

**CEIOPS' Advice for
Level 2 Implementing Measures on
Solvency II:**

**SCR standard formula
Article 111 (I)
Simplified calculations in the standard
formula**

(former Consultation Paper 77)

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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.¹
- 1.2. This consultation paper aims at providing advice with regard to simplified methods and techniques to calculate capital requirements in order to ensure that actuarial and statistical methodologies are proportionate to the nature, scale and complexity of the risks, as requested in Article 86(h) of the Level 1 text.²
- 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.

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

² Directive 2009/138/EC of the European Parliament and of the Council of 25 November 2009 on the taking-up and pursuit of the business of Insurance and Reinsurance (Solvency II), Official Journal, L 335, 17 December 2009, <http://eur-lex.europa.eu/JOHtml.do?uri=OJ%3AL%3A2009%3A335%3ASOM%3AEN%3AHTML>

1. Extract from Level 1 Text

2.1. Legal basis for the implementing measure

Reference for the advice presented in this paper is Article 111 1 (I) of the Level 1 text:

Article 111 - 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:

"1 (I) 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 fulfil in order to be entitled to use each of those simplifications, as set in article 109"

Article 109 - Simplifications in the standard formula

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.

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 following 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."

2.2. Other relevant Level 1 text

Recitals

The following Recitals explicitly refer to the principle of proportionality:

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

(19) This Directive 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. That principle should apply both to the requirements imposed on the insurance and reinsurance undertakings and to the exercise of supervisory powers.

(20) In particular, this Directive should not be too burdensome for insurance undertakings that specialise in providing specific types of insurance or 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. [...]

(21) This Directive regime should also take account of the specific nature of captive insurance and captive 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.

(133) [...] 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.

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

(66) 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.

Articles

With regard to the principle of proportionality, Article 29 stipulates that this is fundamental to all requirements in the Level1 text:

Article 29 - 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, scale and complexity of the risks inherent in the business of an insurance or reinsurance undertaking.*

3a. *The Commission shall ensure that implementing measures take into account the principle of proportionality, thus ensuring the proportionate application of this Directive, in particular to small insurance undertakings.”*

2. 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 111 1(l) 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:

“(l) the simplified calculations provided for specific sub-modules and risk modules, as well as the 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 those simplifications, as set out in Article 109.”

- 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 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 109, "*...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 standardised 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 86 (h)) has been developed by CEIOPS in its Consultation Papers CP 45 and CP 76 (now: CEIOPS-DOC-72-10).
- 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
- 3.10 We note that it is the responsibility of the (re)insurance undertaking to choose an adequate and reliable calculation of the SCR.³ Whereas this responsibility ultimately lies with the administrative or management body of the undertaking, the actuarial function plays an important role in coordinating the calculation of the capital requirement and in providing regular reports to the management body on its mandatory tasks performed.⁴
- 3.11 An assessment of the proportionality of the chosen methodology vis-à-vis the nature, scale and complexity of the underlying risks should be seen as part of this process, which is part of the (re)insurance undertakings' internal system of governance.

³ Cf. CEIOPS-DOC-21-09.

⁴ Cf. CEIOPS-DOC-29-09, section 3.6.

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

- 3.12 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.

Which risks?

- 3.13 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.
- 3.14 Therefore an assessment of the proportionality of the use of SCR simplifications should be carried out on basis of the sub-module or risk module considered. In undertaking such assessment, the undertaking should also have regard to the overall results of the SCR calculation, and should seek consistent treatment between different elements of the SCR. The proportionality assessment should be performed at each instance where the SCR standard formula is (re-)calculated, or where the undertaking would consider using another simplified calculation for a sub-module or risk module.

Nature and complexity

- 3.15 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.⁵
- 3.16 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.
- 3.17 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).

⁵ I.e. whether or not a risk is complex can be seen as a property of the risk which is part of its nature.

- 3.18 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.
- 3.19 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.
- 3.20 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.
- 3.21 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.
- 3.22 Therefore, to appropriately analyse and quantify more complex and/or less predictable risks, more sophisticated and elaborated tools will generally be required. However, we note that in some cases there will not be enough data to support a very complex model. Consequently, in these cases a method would need to be chosen which maximises credibility within the bounds of available data.

