 51 includes simplifications for the calculation of the counterparty default risk module. Further simplifications are not envisaged.

**Former Consultation paper 49 and SCR life underwriting risk module**

Mortality risk

- 3.76 The following factor based mortality stress was allowed as a simplification under QIS4.

The following simplification may be used provided:

(a) There is no significant change in the capital at risk over the policy term of the contract.

(b) The 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-flows

q = Expected average death rate over the next year weighted by sum assured

Projected Mortality Increase =  $1.1^{((n-1)/2)}$

- 3.77 The simplification approximates the impact of a permanent 10% increase in mortality by projecting the effect of a temporary shock into the future. For a given contract, the effect of a temporary increase in mortality rates can be estimated by reference to the capital at risk. For example, for a life aged x, a 10% increase in mortality over the next year results in a loss of approximately 10% of the capital at risk with probability  $q_x$ , where  $q_x$  is the probability that a life aged x dies over the next year.

- 3.78 This can be extended to estimate the impact of the shock over the lifetime of the contract by multiplying this loss by the duration of the contract.

- 3.79 For a portfolio of contracts, it is necessary to make assumptions regarding:

- The probability of death over the next year for that portfolio. This may be determined by calculating the average probability of death, weighted by sum assured.
- The duration of the portfolio.

- 3.80 However this approximation may still underestimate the capital requirement since mortality increases with age. For the purposes of QIS4, it was assumed that mortality rates increase by 10% for each annual increase in age i.e. if the

probability of death for a life aged  $x$  is  $q_x$ , then the probability of death for a life age  $(x + 1)$  is  $q_x * (1 + 10\%)$ .

3.81 The main changes that CP 49 brings compared to the QIS4 specification consists in the recalibration of the mortality shock and further details on the unbundling of the insurance obligations. The proposed mortality shock has been increased from a permanent increase in mortality rates of 10% to a permanent increase in mortality rates of 15%. The above simplification can be maintained. However the factor 10% should be replaced by 15%.

3.82 The adjusted simplification becomes:

Mortality capital requirement = (Total capital at risk) \*  $q$ (firm-specific) \*  $n$  \* 0.15 \* (Projected Mortality Increase)

where:

$n$  = modified duration of liability cash-flows

$q$  = Expected average death rate over the next year weighted by sum assured

Projected Mortality Increase =  $1.1^{((n-1)/2)}$

3.83 For the purposes of QIS4, the specific criteria for the application of the above simplification were that there is no significant change in the capital at risk. In fact, it is sufficient to ensure that there is no significant increase in the capital at risk.

3.84 In addition, an undertaking using the above simplification should ensure that the assumed 10% increase in mortality rates for each annual increase in age is consistent with the mortality assumption used in the calculation of the best estimate liability.

#### Longevity risk

3.85 The following factor based longevity stress was allowed as a simplification under QIS4.

The following simplification may be used provided:

a) The average age of policyholders within the portfolio is 60 years or over.

b) The general criteria for simplifications are followed.

Longevity capital requirement = 25% \*  $q$  \*  $(1.1)^{((n-1)/2)}$  \*  $n$  \* (Technical provisions for contracts subject to longevity risk)

where:

$n$  = modified duration of liability cash-flows

$q$  = Expected average death rate over the next year weighted by sum assured

3.86 The simplification approximates the impact of a permanent 25% decrease in mortality by projecting the effect of a temporary shock into the future. For a given contract, the effect of a temporary decrease in mortality can be estimated by reference to the technical provisions. For example, for a life aged  $x$ , a 25% decrease in mortality rates over the next year results in an increase of approximately 25% to the technical provisions with probability  $q_x$ , where  $q_x$  is the probability that a life aged  $x$  dies over the next year.

3.87 This can be extended to estimate the impact of the shock over the lifetime of the contract by multiplying the increase by the duration of the contract.

3.88 For a portfolio of contracts, it is necessary to make assumptions regarding:

- The probability of death over the next year for that portfolio. This may be determined by calculating the average probability of death, weighted by sum assured.
- The duration of the portfolio.

