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Advice to the European Commission in the Framework of the Solvency II project on Pillar I issues – further advice

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Style convention

The following has been adopted for this document:

Advice appears in shaded (blue) boxes, headed **CEIOPS' Advice**

Descriptive headings are used (such as 'Background', 'Explanatory text' etc.) in an attempt to improve the navigability of the answers.

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Section 1

Introduction

1.1 One of CEIOPS' primary responsibilities is to provide technical support to the European Commission in developing a new solvency system for insurance undertakings in the EU – Solvency II.

1.2 During 2005 and 2006, CEIOPS submitted technical advice for Solvency II on 23 specific areas requested by the Commission. Large parts of this advice related to quantitative requirements on insurance undertakings – broadly termed 'Pillar 1 standards.' At the same time CEIOPS was asked to conduct full quantitative impact studies (QIS) in order to provide comprehensive analysis.

1.3 Following the successful completion of QIS1 and QIS2, CEIOPS is now in a position to further develop its advice on Pillar 1 standards. CEIOPS is also taking this opportunity to consider the impact of recent changes the Commission has made to the *Framework for Consultation*.[1]

Objectives

1.4 The main objective of this advice is to provide the Commission with sufficient technical advice so that it is in a position to finalise its proposal for a Framework Directive (in respect of Pillar 1). This advice also aims to give a 'preview' of some of the further technical detail that is required to make Solvency II fully operational, as the Framework Directive may foresee 'level 2' implementing measures. Furthermore, CEIOPS will also work to develop 'level 3' standards and guidance to enable further convergence of practice.

1.5 Parts of this paper clearly need to be understood as work in progress. Where CEIOPS has been unable to provide the full picture, it has attempted to map out the tangible steps needed before complete advice can be delivered – for example, on the calibration of individual parameters in the SCR standard formula. Projections of future work are provided on a 'best efforts' basis.

1.6 This paper mainly relates to Pillar 1 aspects at the solo level. Detailed advice on Pillar 2, Pillar 3 and group/cross-sectoral issues is published in other papers, available from the CEIOPS website.[2]

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[1] European Commission (2006) – *Amended Framework for Consultation on Solvency II,* MARKT/2515/06.

[2] www.ceiops.org

Harmonisation

1.7 A central driver of the Solvency II project is the need to develop a prudential framework which ensures that undertakings operating in / from different jurisdictions are adhering to a set of commonly-agreed objectives and standards. This should mean that consumers can rely on a minimum, common level of protection across the EU. Additionally, insurers should not be subject to a competitive inequality through a 'race to the bottom.' An increasingly relevant aspect for pan-European groups, is the need to achieve legal certainty when operating in multiple jurisdictions, as well as the desire to reduce administrative and compliance costs which inevitably get passed on to the consumers.

1.8 In the *Amended Framework for Consultation*, the Commission has noted that Solvency II should:

"…aim to attain an appropriate level of harmonisation that is at the same time higher than the present one. [This aim] should be reflected by solvency rules which do not need additional requirements. The new solvency system should provide for uniform application and sufficient consumer protection whilst supporting fair competition."

1.9 Several recent studies have confirmed great variety in the implementation of the current insurance Directives, leading to significant differences in the level of safety across the EU. Technical provisions[3] and accounting for regulatory purposes are, perhaps, the clearest examples of areas where EU members have notably diverging practices and regulations. Hence agreement on a more convergent, common approach in these two areas will go a long way towards achieving a higher level of harmonisation under the current Directives.

1.10 CEIOPS notes that the 'Lamfalussy' procedure would seem to offer a more flexible and easily adaptable way of setting up and maintaining a framework of prudential regulation in Europe. Appropriate use of all the levels should facilitate the achievement of an *"appropriate," "higher"* level of harmonisation. Furthermore, CEIOPS notes that the potential of level 3 – supervisory convergence in practical implementation – is yet to be fully explored. Together, convergence of principles and implementation practices should support the protection of policyholders and beneficiaries, cross-sectoral consistency and competitiveness, without impeding innovation.

1.11 Based solely on technical considerations, CEIOPS supports at this stage the development of the different issues included in this advice. The aim should be to maximise harmonisation, both on quantitative issues and qualitative requirements and procedures, while keeping robustness and consistency of treatment at a sufficiently high level.

1.12 Maximum harmonisation does not preclude the use of entity-specific features or parameters as part of the assessment of technical provisions,

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[3] EU Commission (2002) – *Report of the WG on life assurance to the IC Solvency Subcommittee,* MARKT 2528/02 and the corresponding report for non-life assurance.

SCR and MCR. But entity-specific assumptions must be derived by applying a common methodology, with sufficient detail given at the different levels of Lamfalussy procedure.

1.13 Obviously, maximum harmonisation does not preclude the allowance of full or partial internal models when insurers meet the relevant requirements for their implementation, assuming that these requirements and the details of its application in each jurisdiction are fully harmonised at the EU level.

Status of the text

1.14 This advice builds upon the advice CEIOPS has previously submitted to the Commission in the framework of the Solvency II project, specifically:

- answers to the **first wave** of calls for advice;[4]
- answers to the **second wave** of calls for advice;[5] and
- answers to the **third wave** of calls for advice.[6]

1.15 Unless expressly stated otherwise, the advice in these three documents stands. For convenience, this paper occasionally summarises parts of the advice previously given as 'background information,' but the omission of other parts should not be viewed as a retraction.

1.16 Generally, the advice in this paper may be seen as an extension to the previous answers – providing further detail on specific issues or offering greater clarity where CEIOPS had not yet provided a definitive recommendation. However, there are several areas where CEIOPS has decided to amend its previous advice in light of the results of QIS1 and 2. In each case, the amendment is clearly indicated and an explanation given as to why deviation from the previous advice is considered necessary.

1.17 References to CfA XX.YY denote paragraph YY in CEIOPS' final response to the Commission on Call for Advice XX. References to QIS2 ZZ denote paragraph ZZ in the Technical Specification for QIS2.[7]

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[4] CEIOPS (2005) – *Answers to the European Commission on the first wave of Calls for Advice in the Framework of the Solvency II project* CEIOPS-DOC-03/05 ("first wave answers")

[5] CEIOPS (2005) – *Answers to the European Commission on the second wave of Calls for Advice in the Framework of the Solvency II project* CEIOPS-DOC-07/05 ("second wave answers")

[6] CEIOPS (2006) – *Answers to the European Commission on the third wave of Calls for Advice in the Framework of the Solvency II project* CEIOPS-DOC-03/06 ("third wave answers")

[7] CEIOPS (2006) – *QIS2 Technical Specification, available at: http://www.ceiops.org/content/view/118/124/*

Other initiatives

1.18 CEIOPS recognises that a number of other global bodies are working on issues that are highly relevant to the development of Pillar 1 standards under Solvency II. The IAIS in particular has made significant progress, including:

- the *"Cornerstones Paper*;"[8] and
- the *"Second Liabilities Paper"*[9]

These documents were not available at the time CEIOPS developed its previous advice, although they have been considered in the drafting of this paper.

1.19 A number of IAIS papers are likely to have a significant impact on CEIOPS' future work. These include:

- the *"IAIS Common Structure for the for the assessment of insurer solvency"* paper;
- the Supervisory Standard on Asset-Liability Management; and
- the Standards on *"Enhanced Disclosures"* for life insurance, non-life insurance and investments.

1.20 CEIOPS has also carefully followed progress on phase II of the IASB insurance contracts project and the work of the IAA Working Group on risk margins.

1.21 CEIOPS supports the aim of cross-sectoral consistency and is actively contributing to joint 3L3 initiatives to this end.

1.22 Finally, CEIOPS would like to acknowledge the significant contribution made by stakeholder groups up to and following the publication of the first, second and third wave answers, as well as the support provided through both QIS exercises. Good working level contacts have been established with a number of groups, enabling CEIOPS to receive expert input and to test ideas quickly.

Next steps

1.23 CEIOPS has carefully considered comments from stakeholders on its consultation paper and has revised the contents where appropriate. The

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[8] IAIS (2005) – *Towards a common structure and common standards for the assessment of insurer solvency: Cornerstones for the formulation of regulatory financial requirements* ("Cornerstones paper," approved in October 2005)

[9] IAIS (2006) – *Issues arising as a result of the IASB's Insurance Contracts Project (Phase II), Second Set of IAIS Observations*

final advice is being submitted to the European Commission together with an explanation of how each comment has been addressed.

1.24 After submission of this advice CEIOPS will continue to develop further detailed advice on Pillar 1 standards, in addition to CEIOPS' plans for elaborating the MCR and the SCR standard formula.

1.25 A critical part of the development work on the MCR and the SCR standard formula will be another round of QIS (QIS3). The proposals under test in this exercise should be consistent with:

- the purpose of the MCR & SCR;
- the overall structure of both requirements, including the risks addressed and the mode of combining capital charges; and
- the objectives for each of the individual components that make up the MCR and SCR standard formula

articulated in this paper (as amended following consultation). Given this basis and the work to address design questions in QIS1 and QIS2, CEIOPS should be able to place a greater emphasis on refining the calibration of these requirements.

1.26 Further advice on the MCR and the SCR standard formula arising from QIS3 will be subject to public consultation.

1.27 The broad timetable can be summarised as follows:

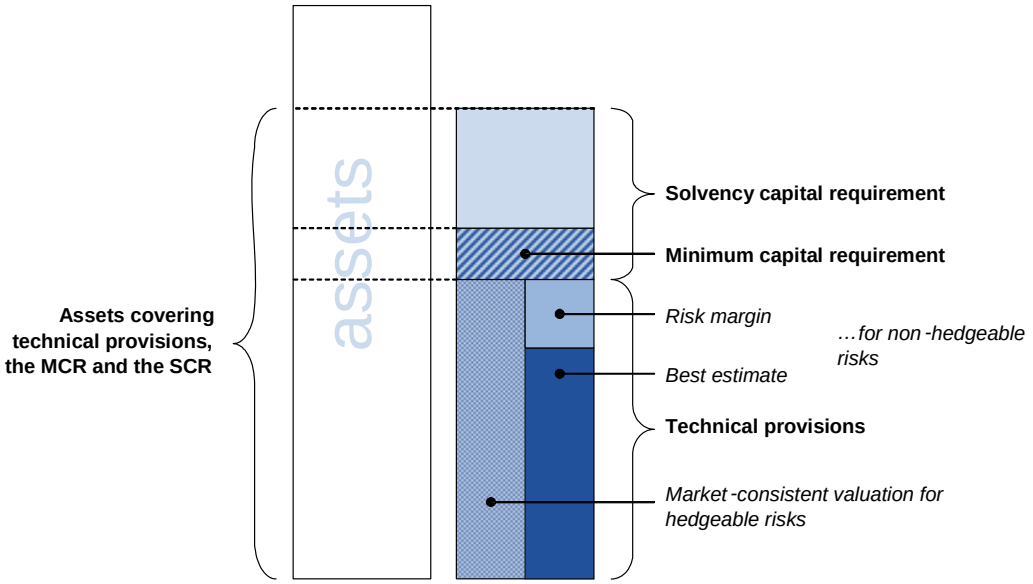
April-June 2007	Technical specification for QIS3 released, based on the purpose, structure and objectives for the MCR/SCR outlined in CEIOPS' advice
October 2007	Summary of results from QIS3
	Consultation paper containing advice on the MCR and the SCR standard formula arising from QIS3
Spring 2008	Final advice on the SCR standard formula delivered to the Commission.

Section 2

Adequacy of financial resources

2.1 The overall objective of prudential regulation must be to ensure that an insurer maintains, at all times, financial resources which are adequate, both as to amount and quality, to ensure there is no significant risk that its liabilities cannot be met as they fall due.

2.2 Pillar 1 is made up of a number of different elements that, in combination, should provide a structured means of assessing whether the insurer has adequate financial resources for the risk it carries.



2.3 CEIOPS has responded to separate Calls for Advice from the Commission on each element of Pillar 1. But, to date, there has been no real opportunity to provide an overview of how valuation standards, capital requirements and safety measures fit together to ensure the adequacy of an undertaking's financial resources.

2.4 The aim of this section is to briefly describe the high-level objectives for the different elements of Pillar 1 and their interaction, providing context for the more detailed sections in the remainder of the paper. Drawing these objectives together should allow for an assessment regarding the overall coherence of Pillar 1 – in particular, whether there are any instances of conflicting/duplicative treatments or, indeed, gaps that need to be addressed.

2.5 As noted, the scope of this paper is mainly restricted to Pillar 1. However, CEIOPS has also reflected on the limits of what can be achieved with minimum quantitative requirements. This section also considers the boundaries between Pillars 1, 2 and 3.

Valuation standards

2.6 Objectives for a standard on technical provisions – relationship with IAIS and IASB

2.7 In its *Amended Framework for Consultation* the Commission sets out objectives for technical provisions[10]:

"Technical provisions need to be established in order for the undertaking to fulfil its (re)insurance obligations towards policyholders and beneficiaries, taking account of expenses. In line with the IAIS Cornerstones and expected IASB developments, technical provisions have to be prudent, reliable and objective, and allow comparison between (re)insurers. They should make optimal use of and be consistent with information provided by the financial markets and generally available data on insurance technical risks. They are the sum of a best estimate and a risk margin.

The best estimate equals the expected present value of future cash flows, using the relevant risk free yield curve, based upon current and credible information and realistic assumptions. The use of realistic assumptions implies that surrender value floors should not be applied to the calculation of technical provisions. The risk margin covers the risks linked to the future liability cash flows over their whole time horizon. It should be determined in a way that enables the (re)insurance obligations to be transferred or put into run-off. Such an approach protects policyholder rights and takes account of the uncertainty of valuation of the best estimate."

2.8 The IASB has continued its work on Phase 2 of its Insurance Project. At its April 2006 meeting, the Board's tentative conclusion was that technical provisions should be based on a 'current exit value' approach:

"Current exit value is the amount the insurer would expect to have to pay today if it transferred all its remaining contractual rights and obligations immediately to another entity".[11]

2.9 Such an approach would be consistent with making optimal use of information from financial markets. CEIOPS notes that, on the subject of technical provisions, there are a few main points where the IASB's current thinking differs from the approach IAIS is advising for regulatory valuations. These are:

- the potential non-recognition of a liability for policyholder participation rights over a pool of assets;
- a possible reduction in insurance liabilities arising from an allowance for own credit risk in the valuation of liabilities;

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[10] Amended Framework for Consultation, para. 16, available at: http://ec.europa.eu/internal_market/insurance/docs/markt-2506-04/amended-framework_en.pdf

[11] IASB (2006) – *Insurance Contracts (Phase II) Project Update 11 July 2006*

- IASB requirement to use general market assumptions, even if this produces lower technical provisions than using entity-specific assumptions (i.e. relating overheads or management expenses).

CEIOPS is also aware of papers recently released by the CFO European Forum[12] and certain North American and Japanese associations and entities. These papers contain interesting suggestions to improve accounting standards relating insurance contracts, whose impact in the calculation of technical provisions needs further analysis (i.e. principles for recognition of margins over the coverage period, measurement rules after inception, etc.).

2.10 While recognising that IASB has yet to reach a final conclusion on its accounting methodology, CEIOPS considers that developments at IAIS and IASB are, to a certain extent, consistent with the objectives for technical provisions as set out by the Commission. In particular, the IASB accounting methodology may need a certain set of filters to derive valuations of technical provisions admissible for supervisory purposes (CfA 21.89). The extent and importance of these filters will depend on the consistency of future developments in the IASB project with the aims of supervisors, having in mind that they are one of the main users of public financial reporting in insurance.

2.11 CEIOPS shares the IAIS's "clear preference for as much similarity between public financial reporting and prudential reporting for solvency assessment purposes as is appropriate" (para. 17 of the Cornerstones paper). The application of consistent principles for both prudential and public financial reporting brings very important advantages (e.g. cost reduction, practical considerations and avoidance of conflicting or inconsistent views between different market operators). However, some points of difference between the accounting and supervisory perspectives may prove to be inevitable, since the accounting methodologies may not be always easily reconcilable with the main aims of supervision.

Role of best estimate and risk margin

2.12 The two main building blocks under Solvency II – the valuation of technical liabilities and determination of capital requirements – are part of a consistent overall framework, which aims to ensure an adequate level of protection of policyholders and beneficiaries.

2.13 Technical provisions should comprise two components: a best estimate and a risk margin. The best estimate seeks to value as accurately as possible, with the information available at the valuation date, the expected value (i.e. the average of the relevant loss probability distribution) of the insurance liabilities, after recognition of the time value of money. Reflecting existing market uncertainties the technical provisions must include a risk margin that meets the objectives either to transfer the portfolio to a third party or

[12] CFO Forum, Elaborated Principles for an IFRS Phase II Insurance Accounting Model, Elaborated Principles and Basis for Conclusions, June 2006; and GNAIE Extended Principles for Non-Life Insurance

to recapitalize the company to ensure a proper run-off scenario by the original undertaking.

2.14 In its Second Liabilities paper, the IAIS states:

"The nature of the margin over CE ['current estimate' or 'best estimate'] is frequently described differently depending on the viewpoint. In an accounting sense it is often thought of as the amount that would be required to compensate a transferee for the risk inherent in a transfer of the liabilities. It is also sometimes thought of as a shock absorber. In solvency terms, this margin in the technical provision tends to be thought of in terms of prudence or a confidence level which, together with the capital requirement in addition to the technical provision, contributes to the overall sufficiency of the solvency assessment regime. In both cases the IAIS believes that one of the key characteristics of the margin is to reflect the level of uncertainty in the calculation of the CE." (para. 37)

The IAIS concluded by saying that:

"at this stage, we do not see any reason why conceptual differences should arise in the methodologies for calculating the margin over CE within the context of insurance liabilities for both accounting and solvency purposes." (para. 38)

2.15 While not excluding other methodologies,[13] the Commission requested that two possible methods for calculating the risk margin are evaluated as working hypotheses:

- The percentile approach, where the risk margin is given by the *"difference between the 75th percentile of the underlying probability distribution until run-off and the best estimate,"* subject to a minimum of half a standard deviation to take into account strong skewed distributions.

- The Cost-of-Capital approach, where the risk margin is calculated *"based on the cost of providing SCR capital to support the business-in-force until run-off."*

2.16 In a more recent text (MARKT/2540/06, 16 Feb. 2007), nevertheless, the Commission requested that the risk margin be calculated by determining the cost of providing SCR capital to support the (re)insurance obligations over their lifetime.

2.17 The merits of any method for the calculation of the risk margin should be assessed relative to the objectives that the risk margin is intended to achieve. As identified in CfA 7.5, the setting of the risk margin should have regard to the following issues:

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[13] As an example, CEIOPS is currently analysing pros and cons of using scenario techniques to assess the risk margin of life insurance products. These techniques may be used in isolation or combined with 'cost of capital' approach.

- Any risk premium necessary to ensure the transferability of the liabilities to a third party;
- Addressing uncertainty in the valuation of the best estimate;
- Achieving an appropriate level of policyholder protection over the run-off period of the liabilities; and
- Supporting harmonisation by setting a quantitative standard in an explicit manner.

2.18 According to the Groupe Consultatif,[14] the following criteria are essential for a good risk margin:

- *"Ease of calculation*
- *Stability of calculation between classes and years*
- *Consistency between different companies*
- *Consistency with overall solvency system*
- *Consistency with future IFRS Phase 2*
- *As close as possible to market consistency."*

2.19 In addition, the risk margins should:

- *"Sit on top of best estimate (defined as mean value of discounted reserves)*
- *Capture uncertainty in parameters, models and trends to ultimate*
- *Be harmonised across Europe*
- *Provide a sufficient level of policyholder protection together with the MCR/SCR"*

2.20 The IAIS, in its 2nd liabilities paper (paragraphs 59 and 61) has commented that:

> *Irrespective of the particular methodology chosen, acceptable methods should reflect the inherent uncertainty in the expected future cash flows and would be expected to exhibit the following characteristics:*
>
> - *"The less that is known about the current estimate* [best estimate] *and its trend; the higher the risk margins should be;*

[14] Letter of 13 February 2006 from the Groupe Consultatif to CEIOPS, available at: http://www.gcactuaries.org/documents/techprov_letter_ceiops_final_050906.pdf.

- *Risks with low frequency and high severity will have higher risk margins than risks with high frequency and low severity;*
- *For similar risks, contracts that persist over a longer timeframe will have higher risk margins than those of shorter duration;*
- *Risks with a wide probability distribution will have higher risk margins than those risks with a narrower distribution;*
- *To the extent that emerging experience reduces uncertainty, risk margins will decrease, and vice versa (paragraph 59).*

The rationale for not imposing a single method of calculation is that the overriding aim should be to encourage companies to measure and manage their risks properly. However, the IAIS believes that the outcomes should be comparable between insurers for similar risks. (paragraph 61)"

Section 3 develops this subject further.

Solvency Capital Requirement

Objectives for the SCR

2.21 The SCR should deliver a level of capital that enables an insurance undertaking to absorb significant unforeseen losses and gives reasonable assurance to policyholders that payments will be made as they fall due. It should reflect the amount of capital required to meet all obligations over a specified time horizon to a defined confidence level. In doing so, the SCR should limit the risk that the level of available capital deteriorates to an unacceptable level at any time during the specified time horizon. The SCR should take into account all significant, quantifiable risks (CfA 10.121). Even if the capital covering the SCR has been used up at some time during the specified time horizon, the risk margin in technical provisions should ensure that the portfolio could still be transferred to a third party (CfA 10.125).

2.22 These objectives should apply, regardless of whether the SCR is calculated using the standard formula, partial internal models or full internal models (CfA 10.122).

Definition

2.23 It is important to have a consistent solvency standard so that there is equivalence in the minimum level of security expected from insurers. Therefore, the definition of the SCR needs to be detailed enough to achieve materially-consistent results in the calculation of the SCR across undertakings. To achieve this, the definition needs to specify a number of key aspects for the quantification of solvency capital that are consistent with the general objectives as laid out above. These **key aspects** concern the following:

- The choice of the **risk measure**;
- The choice of the **confidence level**;
- The choice of the **time horizon** of the solvency assessment;
- the **definition of ruin**, and
- the **valuation of assets and liabilities** underlying the calculation of the SCR

2.24 Specifying these aspects of the SCR provides a common basis for the calculation of the SCR, either by the standard formula, by partial internal models or by full internal models. This should provide comparability of SCR calculations across different insurers, and between the standard formula and internal models.