Scale

- 3.23 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.
- 3.24 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.⁶
- 3.25 Different interpretations of “scale” may be applied when considering risks, depending on the type of assessment to be made. For example, the undertaking may interpret the scale of a risk as the degree to which the un-

⁶ 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 is vulnerable to the risk in terms of the expected loss incurred under 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:

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

- 3.26 Alternatively, 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:

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

- 3.27 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.

- 3.28 However, using the SCR for a measurement of scale could be interpreted as introducing circularity, since it would require a calculation of the SCR before a final assessment of the proportionality of the simplified method which the undertaking considers to apply has been made. To overcome this problem, the undertaking could perform a preliminary determination of the SCR of the sub-module or risk module in question, for example by applying the simplified method envisaged to be used, and use this preliminary calculation to estimate the scale of the risk. Such an approach would of course require that the simplified method would be adequate for this purpose, i.e. would at least be capable of delivering an indication of the "true" risk.

- 3.29 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. benchmark should be defined both at undertaking and risk level (when the undertaking wants to use a simplification in one module or sub-module only).

- 3.30 For the examples described above, introducing a benchmark volume would lead to the following relative assessments of scale:

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

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

- 3.31 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.

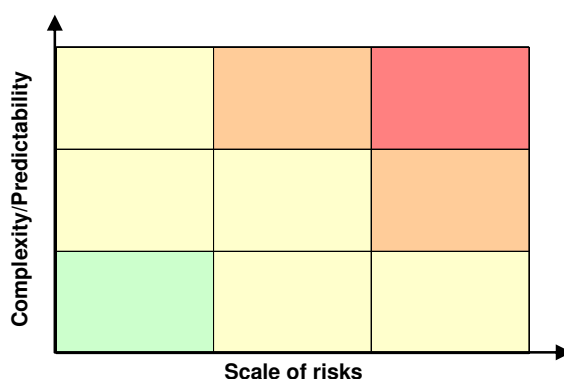
- 3.32 Following this principles-based framework, (re)insurance undertakings would be expected to use an interpretation of scale which is best suited to their specific circumstances and to their risk profile. Whatever interpretation of "scale" for risks or obligations is followed, this should lead to an objective and reliable assessment.

Combination of the three indicators and overall assessment

- 3.33 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.

- 3.34 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



- 3.35 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

- 3.36 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.
- 3.37 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.
- 3.38 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.
- 3.39 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 error⁷ implied by the change of method is immaterial.⁸
- 3.40 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.⁹
- 3.41 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.

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

- 3.42 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 Financial Reporting Standards (IFRS)¹⁰ as

⁷ In the following, the terms “estimation uncertainty” and “model error” are used synonymously. Hence the term “model error” is used in a broad sense, comprising the possibility that the assumptions and parameters used in the model are incorrect (in other sources, this latter risk is sometimes denoted as “parameter risk” as distinguished from model risk).

⁸ Note that this is not intended to imply that the undertaking should be required to quantify the degree of model error in precise quantitative terms (cf. para. 3.50).

⁹ Note that this is similar to the introduction of materiality to assess the scale of risks.

¹⁰ Materiality is defined in the glossary of the [International Accounting Standards Board’s](#) “Framework for the Preparation and Presentation of Financial Statements”

CEIOPS considers that by using this definition undertakings should be familiar with this concept.¹¹ 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".

- 3.43 In the context of a simplified calculation, this means that a misstatement of the value of a sub-module/module¹² 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.
- 3.44 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 the criteria for materiality and clearly document the basis on which the decision on the materiality of a potential misstatement of the SCR is made.
- 3.45 These criteria for materiality 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).
- 3.46 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 quantitative assessment of risk for solvency purposes – this should include the supervisory authority which uses the information when performing the Supervisory Review Process (SRP).

Assessment of the estimation uncertainty in the calculation

- 3.47 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.
- 3.48 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
- 3.49 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

¹¹ Cf. CEIOPS-CP-58-09, <http://www.ceiops.eu/content/view/14/18/>

¹² i.e. the degree of model error inherent in the measurement.

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.

- 3.50 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.¹³

3.4. Simplifications in QIS4 under the standard formula

3.4.1. Application criteria

- 3.51 According to Article 109 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.
- 3.52 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, the Level 1 text does not envisage an approval process for the use of simplifications to the standard formula.
- 3.53 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.
- 3.54 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

¹³ Cf. CEIOPS' Advice on Proportionality (annex), paragraph TS.II.A.36 of the QIS4 Technical Specifications.

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.