3.89 However this approximation may still underestimate the capital requirement since mortality increases with age (if the average probability of death is underestimated, the decrease in mortality rates in the stressed scenario will also be underestimated). For the purposes of QIS4, it was assumed that mortality rates increase by 10% for each annual increase in age. This is consistent with the calibration of the mortality simplification.

3.90 The QIS4 approach and calibration are maintained in CP49. The simplification can therefore be left unchanged.

3.91 For the purposes of QIS4, the specific criteria for the application of the above simplification was that the average age of policyholders is 60 years or over. CEIOPS sees no reason to retain these criteria. However, an undertaking using the above simplification should ensure that the assumed 10% increase in mortality rates for each annual increase in age is consistent with the mortality assumption used in the calculation of the best estimate liability.

#### Disability-Morbidity risk

3.92 The following factor based disability stress was allowed as a simplification under QIS4.

The following simplification may be used provided:

- There is no significant change in the capital at risk over the policy term of the contracts.
- The general criteria for simplifications are followed.

$$\text{Disability capital requirement} = (\text{total disability capital at risk}) * i(\text{firm-specific}) * 0.35 * (\text{Projected Disability Increase}) * n$$

where:

n = Modified duration of liability cash-flows

i = Expected movements from healthy to sick over the next year weighted by sum assured/annual payment

$$\text{Projected Disability Increase} = 1.1^{((n-1)/2)}$$

3.93 The simplification approximates the impact of a permanent 35% increase in disability rates by projecting the effect of a temporary shock into the future. For a given contract, it is assumed that the effect of a temporary increase in disability rates can be estimated by reference to the capital at risk. For example, for a life aged x, an increase in disability rates over the next year results in a loss of approximately 35% of the capital at risk with probability  $i_x$ , where  $i_x$  is the probability of a life aged x moving from healthy to sick over the next year.

3.94 This can be extended to estimate the impact of the shock over the lifetime of the contract by multiplying the increase by the duration of the contract.

3.95 For a portfolio of contracts, it is necessary to make assumptions regarding:

- The probability of moving from sick to healthy over the next year for that portfolio. This may be determined by calculating the average probability of moving from sick to healthy, weighted by sum assured.
- The duration of the portfolio.

- 3.96 The approximation may still underestimate the capital requirement since disability rates increase with age. For the purposes of QIS4, it was assumed that disability rates increase by 10% for each annual increase in age i.e. if the probability of disability for a life age  $x$  is  $i_x$ , then the probability of disability for a life age  $(x + 1)$  is  $i_x * (1 + 10\%)$ .
- 3.97 However CP49 proposes a revised calibration for this risk with an increase of 50% in morbidity/disability inception rates for the first year followed by an increase of 25% in morbidity/disability inception rates for all subsequent years.
- 3.98 The simplification therefore needs to be adjusted as follows:

Disability capital requirement =

$$\begin{aligned}
 & (\text{total disability capital at risk})_1 * i(\text{firm-specific})_1 * 0.50 \\
 & + (\text{total disability capital at risk})_2 * i(\text{firm-specific})_2 * 0.25 \\
 & * (\text{Projected Disability Increase}) * (n-1)
 \end{aligned}$$

Where:

$n$  = Modified duration of liability cash-flows

$i_1, i_2$  = Expected movements from healthy to sick over the first (next) and second years respectively weighted by sum assured or annual payment as appropriate for the product in question.