2.25 However, the definition of the key aspects of the SCR does not preclude the application of different methodologies for the SCR calculation, provided that these calculations are consistent with the overall principles. For example, with regards to the risk measure, CfA 10.123 noted that, depending on the risk characteristics of the portfolio, VaR may be calibrated to deliver approximately the same degree of prudence as TailVaR.

Consistency with standard formula and internal models calculations

2.26 Regarding the standard formula, its design and calibration will need to be consistent with the key aspects laid out above. It should be noted that the consistency of the standard formula with these aspects is likely to be implicit rather than explicit; concerning the choice of the risk measure, for example, CEIOPS has stated that the standard formula should *simulate* the effects of the given risk measure rather than perform a precise calculation (CfA 10.123).

2.27 Concerning internal models, it can be observed that, at present, a wide variety of different 'assumption sets' are used by insurance undertakings to perform economic capital calculations for internal risk management purposes. With regards to the key aspects described above, this concerns, for example, the choice of risk measure, the level of confidence or the length of the time horizon.

2.28 Internal economic capital calculations also typically follow a slightly different perspective from a calculation of solvency capital requirements; whereas the SCR is intended to avoid ruin, economic capital is typically intended to provide strategic and operational flexibility and/or to sustain a target credit rating.

2.29 This presents a general issue of how the future solvency regime should reconcile, on the one hand, the need for a clear and consistent definition of the SCR, and, on the other hand, the intention to give insurers the flexibility to develop models that genuinely reflect their risk profile and fit their risk management processes. This issue is explored further in sections 6 and 7 of this paper.

Risk measure

2.30 The risk measure proposed in CfA 10.123 was TailVaR. Conceptually, it has the following key advantages over VaR:

- it takes account not only of the probability of insolvency, but also of the expected loss on insolvency and thereby encourages insurers and supervisors to consider the consequences of a potential default;

- In many business lines, insurance undertakings may be subject to infrequent, high-impact losses. Under VaR, an insured loss with probability beyond the confidence threshold would receive a zero capital charge.[15] Under TailVaR, such losses would be reflected, setting an incentive for insurers to mitigate even the more extreme losses, and for supervisors to see that they do so;

- It is subadditive, so the capital requirement for two or more risks combined is less than the sum of the requirements for the risks measured singly. VaR, by contrast, may fail to be sub-additive under certain circumstances.[16] Subadditivity is a very important property, since it reflects that diversification effects occur when risks are combined, thereby providing encouragement for good risk management practices, i.e. portfolio diversification.

2.31 However, CEIOPS recognises that the Commission's *Amended Framework for Consultation* continues to support VaR as the risk measure for the SCR, and that the decision on the appropriate risk measure should not only be based on theoretical considerations, but also on practical issues. Therefore, CEIOPS believes that the SCR, at least for an initial implementation of Solvency II, should be based on VaR, with an aspiration of moving to TailVaR at a later date. CEIOPS believes that, this will support the overall goal to design the SCR such it delivers a close approximation of an insurer's risk profile and a more accurate reflection of its tail risks, thereby improving the quality of policyholder protection.

Definition of ruin

2.32 In CfA 10.125, CEIOPS proposed that the unacceptable level of capital which serves as a benchmark for the calculation of the SCR should be defined as the point where assets no longer exceed technical provisions (valued for solvency purposes) and other liabilities.

2.33 CEIOPS recognises that the Commission's *Amended Framework for Consultation* suggests defining ruin as the point where the amount of admissible assets no longer exceeds the amount of technical provisions. This differs from CEIOPS' suggestion in two points:

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[15] Under a 'stand-alone' VaR measurement of such a risk.

[16] Typical situations where VaR is generally not sub-additive were summarised in a recent presentation by Paul Embrechts (ETH Zürich, see www.math.ethz.ch/~baltes/ftp/OpRisk-talk.pdf) as: highly skewed distributions; special dependence structures; heavy-tailed losses. Note that generally insurance risks (especially in non-life insurance) are more likely to have these properties than risks in the banking sector.

- Firstly, the ruin definition in the Commission's framework only refers to technical provisions, and not also to other liabilities;

- Secondly, it refers only to admissible assets, whereas CEIOPS' ruin definition does not make a distinction between admissible and non-admissible assets.

2.34 Concerning the first point, CEIOPS believes that it is important from the point of view of policyholder protection to also include other liabilities into the definition of ruin. For example, in some cases, certain types of 'other liabilities' might rank higher than technical provisions in relation to the entirety of the obligations of the undertaking; in such a case, in order that the obligations of the insurer could be transferred to a third party, it would not suffice that the technical provisions alone could be covered by assets.

2.35 More generally, the 'simplified balance sheet concept' that underlies the calculation of the SCR implies that ruin should be defined as the point where assets no longer exceed liabilities. Liabilities include all 'other liabilities' apart from technical provisions that are not treated as available capital (which is conceptually seen as the difference between assets and liabilities).

2.36 CEIOPS therefore proposes to uphold its previous advice, i.e. to include 'other liabilities' in the definition of ruin. Concerning this proposition, the following two issues arise:

- Which types of 'other liabilities' should be included in the ruin definition?

- Which valuation basis should be used for these 'other liabilities?'

2.37 The second question is addressed in section 3. With regards to the first question, under an approach consistent with the 'simplified balance sheet' concept underlying the SCR calculation, each liability not included in the ruin definition would principally have to be treated as available capital. However, concerning the ongoing discussions on the definition of eligible capital elements to cover solvency requirements, it seems important not to pre-empt decisions in this field. Therefore, most CEIOPS' Members propose to specify the ruin definition such that it refers to those other liabilities that are not counted as available capital. For example, the following wording could be used:

The unacceptable level of capital which serves as a benchmark for the calculation of the SCR should be defined as the point where assets no longer exceed technical provisions (valued for solvency purposes) and other liabilities (to the extent these are not treated as available capital at the date to which the SCR relates).

2.38 An alternative solution supported by some CEIOPS' Members would be to include those other liabilities in the ruin definition which, in the case of insolvency, rank ahead of policyholder obligations. However, such an approach may not be consistent with the definition of eligible capital (in cases where other liabilities with 'lower rank' than technical provisions would not be treated as available capital).

Time horizon

2.39 The SCR should be based on a time horizon of one year, i.e. it is assessed by reference to events assumed to occur within the one-year time horizon. The SCR shall be calculated under the presumption that the undertaking will carry on its business as a going concern. Therefore, this should generally include an allowance for risks arising from continuing business activities within that time horizon.[17] All the information received during the one-year time horizon which may affect the financial position of the insurance undertaking through to the run-off of the business, shall be taken into account when assessing the SCR. Consistent with CfA 10.127, a time horizon of one year is proposed.[18]

Level of confidence

2.40 In the context of a VaR risk measure, CEIOPS considers it appropriate, as a working hypothesis, to calibrate the SCR according to a 99.5% confidence level. This is believed to roughly correspond to a secure financial strength ('BBB') rating of an insurance undertaking.

2.41 Experience from the Swiss Solvency Test suggests that, on average, a 99% confidence level with a TailVaR risk measure may roughly be equivalent to a 99.5% confidence level with a VaR risk measure.[19] This assumption is also consistent with the findings in a recent publication from the rating agency Fitch, where it was observed that, on average, VaR is roughly one-half to two-thirds of the distance between the TailVaR threshold and 100%.[20]

2.42 Therefore CEIOPS considers that, with a TailVaR risk measure, a 99% confidence level would be more appropriate. However, this conclusion will need to be reassessed following QIS3. It needs to be recognised that the level of capital should be set at a level that the industry as a whole can afford.

Risks to be included

2.43 In CfA 10.130, CEIOPS stated that the SCR should include all material, quantifiable risks to which an insurance undertaking is exposed.

2.44 With regards to the standard formula, the following risks will be covered.

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17 Cf. para. 10.127 in CEIOPS' answer to CfA 10.

18 This does not imply that the SCR assessment will not give any consideration to events far beyond the one year time horizon. In fact, to the extent that the valuations of assets and liabilities is based on prospective methods, where all future cash flows are considered, the SCR always maintains a certain forecast on any future development that may influence the solvency of the insurer.

19 Federal Office of Private Insurance (2006) – *The Swiss Experience with Market Consistent Technical Provisions: the Cost of Capital Approach*

20 Fitch Ratings (2006), *Exposure Draft: Prism - Insurance Rating Calibration Measures* However, it should be noted that on the level of individual undertaking's portfolios, it seems unlikely that a universally-applicable formulaic relationship between the TailVaR and VaR risk measures could be found. Whereas such relationships can be established in some cases, they are only true under additional assumptions on the nature of the underlying risk (e.g. by supposing a lognormal distribution).

- Market risk – including interest rate, equity, credit spread, property and currency risks;
- Credit default risk;
- Operational risk;
- Life underwriting risk – including mortality, longevity, morbidity, disability, lapse and expense risks;
- Health underwriting risk (for 'actuarial health insurance' as practiced in Austria and Germany) – including expense, excessive loss/mortality/cancellation and epidemic/accumulation risk; and
- Non-life underwriting risk – including premium, reserve and catastrophe risk.

More details are given in section 5 of the paper. In addition the SCR may include the risk of asset concentrations arising from exposures to companies and groups (and possibly to individual large properties).

2.45 The risk of asset-liability mismatch is also significant, particularly in life insurance business. ALM risk can manifest itself through all of these risk categories and therefore its quantifiable aspects should be addressed as part of the SCR (CfA 10.26).

2.46 However, CEIOPS has noted in CfA 10.24 that there is no unique way of breaking down risks into categories. A categorisation that provides a good fit to the risk profile of one undertaking may be less appropriate in other circumstances. This will depend largely on the nature, scale and complexity of the business undertaken by an individual undertaking. Although the SCR should address risks that are covered in the major risk categories mentioned above, as well as concentration risk and ALM risk, this should not be understood as a prescription of a particular design or modular structure for an SCR calculation by an internal model.

Interplay with valuation of technical provisions

2.47 The SCR cannot be considered in isolation from the technical provisions. The ultimate objective is to require undertakings to hold sufficient resources to ensure that the risk that policyholders will not be paid in full is remote. For the purposes of the SCR, technical provisions should be valued in accordance with the remainder of the solvency framework (CfA. 10.129).

Calculation

2.48 The calculation of the SCR by the standard formula is discussed in section 5. Criteria for the recognition of internal models are discussed in sections 6 and 7.

Minimum Capital Requirement

2.49 In its response to CfA 9, CEIOPS acknowledged the Commission's design priorities for the MCR: a simple and straightforward calculation, robustness, objectivity, smooth transition to Solvency II.

2.50 In addition to the priorities set by the Commission, CEIOPS suggested to consider also the following preferences: risk sensitivity, suitability for interim calculations, reference to audited/auditable data only, consistency with the valuation standards for assets and liabilities and the calculation of the SCR.

2.51 Referring to the Commission's Framework for Consultation and CEIOPS' answer to CfA 9, the MCR should also include an absolute floor requirement.

2.52 CEIOPS advised that the MCR should be calculated by a factor-based formula. As a working hypothesis, CEIOPS sought to develop an MCR based on the standard formula of the SCR, *"possibly by retaining its most significant items, by using a more straightforward technique for aggregation and by calibrating the factors to a lower level of confidence"* (CfA 9.120).

2.53 The results of QIS2 raised several issues concerning this approach. In at least one member state, the MCR proved significantly higher than the SCR in too many cases – largely because reduction for loss-absorbent profit sharing and adjustment for non-life profitability were not reflected in the QIS2 version of the MCR.

2.54 Closely replicating the design of the standard formula (at a lower confidence level) would clearly reduce instances of the MCR dominating the SCR, but at the price of significant extra complexity. It is also at doubt whether under such an approach the MCR could retain the required degree of robustness, objectivity, auditability and suitability for interim calculations.

2.55 At the core of the difficulties is the fact that the design criteria of the SCR and the MCR diverge. Section 8 considers possible calculation methods for the MCR following the results of QIS2, specifically:

- a **modular approach**, supported by most CEIOPS Members, that retains the top-level modular structure of the SCR – focussing only on the most significant and quantifiable modules through straightforward, robust risk charges (at a level of complexity broadly equivalent to Solvency I); thus, the MCR could function as a risk-sensitive extension of the Solvency I requirement; and

- a **compact approach,** supported by some CEIOPS Members, whose main item is a percentage of the last reported SCR – this approach would largely bypass the need for interim calculations and could avoid the duplication of the reporting burden, yet still promising adequate interplay with the SCR.

Safety measures

2.56 Prudent asset and liability management would be supported by risk-sensitive capital requirements. The SCR should be a risk-sensitive capital requirement. However, some risks are too complex to address in a simple and mechanistic way within the context of the SCR standard formula.

2.57 Safety measures should be considered to deal with risks that are either not covered by the SCR or not adequately quantified. Where risks are adequately quantified by the SCR, there is no need for additional safety measures.

2.58 The intention is that safety nets should not interfere with situations where the SCR is able to assess risks in a proper way.

2.59 Safety measures are discussed further in section 9.

Relationship with the other pillars

2.60 It is important to recognise that a coherent solvency framework cannot rely solely on minimum quantitative requirements. The objectives expressed in this section could not be achieved without supervisory activities under Pillar 2 and supervisory reporting / public disclosure requirements under Pillar 3. For example, the hierarchy of different requirements under Pillar 1 could not operate without monitoring and timely intervention on the part of supervisors, including appropriate action in the event that a requirement is breached.[21] From an insurance undertaking's perspective it does not and should not make a difference under which pillar certain risks will be handled.

2.61 It is not within the scope of this paper to provide a comprehensive description of Pillar 2 or Pillar 3. However, in its second wave answers, CEIOPS noted that:

"special considerations [should be] made concerning the interaction between the different pillars of quantitative and qualitative supervision, as well as to the role of disclosure." (para. 19, Framework for Answers)

The aim is to describe the boundaries between the different pillars – in particular, to emphasise the limits of what can be achieved under Pillar 1. While analogies can be drawn with other three-pillar systems, such as the Capital Requirements Directive, it is important to reflect differences in the scope and sophistication of requirements that are specific to Solvency II.

Boundary with Pillar 2

2.62 In its *Amended Framework for Consultation*, the Commission suggests that:

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[21] See CEIOPS' response to CfA 15 on solvency control levels.

"The supervisory activities should aim to identify institutions with financial, organisational or other features susceptible to producing a higher risk profile."

2.63 While the SCR is intended to be a risk-sensitive measure of an insurer's capital needs, the expectation is that it will not have limitless capacity to distinguish between different risk profiles. This is particularly true of the standard formula – a formulaic requirement can only generate an approximation of the appropriate level of capital, albeit an approximation that could be considered reasonable in the majority of cases.

2.64 Pillar 1 provides a generalised framework for assessing risks. In the second wave answers, CEIOPS noted that risks might be excluded from a Pillar 1 treatment if:

- on average, the risk is considered marginal
- simplifying assumptions can be made;
- a standardised risk treatment would not be practicable.

In individual cases where these assumptions do not hold, Pillar 1 might not deliver a sufficient reflection of an insurer's risk profile. Even where there is an explicit capital requirement for a risk under Pillar 1, this may rely on assumptions – for example, about the appropriateness of individual risk proxies – that do not hold in some special individual cases. This could be the case for specific types of insurance business.

2.65 CEIOPS has indicated that supervisors should have a range of tools to respond in these situations – including requiring the insurer to use an internal or partial model or, the ability to require a Pillar 2 capital add-on. But automatic, formulaic add-ons should not be used to address systematic deficiencies or omissions in the Pillar 1 requirements. Therefore a Pillar 2 capital add-on should be neither routinely nor commonly applied. Any 'Pillar 2' response should take account of the specific circumstances of individual insurers, including review of its risk management capabilities and the insurer own assessment of its risks.[22] An individual perspective is essential for determining the appropriate supervisory tool to use.

2.66 Subject to supervisory approval, an insurer may use an internal model to calculate its SCR under Pillar 1. This has implications for the coverage of risks, as internal models should deliver a closer approximation of an insurer's risk profile. However, the supervisor must still have the ability to review an insurer's own assessment of its risks. Concerning internal models Pillar 2 plays a big role as all the qualitative requirements concerning the risk management and implementation in the insurer and also criteria for validating and analysing the model ongoing have to be determined.

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[22] Individual Risk Capital Assessment (IRCA) – see paras 17-20 of CEIOPS' Advice on Advice to the European Commission in the framework of the Solvency II project on insurance undertakings' Internal Risk and Capital Assessment requirements, supervisors' evaluation procedures and harmonised supervisors' powers and tools, available at: http://www.ceiops.org/content/view/14/18/.

2.67 When a full internal model is accepted by a supervisor, even if the model makes simplifying assumptions to reflect at best the risk profile of the company, there should be logically no add-on. For full internal models, add-ons should be only temporary and limited to these cases where an internal model does not fully reflect anymore the risk profile of a company, because the risk factors have changed since the acceptance of the model by the supervisor, for example in case of a merger or acquisition. Moreover, an add-on should not exempt the company from quickly adapting its internal model to its new risk profile and situation.

2.68 Pillar 2 also enables a dynamic assessment of an insurer's risk management. Different periods are covered by the different elements of Pillar 1. The estimation of technical provisions should reflect all available information on all risks for the entire run-off period. The SCR considers emerging asset and liability risks over a one-year time horizon that could impact the adequacy of technical provisions during that one year period. In this way, both the assessment of technical provisions and the SCR under Pillar 1 may change from year to year as new information becomes available. CEIOPS expects that insurers should have in place sound and effective strategies and processes to anticipate and respond to such fluctuations, ensuring their ongoing compliance with regulatory requirements such as the SCR. This is an important element of an insurer's 'policy on solvency,' which can be reviewed by the supervisor under Pillar 2.[23]

[23] See CfA, paras. 10.107-10.110 and 10.163-10.164.

Section 3

Valuation standards

3.1 This section builds on the advice given by CEIOPS in its response to CfA 7 (Life assurance) and CfA 8 (Non-life insurance) from the Commission. It also provides further input and detail as requested subsequently by the Commission.[24]

3.2 The present section considers a number of developments that have been made by several bodies since the last CEIOPS' submissions to the Commission. In particular, the developments made by the IAIS, the IASB and the Groupe Consultatif were taken into account. Additionally, the experience from QIS2 has also provided valuable input for the drafting of the current section.

3.3 The aim of this section is to further explore the high-level objectives that were discussed in Section 2, regarding the valuation standards of assets, technical provisions (comprising both life assurance and non-life insurance) and a discussion on the role and impact of other liabilities in the context of the solvency assessment of insurance undertakings.

3.4 This section has significant impact on the development of capital requirements (SCR and MCR), considering that an adequate interplay of different Pillar 1 elements is necessary to ensure the correct definition of the Commission's prudential objectives for the overall solvency system, as well as to ensure comparability between (re)insurers and to avoid inefficient situations of double-counting of risks.

VALUATION OF ASSETS

3.5 Within a solvency assessment, a specification of prudential valuation rules for assets is indispensable for a number of purposes:

- for the calculation of the SCR, which is based on a ruin definition that refers to the valuation of assets;
- for the calculation of the available solvency margin, which takes into account hidden reserves or deficits in assets; and
- for determining whether admissible assets do cover technical provisions and solvency capital requirements. (CfA 15.31)

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[24] Letter of the European Commission to the CEIOPS Chair regarding the further development of the Solvency II project (24 January 2006), available from www.ceiops.org/media/files/requestsforadvice/Solvency2letterfinal24January2006.pdf

3.6 In its answer to CfA 10, CEIOPS has set out the following high level principles for a solvency valuation on assets:

"As a working hypothesis, CEIOPS notes that assets may generally be accounted for at their market value for the SCR calculation. In cases where there is no readily available market value, an alternative approach should be adopted, but this should still be consistent with any relevant market information. For tradable assets, this should be an estimate of the realisable value." (CfA 10.128)

This approach was confirmed in CfA 19, where CEIOPS stated that a valuation of assets at their market value should be taken as the reference standard for the calculation of eligible supervisory capital (CfA 19.24).

TECHNICAL PROVISIONS

Key principles

3.7 For the Solvency II project, the Commission in its *Amended Framework for Consultation* states that *"The solvency II regime will contain prudential valuation standards for assets and liabilities of insurance undertakings;"* it noted that *"an increased level of harmonisation for technical provisions is a cornerstone of the new solvency system."*[25]

3.8 Indeed, there is clearly a wide diversity in approaches to valuing provisions across the European Union, and these approaches should be harmonised. The Commission has concluded that the general prudence principle of the current directives needs to be clarified so as to promote a more harmonised approach to prudence in technical provisions across the European Union.

3.9 The Commission Services consider "that the IAIS Framework for insurance supervision and Cornerstones for the formulation of regulatory financial requirements provide a valuable basis for the development of a new system." [26] The IAIS Insurance Core Principles principle set out that: *"Technical provisions of an insurer have to be adequate, reliable, objective and allow comparison across insurers."*

3.10 More precisely, the Commission states that *"Technical provisions need to be established in order for the undertaking to fulfil its (re)insurance obligations toward policyholders and beneficiaries, taking account of expenses."*[27] It added that technical provisions:

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[25] Amended Framework for Consultation, paras. 7 and 16, available at: http://ec.europa.eu/internal_market/insurance/docs/markt-2506-04/amended-framework_en.pdf.

[26] Amended Framework for Consultation, para 11, available at: http://ec.europa.eu/internal_market/insurance/docs/markt-2506-04/amended-framework_en.pdf.

[27] Amended Framework for Consultation, para 16, available at: http://ec.europa.eu/internal_market/insurance/docs/markt-2506-04/amended-framework_en.pdf.