- 3.55 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.
- 3.56 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.
- 3.57 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.

3.4.2. Inventory of simplifications in the QIS4 specifications and in the additional consultation papers

3.4.2.1. CEIOPS-DOC-46-09 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

3.58 TS.VIII.C.7. QIS4 Simplification

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:
$$\text{Adj} = +0,1 \bullet \text{FDB}$$

Consultation paper 54

3.59 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.¹⁴

3.4.2.2. CEIOPS-DOC-40-09 and the relevant SCR market risk modules

Mkt_{int} interest rate risk

QIS4 simplification

3.60 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 %

¹⁴ See final advice under CEIOPS-DOC-46/09 (October 2009), see <http://www.ceiops.eu//content/view/17/21/>.

3.61 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.

CEIOPS-DOC-40-09

3.62 Because of the reasons given under 3.58 no simplification for the interest rate risk module will be foreseen.

Mkt_{eq} equity risk

QIS4 simplification

3.63 TS.IX.C.20 QIS4 Simplification

The determination of the capital charge $Mkt_{eq,i}$ 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 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 instruments¹⁵. 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>
<i>volafactor_i</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:

$$\text{ChangeInEquityValue}_i = \sum_j (\text{Equity}_{i,j} - \text{Equity_stress}_{i,j}) - \text{Hedge}_i$$

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 (i.e. value of hedges before stress minus value of hedges after stress). This means that an increase in the value of the hedge following a change in the market level of *volafactor_i* means that *Hedge_i* will be a negative figure.

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

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

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* (i.e. value of liabilities before stress minus value of liabilities after stress). This implies that a decrease in the value of liabilities following the *volafactori shock* will correspond to a positive *PostStressLiabilityValue* figure

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

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

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3.64 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_{int} Currency risk

QIS4 simplification

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

CEIOPS-DOC-40-09

3.66 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.

3.67 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.

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

Mkt_{sp} spread risk

QIS4 simplification

3.69 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.

For bonds: $Mkt_{sp}^{bonds} = MV^{bonds} * Dur^{bonds} * \sum (\%Mv_i^{bonds} F(rating_i)) + \Delta Liab_{ul}$

For structured credit products: $Mkt_{sp}^{struct} = MV^{struct} * Dur^{struct} * \sum (\%Mv_i^{struct} G(rating_i))$

For credit derivatives: $Mkt_{sp}^{cd} = \sum (Mv_i^{cd}) * Dur^{cd}$

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

where:

MV = Total market value of non-government bond portfolio

MVstruct = Total market value of structured credit products portfolio

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

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

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

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

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

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

Where $\Delta Liab_{ul}$ = 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 (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 $MV^{bonds} * Dur^{bonds} * \sum (\%Mv_i^{bonds} F(rating_i))$

$F(rating_i)$: as for non-simplified approach

$G(rating_i)$: as for non-simplified approach

CEIOPS-DOC-40-09

3.70 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.

3.71 The design of the simplification should take into account the changes of the spread risk sub-module proposed in CEIOPS advice on market risk

calibration (CEIOPS-DOC-66-10) compared to QIS4. The resulting simplified calculation is defined as follows:

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

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

$duration$ = Average duration 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 $MV \cdot \sum_i \%MV_i \cdot F(rating_i, duration)$.

Property risk

QIS4 simplification

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

CEIOPS-DOC-40-09

3.73 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

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

CEIOPS-DOC-40-09

3.75 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.

3.4.2.3. CEIOPS-DOC-23-09 and the SCR_{def} counterparty default risk

3.76 CEIOPS-DOC-23-09 includes simplifications for the calculation of the counterparty default risk module. Further simplifications are not envisaged.

3.4.2.4. CEIOPS-DOC-42-09 and SCR life underwriting risk module

Mortality risk

3.77 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 = $1.1^{((n-1)/2)}$

3.78 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.

3.79 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.

3.80 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.

3.81 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 $q_x * (1 + 10\%)$.

3.82 The main changes that CEIOPS-DOC-42-09 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%.

3.83 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 = $1.1^{((n-1)/2)}$

3.84 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.

3.85 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

3.86 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 * (Best estimate 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

3.87 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 best estimate 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 best estimate provisions with probability q_x , where q_x is the probability that a life aged x dies over the next year.

3.88 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.

- 3.89 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.
- 3.90 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.
- 3.91 The QIS4 approach and calibration are maintained in CEIOPS-DOC-42-09. The simplification can therefore be left unchanged.
- 3.92 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

- 3.93 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.