Projected Disability Increase =  $1.1^{((n-2)/2)}$

- 3.99 For the purposes of QIS4, the specific criteria for the application of the above simplification were that there is no significant change in the capital at risk. In fact, it is sufficient to ensure that there is no significant increase in the capital at risk.
- 3.100 In addition, an undertaking using the above simplification should ensure that the assumed 10% increase in disability rates for each annual increase in age is consistent with the disability assumption used in the calculation of the best estimate liability.
- 3.101 CP49 also noted that, for products where benefits consist of a series of payments payable until death or recovery of the policyholder, there is also a risk that the duration of the claim is higher than anticipated. CP49 therefore proposed a combined stress which considers, a 20% decrease in termination rates in addition to the increase in inception rates described above.
- 3.102 The above simplification should therefore be extended as follows:

Disability capital requirement in respect of the risk that duration of claims is greater than expected =

$$= 20\% * t * (1.1)^{((n-1)/2)} * n * (\text{Technical provisions for contracts subject to longevity risk})$$

Where:

$n$  = Modified duration of liability cash-flows

$t$  = Expected termination rate i.e. movement from sick to healthy/dead over the next year

Projected Disability Increase =  $1.1^{((n-2)/2)}$

- 3.103 The total disability capital requirement is the sum of the capital requirement in respect of the increase to inception rates and the capital requirement in respect of the decrease in termination rates.

## Expense risk

3.104 The following factor based expense stress was allowed as a simplification under QIS4.

Expense risk capital requirement = (Renewal expenses in the 12 months prior to valuation date) \* n(exp) \*(0.1 + 0.005\*n(exp))

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

3.105 The simplification assumes that the renewal expenses incurred in the 12 months prior to the valuation date are a good proxy for future expenses. The impact of a 10% increase in total expected future expenses is thus easily approximated as the sum, for each future year over which the risk runs off, of 10% of renewal expenses incurred in the 12 months.

3.106 For QIS4, the impact of a 1% increase in expected future expense inflation was approximated using a very simple formula. The approximation could be improved by calculating the capital requirement as the difference between two geometric series. This results in the following formula:

Expense risk capital requirement (inflation risk) =  
(Renewal expenses in the 12 months prior to valuation date) \*

$$\frac{1}{k} * ((1+k)^{n(\text{exp})} - 1) - \frac{1}{i} * ((1+i)^{n(\text{exp})} - 1)$$

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. the sum of i and the increase to inflation under the stressed scenario)

3.107 Therefore the total capital requirement may be calculated as:

Expense risk capital requirement =  
(Renewal expenses in the 12 months prior to valuation date) \* n(exp) \* 10%  
+ (Renewal expenses in the 12 months prior to valuation date) \*

$$\frac{1}{k} * ((1+k)^{n(\text{exp})} - 1) - \frac{1}{i} * ((1+i)^{n(\text{exp})} - 1)$$

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%)

## Revision risk

3.108 The following factor based revision capital requirement calculation was allowed as a simplification under QIS4.

Revision capital requirement = 3% \* Total net technical provisions for annuities exposed to revision risk.

3.109 As the advice coincides with the QIS4 specification, no changes are needed. The simplification can be kept as such.

#### Catastrophe risk

3.110 The following factor based catastrophe stress was allowed as a simplification under QIS4.

The following formula may be used as a simplification for the Life catastrophe risk sub-module: the input data is required for each policy where the payment of benefits (either lump sum or multiple payments) is contingent on either mortality or disability:

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

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  $Capital\_at\_Risk_i$  is determined as:

$$Capital\_at\_Risk_i = SA_i + AB_i \bullet Annuity\_factor - TP_i$$

and

$TP_i$  = Technical provision (net of reinsurance) for each policy  $i$

$SA_i$  = 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.

$AB_i$  = 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

3.111 No changes to the QIS4 approach seem to be necessary.

#### Lapse risk

3.112 CP 49 includes two simplifications for the calculation of the lapse risk sub-module. Further simplifications are not envisaged. For final advice, see CEIOPS-DOC-42/09, (October 2009), see <http://www.ceiops.eu/content/view/17/21/>.

### **Former Consultation paper 50 and SCR health underwriting risk module**

3.113 As the structure of the module and the approach of the risks has been changed by Consultation paper 50, the simplifications included in the QIS4 Technical specifications are no longer valid. New simplifications are introduced.