- have to be valued on a prudent, reliable, objective and transparent basis;

- have to allow comparison between (re)insurers;

- should make optimal use of and be consistent with information provided by the financial markets and generally available data on insurance risks;

- are the sum of a best estimate and a risk margin.

3.11 The Commission sets out its definition of the best estimate of the value of insurance liabilities as follows: *"The best estimate equals the expected present value of future cash flows, using the relevant risk free yield curve, based upon current and credible information and realistic assumptions"*. [28] The best estimate may be determined by using both stochastic methods and deterministic methods provided these ones produce consistent results with those obtained using stochastic approaches.

3.12 Concerning the risk margin, the Commission states that it *"covers the risk linked to the future liability cash flows over their whole time horizon. It should be determined in a way that enables the (re)insurance obligations to be transferred or put into run-off"*.[29]

3.13 It is agreed that the new system should generally not result in a lower level of protection to policyholders' rights. In particular, there should be an explicit statement on whether the new system would result in an overall increase, decrease or maintenance of the prudence level implicit on technical provisions. In the latter case, any anticipated loss of prudence in technical provisions could be reflected in the calibration of capital requirements. Practical experience demonstrates that there are some technicalities where there is not unanimous views about where allocate certain features (whether in technical provisions or capital requirements), and therefore a judgmental decision is needed, including among other considerations the supervisory goals prioritizing the solvency assessment.

3.14 Both, technical provisions and capital requirements, are part of a consistent overall framework, which aims to ensure an adequate level of protection of policyholders and beneficiaries:

- The 'best estimate' included in technical provisions should represent the amount that, expectedly, is required for an insurer to settle all insurance liabilities to policyholders and other beneficiaries arising over the lifetime of the portfolio. To fulfil this main principle, insurers shall consider the specific characteristics of its business. For those assumptions objectively and reliably observable the insurer

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[28] Amended Framework for Consultation, para 16.2, available at: http://ec.europa.eu/internal_market/insurance/docs/markt-2506-04/amended-framework_en.pdf.

[29] Amended Framework for Consultation, para 16.2, available at: http://ec.europa.eu/internal_market/insurance/docs/markt-2506-04/amended-framework_en.pdf.

will make optimal use of information provided by the financial markets and generally available data on insurance technical risks;

- Capital provides further safeguarding of the policyholders and beneficiaries by 'protecting' the technical provisions and the assets backing them. The level of capital provides a cushion to absorb the impact of adverse conditions occurring over a predefined period (one year), including the need for increasing technical provisions in result of such adversity.

3.15 CEIOPS agrees that the solvency system should be firmly founded on the principles of prudence, optimal use and consistency with information provided by financial markets and with a strong link to the economic reality of the business.

International developments

IFRS and IAIS

3.16 IASB clearly stated that insurance liabilities for general financial reporting purposes cannot include higher prudential margin above the 'best estimate' than the margin that would be required by a transferee under market conditions. The definition of liability for general financial reporting purposes (currently in process of co-ordination between IASB and FASB) and the measurement rules of assets and liabilities in the framework of IAS-IFRS repeatedly focus on making-decision useful information from a transfer point of view. It should also be noted that IAIS *"[does] not see any reason why conceptual differences should arise in methodologies for calculating the margin over [best estimate] within the context of insurance liabilities for both accounting and solvency purposes."*[30]

3.17 The IASB's April 2006 decision on using 'current exit value' as the measurement attribute of insurance liabilities gives an idea on the likely final shape of the IFRS-4 phase II. 'Current exit value' is defined as the amount that the insurer would expect to have to pay to another entity if it transferred all its remaining rights and obligations immediately to that entity (and excluding any payment receivable or payable for other rights and obligations, such as renewal rights). More precisely, the details released by IASB through its papers on the definition of 'current exit value' (April 2006) and the way of estimating future cash flows (March 2006) are not easily reconcilable with the main principles of supervision. Just for the sake of illustration, it may be relevant to list three main points of divergence:

- The 'Second Liabilities Paper' prepared by IAIS states as one of the highest principles on technical provisions the so-called 'settlement approach', that is, "*…the measurement of an insurance liability should be based upon the future cash flows relating to full settlement with the claimant/beneficiary.*" Comparing this definition

[30] Para. 37, IAIS second liabilities paper.

with 'current exit value' definition shows that there are essential differences that lead to important quantitative discrepancies. Both approaches accept the same general method geared to a market-consistent value (prospective method, projecting future cash flows, discounting them, and adding a margin). But the differences lay on which cash flows to consider, for which amounts, with which discounting rates and which adjustments on them, and finally how to assess the risk margin.

- A second point of unavoidable divergence is the consideration of a reduction in the value of insurance liabilities due to the own creditworthiness of the insurer. Such adjustment is clearly rejected by CEIOPS and IAIS. IASB has released their position on this issue in May 2006, giving allowance for such a consideration under certain circumstances.

- Eventually, the recognition of future participation features as equity or liabilities has raised another conflictive issue, especially after the decisions made by the IAS Board on March and April 2006, and the quite opposite view stated by IAIS in its 'Second Liabilities paper.'

3.18 Accordingly, it seems difficult for the time being to achieve a situation where the technical provisions used for general financial reporting purposes may be used without any change for supervisory purposes. This view seems to be also that of IAIS; but as stated at the beginning of their 'Second Liabilities paper,' once accepted this divergence, it is desirable to reduce the 'filters' or differences as much as possible.

3.19 In this context, limited divergences with IASB's criteria are compatible with a 'market-consistent' valuation of technical provisions. As stated in the Framework for consultation, *"the valuation of technical provisions should make optimal use of and be consistent with information provided by the financial markets and generally available data on insurance technical risks."* There may be, though, several ways of measuring insurance liabilities consistently with observable and objective market variables; the decision on using one or other alternative is highly dependent on the target of the users of the information, in our case, on the supervisory needs.

Hedgeable and non-hedgeable risks

3.20 Two important concepts that will have practical impact on the valuation of insurance liabilities are 'hedgeable' and 'non-hedgeable' risks. CEIOPS has analysed these concepts further.

3.21 Hedging may be achieved, for example, through the use of derivative financial instruments, or more traditionally by the technique of designing a portfolio of financial assets with cash flows that offset other cash flows. Consistent with the replicating portfolio valuation method, if an exposure can be fully hedged on a sufficiently liquid and transparent market, the 'hedging market' provides a directly observable price.

3.22 It should be noted that, for distinguishing the hedgeable and non-hedgeable risks, reinsurance protection is not considered an hedging instrument.

3.23 Whenever risks can be hedged in deep liquid and transparent markets at reliable market prices, the valuation of liabilities should be – like the valuation of assets – marked-to-market. At the same time, the risk of the fluctuation of market price hedges should be reflected in the SCR. This is consistent with the opinion of the Groupe Consultatif: *"cash flows which can be associated with replicating assets priced observably allowing market-consistent valuation should be so valued*."[31]

3.24 Deep, liquid and transparent markets are defined as markets where participants can rapidly execute large-volume transactions with little impact on prices.

3.25 Therefore, a first step towards valuation of insurance liabilities would be the separation of liabilities between hedgeable and non-hedgeable risks. The non-arbitrage principle would then imply that the market consistent value of the hedgeable risks should be equal to the market value of the relevant replicating portfolio, if such valuation methodology is used (with the fluctuation of the market price of hedges reflected in the SCR).

3.26 The non-hedgeable risk arises from the difference between the actual cash flow and the hedging portfolio cash flow. A supervisory valuation principle needs to be applied to this non-hedgeable risk. The valuation process cannot rely on mark-to-model techniques based on the no-arbitrage principle. In this respect, the CEIOPS notes that risks are non-hedgeable whenever they cannot be hedged in deep liquid and transparent markets, or market prices tend not to be reliable – including an implicit additional uncertainty. In those cases, a prudent risk margin should be added to the value of the best estimate.

3.27 The IAIS describes in its 2nd liabilities paper, a possible *"components methodology to the valuation of insurance liabilities,"* where liabilities would be split into financial and non-financial components at a first level and further split into market-traded and non market-traded risks at a second level (paras. 17-19). The market-traded component could then be valued on the following basis:

- Financial components would be valued using projections of the cash flows arising from insurance contract liabilities taking into account options and guarantees embedded in the insurance contract. The valuation is determined using observed market prices or capital markets valuation models with reference to the prices and valuation curves;

- Non-financial components refer to the non-financial risks to which the liabilities are exposed: namely, underwriting and operational risks. The non-financial components of the liabilities are valued by a mark-to-model approach (which includes judgement and experience), as no deep liquid secondary market is available to value them. The value is presumed to be the amount that a

[31] Letter of Groupe Consultatif, letter to CEIOPS, 5 September 2006, para. 8, available from www.qcactuaries.org/documents/techprov_letter_ceiops_final_050906.pdf.

knowledgeable independent buyer would require to take over the liabilities.

3.28 The IAIS will consider further the steps which might be put into practice to promote a common reference framework to model as objectively as possible the inputs not corroborated by other market data (paras. 20–22).

3.29 CEIOPS has taken the view that in each case where risks are non-hedgeable, a risk margin should be added to the best estimate. This may also include financial risks, whenever these risks can not be hedged in deep liquid and transparent markets, or reasonable inter/extrapolations from directly observable prices are not possible, or market prices tend not to be reliable, including an implicit additional uncertainty.

3.30 Reflecting existing market uncertainties technical provisions must include a risk margin that meets the objectives either:

- To transfer the liabilities portfolio to an able, rational and willing third-party (another (re)insurer) with a sufficiently high level of confidence; or

- To recapitalize the company with a sufficiently high level of confidence to ensure a proper run-off scenario by the original undertaking.

3.31 IAIS *"supports an approach whereby observable inputs from deep and liquid markets are used to the fullest extent possible, and the remaining elements are modelled. Since inputs which cannot be observed in deep and liquid markets play an essential role in the measurement of insurance liabilities, a common reference framework is appropriate to model as objectively as possible such inputs."*

3.32 Generally speaking, it can be expected that most financial risks, i.e. market risk and credit risk, may principally be considered hedgeable in deep liquid and transparent markets, with the exception of, for instance, risks with a significantly high duration. On the other hand, underwriting risks, such as mortality, expense, lapse etc. are unlikely to be considered hedgeable (at least currently). The market-consistent value of hedgeable risks should be based on deep liquid and transparent markets.

3.33 Underwriting and operational risks are likely to be considered as elements for which financial markets provide no relevant information (at least currently). IAIS suggests that non-financial components of the liabilities be valued by a mark–to–model approach:

- *"Non-financial components refer to the non-financial risks to which the liabilities are exposed: namely, underwriting and operational risks. The non-financial components of the liabilities are valued by a mark to model approach (which includes judgement and experience), as no deep liquid secondary market is available to value them. The value is presumed to be the amount that a knowledgeable independent buyer would require to take over the liabilities.*

- *It seems likely that some of the inputs to the valuation of insurance liabilities would need to be modelled.*

- *In the absence of an observable market for insurance liabilities, one approach would be to define a common reference framework to model as objectively as possible the unobservable 'inputs', and hence promote a consistent and compatible methodology."*

Segmentation and diversification

3.34 IAIS' second liability paper advised that:

"Similar obligations with similar risk profiles should result in similar liabilities."

3.35 It added that:

"Pooling and inter-portfolio offsetting across risk types can give rise to a benefit to be reflected in the measurement of the liabilities, only to the extent that they are recognised in market transactions. To the extent that the market does not reflect such benefits, or to the extent that the insurer achieves greater or smaller pooling or offsetting benefit than the market, the effect is company specific, and the IAIS believes this should be included in the solvency capital requirement rather than in the insurance liabilities."

3.36 In other words, the risk margin needs to be high enough to encourage enough undertakings to bid for the portfolio of a failed insurance undertaking, in order to ensure transferability. This implies that, for the purposes of transferability, the 'typical' segmentation and inter-portfolio diversification effects of potential bidders determine the size of the risk margin, rather than the segmentation and inter-portfolio diversification effects of the insurance undertaking that computes its risk margin.

3.37 In fact, in the practice of life insurance, the risk margin implied by the difference between a best estimate life table and a conservative life table is usually independent of the diversification level of a specific undertaking. Rather, it is determined with respect to the diversification level of a model portfolio.

3.38 From the viewpoint of full settlement by the 'original' insurer, however, the risk margin depends only on the segmentation and diversification effects of the undertaking at hand. When different portfolios are grouped together, offsetting across risk types may give rise to a diversification benefit that, from a full settlement point of view, could be recognised in the 'overall' amount of technical provisions (i.e. resulting from the grouping of all lines of business or insurance products), more specifically on the 'overall' risk margin. This makes economic sense in the full settlement point of view, because diversification reduces the overall level of risk, and so it reduces the capital needed to support the settlement of the liability.

3.39 On the other hand, full inclusion of diversification benefits on the 'overall' risk margin does not ensure sufficiency on the scenario of transfer of individual blocks of business. Due to the frequency of such partial transfer

scenarios, it could therefore be argued that diversification within risk margins should not be allowed when calculating technical provisions.

3.40 In the second liability paper, the IAIS advised *"the appropriate level of margin over the current estimate should be set at the level of a portfolio of independent but similar obligations, including the recognition of benefit from pooling of risks across the obligations present in the portfolio."*

3.41 To remain in line with this advice implies that intra–portfolio diversification benefits are taken into account when determining the technical provision — which is already current practice when a mortality table or any other statistical data are used. But it could be argued that inter–portfolio diversification benefits should not in general diminish the global amount of technical provisions – if at all, they might be recognised as an intangible asset covering the capital requirement.

3.42 Retaining benefit of diversification within a homogeneous group of contracts is thus widely (if not unanimously) accepted, and besides follows tentative IASB's view expressed in its Update September 2006, where the Board '…concluded tentatively that risk margins should be determined for a portfolio of insurance contracts that are subject to broadly similar risks and managed together as a single portfolio. Risk margins should not reflect benefits, if any, of diversification between portfolios and negative correlation between portfolios.' The option is more questioned when it comes to heterogeneous groups or different lines of business.

3.43 Further analysis is needed to determine whether it is possible and/or appropriate to use the same segmentation for technical provisions and for SCR-MCR purposes.

3.44 Both the computation of a risk margin with respect to a suitably chosen, prescribed model portfolio (especially in life) and the computation of the risk margin with the respect to suitably chosen portfolios of homogeneous groups of contracts (especially in non-life) can be seen as possible implementations of the main principle that non-hedgeable risks should be valued according to a prescribed supervisory valuation principle. This supervisory approach to the valuation of non-hedgeable risks ensures both full settlement and transfer in stressed situations.

3.45 Some CEIOPS Members believe that there should be no recognition of diversification effects in the 'overall' risk margin of technical provisions, although some consider its recognition as an intangible asset.

3.46 Other CEIOPS' Members suggest that a full or partial diversification could be allowed when technical provisions are grouped together (to highlight the 'economic' value of the whole portfolio) while including in capital requirements a risk charge corresponding to the (full or partial) amount of diversification benefits embedded in the 'overall' risk margin. This would provide the same level of protection to ensure partial transfers, but with the advantage that technical provisions would reflect a more 'true' and accurate measurement of the value of the 'total' liability portfolio held by the insurer.

3.47 If inter-portfolio diversification benefits are to be measured, the correlation measures between lines of business and insurance products should be

determined on a sufficiently robust and adequate basis, reflecting the most credible assumptions and taking into account information from the market and from the underlying portfolios. The risk that correlations deviate from expectations should be considered on capital requirements, including the possibility of a general increase of correlations due to stressed situations (e.g. catastrophes).

Measurement of the best estimate

3.48 As outlined in para. 3.26 in each case where risks are non-hedgeable, a prudent risk margin should be added to the best estimate.

3.49 In CfA 7.35, CEIOPS advised that the best estimate of insurance liabilities should be based on the mean of the probability distribution for the expected present value of cash flows arising from the liabilities considered. To carry out these calculations, cash flow projections are required based on a range of possible outcomes.

3.50 Being a corner stone of technical provisions the best estimate must be based on a reliable actuarial method[32]. More work should be dedicated to define harmonized criteria in close co-operation with the Groupe Consultatif on level 3. The most appropriate method should be used to value the best estimate allowing also for non-life discounting together with claims specific inflation figures. A most appropriate method is a technique which is part of best practise and which captures the nature of the liability most adequately.

3.51 The cash flow projections should reflect expected demographic, legal, medical, technological, social or economic developments. For example, a foreseeable trend in life expectancy should be taken into account. The realistic valuation of assets and liabilities means that all potential future cash flows that would be incurred in meeting liabilities to policyholders need to be identified and valued.

3.52 In the absence of relevant statistical observations actuarial methods can be completed by a case by case approach as a proxy for the best estimate valuation.

3.53 The following aspects are common to both life and non-life insurance:

Discounting

3.54 As noted previously, CEIOPS advises that discounting should be carried out using the risk free yield curve relevant to the liability under consideration. The choice of risk free interest rates should depend on the currency in question, be credit risk free and take into account possible illiquidity.

[32] This implicitly also concerns fitting distributions to statistical samples (such as for instance mortality and morbidity) that are used within the valuation of the best estimate. However, since changes to for instance mortality occurs on a rather long-term basis, alternative methods and approaches to these kinds of samples would be expected to be carried out less frequently than annually.

Inflation

3.55 Appropriate assumptions for future inflation should be built into the cash flow projections. Care should be taken to identify the type of inflation to which particular cash flows are exposed. For some cash flows, the link may be to consumer prices, but there are other links such as salary inflation, which tends to exceed consumer price inflation. Groupe Consultatif has provided its recommendations on allowing for future claims inflation[33].

Taxation

3.56 Taxation payments required to meet policyholder liabilities should be allowed for in the calculation of technical provisions on the basis that currently applies. In cases where changes to taxation requirements have been agreed (but not yet implemented), the pending adjustments should be reflected in the calculations. Taxation that would not be due if the firm made a loss should not be provided for.

Reinsurance

3.57 Under certain reinsurance arrangements, the timing of recoveries and of direct payments may diverge markedly, and this should be taken into account when valuing the technical provisions (e.g. when discounting cash flows). When calculating technical provisions corresponding to ceded reinsurance, undertakings should take account of expected losses due to the counterparty default, based on an assessment of the probability of default of the counterparty.

Creditworthiness of the undertaking

3.58 As set out in CfA 7.39, no reduction in liabilities should be made on account of the creditworthiness of the undertaking itself.

Issue specific to life insurance

3.59 Mortality, longevity and morbidity assumptions should be assessed consistently with considerations to the specific character of each risk group. The volatility of mortality, longevity and morbidity experience should also be considered in setting the assumptions. The Groupe Consultatif has provided recommendations on setting longevity assumptions[34].

3.60 As advised in CfA 7.54, undertakings may use credible and relevant discontinuance experience. Where a discretionary surrender value is paid on discontinuance, the estimates should allow for the payment the insurer would reasonably make in the scenario under consideration[35].

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[33] Letter of 05 September 2006 from the Groupe Consultatif to CEIOPS, para 6, available at: http://www.gcactuaries.org/documents/techprov_letter_ceiops_final_050906.pdf.

[34] Letter of 05 September 2006 from the Groupe Consultatif to CEIOPS, para 7, available at: http://www.gcactuaries.org/documents/techprov_letter_ceiops_final_050906.pdf.

[35] Letter of 05 September 2006 from the Groupe Consultatif to CEIOPS, para 11, available at: http://www.gcactuaries.org/documents/techprov_letter_ceiops_final_050906.pdf.

- *Financial guarantees and other embedded options*

3.61 It is important to consider financial guarantees and policyholder options to change the terms of the contract. Cash flow projections should take account of the proportion of policyholders that are expected to take up options. This may depend on financial conditions at the time the option crystallises, which will affect the value of the option. Non-financial conditions should also be considered – for example, deterioration in health could be expected to have an impact on take-up rates of guaranteed insurability options[36].

- *Management actions*

3.62 Future management actions should be reflected in the projected cash flows. The assumptions used should reflect the actions that management would reasonably expect to carry out in the circumstances of each scenario, such as changes in asset allocation, changes in bonus rates or product changes, or the way in which a market value adjustment is applied. Allowance should be made for the time taken to implement actions. In considering the reasonableness of projected management actions, undertakings should consider their obligations to policyholders, whether through policy wordings, marketing literature or other statements that give rise to policyholder expectations of how management will run the business.

- *Valuation of future discretionary benefits*

3.63 For with-profits life insurance business, technical provisions should generally include amounts in respect of guaranteed, statutory and discretionary benefits.[37]

3.64 Amounts in respect of future discretionary benefits may often be reduced in the event of an adverse scenario, thus absorbing part of the economic loss which the undertaking incurs. Within the context of a solvency assessment, this risk absorption ability of future discretionary benefits may make amounts in respect of such benefits, at least in some circumstances, more akin to available capital rather than to a liability. Therefore, the general issue arises as to what extent future discretionary benefits should be included in the valuation of technical provisions for with-profits life insurance business.

3.65 CEIOPS recognises that the degree to which future discretionary profit sharing may be used to absorb future losses under adverse circumstances will depend on a range of aspects, including:

- the specifics of the profit sharing system used within individual markets; [38]

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[36] Letter of 05 September 2006 from the Groupe Consultatif to CEIOPS, para 9, available at: http://www.gcactuaries.org/documents/techprov_letter_ceiops_final_050906.pdf.

[37] In what follows, the term 'guaranteed benefits' is intended to include any profit-sharing benefits (bonuses) to which policyholders are already individually and unconditionally entitled, irrespective of how those bonuses are described (e.g. vested, declared or allotted).

- the extent to which legal or statutory restrictions impede the use of future discretionary benefits to absorb losses;
- the degree of policyholder expectations on future profit sharing; and
- the nature of agreed management actions in adverse circumstances.

3.66 In line with the current directives, cash flows arising from (realised) profit reserves appearing in the balance sheet where they may be used to cover any losses which may arise and where they have not been made available for distribution to policy holders should be excluded from the valuation of technical provisions. (Cf. Article 27 (2) d) of the Directive 2002/83/EG on Life Assurance.) Such profit reserves shall be included (as tier 1 capital) in the available solvency margin.