Disability capital requirement = (total disability capital at risk) * i (firm-specific) * 0.35 * (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

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

- 3.94 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.

- 3.95 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.
- 3.96 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.
- 3.97 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 $i_x * (1 + 10\%)$.
- 3.98 However CEIOPS-DOC-42-09 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.
- 3.99 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 = $1.1^{((n-2)/2)}$

- 3.100 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.
- 3.101 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.
- 3.102 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.
- 3.103 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 =
 $= 20\% * t * (1.1)^{((n-1)/2)} * n * (\text{Best estimate provisions for contracts subject to disability claims})$

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

3.104 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

3.105 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 (RE) = $\sum_i (i \cdot RE_i) / RE$ with $RE = \sum RE_i$

3.106 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.

3.107 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) *

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

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)

3.108 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

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

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

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

Catastrophe risk

3.111 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:

$$Life_{CAT} = \sum_i 0.0015 \cdot Capital_at_Risk_i$$

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:

$$Capital_at_Risk_i = SA_i + AB_i \cdot Annuity_factor - BE_i$$

and

BE_i = Best estimate 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

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

Lapse risk

3.113 CEIOPS-DOC-42-09 includes two simplifications for the calculation of the lapse risk sub-module. Further simplifications are not envisaged.

3.4.2.5. CEIOPS-DOC-43-09 and SCR health underwriting risk module

3.114 As the structure of the module and the approach of the risks has been changed in CEIOPS advice CEIOPS-DOC-43-09, the simplifications included in the QIS4 Technical specifications are no longer valid. New simplifications are introduced.

SLT Health mortality risk

3.115 The simplifications under section 3.4.2.4. can be used.

SLT Health longevity risk

3.116 The simplifications under section 3.4.2.4. can be used.

SLT Health disability/morbidity risk for income insurance

3.117 The simplifications under section 3.4.2.4. can be used.

SLT Health expense risk

3.118 The simplifications under section 3.4.2.4. can be used.

SLT Health revision risk

3.119 The simplifications under section 3.4.2.4. can be used.

SLT Health lapse risk

3.120 The simplifications under section 3.4.2.4. can be used.

SLT Health catastrophe risk

3.121 No simplifications allowed.

3.4.2.6. CEIOPS-DOC-41-09 and SCR non-life underwriting risk module

Premium and reserve risk

3.122 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

3.123 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.

3.4.2.7. QIS4 simplifications for captive insurance and reinsurance undertakings

3.124 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} :

$$NL_{pr} = 0.45 * (Rt - Pt, \text{ earned})$$

where

- $Pt, \text{ earned}$ = estimate of net earned premium during the forthcoming year
- Rt = contractually agreed maximum annual claims net of reinsurance.

3.125 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

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

3.127 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

3.128 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

3.129 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

3.130 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

- 3.131 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.
- 3.132 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.
- 3.133 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.
- 3.134 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 more accurate method in order to demonstrate that the difference between the result of the chosen method and the result of a more accurate 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 chosen method (and hence the difference between these two amounts) is immaterial.
- 3.135 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

3.136 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 standard calculation of the spread risk sub-module is an undue burden for the undertaking.

3.137 3.127 The simplification is defined as follows:

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

where:

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

$\%MV_i^{bonds}$ = 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

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 $MV \cdot \sum_i \%MV_i \cdot F(rating_i, duration)$.

Mortality 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 mortality risk capital requirement.
- The standard calculation of the mortality risk sub-module is an undue burden for the undertaking.

3.139 The simplification is defined as follows:

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

Longevity 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 longevity 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 an undue burden for the undertaking.

3.141 The simplification is defined as follows:

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

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

3.142 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 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 an undue burden for the undertaking.

3.143 The simplification is defined as follows:

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 * (1.1)^{((n-1)/2)} * n * (Best estimate provisions for contracts subject to disability claims)

Where:

n = Modified duration of liability cash-flows

i₁, i₂ = 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)}

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

3.144 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 an undue burden for the undertaking.

3.145 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

3.146 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 catastrophe 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 catastrophe risk sub-module is an undue burden for the undertaking.

3.147 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:

$$Capital_at_Risk_i = SA_i + AB_i \cdot Annuity_factor - BE_i$$

and

BE_i = Best estimate 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
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

3.148 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

3.149 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.