#### SLT Health mortality risk

3.114 The simplifications under section 3.4.2.4. can be used.

#### SLT Health longevity risk

3.115 The simplifications under section 3.4.2.4. can be used.

#### SLT Health disability/morbidity risk for income insurance

3.116 The simplifications under section 3.4.2.4. can be used.

SLT Health expense risk

3.117 The simplifications under section 3.4.2.4. can be used.

SLT Health revision risk

3.118 The simplifications under section 3.4.2.4. can be used, with an adapted calibration in order to reflect the inclusion of inflation risk and the enlargement of the scope to all kind of benefits and not just annuities.

SLT Health lapse risk

3.119 The simplifications under section 3.4.2.4. can be used.

SLT Health catastrophe risk

3.120 No simplifications allowed.

**Consultation paper 48 and SCR non-life underwriting risk module**

Premium and reserve risk

3.121 As for non-life premium and reserve risk a factor-based approach is used, no simplifications are considered as this approach is deemed to be acceptable also for less sophisticated undertakings.

Non-life catastrophe risk

3.122 The standard formula catastrophe risk module shall result from the application of standardized scenarios. The scenarios should be constructed in such a way that they are proportionate to the risks that they attempt to capture. Where this is not possible, simplifications should be introduced. CEIOPS will give advice on the standardized scenarios at a later stage.

**QIS4 simplifications for captive (re)insurance undertakings**

3.123 TS.XII.B.39 QIS4 Simplification

Insurance and reinsurance captives defined as an (re)insurance undertaking owned either by a financial undertaking other than an insurance or a reinsurance undertaking or a group of insurance or reinsurance undertakings to which Directive 98/78/EC applies, or by a non-financial undertaking, the purpose of which is to provide (re)insurance cover exclusively for the risks of the undertaking or undertakings to which it belongs or of an undertaking or undertakings of the group of which the captive (re)insurance undertaking is a member, are allowed to apply a simplification, provided that they satisfy the general criteria for simplifications (see para TS.VI.G.6).

If a captive does not meet the threshold indicated, but nevertheless thinks it should be allowed to apply a simplified approach, it can do so provided that it justifies the reason for this and stating the criteria it considers relevant in its situation. The participant is also expected to do the full calculation to allow CEIOPS to benchmark the simplified calculation. All participants are invited to comment on the level of threshold.

Under these circumstances, the following simplification can be applied to the  $NL_{pr}$ :

$$NL_{pr} = 0.45 * (R_t - P_t, \text{ earned})$$

where

- $P_t$ , earned = estimate of net earned premium during the forthcoming year
- $R_t$  = contractually agreed maximum annual claims net of reinsurance.

3.124 For captive insurance and reinsurance undertakings, specific simplifications are proposed in CEIOPS-CP-79/09. These simplifications should replace the simplification defined above.

### 3.5 CEIOPS' advice

#### **Role of proportionality in the calculation of the SCR**

3.125 The principle of proportionality is intended to support the consistent application of the principles-based solvency requirements to all insurers.

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

- full internal model
- standard formula and partial internal model
- standard formula with undertaking-specific parameters
- standard formula
- simplification

3.127 The undertaking should be able to explain what methods are used and why the specific methods are selected.

#### **Process of assessment of proportionality for SCR standard formula simplifications**

3.128 In assessing whether the standard calculation or the simplified calculation could be considered proportionate to the underlying risks, the insurer should have regard to the following steps:

##### *Step 1: Assessment of nature, scale and complexity*

3.129 The insurer should assess the nature, scale and complexity of the risks. This is intended to provide a basis for checking the appropriateness of specific simplifications carried out in the subsequent step.

##### *Step 2: Assessment of the model error*

3.130 In this step the insurer shall assess whether a specific simplification can be regarded as proportionate to the nature, scale and complexity of the risks analysed in the first step.

3.131 Where simplified approaches are used to calculate the SCR, this could introduce additional estimation uncertainty (or model error). The higher the estimation uncertainty, the more difficult it will be for the insurer to rely on the estimation and to verify that it is suitable to achieve the objective of deriving a 99.5% VaR.