3.67 To the extent that non-guaranteed benefits are included in the valuation of technical provisions, assumptions regarding them shouldfollow the general principles for management actions. Undertakings should take into consideration recent bonus rates, especially where their policy is to smooth changes in bonus rates. Where undertakings differentiate their bonuses between policy types or risk groups, this should be reflected in the assumptions on future bonus rates. Where this is material to the results, the expected apportionment between annual and final bonuses should be taken into account. Also any constraints arising from legal restrictions or profit-sharing clauses in policy conditions should be taken into consideration.

- *Unit-linked and index-linked business*

3.68 The same general cash flow projection approach should be used for unit-linked and index-linked business. Undertakings should assume that unit-linked funds perform on a market-consistent basis. All cash flows arising from the product should be considered, including expenses, death benefits and charges receivable by the insurer. Where insurers have the right to increase charges, assumptions on increased charging should be consistent with the general principles for management actions.

Issues specific to non-life insurance

3.69 Models and parameters used to derive the best estimate should reflect the volatility of experience within individual insurers.

3.70 The measurement process would typically involve prospective calculations and statistical/actuarial modelling techniques. It should be based upon current and credible information. Assumptions regarding future experience – for example, on claims run-off patterns, discount rates, claims inflation, claims expenses, etc. – should be drawn on past experience and the specific circumstances of the individual insurer.

3.71 It may be difficult to assess the best estimate of the future cash flows with reasonable accuracy. However, for many non-life technical provisions, especially those relating to mass risks, several methods are already

[38] Including, in the presence of fund structures, the extent to which profits/losses may be shared across different funds.

available: in QIS1 and QIS2, most common methods in the best estimate calculation appeared to be Chain Ladder and Bornhuetter-Ferguson; but loss ratio, Benktander, link ratio, Cape Cod and the grossing up method were also employed.

Approaches to the risk margin

3.72 Reflecting existing market uncertainties technical provisions must include a risk margin that meets the objectives either:

- To transfer the liabilities portfolio to an able, rational and willing third-party (another (re)insurer) with a sufficiently high level of confidence; or
- To recapitalize the company with a sufficiently high level of confidence to ensure a proper run-off scenario by the original undertaking.

3.73 Without excluding other possible ways, the Commission proposed two possible ways to calculate the risk margin as working hypotheses:

- it can be calculated as the difference of the 75th percentile minus the best estimate (with half of standard deviation being a minimum); or
- by using a cost of capital approach[39].

3.74 In line with the Commission's proposal, CEIOPS considered the percentile and cost of capital approaches, as well as a further one, based on the estimation of life insurance liabilities using pre-specified stress scenarios.

Percentile approach

3.75 The percentile approach directly uses the probability measure on the valuation of liabilities. The underlying concept is the amount of technical provisions necessary to ensure that full settlement of liabilities is possible with a pre-specified degree of probability (75%). Worst-case scenarios are dealt with through capital requirements.

3.76 Risk margins so calculated will, by construction, provide adequate protection in the scenario of full settlement of liabilities by the original (re)insurer. On the other hand, a clear link with adequate protection in the event of a transfer of the liability portfolio is not proved. This is because there is no economic evidence that the market implies the use of a fixed probability measure of 75% as a proxy for the market consistent value of liabilities.

3.77 In practice, the risk margin is taken from the difference between the 75th percentile and the mean (best estimate) of the probability distribution

[39] Amended Framework for Consultation, para. 16.2.

describing the amount of liabilities. Thus, the percentile approach requires the knowledge of the full distribution of liabilities. This distribution can generally be obtained using one of the following statistical techniques:

- Direct determination of the full empirical probability distribution of the liabilities. Such approach requires a significant amount of historical data, especially for tail-risks (where data is usually scarce). Assuming good quality of estimation, this technique should provide better results, as it is expected to be closer to the 'true' probability distribution;

- Fitting of a theoretical probability distribution, with the relevant parameters being estimated from historical data. Although quantity of data is still important to ensure reliable estimates of the parameters, less data is needed than in the previous technique. The lognormal distribution is a common choice due to its right skewness. The consideration of statistical hypothesis tests and goodness-of-fit tests is particularly relevant to measure the quality of the approach.

3.78 Simplified approaches are possible through this method. For instance, a study of the distributions underlying each line of business could allow for the estimation of the expected proportion of the risk margin relative to the best estimate. However, such proportion would probably have to be made relative to the size of the portfolio, as smaller portfolios are likely to bear higher uncertainty, and thus a higher risk margin.

Cost of capital

3.79 The Cost-of-Capital methodology is directly based on an exit-value concept for technical provisions. The underlying framework is based on the concept of what a rational investor would demand in excess of the best estimate of technical provisions to take over the liabilities. Such concept can be applied both on a run-off and a transfer perspective, i.e. the term 'investor' may refer to capital providers of the (re)insurer or to potential 'buyers' (other (re)insurers) of the liability portfolio.

3.80 Therefore, by construction, the Cost-of-Capital aims at ensuring both alternatives that are required by the Commission: full settlement of liabilities by the original insurer and transfer of the liability portfolio to a potential buyer.

3.81 In practice, it is assumed that the risk margin is a measure of the cost of the future regulatory capital (SCR) that the insurer or potential buyers will incur to hold the liabilities until run-off. Conceptually, such risk margin should, by itself, guarantee that the required SCR can be met at each future point, thus ensuring with a high level of confidence (i.e. the one implicit on the SCR calculation – 99,5% per year) the full settlement of liabilities.

3.82 However, the robustness of this methodology is directly linked to the robustness of the SCR calculation.

3.83 To achieve a harmonised approach that is consistent with the supervisory objectives for a risk margin in technical provisions, for a solvency

application of a Cost-of-Capital approach the key parameters and assumptions underlying such an approach would need to be set, including:

- the definition of the future 'capital' to be considered (it would need to be specified that this is the regulatory capital requirement);
- the setting of the Cost-of-Capital factor (for example, whether 'stressed' factors would need to be used);
- assumptions regarding the extent to which diversifiable risks would need to be taken into account; and
- assumptions regarding the extent to which future financial risks would need to be taken into account.

3.84 The Cost-of-Capital methodology is currently the standard approach for the Swiss (re)insurance market. Additionally, the Cost-of-Capital approach is a common framework used by (re)insurers applying the European Embedded Value as well as in the economic assessment of transactions involving both insurance portfolios and companies. The Swiss approach (SST) is built on a market consistent basis, with the following simplifying assumptions:

- The risk margin takes only into account the diversification benefit within the considered portfolio, i.e. it is not based on an average market level of diversification;
- The financial market risk underlying the insurer's assets is assumed to be equal at times t=1 and t=0, i.e. a stable asset portfolio is assumed during the first year. The reasons for this will be outlined below;
- No current year risks (i.e. arising from new business) are taken into account on the computation of the risk margin;
- De-risking is assumed to occur, to the extent possible, once an insurer enters on a financial distress situation. In particular, the asset portfolio is assumed to be swapped to the 'optimal replicating portfolio' – defined as the asset portfolio consisting of liquidly traded financial instruments replicating as well as possible the liabilities. A time delay is, however, assumed for such swap, depending on the liquidity characteristics of the assets involved;
- A Cost-of-Capital factor of 6% (in excess of the risk-free rate) is assumed for all insurers, considered by FOPI as a reasonable estimate of the Cost-of-Capital for a strong BBB rated company (equivalent to a VaR 99.6%-99.8% standard).

3.85 In terms of practical implementation, two different approaches are envisaged, depending on the degree of complexity that each insurer is capable of:

- A sophisticated approach, based on a cash flow projection model for both assets and liabilities. Such projection will allow the computation of the projected SCR for each future year until the full run-off of the

liabilities. The Cost-of-Capital factor is then applied to the present value of future SCR (discounted with the risk-free yield curve at time 0) to derive the risk margin;

- A simple approach, where each relevant risk component of the future SCR (at each node) is assumed to be proportional to an adequate exposure measure for the risk in analysis (e.g. best estimate of technical provisions, sum insured, etc.).

3.86 The Swiss approach considers the impact of the assets currently held by the insurer on the valuation of technical provisions. The rationale for this is that a financial distressed insurer (or a buyer to whom both assets and liabilities are transferred) may incur further losses due to possessing an illiquid asset portfolio. It is assumed that such portfolio cannot be de-risked instantaneously (i.e. swapped into the 'optimal replicating portfolio'). Therefore, a time delay for such swap is assumed, taking into account the liquidity characteristics of the assets involved.

3.87 In practice, the financial market risk component is included on the projection of the future SCR used for the estimation of the risk margin, with a gradual relative reduction across time reflecting the evolution of the de-risking process.

3.88 The inclusion of such financial market risk component constitutes a relaxation of a pure market-consistent approach, since it is intuitively expected that the asset portfolio held by the insurer should only affect the valuation of market consistent technical provisions to the extent that risks are non-hedgeable (e.g. financial risks of a long duration). On the other hand, it can be argued that the lack of liquidity of the assets is already reflected on its market value. Because of such argument, the Swiss supervisory authority is currently considering the possibility of assuming that the 'optimal replicating portfolio' is reached at time t=1.

3.89 While the projection of the total SCR (i.e. considering all lines of business or all insurance products) is the basis for calculating the risk margin, FOPI highlights the practical possibility of the estimation per individual level – in this case, the total SCR needs to be disaggregated per individual level. The use of a 'global' approach has the advantage of implicitly taking into account the diversification benefits resulting from the aggregation of the individual levels. On this issue, the Comité Européen des Assurances (CEA) asserts that the computation of the risk margin should be explicitly made at the product line level, to promote transparency and facilitate the insurers' risk analysis process. However, that is only for presentation purposes, since the CEA also agrees that diversification benefits should arise when aggregating all individual calculations.

3.90 The experience so far registered by FOPI is considered very positive.[40] The risk margin calculated under the SST is sensitive to the risks underlying technical provisions. For instance:

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[40] Federal Office of Private Insurance (2006) – *The Swiss Experience with Market Consistent Technical Provisions – the Cost of Capital Approach*, available from www.bpv.admin.ch ("SST experience").

- *"The longer the duration of the technical provisions and the higher the insurance risk, the higher relatively the MVM [market value margin, i.e. the risk margin calculated on a market consistent basis]. This was the case for life companies writing mainly risk products"*

- *"For short durations of technical provisions or for companies which are mainly exposed to market risks (e.g. life companies writing predominantly savings products), the MVM is relatively low."*

Stress-testing

3.91 For life insurance a further approach based on the use of pre-specified stress tests directly on the valuation of technical provisions was considered.

3.92 The amount of the risk margin in technical provisions would be determined on the basis of pre-specified stress tests occurring immediately at the valuation date. The stress test would specify stress scenarios for all risk factors that are relevant for the determination of the risk margin. For each risk factor and scenario, the undertaking would calculate the increase in best estimate provisions incurred under the scenario. These increases would be aggregated by means of a correlation matrix to arrive at an overall risk margin

3.93 Conceptually, technical provisions estimated through this methodology would guarantee that the amount of technical provision is sufficient to withstand a shock similar to the one underlying the model. An appropriate calibration of the stressed scenarios (comprising both the determination of scenarios for individual stress factors, as well as the setting of correlation coefficients) would derive in a valuation of total technical provisions sufficient to guarantee the full settlement of liabilities with a level of confidence similar to that obtained using the percentile approach.

3.94 Where this technique was applied in QIS2, it was well accepted among the participants for the following reasons:

- the stress test is more practical than a simulation approach. Most insurers have IT systems at their disposal that can perform the necessary calculations. Simulation techniques can only be applied by a small number of insurers;

- the stress test results are more comparable than simulation results. So far no reliable distribution assumptions are available for life underwriting risks. The pre-specified stress test resolves this problem by providing all insurers with a uniform set of scenarios; and

- the stress test results are comprehensible. Unlike a simulation result, the stress test allows the insurer to detect the risk drivers of its portfolio and thereby supports the risk management process.

3.95 However, important questions arise with such an approach, in terms of implementation and consistency, namely:

- What scenarios should be set so that the assessment is consistent with the targeted confidence level?

- How can consistency be assured between the valuation of life assurance and non-life insurance business?

- How can the interplay between technical provisions and capital requirements be efficiently ensured, in particular to avoid situations of double-counting of risks?

Equivalence between the percentile and cost of capital approaches

3.96 Due to the differing methodological frameworks, it is not a straightforward exercise to compare the quantitative results given by the percentile and the Cost of Capital approaches. However, FOPI has published the following market information on this issue:

"FOPI was informed by a number of companies that the MVM compared to a quantile on a confidence level of between 65% and 90%, differing between companies and between life and nonlife risks" (SST experience, p.13).

3.97 A rough equivalence may be achieved if both methods are calibrated on a market-consistent basis. The IAA are currently looking at this question starting from the cost of capital approach and calibrating to the percentile and traditional approaches both at a conceptual level and for numerical examples for particular product types.

3.98 Moreover, on a preliminary analysis of QIS2 results, which requested insurance undertakings to calculate technical provisions both on the basis of a 75th percentile and the Cost-of-Capital, CEIOPS has reached the following (provisional) conclusions:

- There may be a slight preference for 'cost-of-capital' within the sector;

- It seems that the risk margins for the percentile and the cost-of-capital approaches were roughly similar for those undertakings that provided both calculations.

Choice of the method for calculating the risk margin

3.99 CEIOPS agrees that for non-hedgeable risks the cost of capital approach should be used [41] under certain preconditions to be defined in the Framework Directive:

3.100 Reflecting existing market uncertainties the cost of capital must consist of a risk margin that meets the objectives either to transfer the portfolio to a third party or to recapitalize the company to ensure a proper run-off scenario by the original undertaking.

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[41] For long tail non-life business further analysis is needed.

3.101 The calibration of the risk margin must not be left to the discretion of undertakings but key parameters and assumptions should be prescribed by supervisors on level 3 using historical volatilities in credit spreads for a BBB rating (corresponding to a 99,5 % confidence level) or applying current credit spreads for BBB but adding a stress scenario to also be developed on level 3.

Modelling and parameter errors

3.102 Technical provisions with an explicit level of prudence may prove difficult to assess with any confidence. Many aspects of the measurement process can lead to uncertainty:

- error of the applied stochastic model;
- uncertainty whether historical data fit current business and future developments;
- uncertainty in estimation due to insufficient data basis (e.g. claims triangles too short for long-tailed business);
- uncertainty about the shape of the probability distribution of future cash flows; and
- regarding discounted provisions: uncertainty concerning the timeframe of cash flows and whether the provided term structure is risk-free regarding long durations.

3.103 These modelling errors are not specific to any method. They are likely to affect the best estimate itself. Thus any approach using a best estimate concept may lead to uncertain amounts.

3.104 A choice has to be made between simplification and reliability. Simplifications lead to a loss in risk sensitivity, but enable all insurers to derive the risk margin.

3.105 Given the uncertainties in the measurement of the risk margin, the supervisory review process on provisions should, as far as possible, take account of the specificity of each undertaking. To ensure that the amount of technical provisions includes an adequate risk margin, the supervisor, when appropriate, should:

- review the quality of the data. This step will be key in the supervisory review process: bad quality data may increase significantly the estimation error of statistical methods;
- review the applicability and the relevance of statistical methods;
- examine other actuarial or technical justification (case-by-case estimation, etc);
- assess whether the level of prudence retained by the undertaking is in line with the prescribed supervisory valuation principle for technical provisions.

From a procedural as well as legal point of view, supervisors must be in a position to quality check the method and level of technical provisions at any time. Therefore, the undertaking should be able to demonstrate and defend the appropriateness of the level of its technical provisions, as well as the applicability and relevance of the applied methodology and the adequacy of the underlying statistical data.[42]

3.106 When the results of this process lead the supervisor to conclude that technical provisions are insufficient, the supervisor should have the formal power to require that provisions be increased or/and provisioning procedures be revised as part of its Pillar II tool kit.

3.107 Checking the level of prudence is part of the supervisory review process related to provisioning procedures.

OTHER LIABILITIES

3.108 In addition to the solvency valuation of technical provisions, CEIOPS will also need to develop principles and guidance on the valuation of other accounting liabilities apart from technical provisions. This is necessary

- to ensure that the calculation of eligible supervisory capital (to the extent this is impacted by a valuation of other liabilities) can be based on a common reference standard, so that this calculation is both independent from the choice of an accounting regime, and consistent with what the supervisory regime is aiming to achieve (CfA 19.19); and

- to consistently quantify (within the calculation of the SCR) the risk of a potential deterioration of those other liabilities that, according to the ruin definition for the SCR, need to be covered by assets during the solvency time horizon.

3.109 Generally, the solvency valuation for other liabilities, to the extent these liabilities are impacted by risks that are similar or identical to risks arising from insurance contracts, should be compatible with the solvency valuation rules for technical provisions. No adjustment in the valuation of other liabilities should be made on account of the creditworthiness of the undertaking itself.

3.110 As a general rule, other liabilities are valued at the amount for which they could be transferred, or settled, between knowledgeable willing parties in an arm's length transaction.

3.111 Obligations that are not tradable in a deep, liquid market should be valued on a prudent basis, at the present value of the future cash flows allowing, to the extent possible, for all aspects that affect those cash flows, such as the

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[42] Para. 23, CEIOPS (2006) – *Advice on insurance undertakings' internal risk and capital requirements, supervisors' evaluation procedures and harmonised supervisors' powers and tools, CEIOPS-DOC-06/06, available at: http://www.ceiops.org/content/view/14/18/#CP13.*

right to early re-payment , the right of conversion, and by being consistent with information provided by the financial markets. Relevant consideration may include the amount to be paid when the liability comes due, or by which the liability is expected to be settled.

CEIOPS' Advice

Role of technical provisions and capital requirements

3.112 Reflecting existing market uncertainties technical provisions must include a prudent risk margin that meets the objectives either:

- To transfer the liabilities portfolio to an able, rational and willing third-party (another (re)insurer) with a sufficiently high level of confidence; or
- To recapitalize the company with a sufficiently high level of confidence to ensure a proper run-off scenario by the original undertaking.

These principles should be defined in the Framework Directive,

3.113 Both technical provisions and capital requirements are part of a consistent overall framework, which aims to ensure an adequate level of protection of policyholders and beneficiaries:

- The 'best estimate' included in technical provisions should represent the amount that expectedly is required for an insurer to settle all insurance liabilities to policyholders and other beneficiaries arising over the lifetime of the portfolio. To fulfil this main principle, insurers shall consider the specific characteristics of its business. For those assumptions objectively and reliably observable the insurer will make optimal use of information provided by the financial markets and generally available data on insurance technical risks;
- Capital provides further safeguarding of the policyholders and beneficiaries by 'protecting' the technical provisions and the assets backing them. The level of capital provides a cushion to absorb the impact of adverse conditions occurring over a predefined period (one year), including the need for increasing technical provisions in result of such adversity.

3.114 CEIOPS agrees that the solvency system should be firmly founded on the principles of prudence, optimal use and consistency with information provided by financial markets and with a strong link to the economic reality of the business.

Principles for calculating the technical provisions

3.115 CEIOPS believes that a first step towards the valuation of technical provisions should be the separation between hedgeable and non-hedgeable risks. A risk is considered hedgeable if it can be reduced by an offsetting measure or transaction (for this purpose, reinsurance is not considered to

be an hedging instrument). For hedgeable risks market consistent values should be based on deep liquid and transparent markets. At the same time the risk of fluctuation of market prices of hedges is to be reflected in the SCR.

3.116 CEIOPS has to dedicate more level 3 work on the definition of deep liquid and transparent markets in close cooperation with the other level 3 committees taking into account the evolving nature of capital markets.

3.117 The value of the hedgeable risks valued with reference to market observable values implicitly includes both the best estimate and the risk margin.

3.118 For non-hedgeable risks both the best estimate and the risk margin will need to be separately identified.

3.119 Being a corner stone of technical provisions CEIOPS thinks that the best estimate must be based on a reliable actuarial method. More work should be dedicated to define harmonized criteria in close co-operation with the Groupe Consultatif on level 3. The most appropriate method should be used to value the best estimate allowing also for non-life discounting together with claims specific inflation figures. A most appropriate method is a technique which is part of best practise and which captures the nature of the liability most adequately. In the absence of relevant statistical observations actuarial methods can be completed by a case by case approach as a proxy for the best estimate valuation.

3.120 As to the calculation of the risk margin, CEIOPS thinks that the cost of capital approach should be used[43] under certain preconditions to be defined in the Framework Directive.

3.121 The Framework Directive should clearly set out that the calibration of risk margin must not be left to the discretion of undertakings but key parameters and assumptions should be prescribed by supervisors on level 3 using historical volatilities in credit spreads for a BBB rating (corresponding to a 99,5 % confidence level) or applying current credit spreads for BBB but adding a stress scenario to also be developed on level 3.

Discounting

3.122 In line with the Commission's *Amended Framework for Consultation*, technical provisions should be discounted both for life assurance and non-life insurance business. The discount rates should be taken from the risk-free interest rate term structure at the valuation date. The choice of risk free interest rates should depend on the currency in question, be credit risk free and take into account possible illiquidity.

[43] For long-tail non-life business further analysis is needed.

Segmentation

3.123 The valuation of technical provisions should generally be determined on the basis of homogeneous risk groups, which may require the use of a higher level of segmentation than that defined for reporting purposes in the Insurance Directives.

Inflation

3.124 Appropriate assumptions for future inflation should be built into the cash flow projections. Care should be taken to identify the type of inflation to which particular cash flows are exposed. For some cash flows, the link may be to consumer prices, but there are other links such as salary inflation, which tends to exceed consumer price inflation.

Expenses

3.125 Expenses that will have to be incurred in the future to service insurance contracts are cash flows for which a provision should be calculated. For the valuation undertakings should make assumptions with respect to future expenses arising from commitments made on, or prior to, the valuation date. All future costs should be considered, including investment management, commissions, claims expenses and an appropriate amount of overheads. Whenever the present value of future contract loadings is taken as a starting point any shortfall relative to future expenses that will have to be incurred in the future to service insurance contracts should be recognised as an additional liability (and the opposite).

3.126 Expense assumptions should include an allowance for future cost escalation. This should have regard to the types of cost involved. The allowance for inflation should be consistent with the economic assumptions made. For disability income and other similar types of business, claims expenses may be a significant factor. Where future premiums or deposits are taken into the cashflows, valued expenses related to those amounts should also be taken into consideration. In setting expense assumptions undertakings should consider their own analysis of expenses, future business plans and relevant market data. However, economies of scale should not be assumed where these have not yet been realised.

Taxation

3.127 Taxation payments required to meet policyholder liabilities should be allowed for in the calculation of technical provisions on the basis that currently applies. In cases where changes to taxation requirements have been agreed (but not yet implemented), the pending adjustments should be reflected in the calculations. Taxation that would not be due if the firm made a loss should not be provided for.

Model and parameter error

3.128 Given the uncertainties in the measurement of technical provisions, the supervisory review process on provisions should, as far as possible, take account of the specificity of each undertaking. To ensure that the level of prudence retained in the technical provisions is in line with the Solvency

supervisory valuation principles, the supervisor, when appropriate, should review the quality of the data as well as the applicability and the relevance of statistical methods, and examine other actuarial or technical justification. From a procedural point of view, supervisors must be in a position to quality check the method and level of provisions at any time. Therefore, the undertaking shoul be able to demonstrate and defend the appropriateness of the level of the provisions, as well as the applicability and relevance of the applied methodology and the adequacy of the underlying statistical data. In addition to that the supervisor should have the power to strengthen the provisions on demand as part of the future Pillar II tool kit.

Reinsurance

3.129 Under certain reinsurance arrangements the timing of recoveries and of direct payments may diverge markedly, and this should be taken into account when valuing the technical provisions (e.g. when discounting cash flows). When calculating technical provisions corresponding to ceded reinsurance, undertakings should take account of expected losses due to the counterparty default, based on an assessment of the probability of default of the counterparty.

Creditworthiness of undertaking

3.130 As set out in CfA 7.39, no reduction in liabilities should be made on account of the creditworthiness of the undertaking itself.

Advice specific to life assurance

Discontinuance rates

3.131 As advised in CfA 7.54, undertakings may use credible and relevant discontinuance experience. Where a discretionary surrender value is paid on discontinuance, the estimates should allow for the payment the insurer would reasonably make in the scenario under consideration.

Financial guarantees and other embedded options

3.132 It is important to consider financial guarantees and policyholder options to change the terms of the contract. Cash flow projections should take account of the proportion of policyholders that are expected to take up options. This may depend on financial conditions at the time the option crystallises, which will affect the value of the option. Non-financial conditions should also be considered – for example, deterioration in health could be expected to have an impact on take-up rates of guaranteed insurability options.

Management actions

3.133 Future management actions should be reflected in the projected cash flows. The assumptions used should reflect the actions that management would reasonably expect to carry out in the circumstances of each scenario, such as changes in asset allocation, changes in bonus rates or product changes, or the way in which a market value adjustment is applied. Allowance should be made for the time taken to implement actions. In considering the reasonableness of projected management actions, undertakings should

consider their obligations to policyholders, whether through policy wordings, marketing literature or other statements that give rise to policyholder expectations of how management will run the business.

Valuation of future discretionary benefits

3.134 The valuation of technical provisions should generally comprise cash flows arising from future non-guaranteed benefits.

3.135 In line with the current directives, cash flows arising from (realised) profit reserves appearing in the balance sheet where they may be used to cover any losses which may arise and where they have not been made available for distribution to policy holders shall be excluded from the valuation of technical provisions. (Cf. Article 27 (2) d) of the Directive 2002/83/EG on Life Assurance.)

3.136 Such profit reserves shall be included (as tier 1 capital) in the available solvency margin.

Unit-linked and index-linked business

3.137 The same cash flow projection approach should be used for unit-linked and index-linked business. Undertakings should assume that unit-linked funds perform on a market-consistent basis. All cash flows arising from the product should be considered, including expenses, death benefits and charges receivable by the insurer. Where participants have the right to increase charges, assumptions on increased charging should be consistent with the general principles for management actions.

Advice specific to non-life insurance

Harmonisation of reporting tools

3.138 Harmonisation of technical provisions' margins will be enhanced by harmonising reporting for provisions. CEIOPS recommends to progress decidedly in defining common reporting tools, as for example run-off triangles.

Section 4

Capital

4.1 Following the publication of CP 20 in November 2006, there have been significant developments on eligible capital, including the recent Pillar I Discussion paper MARKT/2540/06 issued by the European Commission for the February 2007 EIOPS Solvency meeting, proposed for inclusion in the Framework Directive.

4.2 Various aspects and elements of CEIOPS' advice to the European Commission in CP 20 have been reflected in the European Commission's proposed text. As a result, the two have, in various respects, been aligned.

4.3 CEIOPS considers that further alignment is desirable, and possible, given, inter alia, that the European Commission's proposed text is expected to undergo further changes.

4.4 In CEIOPS' view, further work is needed on the elaboration of the approach applied, in relation to, for example, the composition of the tiers and the system of limits to be applied; considering also the cross-sector dimension with banking supervision to achieve an appropriate harmonised framework.

4.5 Accordingly, and to avoid pre-empting an outcome, CEIOPS considers that it is premature to introduce significant new issues in relation to its advice provided in the previous version of CP 20.

4.6 Providing advice now could in effect result in the awkward situation where CEIOPS advice would seemingly contradict the European Commission's proposed text. This would not serve the interests of the development of Solvency 2, as it could, for example, create confusion among stakeholders.

4.7 Given these considerations, CEIOPS has decided not to provide formal advice to the European Commission on eligible capital at this stage.

4.8 CEIOPS looks forward to providing more detailed advice in further developing a framework that adequately reflects the views and interests of stakeholders and assures a level playing field.

Section 5

Solvency Capital Requirement: standard formula

5.1 CEIOPS presented a broad vision for the SCR standard formula in its response to CfA 10 from the Commission. This highlighted some fundamental design choices that needed to be resolved at an early stage in the formula's development, as well as describing how quantitative impact studies could be used to inform decision-making on specific questions.

5.2 QIS2 tested a number of different modelling approaches for the standard formula. But CEIOPS clearly stated that:

"[The QIS2 Technical Specification] should not be understood as a closed CEIOPS proposal about the future Solvency II regime, nor should it limit the future room for manoeuvre to follow other approaches or re-open alternatives previously discussed. The specifications can be regarded as only an initial and tentative step towards the 'final' SCR…"[44]

5.3 Although QIS2 contained an initial calibration, CEIOPS emphasised that the focus of the exercise was very much on design questions. Further QIS exercises would be necessary to refine the calibration and ensure its consistency with CEIOPS' prudential objectives for the SCR.[45] However, the experience of QIS2 has allowed CEIOPS to develop its thinking on a number of areas, specifically:

- the overall structure of the standard formula, including the method for combining capital charges for different risks;
- clear definitions of individual risks within the formula's scope;
- calibration objectives for each risk, consistent with the overall objectives for the SCR; and
- the steps that need to be taken to ensure charges for individual risks – and the SCR as a whole – achieve the desired calibration.

5.4 This section considers issues specific to the SCR standard formula, building on the previous answer to CfA 10. The possible use of full or partial internal models to calculate the SCR is considered later in the paper. The overall objectives of the SCR (which apply regardless of calculation method) were discussed in section 2.

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[44] CEIOPS (2006) – *Quantitative Impact Study 2: Technical Specification,* available at: www.ceiops.org.

[45] Letter of the CEIOPS Chair to the CEA con the QIS2 specification (8 May 2006): http://www.ceiops.org/media/files/consultations/QIS/QIS2/CEIOPS-CEA-QIS2specification.pdf

PART A: STRUCTURAL ISSUES

5.5 In the first part of this section, CEIOPS considers some high-level structural issues for the design of the standard formula. These are:

- the implications of a modular approach for the development of the standard formula;
- the approach to aggregation;
- the calibration objectives for the standard formula; and
- the treatment of risk mitigation instruments.

The section then continues with a discussion of the individual modules that make up the standard formula.

Modular approach

5.6 In responding to CfA 10, CEIOPS considered the respective merits of a 'top-down' versus a 'bottom-up' method for developing the standard formula. QIS2 adopted a bottom-up or 'modular approach' for the standard formula. In each module, proxies for individual risks were transformed into a capital charge. The capital charges for individual risks were then combined, eventually resulting in an estimate for SCR.

5.7 This modular approach was chosen for practical reasons as it allowed CEIOPS to test a number of different modelling treatments for the same risk. For example, supervisors could determine the effect on the overall SCR of moving from a factor-based approach to a scenario-based approach for equities. This enabled CEIOPS to form a view on the most appropriate modelling treatments and, by extension, the right balance between risk-sensitivity and complexity. But the modular approach seems to have considerable merit beyond QIS:

- provided that the modules are clearly defined, supervisors have access to a rich source of information on an insurer's exposure to individual risks (rather than a single SCR number) enabling supervisory action to be more closely tailored to an insurer's circumstances; and
- modules allow inter-changeability of calculation methods for individual risks, thereby facilitating the transition to full internal models as well as the future development of the standard formula.

5.8 However, the approach does present a number of problems:

- it may be difficult to capture the interrelationships between different risks in a straightforward manner; and
- the modular structure used may diverge substantially from the manner in which individual insurers run their business, leading to

increased compliance costs or the possible omission of significant sources of risk.

The ability to develop an internal model to calculate the SCR should offer a response to those cases where these problems become material. Most CEIOPS Members therefore consider that the practical advantages of a modular approach outweigh the disadvantages.

5.9 Some CEIOPS Members do not agree on the use of a modular approach to calculate the SCR corresponding life insurance activities:

- QIS2, where such a modular structure was applied, lead to unreliable and disperse results;
- it does not take sufficient account of interactions between assets and liabilities.

5.10 These members support the use of an integrated scenario approach quite similar conceptually to stress test techniques used in some financial activities. Following this proposal, SCR for life insurance would be calculated through a twofold step:

- The first step assesses the SCR resulting from specific ALM position of each insurer. This step starts in the initial value of assets associated with life insurance technical provisions and the corresponding difference between assets and liabilities. Four different scenarios are applied to assess the impact of simultaneous and consistent changes in biometric assumptions, lapses rates, expenses, asset prices and credit spreads. The charge for ALM risk is taken from the scenario that results in the most detrimental change to the net asset value.
- The second step applies capital requirements for default, concentration, catastrophe and operational risks,[46] not covered by the calculation for ALM risk in the previous step.

The total SCR corresponding to life activities would be the aggregate of the capital requirements produced under these two steps.

5.11 For the sake of clarity, the following paragraphs of this section have been written without mentioning explicitly in each one the impact of using this alternative view. Annex A to this consultation paper includes a more detailed description of this proposal.

Calculation methods within the standard formula

5.12 In line with the response to CfA 10, QIS2 tested different modelling approaches for the same risks. One approach was always denoted as a 'placeholder,' the result of which was taken forward into the overall SCR calculation. Generally, the choice of placeholder was informed by a

[46] These could take the same form as the SCR_{def}, Mkt_{conc}, $Life_{CAT}$ and SCR_{op} modules discussed later in this section.

judgement on the relative simplicity and 'robustness' of the approaches under test. The aim was for the placeholder SCR to be as simple as possible. The results from the alternative approaches would then inform supervisors of the likely magnitude of error introduced by sacrificing risk sensitivity for simplicity.

5.13 An important lesson from QIS2 was that 'simplicity' is a very elastic concept. It does not follow, for example, that insurers find factor-based approaches less onerous from an operational point of view than scenario-based approaches for a given risk. In many cases, the relative simplicity of an approach depends on the characteristics of the business or product features specific to individual Member States. Although the functional form of a requirement may appear straightforward, actually breaking the insurer's risk exposure down into the components needed by the formula can be exceedingly complex. Problems are compounded by different possibilities for hedging behaviour which can be difficult to express through simple functions.

5.14 One possibility would be to place greater emphasis on scenario testing in the standard formula, rather than formulaic requirements. Scenario approaches have the advantage of scalability – their calculation need only be as complex as the business to which they are applied. However, this should not be mistaken for a panacea. Scenarios present the challenge of objective verification.

5.15 Another approach would be to take advantage of the different levels of sophistication within the SCR already envisaged by the Commission's *Amended Framework for Consultation*. If the standard formula does not reflect the insurer's business or cannot cope with its hedging behaviour, an insurer always has the ability to apply to use a model. But the experience from QIS2 suggests that a very significant proportion of undertakings could find themselves in this category – not just the largest and most sophisticated insurers. It seems disproportionate to automatically impose the costs of model development and recognition on whole segments of the EU market. The standard formula needs to be a relevant measure to the majority of insurers.

5.16 Some CEIOPS Members suggest that a way forward might be to allow different, pre-defined calculation methods. As in QIS2, a modular structure could allow inter-changeability of methods within the standard formula while still enabling the construction of an overall SCR. So, for example, an insurer could calculate its charge for interest rate risk by simulating the effect of a movement in the yield curve. Or it could apply a formula that uses representative data for its interest rate exposure (such as durations arranged into buckets) and approximates for the same yield curve movement. The choice of method would be determined by the insurer, subject to supervisory review and/or eligibility criteria. [47] But either method would result in an acceptable Pillar 1 charge for interest rate risk.

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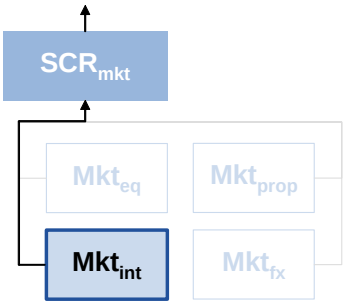
[47] For example, criteria for moving between the Basic Indicator Approach (BIA) and The Standardised Approach (TSA) for operational risk under the *Capital Requirements Directive (CRD)*. TSA enables a more granular

5.17 The decision within any one risk module is not necessarily between 'factor-based' and 'scenario-based' methods. But a pre-requisite is that the different methods are based on the same underlying principle. The following example considers how this would operate for interest rate risk:



1. **Objectives for *Mkt$_{int}$***

   To estimate the level of capital needed to sustain a movement in the yield curve consistent with the prudential objectives for the SCR

2. **Acceptable calculation methods for *Mkt$_{int}$***

   (a) interest rate scenario

   (b) formulaic approximation of (a) using duration buckets

3. ***SCR$_{mkt}$* uses the output from *Mkt$_{int}$***

   (Regardless of the calculation method adopted in *Mkt$_{int}$*)

5.18 Introducing such flexibility would immediately raise questions regarding harmonisation – and it should be noted that most CEIOPS Members strongly reject this approach on those grounds. Furthermore:

- Experience from QIS2 suggests that it may not be possible to ensure sufficient comparability between the results of different calculation methods.
- The availability of different calculation methods may encourage 'cherry-picking.'
- Allowing different methods within a number of modules will have a multiplicative effect on the number of possible 'versions' of the standard formula, potentially increasing the costs of supervision.

In the final design of the standard formula, CEIOPS would then need to select the one method (e.g. factor-based or scenario-based) that would be allowable in each risk module. This process would need to take place before QIS3 is executed, as that exercise needs to focus on calibration, rather than testing the effects of different approaches.

However, it does not follow that harmonisation can only be achieved by imposing a single calculation method – indeed, applying the same method is no guarantee that the outcome (in terms of the level of prudence, measured by the probability of survival) will be the same. But clearly a degree of balance would be necessary, otherwise the standard formula would become too complex to verify objectively. No more than two methods in any one module (as in QIS2) could offer sufficient flexibility; anything more might threaten the overall consistency of the standard formula.

assessment of operational risk, but, under certain (simplified) conditions, TSA and BIA will deliver the same result.

Aggregation

Technique

5.19 Dividing the standard formula into modular components immediately raises the question of how the results of individual modules could be combined to deliver an overall capital requirement for the SCR.

5.20 In responding to CfA 10, CEIOPS noted that:

"Further analysis is required to assess whether linear correlation, together with a simplified form of tail correlation, may be a suitable technique to aggregate capital requirements for different risks." (CfA 10.138)

5.21 CEIOPS acknowledged that such an approach had theoretical deficiencies – not least the assumption that risks are subject to a normal distribution, which is difficult to assert for most insurance risks. This could lead to an understatement of capital requirements (CfA 10.45). Nevertheless, linear correlation techniques were seen as a *"practical expedient"* for the development of the standard formula (CfA 10.46) and therefore formed the basis of the QIS2 proposals.

5.22 Where QIS2 participants provided information on their own approach to measuring risk dependencies, practices varied considerably, and most required a degree of modelling sophistication that would be difficult to apply generally to all insurers. So within the context of a modular approach to the standard formula, it is difficult to envisage an alternative to the use of linear correlation techniques. However, the potential for understatement of capital requirements suggests that correlation assumptions will need to be estimated cautiously. This in turn should mean that insurers are given incentives to better assess the diversification effects between their different risk exposures (through full and partial internal models).

Structure

5.23 For QIS2, CEIOPS adopted a two-step approach linked to the modular structure of the standard formula:

- as a first step, all risks belonging to the same major category would be combined. For example, equity, property, interest rate and foreign exchange risk were aggregated using a correlation matrix to produce an overall requirement for market risk; then
- as a second step, the major risk categories would be combined using another correlation matrix. So the requirement for market risk would be combined with requirements for underwriting, credit and operational risks to arrive at an overall BSCR.[48]

[48] The SCR before adjustments for profit-sharing or the expected profitability of non-life business.

Tentative values were proposed for the calibration matrices in the first step, but those in the second step were left to the discretion of participants. Some used assumptions from their internal models, while others replicated the correlation matrix that CEIOPS had provided for calculation of the MCR.

5.24 A two-step approach clearly has some limitations in its ability to capture dependencies between risks. For example, there might be a clear relationship between interest rate risk and lapse risk. But under the structure tested for QIS2, interest rate risk is part of the market risk category and lapses are part of life underwriting risk – the relationship between the two is captured only when market and life underwriting risk categories are combined. Compared to an one step approach, where all risks would be aggregated directly irrespective of the risk category they belong to, this is less risk sensitive since it does not accurately calculate risk percentiles.

5.25 During the pre-test phase of QIS2, some stakeholders suggested that it would be more intuitive to have an enlarged correlation matrix combining all risk modules of the standard formula as a single step. This would enable a more granular assessment of the dependencies between risks. Arguably, such relationships might prove more stable over time, compared with those between the major risk categories.[49]

5.26 Although CEIOPS would welcome any input that might clarify the practical consequences and reliability of alternative approaches, the two-step aggregation approach does seem to be the most pragmatic way forward. The challenges of populating an enlarged, 'one-step' correlation matrix would be immense given the paucity of data on dependencies between risks under stress conditions. While evidence might exist to support the choice of correlation coefficients for some risk pairs (lapse risk and interest rate risk, for example), very broad assumptions would need to be made for other risk pairs (e.g. lapses and operational risk). The risk of introducing spurious accuracy seems significant.

5.27 CEIOPS recognises that the absence of data is equally problematic for the two-step approach – possibly more so given the high-level nature of the major risk categories. But, again, this seems to support the need for a relatively simple, robust approach to aggregation that provides incentives for insurers to move towards more sophisticated techniques for modelling risks and their dependencies.

5.28 Industry feedback to the consultation paper has highlighted that the proposed structure of the SCR may need to be adjusted to allow for situations where the undertaking's fund structure restricts the transferability of capital between different parts of the business. This arises as the standard formula allows for diversification benefits that may not be available due to the undertaking's fund structure. An example is an undertaking with a participating fund where the assets of that fund are ring-fenced from other parts of the business and so are unavailable to support

[49] Section on risk aggregation, CEA (2006) – *Description of CEA's proposal for a European Standard Approach.*

losses elsewhere in the business. CEIOPS is carrying out further work on this issue, including collecting additional data on such funds in the QIS3 exercise. This will inform further consideration of the standard formula in these circumstances.

Calibration

5.29 The calibration of the standard formula should be consistent with the key aspects of the SCR's design expressed in section 2.

5.30 A first step towards achieving this aim is to ensure that the different modules of the standard formula are calibrated in a consistent manner. The most intuitive approach seems to be to apply the calibration objectives for the overall SCR (confidence level, time horizon etc.) to each individual risk module. So, for example, the choice of parameters, factors and scenarios for assessing interest rate risk should be consistent with a 99.5% probability of survival over 1 year, while also taking account of any model error arising from the particular technique chosen to assess that risk.

5.31 This approach would enjoy a number of advantages:

- it provides an unambiguous reference for the calibration of each module, without the need for arbitrary decisions on the relative weight each risk should contribute to the overall SCR;
- it would give supervisors a clearer picture of the composition of the overall SCR and of the influence of individual risk drivers on the overall risk profile of each insurer, informing the choice of supervisory action; and
- it would facilitate the use of partial internal models.

But, clearly, the aggregation of the modules needs to reflect cross-risk diversification effects to avoid overstating capital requirements.

5.32 In principle, the approach to aggregation should also be consistent with the calibration objectives for the SCR. If linear correlation techniques are used, correlation coefficients between risk pairs should be chosen for consistency with the SCR objectives expressed in section 2. But, as noted above, such techniques are problematic because they are only mathematically correct in the case of multivariate normally distributed risks. The practical consequence of this is that the resulting capital requirements would be too low in the case of risks that follow a heavily-skewed distribution, or for risks where the dependency relationship is non-linear.

5.33 In responding to CfA 10, CEIOPS noted that, if linear correlation was to be adopted within the standard formula, it would be important:

- *"to keep note of any dependencies that would not be addressed properly by this treatment;*
- *to choose the correlation coefficients to adequately reflect potential dependencies in the tail of the distributions;*

- *to assess the stability of any correlation assumptions under stress conditions…" (CfA 10.139)*

CEIOPS acknowledged that *"[within] this context, it may be necessary to incorporate a cushion for model error in the calibration of the formula."*

5.34 Following QIS2, CEIOPS considers that the most appropriate response to these concerns is to build a degree of caution into the modelling of the aggregation of the individual risk modules to an overall SCR. As well as addressing the (potentially significant) modelling error that is introduced by the application of simple linear correlation techniques, this is also a practical response to the lack of data on tail correlations.