3.132 Therefore the insurer shall assess the model error that results from the use of a given simplification, having regard to the nature, scale and complexity of the underlying risks. The simplification should be regarded as

proportionate if the model error is expected to be non-material.

3.133 Where in the calculation process both the standard and the simplified calculation turn out to be proportionate, the standard calculation should be chosen. Likewise, where several simplifications turn out to be proportionate, the insurer should generally apply the simplification which is likely to include the smallest degree of model error.

### **Simplifications**

#### Credit spread sub-module of the market risk module

3.134 The following simplification may be used provided:

- The simplification is proportionate to the nature, scale and complexity of the risks that the undertaking faces.
- The average credit rating for long duration bonds (10 year and above) is not less than one rating below the credit rating for short duration bonds (5 years or below).
- The standard calculation of the spread risk sub-module is not an undue burden for the undertaking.

3.135 The simplification is defined as follows:

$$Mkt_{sp}^{bonds} = MV^{bonds} \cdot \sum_i \%MV_i^{bonds} \cdot F(\text{rating}_i, \text{maturity}) + \Delta Liab_{ul}$$

where:

$MV^{bonds}$  = 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

$\text{maturity}$  = Average maturity of non-government bond portfolio, weighted with the market value of the bonds

and where  $\Delta Liab_{ul}$  is 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 (sign convention: positive sign means losses). The stressed scenario is defined as a drop in value on the assets by  $MV \cdot \sum_i \%MV_i \cdot F(\text{rating}_i, \text{maturity})$ .

#### Mortality risk sub-module of the life underwriting risk module

3.136 The simplification may be used provided the following conditions are met:

- The simplification is proportionate to the nature, scale and complexity of the risks that the undertaking faces.
- The assumed 10% increase in mortality rates underlying the simplification for each annual increase in age is consistent with the mortality assumption used in the calculation of the best estimate liability.
- The capital requirement for mortality risk under the simplified calculation is less than 5% of the overall SCR before adjustment for the loss-absorbing capacity of technical provisions and deferred taxes. For this comparison the overall SCR can be calculated by means of the simplified calculation for the mortality risk capital requirement.
- The standard calculation of the mortality risk sub-module is not an undue

burden for the undertaking.

3.137 The simplification is defined as follows:

$$\text{Mortality capital requirement} = (\text{Total capital at risk}) * q(\text{firm-specific}) * n * 0.15 * (\text{Projected Mortality Increase})$$

where:

n = modified duration of liability cash-flows

q = Expected average death rate over the next year weighted by sum assured

$$\text{Projected Mortality Increase} = 1.1^{((n-1)/2)}$$

#### Longevity risk sub-module of the life underwriting risk module

3.138 The simplification may be used provided the following conditions are met:

- The simplification is proportionate to the nature, scale and complexity of the risks that the undertaking faces.
- The assumed 10% increase in mortality rates underlying the simplification for each annual increase in age is consistent with the mortality assumption used in the calculation of the best estimate liability.
- The capital requirement for mortality risk under the simplified calculation is less than 5% of the overall SCR before adjustment for the loss-absorbing capacity of technical provisions and deferred taxes. For this comparison the overall SCR can be calculated by means of the simplified calculation for the longevity risk capital requirement.

The standard calculation of the longevity risk sub-module is not an undue burden for the undertaking.

3.139 The simplification is defined as follows:

$$\text{Longevity capital requirement} = 25\% * q * (1.1)^{((n-1)/2)} * n * (\text{Technical provisions for contracts subject to longevity risk})$$

where:

n = modified duration of liability cash-flows

q = Expected average death rate over the next year weighted by sum assured.

#### Disability - morbidity risk sub-module of the life underwriting risk module

3.140 The simplification may be used provided the following conditions are met:

- The simplification is proportionate to the nature, scale and complexity of the risks that the undertaking faces.
- The assumed 10% increase in mortality rates underlying the simplification for each annual increase in age is consistent with the mortality assumption used in the calculation of the best estimate liability.
- The capital requirement for disability-morbidity risk under the simplified calculation is less than 5% of the overall SCR before adjustment for the loss-absorbing capacity of technical provisions and deferred taxes. For this comparison the overall SCR can be calculated by means of the simplified calculation for the disability-morbidity risk capital requirement.
- The standard calculation of the disability-morbidity risk sub-module is not

an undue burden for the undertaking.

3.141 The simplification is defined as follows:

Disability capital requirement =

(total disability capital at risk)<sub>1</sub> \* i(firm-specific)<sub>1</sub> \* 0.50

+ (total disability capital at risk)<sub>2</sub> \* i(firm-specific)<sub>2</sub> \* 0.25  
\* (Projected Disability Increase) \* (n-1)

+ 20% \* t \* (1.1)<sup>((n-1)/2)</sup> \* n \* (Technical provisions for contracts subject to longevity risk)

Where:

- n = Modified duration of liability cash-flows
- i<sub>1</sub>, i<sub>2</sub> = Expected movements from healthy to sick over the first (next) and second years respectively weighted by sum assured or annual payment as appropriate for the product in question.
- Projected Disability Increase = 1.1<sup>((n-2)/2)</sup>
- t = Expected termination rate i.e. movement from sick to healthy/dead over the next year

Expense risk sub-module of the life underwriting risk module

3.142 The simplification may be used provided the following conditions are met:

- The simplification is proportionate to the nature, scale and complexity of the risks that the undertaking faces.
- The capital requirement for expense risk under the simplified calculation is less than 5% of the overall SCR before adjustment for the loss-absorbing capacity of technical provisions and deferred taxes. For this comparison the overall SCR can be calculated by means of the simplified calculation for the expense risk capital requirement.

The standard calculation of the expense risk sub-module is not an undue burden for the undertaking.

3.143 The simplification is defined as follows:

Expense risk capital requirement =

(Renewal expenses in the 12 months prior to valuation date) \* n(exp) \* 10%

+ (Renewal expenses in the 12 months prior to valuation date) \*

$\frac{1}{k} * ((1+k)^{n(\text{exp})} - 1) - \frac{1}{i} * ((1+i)^{n(\text{exp})} - 1)$

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%)

Catastrophe risk sub-module of the life underwriting risk module

3.144 The simplification may be used provided the following conditions are met:

- The simplification is proportionate to the nature, scale and complexity of the risks that the undertaking faces.
- The capital requirement for expense risk under the simplified calculation is less than 5% of the overall SCR before adjustment for the loss-absorbing capacity of technical provisions and deferred taxes. For this comparison the overall SCR can be calculated by means of the simplified calculation for the expense risk capital requirement.

The standard calculation of the expense risk sub-module is not an undue burden for the undertaking.

3.145 The following formula may be used as a simplification for the Life catastrophe risk sub-module: the input data is required for each policy where the payment of benefits (either lump sum or multiple payments) is contingent on either mortality or disability:

$$Life_{CAT} = \sum_i 0.0015 \cdot Capital\_at\_Risk_i$$

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  $Capital\_at\_Risk_i$  is determined as:

$$Capital\_at\_Risk_i = SA_i + AB_i \cdot Annuity\_factor - TP_i$$

and

$TP_i$  = Technical provision (net of reinsurance) for each policy  $i$

$SA_i$  = 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.

$AB_i$  = 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

#### Lapse risk sub-module of the life underwriting risk module

3.146 Regarding simplifications for the lapse risk sub-module, please refer to CEIOPS-DOC-42/09 (October 2009), see <http://www.ceiops.eu//content/view/17/21/>.

#### Health underwriting risk simplifications

3.147 Except for the health catastrophe risk the simplifications that can be used in the different health sub-modules are identical to the simplifications used in the corresponding life modules.

3.148 For the health revision risk an adapted calibration compared to the life calibration is foreseen. It reflects the inclusion of inflation risk and the enlargement of the scope to all kind of benefits and not just annuities.