5.35 CEIOPS acknowledges that this approach will lead to instances where the result of applying the standard formula is more conservative than the stated prudential objectives for the SCR. But this would avoid a situation where, in a large proportion of cases, the SCR estimate produced by the standard formula will be below the true capital needs of individual insurers, which would lead to a situation requiring a systematic quantitative check (and systematic Pillar 2 add-ons). Under CEIOPS' approach, there would also be a clear incentive for insurers to improve their assessment of the diversification effects between different risks by developing SCR internal models.

Adjustments

5.36 The modular structure in QIS2 included two top-level adjustments before arriving at the final result of the standard formula,[50] namely:

- the EP_{NL} adjustment to the Basic SCR which, for non-life insurance, took account of the expected profit (or loss) arising from next year's business; and

- the RPS adjustment to the Basic SCR which, for with-profits business in life insurance, took account of the ability of future profit sharing to absorb risks.

5.37 The EP_{NL} adjustment affected the modelling of the non-life underwriting risk module of the standard formula. Given the EP_{NL} adjustment, this module was intended to cover the excess losses that might occur over the solvency time horizon on existing provisions and new business.[51] Therefore the SCR for non-life underwriting risk had to capture only unexpected losses, whereas, in general, the SCR should capture both expected and unexpected losses.

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[50] Some CEIOPS Members are strongly opposed to these adjustments – see the discussion on the treatment of profit-sharing and EP_{NL} later in this section. These members support the deletion of this adjustment, although obviously accompanied by the correspondent re-calibration of parameters applied in non-life underwriting risk module.

[51] The underwriting losses in excess of those expected, or the expected profit less the actual outcome at the end of the period.

5.38 The RPS adjustment in life insurance measured the potential risk mitigating impact of discretionary future benefits, i.e. it was related to the assessment of the *impact* of a given shock on the economic balance sheet of the undertaking. This could be seen to be independent from the calibration of the underlying shock itself, so the RPS adjustment would not have an immediate impact on the calibration objectives for the risk modules in the standard formula.

Risk mitigation

5.39 Risk mitigation is taken to include both traditional and non-traditional risk transfer instruments on the asset side (e.g. financial hedging) and on the liability side (e.g. hedging instruments, reinsurance).

Principles for recognition

5.40 The response to CfA 12 established general principles for the recognition of reinsurance and other risk mitigation techniques, including:

- *"It is essential that the determination of the SCR (by application of the standard formula or otherwise) allows for the impact on an undertaking's risk profile of risk mitigation (reinsurance)."* (CfA 12.38)
- *"The underlying impact on risk associated with risk mitigation (reinsurance) should be treated consistently, regardless of the legal form of the protection."* (CfA 12.34)
- *"The prime consideration is the extent of risk transfer. The different risk characteristics (including risks transferred and acquired) of various covers will need to be taken into account."* (CfA 12.35)

The response to CfA12 also included requirements regarding reinsurance risk management (CfA 12.45–12.61).

5.41 CEIOPS recognises that the advice in CfA 12 was less well developed on the recognition of financial risk mitigation techniques. A number of additional principles for recognition might therefore be considered, inspired by the operational requirements in the banking sector:

- Risk mitigation arrangements should be legally effective and enforceable in all relevant jurisdictions. Insurers would need to take appropriate steps (for example, a legal review) to ensure the effectiveness and continuing enforceability of the risk mitigation arrangement and that the level of cover is well-defined.[52]
- Risk mitigation arrangements should provide appropriate assurance as to the risk mitigation achieved, having regard to the approach used to calculate the extent of risk transfer and the degree of

[52] Comparable to Art. 92, paras. 1 and 2 in 2006/48/EC *Capital Requirements Directive* ("CRD").

recognition in the SCR.[53] The arrangements should be capable of realisation within a reasonable period of the risk crystallising (e.g. the event of default, insolvency or bankruptcy of the provider of the risk mitigation instrument – or other event set out in the transaction document). The degree of correlation between the value of the instruments relied upon for risk mitigation and the credit quality of the provider should not be undue.[54]

CEIOPS will further explore the principles for recognition of risk mitigating techniques in its third quantitative impact study (QIS 3).[55]

CEIOPS would welcome comments on the appropriateness of these principles and whether they could be applied equally to reinsurance and other risk mitigation techniques.

5.42 The banking sector also applies requirements on the credit quality of the provider of the risk mitigation instrument before any reduction to the Pillar 1 requirements can take place. CEIOPS would welcome comments on whether it makes sense to forbid any reduction of standard SCR based on protection of non-EU reinsurers (unrated or rated) below a certain level (BBB or BB), and the practical implications that this could have.

Impact on the SCR standard formula

5.43 In principle, the SCR should allow for the effects of risk mitigation through:

- a reduction in requirements commensurate with the extent of risk transfer; and
- appropriate treatment of any corresponding risks that are acquired in the process.

For example, for reinsurance, the extent of the risk transfer should be recognised in the assessment of underwriting risk, while the acquired counterparty risk (in the event of the reinsurer's default) should be captured in the treatment of credit risk. In QIS2, it was generally decided to separate the two effects in order to simplify the overall treatment.

5.44 In practice, many of the proposals for the standard formula that were tested under QIS2 implied broad assumptions on the extent of risk transfer provided by risk mitigation techniques. The factor-based requirements for underwriting risk used net inputs for premiums and claims reserves. As there was no scope for insurers to adjust these inputs, effectively the assumption was that the risk transfer would be entirely effective.[56]

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[53] Comparable to CRD Art. 92, para. 3.

[54] Comparable to CRD Art. 92, para. 4.

[55] See QIS 3 Technical Specifications, Annex on financial risk mitigation.

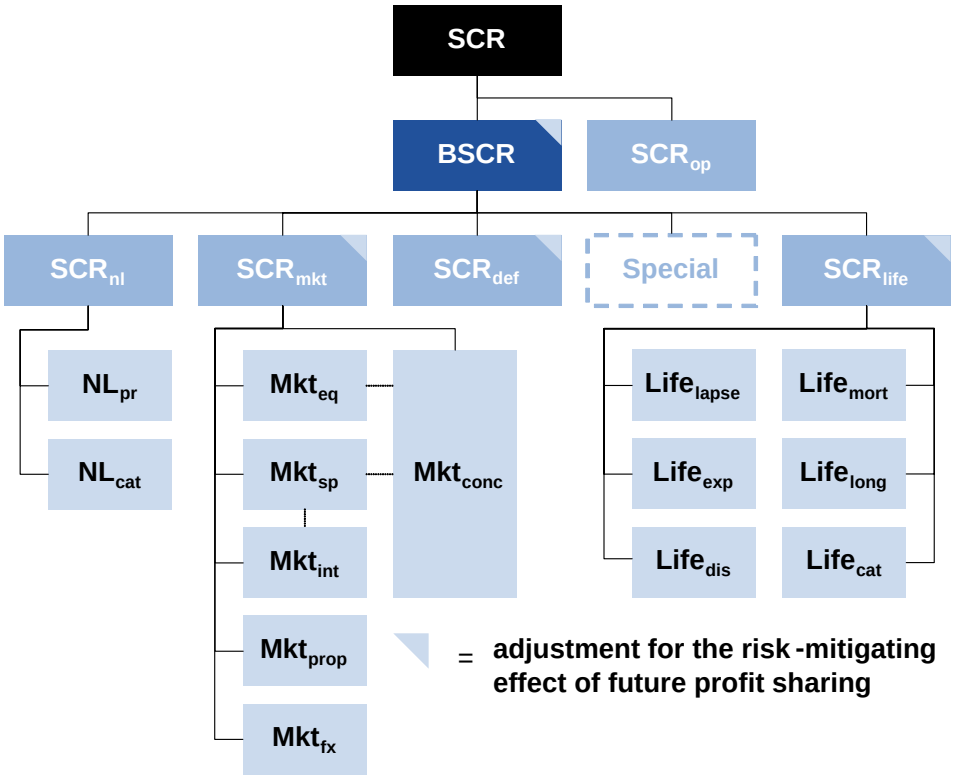
[56] Insofar as this is reflected in the difference between gross and net figures for premiums and claims reserves.

5.45 If the standard formula continues to use factor-based treatments for underwriting risk, its ability to take account of different levels of risk transfer will be constrained.[57] Therefore the Pillar 2 supervisory review process may need to determine whether the results of the standard formula overstate the extent of risk transfer, or whether the corresponding increase in requirements for counterparty credit risk offsets this effect.

5.46 For risk mitigation techniques other than reinsurance, the situation is similar – under the factor-based approaches, the recognition of risk mitigation techniques will, to some extent, be dictated by the functional form and input requirements for each risk module, regardless of whether this overstates (or understates) the extent of the risk transfer. Scenario approaches may offer additional flexibility to capture different hedging behaviour.

PART B: STANDARD FORMULA RISK MODULES

5.47 In the remainder of this section, the individual modules that make up the SCR standard formula are discussed. The risk modules may be summarised as follows:



5.48 This is similar to the structure adopted for QIS2, but with the following potential amendments:

[57] This problem may be less material under the scenario-based approaches for life underwriting risk and non-life catastrophe risk, although the modular structure of the SCR remains a constraint.

- the credit risk module is replaced with separate modules for counterparty default risk (SCR_{def}) and spread risk (Mkt_{sp});
- an additional, explicit recognition of the risk arising from concentrations (Mkt_{conc});[58]
- non-life premium and reserve risk have been combined in a single module (NL_{pr})
- life disability and morbidity risk have been combined in a single module ($Life_{dis}$)
- a separate module for life catastrophe risk has been introduced ($Life_{cat}$)
- the 'reduction for profit sharing' has been replaced with a number of lower-level adjustments for future profit sharing
- operational risk (SCR_{op}) is no longer treated on the same level as the other major risk categories; and
- expected profit or loss in non-life insurance (NL_PL) is no longer retained.

5.49 The 'Special' module refers to types of business where the treatment of underwriting risk follows a different structure, such as the form of actuarial health insurance common in Austria and Germany. This is discussed in section 10 of this paper.

5.50 The principle of substance over form should be followed in determining how risks are to be treated. For instance, where claims are payable in the form of an annuity, agreed claims should normally be part of SCR_{life}.

SCR Solvency Capital Requirement

5.51 The SCR is an insurer's Solvency Capital Requirement.

5.52 The SCR uses the results of the following modules as input information:

SCR_{op} = Operational risk

$BSCR$ = Basic Solvency Capital Requirement

Calculation

5.53 The SCR would be given by the results of the following function:

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

[58] One member is opposed to this change.

5.54 Note that, differently from the approach taken in QIS 2, the calculation does not explicitly include recognition of expected profit or losses in non-life insurance. Further technical analysis would be necessary to explore the extent to which such recognition should be made within the context of the standard formula calculation, including the design of an adequate calculation method. The function also differs in two respects from the proposal tested under QIS2, where:

- there was a separate module (RPS) for the effect of profit sharing; and
- operational risk was treated alongside the other major risk categories (market, credit and underwriting risk) as part of the BSCR.

5.55 Profit sharing is discussed further below.

5.56 The amended position for operational risk in the overall structure was prompted by two considerations. Firstly, data on operational risk losses is extremely limited, therefore it is difficult to make generalised assumptions about the correlation between operational risk and the other risk categories. However, a more significant concern is the impact on internal models. Under CEIOPS' approach to partial internal models (discussed in section 7), insurers can only adjust or replace the correlation matrices that combine charges for different risks (such as the one in BSCR) if all the input modules have been calculated using an internal model. Given the comparative infancy of operational risk measurement and management, this would seem a disproportionate response where insurers are capable of modelling all their other risks, but wish to use a relative simple, robust treatment for operational risk.

Treatment of profit-sharing business

5.57 For with-profits business in life insurance, the solvency assessment has to take into account the risk absorption ability of future profit sharing.

Experience from QIS 2

5.58 In QIS 2, an allowance for the risk absorption ability of future profit sharing was built into the formula by the RPS adjustment that led – on the 'top level' – to a reduction of the 'basic' SCR capital requirement (QIS2 5.12). This reduction became known as the 'K-factor' approach since it was computed as the product of $TP_{benefits}$ (the total amount in the placeholder valuation of technical provisions relating to future discretionary benefits) and the factor K (the risk-absorbing proportion of $TP_{benefits}$). Note that the 'K-factor' approach is consistent with the suggestions for the standard formula made by the industry.[59]

[59] Section 7, CEA (2006) – *CEA Working Document on the Standard Approach for calculating the Solvency Capital Requirement*, available from www.cea.assur.org.

5.59 The factor *K* could range between 0 and 1 and was intended to reflect the extent to which future discretionary profit sharing may be used to absorb future losses under adverse circumstances. For QIS2, it was specified that the factor *K* should be set by the participating undertakings using their own assumptions, taking into account any aspect that has a material impact on the degree to which amounts in technical provisions relating to discretionary benefits may be used to cover losses under adverse circumstances.

5.60 In order to avoid multiple recognition of the risk absorption of future profit sharing, the RPS adjustment was linked with the requirement that the capital charges for the individual modules should be calculated *before* allowing for the risk mitigating effects of future profit sharing. (QIS2 5.7)

5.61 The approach in QIS2 was consistent with the potential distinction between two categories of future discretionary benefits as laid out in section 3, insofar as undertakings were given the option to value only guaranteed benefits where future bonus provisions may be used to cover 'general' losses. In cases where undertakings made use of this option, amounts in respect of future discretionary benefits were treated as available capital, and hence the factor K was set to be zero (QIS2 5.18).

5.62 However, QIS 2 participants encountered a number of problems when following the QIS 2 implementation of the 'K-factor' approach:

- in some cases, the application of the K-factor approach resulted in negative SCRs;
- the specifications did not provide clear guidance on how to calculate the K-factor in a sound and practicable way; this led to an unwanted degree of arbitrariness in the setting of the K-factor, which, at the same time, has a material effect on the overall level of the SCR; and
- the capital charges for the individual risk modules (e.g., interest rate risk or equity risk), when calculated on the assumption of no loss-absorption by policyholder benefits (see above) turned out to be relatively large.

Below, a potential improvement of the K-factor approach used under QIS2 is presented, although clearly this would require further development before QIS3 – and the inclusion of any adjustment remains controversial.

Future development

5.63 CEIOPS[60] believes that the standard formula should provide, as under QIS2, adequate recognition for the risk mitigating effect of profit-sharing business. However, the practical experience of QIS2 has demonstrated that the

[60] This position is supported by a qualified majority of CEIOPS Members as defined by Article 9 (3) of its Articles of Association.

approach finally chosen needs to balance a number of different, potentially competing, concerns:

- Any reduction to capital requirements needs to be conducted in a clear and objective manner, and must avoid multiple recognition (double-counting) of the same risk mitigation.

- But to the extent possible, the charges for individual risks should themselves reflect risk mitigation, so as to avoid crude, one-off adjustments, and to allow a transition to (partial) internal models.

- It needs to be a mathematically consistent approach, compatible with the overall modular structure of the SCR standard formula.

- The calculation should not represent an undue operational burden on insurers and must be compatible with both factor-based and scenario-based approaches to modelling SCR risks.

5.64 However, a minority of CEIOPS Members is opposed to the idea that there should be a reduction for future profit sharing in the assessment of the SCR. They doubt whether such recognition could be implemented in a reliable and objective manner within the confines of the standard formula. They argue that the loss-absorbing ability of these provisions could be seen as a part of the available capital requiring supervisory approval.

5.65 As it develops proposals for QIS3, CEIOPS will consider replacing the current top-level 'Reduction for Profit Sharing' module with adjustments at the level of individual SCR risks.

5.66 The **first step** is to calculate the capital requirements for individual risks – for example, interest rate risk – under two different assumptions:

- that the insurer is able to vary its assumptions on future bonus rates in response to the shock being tested ($nMkt_{int}$); and

- that the insurer is not able to vary its assumptions on future bonus rates in response to the shock being tested ($gMkt_{int}$)

The difference between the two capital requirements ($gMkt_{int}$ – $nMkt_{int}$) is termed KC (KC_{int}).

5.67 Performing these two calculations for different risks reflects the fact that the ability to vary policyholder benefits will depend on the nature of the shock to which the insurer is exposed. For example, the potential for risk mitigation might be more significant in the case of yield curve movements than, say, a shock to property values.

5.68 The **second step** would be to aggregate capital requirements for risks within the same category (equity, interest rate, property etc.) using the relevant correlation matrices. To preserve the coherence of the modular approach, the aggregation would use the capital requirements produced assuming that the insurer is not able to vary its assumptions on future bonus rates in response to the shock being tested. For instance, the capital requirement $gSCR_{mkt}$ for market risk would be derived by combining $gMkt_{int}$,

$gMkt_{eq}$ and so on. The KCs would also be combined using the same correlation matrices.

5.69 The **final step** would be to repeat the aggregation process for the major risk categories. $gSCR_{mkt}$ is combined with $gSCR_{life}$ and all the other risk modules using the relevant correlation matrix. The aggregation would also be made for the KCs using the same correlation matrix. Finally, the aggregated KC would be subtracted from the aggregated gSCR to derive the overall SCR. The total amount of this adjustment to the aggregated gSCR would be limited by the total amount of technical provisions corresponding to future discretionary benefits.

SCR_{op} operational risk

5.70 Operational risk is the risk of loss arising from inadequate or failed internal processes, people, systems or from external events. Operational risk also includes legal risks. Reputation risks and risks arising from strategic decisions do not count as operational risks.

5.71 The challenges of setting capital requirements for operational risk are well-documented. The greatest obstacle is the lack of data, arising from the absence of established approaches to classify and quantify losses. In those Member States that have encouraged the holding of capital specifically to address operational risk, the methods used by insurers vary widely in their sophistication.[61] But operational risk could be a potentially material threat to policyholder protection, therefore some attempt should be made to quantify it under the SCR (CfA 10.130).

Experience from QIS2

5.72 CfA 10.162 proposed a multiple factor-based approach to operational risk, using appropriate proxies for the scale of an insurance undertaking's operations. CEIOPS recognised that premium and reserve-based volume measures for operational risk entail different advantages and disadvantages.[62] In QIS2, CEIOPS therefore tested a simple, robust formula that combined both measures:

$$SCR_{op} = Op_1 = \max\left\{\begin{matrix} 0.06 \bullet Earn_{life} + 0.03 \bullet Earn_{nl} + 0.03 \bullet Earn_h; \\ 0.006 \bullet TP_{life} + 0.03 \bullet TP_{nl} + 0.003 \bullet TP_h \end{matrix}\right\}$$

where

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[61] See, for example, paras. 4.14-4.29, Financial Services Authority (2006) – *Insurance Sector Briefing: ICAS one year on*, available from www.fsa.gov.uk

[62] See Question 6, Groupe Consultatif (2005) – *Request from CEIOPS to Groupe Consultatif on 10 key technical questions on 2nd wave calls, and the Groupe's response*, available from www.gcactuaries.org

$Earn_{life}$ = Total earned life premium

$Earn_{nl}$ = Total earned non-life premium

$Earn_{h}$ = Total earned health premium

TP_{life} = Total life insurance technical provisions

TP_{nl} = Total non-life technical provisions

TP_{h} = Total health technical provisions

All terms were gross of reinsurance. In addition, TP_{life} and $Earn_{life}$ could be reduced to one-tenth of their actual value in the case of linked business with no policyholder guarantees.

5.73 The initial calibration of the factors was taken from a proposal by the German Insurance Association for the standard formula,[63] adjusted to take account of business where a material portion of the overall risk is borne by policyholders.

5.74 QIS2 results showed a very wide degree of dispersion in the capital requirements for operational risk, suggesting the proposal was too simplistic to capture differences in the management of this risk between insurers. In some cases, the operational risk charge completely dominated the SCR, while other insurers reported that their internal modelling approaches implied the need for higher capital requirements.

Further development

5.75 Despite the problems encountered during QIS2, CEIOPS remains of the view that the SCR should take account of operational risk. Deferring the problem entirely to the insurer's individual risk and capital assessment (IRCA) would not provide much incentive to improve the identification and management of operational risks. CEIOPS is encouraged by industry attempts to improve understanding and consistency of data on operational risk losses,[64] which should eventually support more sophisticated approaches to operational risk (including partial models).

5.76 As with QIS2, the standard formula treatment for operational risk should be based on a simple, robust formula. But CEIOPS will consider the following revision to the operational risk charge as it develops proposals for QIS3:

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[63] Section 5.1.2, Gesamtverband der Deutschen Versicherungswirtschaft (2005) – *Discussion paper for a Solvency II Compatible Standard Approach (Pillar I)*, available from www.gdv.de

[64] See, for example, the insurance-adapted Basel II loss categorisation developed by the Operational Risk for Insurance Consortium, available from www.abioric.com

$$SCR_{op} = \min\left\{Op_{load} \bullet BSCR; \max\left\{\begin{matrix} 0.06 \bullet Earn_{life} + 0.03 \bullet Earn_{nl} + 0.03 \bullet Earn_{h}; \\ 0.006 \bullet TP_{life} + 0.03 \bullet TP_{nl} + 0.003 \bullet TP_{h} \end{matrix}\right\}\right\}$$

where

Op_{load} = a pre-specified coefficient with a value less than 1

$BSCR$ = the basic SCR

and all other terms are the same as in the QIS2 proposal above.

5.77 The aim of the loading factor is to avoid excessive dominance of the overall SCR by the component for operational risk. But CEIOPS recognises that loading approaches have significant weaknesses. One particular difficulty is the potential exaggeration of risk mitigation effects in other modules. For example, an insurer might use credit derivatives to reduce its exposure to credit risk. The SCR charge for credit risk is therefore lower, which feeds through to a lower operational risk charge – when, arguably, operational risk has actually increased. Equally, there may be instances where an insurer has a very limited exposure to other risk categories (e.g. some forms of linked business), and that it is quite appropriate for operational risk to be the largest contributor to the SCR.

5.78 Tentatively, CEIOPS proposes that Op_{load} is set in the range 25-50%. Further attempt will be made before QIS3 to establish the consistency of all SCR_{op} factors with the soundness standard for the SCR, although this will be extremely difficult given the absence of historical operational risk data. CEIOPS will also consider whether a differential treatment is needed for unit-linked insurance business or in cases where operational risk is the dominant risk.

5.79 CEIOPS recognises the potential need for including an additional factor to the operational capital amount depending on the quality of the company's risk management processes and procedures.

5.80 As SCR_{op} would no longer be part of BSCR, capital requirements would no longer reflect any diversification effects between operational risk and the other risk categories. CEIOPS acknowledges that the calibration of the other factors in SCR_{op} may also need to be adjusted to compensate for this.

BSCR basic SCR

5.81 BSCR is the Solvency Capital Requirement before any adjustments, combining capital charges for four major risk categories.

5.82 The BSCR uses the results from the following modules as input information:

SCR_{mkt} = Market risk

SCR_{def} = Counterparty default risk

SCR_{life} = Life underwriting risk

SCR_{nl} = Non-life underwriting risk

together with any special types of business (see Section 10).

5.83 In addition to the removal of operational risk discussed previously, the QIS2 credit risk module has been replaced with a module addressing counterparty default risk (with spread risk falling under the market risk category). This broadly reflects the approach envisaged by some of CEIOPS' stakeholders,[65] and also has the advantage that it is more closely aligned with requirements in the banking sector, where specific interest rate risk is treated as part of the trading book and default risk as part of the banking book.

Experience from QIS2

5.84 In QIS2, the placeholder approach involved a linear correlation technique based on a simple correlation matrix CorrSCR as follows:

CorrSCR	SCR_{mkt}	SCR_{cred}	SCR_{life}	SCR_{nl}	SCR_{health}	SCR_{op}
SCR_{mkt}	1	MH	ML	ML	ML	M
SCR_{cred}	MH	1	ML	M	ML	ML
SCR_{life}	ML	ML	1	L	ML	ML
SCR_{nl}	ML	M	L	1	L	M
SCR_{health}	ML	ML	ML	L	1	ML
SCR_{op}	M	ML	ML	M	ML	1

5.85 The terms L, M and H (and combinations of them) in CorrSCR were used to denote low, medium and high correlation, but the actual values to use in the matrix were left to the discretion of the participants. In practice, participants used either:

- the values from the prescribed correlation matrix for the MCR; or
- estimates of risk dependencies derived from their internal models.

5.86 CEIOPS also tested the assumption of full independence between the risk categories and also a combination that assumed no diversification effects between the main risk modules. As expected, this showed a significant range of BSCR results is possible depending on the assumed extent of cross-risk diversification effects. However, the range was partly constrained by the prescribed assumptions for correlation between lower-level risk modules (e.g. the combination of different market risks).

Further development

[65] CEA (2006) – *Description of CEA's proposal for a European Standard Approach.*

5.87 In line with the general approach to aggregation and calibration discussed earlier in this section, a simple, relatively robust approach should be adopted for combing the requirements from the different risk modules.

5.88 As CEIOPS develops proposals to test under QIS3, the starting point will be the values from the prescribed correlation matrix for the MCR that were used by many of the QIS2 participants. Some change would be necessary to take account of the replacement of the credit risk module with a module restricted to counterparty default risk.

5.89 BSCR would be calculated as follows:

$$BSCR = \sqrt{\sum_{rxc} CorrSCR_{r,c} \bullet SCR_r \bullet SCR_c}$$

where

$CorrSCR_{r,c}$ = the cells of the correlation matrix CorrSCR

SCR_r, SCR_c = capital charges for the individual SCR risks according to the rows and columns of the correlation matrix CorrSCR

and CorrSCR is defined as follows:

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

(together with any special types of business addressed in Section 10 of this paper).

SCR_{mkt} market risk

5.90 Market risk arises from the level of volatility of market prices of financial instruments. Exposure to market risk is measured by the impact of movements in the level of financial variables, such as stock prices, interest rates, real estate prices and exchange rates.

5.91 SCR_{mkt} is comprised of capital requirements from the following modules:

Mkt_{int} = Interest rate risk

Mkt_{eq} = Equity risk

Mkt_{prop} = Property risk

Mkt_{sp} = Spread risk

Mkt_{conc} = Risk concentrations

Mkt_{fx} = Currency risk

Experience from QIS2

5.92 Under QIS2, the capital requirements for interest rate risk, equity risk, property risk and currency risk were combined using the correlation matrix CorrMkt as follows:

CorrMkt	Mkt_{int}	Mkt_{eq}	Mkt_{prop}	Mkt_{fx}
Mkt_{int}	1	0.75	0.75	0.25
Mkt_{eq}	0.75	1	1	0.25
Mkt_{prop}	0.75	1	1	0.25
Mkt_{fx}	0.25	0.25	0.25	1

(Mkt_{conc} and Mkt_{sp} were not included as these are new risk modules that CEIOPS proposes to develop for QIS3).

5.93 Participants raised a number of concerns with the specific values used in this matrix, suggesting in particular that the correlations between:

- interest rate risk and equity risk;
- interest rate risk and property risk; and
- property risk and equity risk.

were significantly higher than might be expected and did not recognise the diversification of portfolios. Some participants also noted that the matrix approach did not provide sufficient incentive for insurers to pursue investment strategies that were well-diversified across different asset classes.

5.94 The correlation assumptions in QIS2 were based on work performed for the domestic *Financial Assessment Framework* (FTK) in the Netherlands, where the following observations were made:

"The correlation between interest rates and shares (and variable yield securities) is unstable over time; consequently, the standardised method uses a robust estimate, allowing for the parameter uncertainty in that correlation. A degree of diversification is assumed between variable-yield securities and interest rates, being a correlation of ρ=0.8 between the effects of the interest rate scenario and the scenarios for variable yield securities." [66]

[66] Pensioenverzekeringskamer (2004) – *Financial Assessment Framework Consultation Document*, available from www.dnb.nl.

(Note that, in this framework, 'variable yield securities' included both equity and property).

5.95 Using a rolling-window technique, the authorities in the Netherlands estimated the distribution of the 12-month correlation between interest rate risk and 'variable yield' risk. They determined that the correlation corresponding to the 99.5% confidence level was 0.8. For QIS2 purposes, this was rounded down to 0.75 for both the interest rate-equity and the interest rate-property relationship. Also following the Dutch analysis, perfect correlation was assumed between equity and property risk.

Further development

5.96 Notwithstanding the concerns raised by QIS2 participants, CEIOPS would observe that the correlation assumptions used to combine market risks need to reflect the risk of non-linear dependencies in the tail of the risk distribution. Although the degree of correlation between interest rate risk and equity risk may be comparatively low in 'normal' market conditions, the relationship may change significantly under the occurrence of adverse events in the individual risks.

5.97 CEIOPS[67] recognises that on market risk the QIS2 approach did not give due recognition for diversification effects and that some of the correlation assumptions will need to be revised downwards. CEIOPS would welcome evidence from stakeholders that could be used to justify the use lower correlation assumptions (bearing in mind the potential for non-linear dependencies).

5.98 A minority of CEIOPS Members considers that the analysis on market risk correlations performed for the Dutch Financial Assessment Framework is broadly consistent with the need for a simple, robust approach to aggregation and calibration identified earlier in this section. They would prefer the use of the QIS2 market risk correlation assumptions as a starting point for QIS3.

5.99 SCR_{mkt} would be calculated as follows:

$$SCR_{mkt} = \sqrt{\sum_{rxc} CorrMkt_{r,c} \bullet Mkt_r \bullet Mkt_c}$$

where

$CorrMkt_{r,c}$ = the cells of the correlation matrix CorrMkt

Mkt_r, Mkt_c = capital charges for the individual market risks according to the rows and columns of the correlation matrix CorrMkt

[67] This position is supported by a qualified majority of CEIOPS Members as defined by Article 9 (3) of its Articles of Association.

CorrMkt could be defined as follows (the entries for the interest rate risk, equity risk, property risk and currency risk were already tested in QIS2):

CorrMkt	Mkt_{int}	Mkt_{eq}	Mkt_{prop}	Mkt_{sp}	Mkt_{conc}	Mkt_{fx}
Mkt_{int}	1	0.75	0.75	0.25	0	0.25
Mkt_{eq}	0.75	1	1	0.25	0	0.25
Mkt_{prop}	0.75	1	1	0.25	0	0.25
Mkt_{sp}	0.25	0.25	0.25	1	0	0.25
Mkt_{conc}	0	0	0	0	1	0
Mkt_{fx}	0.25	0.25	0.25	0.25	0	1

5.100 This CorrMkt table would need to be revised accordingly.

5.101 The comparatively low correlation assumptions for Mkt_{spread} and Mkt_{conc} reflect features of the design of these new modules:

- As Mkt_{conc} quantifies the diversifiable, residual risk of individual exposures, it can be considered independent from the other market risks.
- In times of 'flight to quality,' credit spreads tend to widen when other asset classes such as equity are depressed as well, suggesting a positive correlation between Mkt_{sp} and other market risks.

However, the assumption of a zero correlation between the concentration risk module and the other market risk modules may not be appropriate, and will, in any case, require further consideration.

5.102 Government bonds should be exempted from the concentration risk and spread risk modules. The exemption should relate to borrowings by the national Government or guaranteed by the national Government of an OECD or EEA state, issued in the currency of the national Government.

5.103 CEIOPS will also consider the issue whether "free assets" (i.e., assets that are not needed to cover technical provisions or the SCR) should be exempted from the calculation of a market risk capital charge. However, such treatment would need to be designed such that it is consistent with the simplified balance sheet concept underlying both the determination of eligible capital and the calculation of the solvency requirement.

Mkt_{int} interest rate risk

5.104 Interest rate risk is the sensitivity of asset and liability values to changes in the term structure of interest rates or interest rate volatility (excluding those assets and liabilities where policyholders bear the investment risk).

Experience from QIS2

5.105 Both the factor-based and scenario-based approach from QIS2 used a series of stress factors for interest rate risk that were constant over five maturity buckets.

Maturity n in years	1-3	4-6	7-12	13-18	18+
relative change $S_{up}(n)$	0.75	0.5	0.4	0.35	0.3
relative change $S_{down}(n)$	-0.4	-0.35	-0.3	-0.25	-0.2

5.106 Under the placeholder, scenario-based approach, participants were asked to perform two separate shocks, recalculating the net value of assets and liabilities by revaluing all interest rate sensitive instruments using altered term structures. The altered term structures could be derived by multiplying the current interest rate curve (prescribed by CEIOPS for QIS2) by $(1+s_{up})$ and $(1+s_{down})$. The capital requirement was the larger of the two changes in the net asset value in response to these shocks (or zero if the shocks actually generated an improvement in net asset value).

5.107 CEIOPS also tested a duration approach in QIS2 which broadly approximated the scenario using formulaic requirements.

5.108 The stress factors for changes in interest rates were calibrated using two data sources:

- monthly data from 1972 onwards on German government bond zero rates, for maturities between 1 and 10 years (Source: Bundesbank)
- daily data from 1997 onwards on European zero swap rates, for maturities up to 30 years (Source: Datastream)

5.109 A log-normal model was used because the observed data showed that, in general, higher interest rates were associated with higher absolute changes in interest rates.[68] It can be shown that the log-normal model assumes that an absolute change in interest rates linearly depends on the level of interest rate.[69]

5.110 The annualised standard deviations for different maturities were calculated, showing (for both data sources) higher standard deviations for shorter maturities than longer maturities. The same result was observed when using data on three non-Eurozone currencies: Danish Krone, Swedish Krone and British Sterling. This implied a shock of greater magnitude for shorter maturities

5.111 The stress factors for interest rate risk were estimated as follows:

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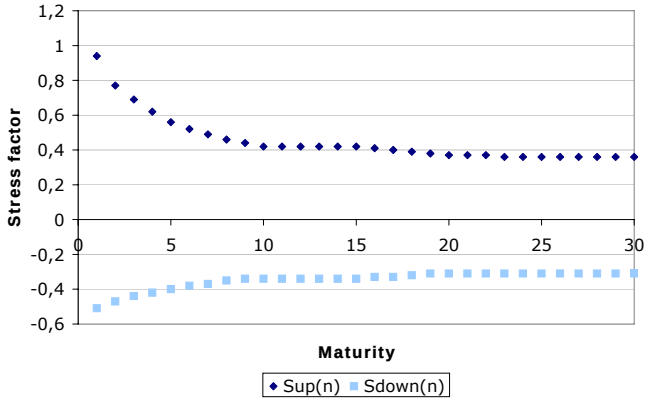
[68] The Black-Karasinski and Cox-Ingersoll-Ross models were also considered. However, these mean reversion models were not used because, based on the observed data, the mean reversion assumption did not hold. The resulting shocks were also highly dependent on the exact model chosen.

[69] Campbell, Lo and McKinlay (1997) – *Econometrics of financial markets.*



To determine stress factors for long-end interest rates that were consistent with the short-end stress factors, the factors were fitted using information from both data sources and assuming a constant volatility ratio.

Further development

5.112 The interest rate treatment will continue to be developed in advance of QIS3, with a focus on refining the calibration. This will include:

- assessing the degree of alignment between the results produced under the scenario and the factor-based approximation;
- possible correction for bias in the time series used to calibrate s_{up} and s_{down}; and
- potential use of real interest rates.

5.113 CEIOPS will also consider the appropriate level of granularity to use when applying the two shocks – in particular, the appropriate number of maturity buckets to use, or whether the bucket approach could be replaced with a continuous transformation function.

Mkt_{eq} equity risk

5.114 Equity risk arises from the level or volatility of market price for equities. Exposure to equity risk refers to all assets and liabilities whose value is sensitive to changes in equity prices.

Experience from QIS2

5.115 The placeholder approach for equity risk required the application of a prescribed shock to the value of all individual equities, also taking account of the effect on derivatives and short positions. It was calculated as follows:

$$Mkt_{eq} = (\Delta eq \mid eqfall) - (\Delta eq_{link} \mid eqfall)$$

where

eq	=	the market value of the overall equity exposure
eq_{link}	=	the market value of equity exposures where policyholders bear the investment risk
eqfall	=	an immediate 40% fall in the value of all individual equities

5.116 A scenario approach was also tested where the 40% fall was applied to equity benchmarks, taking into account the specific investment policy of the insurer (e.g. non-market portfolios of equity,[70] hedging arrangements and gearing).

5.117 The design of both approaches assumed, for simplicity, that equity risk could be tested using a single, global shock. However, the magnitude of the initial shock chosen for QIS2 was identified as problematic by many of CEIOPS' stakeholders. [71] Additionally, concern was expressed that the treatment did not reflect the use of equities to match longer-term liabilities, resulting in over-dominance of the SCR by the equity risk component.[72]

5.118 The QIS2 shock was calibrated using quarterly data from the MSCI Developed Markets index on total returns over the period 1970-2005 (Source: Datastream). The index covers 23 indices from developed markets, excluding private equity investments and (by definition) emerging markets. Individual country weights are calculated on the basis of their market capitalisation. Total returns are estimated on the assumption that dividends are reinvested in the index on the day the security is quoted ex-dividend.

5.119 As a first step, global returns were assumed to follow a normal distribution, although the observed data exhibited negative skew and a negative fat tail. There are a number of possible responses to this, including:

- extreme value theory, where the assumption is made that the distribution of the tail converges to a limit distribution;
- log-linear estimation methods, where the tail in the historical probability distribution is extrapolated using linear regression for the historically worst outcomes;
- the Gumbel distribution; and
- fitting a Generalised Pareto Distribution (GPD) to the tail of the equity return distribution, which can be estimated using maximum likelihood estimators or with regression models.

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[70] E.g. where the volatility of returns on the specific equities chosen may vary significantly from the volatility of returns on benchmark portfolios

[71] Letter of the CEA to the CEIOPS chair on the QIS2 specification (21 April 2006), available from: http://www.ceiops.org/media/files/consultations/QIS/QIS2/CEA-CEIOPS-QIS2specification.pdf

[72] Letter of the FFSA to the CEIOPS chair on QIS2 (21 July 2006), available from: http://www.ceiops.org/media/files/consultations/QIS/QIS2/LettreHenrikBjerre-Nielsen21juillet06.pdf

5.120 The geometric mean for the source data equals 10.1% and the standard deviation corresponds to 16.9%. Assuming normally-distributed equity returns, the shock corresponding to the 99.5% confidence level is 33.4%. However, after tail correction, the 99.5% confidence level corresponds to a shock of approximately 35%, depending on the exact correction method chosen:

- Log-linear: 34.3%
- Gumbel: 34.6%
- GPD via maximum likelihood (ML): 33.3%
- GPD via regression (R): 37.9%

The equivalent result for TailVaR 99% was a shock of approximately 37.5%.

5.121 As the MSCI Developed Markets Index is restricted to the period from 1970 onwards, it does not reflect significant market declines that occurred before World War II. CEIOPS therefore performed analysis on a data series covering the period 1900-2000. [73] Here, the geometric mean equalled 11.2% and the standard deviation corresponded to 16.5%. Based on normality, the 99.5% confidence level corresponded to a shock of 31.2%. But correction for fat tails brought this shock up to approximately 35%, depending on the exact method chosen.

Further development

5.122 CEIOPS [74] believes that the equity risk treatments should continue to be developed in advance of QIS3 on the basis of the QIS2 proposal, with a focus on refining the calibration. CEIOPS will consider whether the results of its analysis are sufficiently stable to warrant a reduction of the QIS2 shock to 35%, and the degree of alignment between the results produced under the scenario and the factor-based approximation.

5.123 One particular aspect that requires further attention is the interaction between equity and currency risk. The analysis presented above was based on hedged returns. The current currency risk module considers only direct exposures, since, the indirect impact may be technically difficult to quantify (e.g. a euro-denominated stock will be impacted indirectly by a move in the US dollar via the issuer's unhedged dollar activities). Alternatively, unhedged returns (include movements in exchange rates) could be used. However, this would lead to double-counting if equity positions are included in the currency risk module.

5.124 CEIOPS will also consider further the appropriateness of a global shock. Alternative proposals for the standard formula have suggested that different

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[73] Indices from Dimson, Marsh and Staunton (2001) – *Triumph of the Optimists* (Source: Ibbotson Associates).

[74] This position is supported by a qualified majority of CEIOPS Members as defined by Article 9 (3) of its Articles of Association.

factors should be applied to take account of the volatility of returns experienced in different markets. Due to a lack of historical data, it seems unlikely that this could reach the level of granularity of different shocks for exposures in different Member States. But it might, for example, distinguish between developed and emerging markets, or between different global regions. However, CEIOPS' first analysis suggests that increased granularity could actually increase the magnitude of the equity risk shock:

Data series[75]	Region	Global	Europe	Germany
	Time period	1970-2006	1970-2006	1970-2006
	Frequency	Quarterly	Quarterly	Monthly
Corrected VaR 99.5	GPD ML	33%	36%	N/A
	GPD R	38%	41%	49%

This result is intuitive given that increasing the diversification of the index reduces the level of the shock.

5.125 CEIOPS will also need to consider the practical implementation of the scenario approach – for example, whether the equity benchmarks need to be specified more clearly (e.g. MSCI Developed Markets Index, EuroStoxx etc). This also presents the question of how 'non-market' portfolios would map across to the benchmarks under the stress conditions.

5.126 There is a concern that a large risk weight on equities may have the unwanted effect of European insurers reducing their equity holding significantly. This may be addressed in two ways:

- if the correlation parameter between interest rate risk and equity risk is reduced to a relatively low level (for example, 25%), then moderate equity holdings would lead to a larger than proportional increase of the market risk SCR; or

- lower risk weights could be used if the proportion of all assets in equities was relatively small, while the correlation parameter between interest rate risk and equity risk could continue to be set cautiously (for example, 75%).

Both solutions would penalise concentrations in the equity asset class. In the second solution, the equity SCR would represent an estimate of the risk contribution to the portfolio, rather than a standalone estimate of the risk.

Alternative view

5.127 A minority of CEIOPS Members advocates a different solution to the treatment of equity risk. They note that, in the long run, equities typically provide better returns than bonds and provide good cover against various

[75] Source: Datastream.

types of inflation. It would therefore be appropriate to consider equity risk in conjunction with the liabilities that the assets are being used to match.

5.128 They also note that volatility of equities is important in the short term but is not significant in the long term. Some theoretical and empirical studies suggest, for example, that a duration of 25 years could be attributed to equities. [76] Accordingly, the treatment of equity risk might differentiate between cases where the liability side is instable or of short duration and cases where the liability side is stable and of long duration, such as life annuities. Even on the non-life side, there are examples where the duration of liabilities is, effectively, long and stable (e.g. through tacit renewal of insurance contracts).

5.129 QIS2 produced examples – particularly for non-life insurers – where the capital resulting from the equity risk treatment resulted in a disproportionately high contribution to the final SCR. But the solution does not seem to be a universal reduction in the 40% shock applied under QIS2. This would not be prudent for insurers with a high proportion of the balance sheet invested in equities. Under some implementations of Solvency I, Member States apply a 0% loading on equities that represent less than two thirds of policyholder liabilities, and 100% for any equities above this amount. This could, of course, be replaced with a more finely graduated approach.

5.130 As it develops proposals for QIS3, CEIOPS could alternatively investigate an approach where the magnitude of the equity shock depends on the expected holding period of the equity position and the overall concentration of its investments in equities. The shocks might be set as follows:

$$Mkt_{eq} = Eq_{load} \bullet \rho EqVaR$$

where

$\rho EqVaR$ = a proxy of VaR 99.5% estimated as 70% of the weighted average one-year volatility of the insurer's equity portfolio

and Eq_{load} is defined according to the following table[77]:

Eq_{load}		Equities as a proportion of policyholder liabilities[78]		
		15-25%	25-40%	40%+
Expected holding	Less than 2 years			
	2 – 5 years			

[76] See, for example, Standard and Poor's (2004) – *Using equity duration in pension fund asset allocation.*

[77] As stated, further analysis is needed on this issue. Therefore, this table is currently left blank.

[78] Excluding equities and liabilities where the policyholder bears the investment risk.

	More than 5 years			

5.131 Objective criteria will be needed to determine the expected holding period. However, many CEIOPS members are strongly opposed to such a concept which they consider inconsistent with the design of the SCR (in particular, the one-year time horizon for assessing risk).

5.132 The 70% factor applied to the weighted average one-year volatility of the insurer's equity portfolio would produce results consistent with the 99.5% VaR observed for the EuroStoxx 50 equity index. However this assumption – and the equity loadings given in the table above – would need further testing and refinement as part of QIS3.

5.133 Basing the size of the equity shock on the volatility of the equity portfolio provides incentives for insurers to manage their equity risk effectively (rather than applying a 'one-size-fits-all' shock). Although the practicalities of such an approach would require careful consideration, it does seem that information on the volatility of traded equities should be readily available – and where unknown, a default (prescribed) value could be used.

Mkt_{prop} property risk

5.134 Property risk arises from the level or volatility of market prices of real estate.

Experience from QIS2

5.135 The placeholder treatment for property risk applied a 20% stress factor to the market value of property exposures (excluding exposures where the policyholders bear the investment risk). For reasons of simplicity, no distinction was made between direct or indirect exposure to real estate, or between different types of real estate investment (offices, retail, residential etc.) QIS2 also tested a scenario-based approach where the 20% stress factor was applied to property benchmarks.

5.136 For reasons of simplicity, it was assumed that property returns are normally distributed. Choosing a more sophisticated model might have given a better fit, but insufficient data exist to model the negative tail of the distribution very precisely. The aim was to use a simple and transparent model to produce reasonable estimators for the lower percentiles.

5.137 The stress factor was calibrated using the following data indices (Source: Investment Property Databank):[79]

- the Netherlands, 1977-2005;
- France, 1998-2005;

[79] The French, German and Swedish IPD data lack long-dated information on these property markets. Consequently, the corresponding analyses do not include a full property cycle.

- Germany, 1996-2005;
- Sweden, 1997-2005; and
- the United Kingdom, 1971-2005.

5.138 The indices were based on annualised total returns (capital growth + income) of direct investments in real estate. The total returns were based on valuation data, such as surveyors' estimates, rather than actual market prices, and therefore reflected a degree of smoothing over time. Since transaction prices are important, an 'unsmoothed' return also needs to be considered. This can be derived mechanistically from the unsmoothed data.[80]

5.139 Based on the specific unsmoothing mechanism used, the standard deviations of the unsmoothed property returns were determined.

Country	Mean	Standard deviation		99.5% shock
		Smoothed	Unsmoothed	
France	10.5%	3.4%	7.6%	8.92%
Germany	3.6%	1.7%	9.3%	20.36%
Netherlands	9.4%	5.1%	8.4%	12.20%
Sweden	9.9%	7.2%	11.4%	19.40%
United Kingdom	12.4%	10.3%	16.0%	28.87%

5.140 Since the historical series varied considerably in length, covariances were estimated using the shortest common subset of returns, thereby discarding some of the information in the longer time series. Instead of using the market-weighted basket of the five countries, the 99.5% was conservatively rounded to 20%.

Further development

5.141 CEIOPS [81] considers that the property risk treatments will continue to be developed in advance of QIS3 on the basis of the QIS2 proposal, with a focus on refining the calibration. Particular aspects that will be considered include:

- fat tails correction;
- illiquidity correction;
- return truncation correction; and

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[80] Fisher, Geltner and Webb (2003) – *Value Indices of Commercial Real Estate: a Comparison of Index Construction Methods.*

[81] This position is supported by a qualified majority of CEIOPS Members as defined by Article 9 (3) of its Articles of Association.

- the degree of alignment between the results produced under the scenario and the factor-based approximation.

5.142 Given the significant degree of dispersion between the volatility of returns in different countries, CEIOPS will also consider whether the application of a single, global shock is the most appropriate treatment. However, this must be set against the practical difficulties of calibrating more granular shocks, given the paucity of data on property risk.

Alternative view

5.143 A minority of CEIOPS Members advocate an approach where the magnitude of the property risk shock depends on the average duration of the insurer's liabilities and the overall concentration of its investments in property. The shocks might be set as follows:

Propfall		Property as a proportion of policyholder liabilities[82]			
		<15%	15-25%	25-40%	40%+
Avg. duration of liabilities (yrs)	1	20%	20%	20%	50%
	2	14.5%	14.5%	20%	50%
	3	11%	11%	20%	50%
	4	8%	10%	20%	50%
	5	7%	10%	20%	50%
	6	6%	10%	20%	50%
	7	5.5%	10%	20%	50%
	8	5%	10%	20%	50%
	9	4.5%	10%	20%	50%
	10+	4%	10%	20%	50%

The shocks in the first column reflect a proposal to CEIOPS by the Fédération Française des Sociétés des Assurances. However, the values of Propfall would require further refinement and testing as part of QIS3.

5.144 Many CEIOPS members are strongly opposed to such a proposal which they consider inconsistent with the design of the SCR (in particular, the one-year time horizon for assessing risk).

Mkt_{fx} currency risk

5.145 Currency risk arises from the level or volatility of currency exchange rates.

[82] Excluding equities and liabilities where the policyholder bears the investment risk.

Experience from QIS2

5.146 QIS2 applied a 25% stress for currency risk, relating to a simultaneous change (rise or fall) in the value of all other currencies against the insurer's reporting currency. The placeholder approach delivered this by means of a factor applied to the market value of the overall net foreign currency position.

5.147 A scenario-based approach was also tested, using the same 25% stress but applied to all exchange rates with the insurer's base (reporting) currency. Participants were requested to consider the more onerous of a 25% rise or fall in each exchange rate, taking account of all its individual positions and its investment policy (e.g. gearing, hedging etc).

5.148 The calibration of the stress factor was based on work performed for the domestic *Financial Assessment Framework* (FTK) in the Netherlands. This considered the exchange rates of seven currencies against the Euro. A currency basket was constructed using an estimation of currency positions held by Dutch financial institutions, with weighting as follows:

- 35% United States dollar (USD);
- 24% British sterling (GBP);
- 13% Argentine peso (ARP);
- 8% Japanese yen (JPY);
- 7% Swedish krone (SEK);
- 7% Swiss Franc (CHF); and
- 6% Australian dollar (AUD)

The comparatively high weighting for the Argentine peso reflected its use as a proxy for all currency exposure to emerging markets. [83] Some undertakings where the base currency is linked to the Euro excluded the currency risk on exposures in Euro in order to reflect the rather modest risk

5.149 The source data were monthly exchange rates for the period 1958-2006 (source: Datastream), using a synthetic Euro for the period before the currency's adoption. Given the monthly frequency of the data, the holding period in the calculation of the risk measure needs to be scaled up to a one year risk evaluation. This adjustment assumes that the monthly distributions are statistically independent.

5.150 The annualised standard deviations of the seven exchange rates versus the Euro were calculated. For reasons of simplicity, it was assumed that the relative changes in exchange rates are normally distributed. The 99.5% shocks were estimated as follows:

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[83] Note that the analysis includes the period 1992-2001 in which the peso was fixed to the US dollar.

Euro vs.	USD	GBP	ARP	JPY	SEK	CHF	AUD	Basket
σ	9%	7%	37%	9%	6%	6%	11%	7%
99.5% shock	22%	18%	95%	23%	15%	14%	28%	17%

For this specific currency basket, the 99.5% confidence level corresponds to a shock of approximately 17%. However, if the period of the Bretton Woods agreement is excluded, the 99.5% shock corresponds to 20%.

5.151 The same analysis was performed using British Sterling as the base currency. For simplicity, the Euro was assumed to represent 24% of the currency basket (i.e. directly replacing sterling), with all other weights held the same. The 99.5% shocks were estimated as follows:

GBP vs.	USD	EUR	ARP	JPY	SEK	CHF	AUD	Basket
σ	9%	7%	37%	10%	8%	9%	14%	8%
99.5% shock	23%	18%	96%	26%	21%	23%	37%	21%

Assuming the same currency basket, the standard deviation for British sterling is higher and the corresponding 99.5% shock is approximately 21%.

5.152 CEIOPS recognises that the implied level of shock depends on the precise currency basket chosen, therefore sensitivity analysis was performed by varying the weights of the three largest currencies (all other weights moved in the same proportion as the original basket).

Basket vs. Euro	No change	USD		GBP		ARP	
		more	less	more	less	more	less
Weight	-	50%	0%	50%	0%	20%	0%
σ	7%	7%	8%	6%	8%	9%	5%
99.5% shock	17%	17%	20%	15%	21%	23%	12%

The key observation is the impact of inclusion or exclusion of the Argentine peso from the currency basket on the level of the overall shock. This is an intuitive result given ARP has the highest standard deviation and because of its specific dependency structure with the other currencies.

5.153 The same analysis was performed using British sterling as the base currency, producing shocks as follows:

Basket vs. GBP	No change	USD		EUR		ARP	
		more	less	more	less	more	less
Weight	-	50%	0%	50%	0%	20%	0%
σ	8%	8%	10%	7%	9%	10%	7%
99.5% shock	21%	20%	25%	19%	24%	25%	17%

5.154 Since all the modelled currency baskets produced shocks in the range 12%-25%, the QIS2 shock was cautiously set at 25%.

Further development

5.155 The currency risk treatments will continue to be developed in advance of QIS3, with a focus on refining the calibration. Particular aspects that will be considered include:

- fat tails correction;
- different model assumptions; and
- the degree of alignment between the results produced under the scenario and the factor-based approximation.

CEIOPS will consider whether the results of its analysis are sufficiently stable to warrant a reduction of the QIS2 shock to 20%.

5.156 Given the results of the sensitivity analysis, CEIOPS will also investigate the appropriate level of granularity for the currency risk requirement – in particular, the appropriateness of a single, global shock. CEIOPS might consider:

- different shocks for different currency exposures – for example, one shock for yen exposures and another shock for dollar exposures;
- differentiating between three broad groups: European economies, other highly-developed economies and emerging economies; or
- varying the magnitude of the shock dependent on the base (reporting) currency – for example, a different set of shocks for British sterling versus the Euro.

In countries where Euro is not the base currency but where the exchange rate is linked to the Euro (ERM II) the size of the shock for the base currency versus the Euro should reflect the maximum fluctuations set under ERM II.

5.157 But while data availability on exchange rate movements should be less of a concern, the practicability of setting different stress factors for different currencies – and the materiality of the effect on capital requirements - needs to be carefully considered. Additionally, care must be taken to maintain a level playing field between Euro and non-Euro markets.

Mkt_{sp} spread risk

5.158 Spread risk is the part of risk originating from assets that is explained by the volatility of credit spreads over the risk-free curve.

Experience from QIS2

5.159 QIS2 did not contain a specific module for spread risk. In the technical specification, this was subsumed into the credit risk module, alongside

default risk. But arguably, such an agglomeration of risks is not intuitive. For example, the risk contributed by a BBB rated bond has three components:

- the change in value due to a move of the default-free interest rate curve;
- the change in value due to a move of the BBB curve relative to the default-free interest rate curve; and
- the change in value due to changes in the credit standing of the individual issuer.

Unlike QIS2, these three components would be addressed in Mkt_{int}, Mkt_{sp} and Mkt_{conc} respectively.

5.160 The three-component structure is commonly observed in the risk management of financial institutions. It is also naturally aligned with the possibilities for hedging: interest rate risk is most commonly hedged using interest risk swaps, while spread risk is most commonly hedged using index credit default swaps.

Development

5.161 The spread risk module will be developed for testing under QIS3. As a starting point, CEIOPS assumes the approach will use the following input information:

$rating_i$ = the external rating of credit risk exposure i

dur_i = the effective duration of credit risk exposure i

MV_i = the nominal size of credit risk exposure i as determined by reference to market values (exposure at default)

5.162 In cases where there is no readily-available market value of credit risk exposure i, alternative approaches might be adopted to determine MV_i. For example, in the case of insurance-related recoveries, the best estimate of the credit risk exposure could be used. However, any alternative approaches should still be consistent with any relevant market information.

5.163 The capital requirement for spread risk would be calculated as follows:

$$Mkt_{sp} = \sum_i RW(rating_i) \bullet m(dur_i) \bullet MV_i$$

where the function RW produces a risk weight according to the following table:

$rating_i$	Credit Quality Step[84]	RW risk weight
AAA	1	0.04%
AA		0.28%
A	2	3.3%
BBB	3	6.56%
BB	4	10.16%
B	5	22.23%
CCC or lower	6	34.96%
Unrated	-	8%

The ratings notation used by Standard and Poor's is given for illustrative purposes. In cases where several ratings are available for a given credit exposure, generally the second-best rating should be applied.

5.164 The specific form of the function m requires further development, although possible approaches include:

- a stress applied to the spread curve, which would be similar to the scenario-based approach to interest rate risk;
- a linear dependence, which would have similarities with the duration-based approximation for interest rate risk;
- a linear dependence where the duration is capped at five years, as under the QIS2 credit risk module.

5.165 The five-year cap – which prompted some confusion under QIS2 – does have some advantages:

- Some governments issue 50-year bonds which are especially targeted at insurers and pension funds aiming to match their long-term liabilities. Linear dependence might not achieve the proper calibration for long-term exposures, hence a cap should be applied to prevent the m function increasing indefinitely.
- Insurers who face relatively large costs in computing the duration could use the conservative approximation of treating all exposures as the maximum, five-year duration.

The cap is also related to banking book regulation. In some standardised methods, there is no dependence on maturity at all. In the more advanced methods (which do take account of maturity dependence), five years is an important reference point.

[84] Credit Quality Steps are a feature of the Capital Requirements Directive. This mapping is taken from CEBS (2006) – *Press release: European supervisors agree on the outcome of the informal joint assessment process of three external credit assessment institutions* (standardised approach).

Mkt_{conc} market risk concentrations

5.166 Market risk concentrations present an additional risk to an insurer because of:

- additional volatility that exists in concentrated asset portfolios; and
- the additional risk of partial or total permanent losses of value due to the default of an issuer

5.167 For the sake of simplicity and consistency, the definition of market risk concentrations is restricted to the risk regarding the accumulation of exposures with the same counterparty. It does not include other types of concentrations (e.g. geographical area, industry sector etc.)

Experience from QIS2

5.168 Market risk concentrations were not explicitly addressed in QIS2. However, this omission is not consistent with the general design of the SCR, which should cover *"quantifiable risks to which a supervised institution is exposed."*[85] Insurers with badly diversified exposures face increased risks which should result in an increased SCR.

Development

5.169 A degree of pre-processing is necessary to establish the net exposure to a single counterparty. All entities which belong to the same group[86] should be considered as a single counterparty for the purposes of the module. However, CEIOPS recognises that further guidance will be needed on the definition of such groups. For example, exposures via investment funds or such entities whose activity is mainly the holding and management of an insurer's own investments would need to be considered on a look-through basis. The same holds for CDO tranches and similar investments embedded in 'structured products'.

5.170 The net exposure to a single counterparty is the sum of net exposures across all asset classes. This could be calculated in two steps. Firstly, an exposure at default (based on market values) should be calculated as in the equity, spread and property risk modules. Secondly, a weight (roughly corresponding to a loss given default) could be applied to each asset class – for example:

- equity = 1;
- fixed income = 0.5; and
- property = 0.75.

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[85] *Amended Framework for Consultation.*

[86] Excluding the insurer's own group. A separate CEIOPS working group is considering the treatment of intra-group exposures.

For simplicity, also a risk weight of one could be chosen for each asset class.

5.171 The net exposure E_i to a single counterparty i would be computed as a weighted sum of all exposures j across all asset classes k to counterparty i:

$$E_i = \sum_k w_k \bullet \sum_j EAD_{i,j,k}$$

5.172 A simple approach would be to determine a threshold amount under which no additional capital requirement for concentrations applies (as the other market risk modules assume a degree of diversification). Any excess exposure over this threshold would be subject to a capital requirement.[87]

5.173 The excess exposure would be defined as:

$$XS_i = \max\left\{0; \frac{E_i}{Assets_{xl}} - CT\right\}$$

where:

5.174 Alternatively, different CT thresholds could apply according to the rating of the exposures.[88]

5.175 The capital requirement due to a concentration on exposure i would be a function of the excess exposure over the threshold. For example:

$$Conc_i = Assets_{xl} \bullet XS_i \bullet \left[f_0 + f_1 \bullet XS_i\right]$$

where f_0 and f_1 are parameters that depend on the rating of the exposure i.

The total capital requirement for market risk concentrations would be calculated assuming independence between the requirements for each counterparty i:

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

5.176 The effect of a risk concentrations module on smaller insurers needs to be considered to avoid undue impact on the capital requirements and investment management of these entities. While concentrations are more likely to arise for smaller insurers, this should not mean:

- a systematic additional requirement for smaller insurers; or

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87 This approach is similar to the penalty factors envisaged in CEA (2006) – *Description of CEA's proposal for a European Standard Approach.*

88 For illustrative purposes, thresholds could be settled as follows: counterparties rated AAA to AA: 7%; counterparties rated A to BBB: 5%; less than BBB or unrated: 3%.

- the fragmentation of exposures in credits of low significance.[89]

Also, the practicalities of this approach regarding group exposures (e.g. definition of group accumulation of exposures, simple approximations etc) will need to be explored further.

SCR_{def} counterparty default risk

5.177 Counterparty default risk is the risk of default of a counterparty to risk mitigating contracts like reinsurance and financial derivatives.

5.178 Counterparty default and replacement cost of risk mitigation can be positively related ('wrong way risk'). In principle, there are three ways of accounting for this in the context of the standard formula:

- when computing the effect of a shock net of reinsurance, not giving full recognition to the risk mitigation;
- when computing the loss given the default of the reinsurer, using an estimate of the (potentially higher) replacement cost that would occur in the even of a reinsurer's default; or
- to aggregate the capital requirements for default risk and the other major risk categories conservatively. This accounts for wrong way risk originating from reinsurance (SCR_{def}:SCR_{nl}; SCR_{def}:SCR_{life}) and from financial derivatives (SCR_{def}:SCR_{mkt}).

In the following, it is assumed that the third approach is taken.

Experience from QIS2

5.179 As noted earlier, counterparty default risk was not addressed explicitly. Indeed, some participants noted this was a material omission from the QIS2 Technical Specification.

Development

5.180 In common with the treatment of default risk in the banking sector, the module could use information on the probability of default (PD) and the replacement cost of the exposure, given default of the counterparty.

5.181 A PD estimate could be derived from external ratings according to the following table:

$rating_i$	Credit Quality Step	PD_i
AAA	1	0.004%

[89] Since smaller undertakings may lack the expertise to analyse a large number of counterparties, fragmentation of exposures may generate an unjustified burden, endanger the simple and transparent management typical of such insurers and, as a consequence, increase their operational risk.

AA		0.01%
A	2	0.05%
BBB	3	0.26%
BB	4	1.22%
B	5	5.78%
CCC or lower, unrated	6, -	16.32%

The ratings notation used by Standard and Poor's is given for illustrative purposes. In cases where several ratings are available for a given credit exposure, generally the second-best rating should be applied.

5.182 Alternatively, the PD could be derived from the SCR coverage ratio under the following conditions:[90]

- the counterparty is a reinsurer subject to Solvency II supervision; and
- the reinsurer computes its SCR and available capital at least on a quarterly basis.

5.183 If the counterparty is a reinsurer with an internal model, the PD can be derived directly from the internal model of that reinsurer, provided the reinsurer has approval to use that internal model for its SCR (subject to the same conditions as above).

5.184 RC is a conservative estimate of the replacement cost of the exposure, given default of the counterparty. It is therefore approximately the difference between gross and net technical provisions (plus any other credit against the reinsurer, minus any debt capable of offset), adjusted for the effect of collateral and other risk mitigants admitted.

5.185 Exposures to reinsurance counterparties should take account of the availability of risk mitigants, such as collateral. Undertakings would need to consider the net exposure to the reinsurer, which would then be treated as follows:

- where the reinsurer is rated, a PD should be estimated as above; but
- unrated reinsurers not subject to Solvency II regulation would be treated as B risks.

5.186 The counterparty default risk requirement for an exposure i could be based on the Vasicek distribution, which is the basis for the 'IRB' credit risk formula from the Capital Requirements Directive. If 99.5% VaR is the SCR calibration standard, the requirement could be calculated as follows:

[90] This requires specifying a 'standard' shape of the probability distribution.

$$Def_i = RC \bullet \left[N[(1-R)^{-0.5} \bullet G(PD) + \sqrt{\frac{R}{1-R}} \bullet G(0.995)] \right]$$

where

N	=	the cumulative distribution function for the standard normal random variable
G	=	the inverse of the cumulative distribution function for the standard normal random variable
R	=	correlation

5.187 The correlation to enter into this function could depend upon the distribution of risk exposures to different reinsurers, using 0.5 as a conservative base correlation. This could be determined as:

$$R = 0.5 + 0.5 \bullet H$$

5.188 H is the Herfindahl index:

$$H = \sum_i w_i^2$$

where w_i denotes the exposure to reinsurer i as a fraction of the total reinsurance exposure.

5.189 Counterparty credit risk originating from financial derivatives like interest rate swaps has similarities and differences with the reinsurance counterparty risk.

5.190 Similarities are:

- the potential for positive correlation between counterparty default and replacement cost; and
- the fact that insurers tend to have very few selected counterparties for either form of risk mitigation.

5.191 Differences are:

- the availability of market prices as a proxy for replacement cost; and
- although the current replacement cost for a derivative may be zero, its value may be positive over the time horizon of one year.

The differences may require treating counterparty credit risks similarly to the 'expected positive exposure' (EPE) method in banking regulation. However, for the purpose of this consultation paper, CEIOPS proposes to apply the same method as for reinsurance counterparty default risk, except for the option to use the SCR coverage ratio as an alternative source of information on the creditworthiness of the counterparty. The Herfindahl

index should be calculated considering reinsurance exposures and financial derivatives exposures separately.

SCR_{life} life underwriting risk

5.192 Life underwriting risk is the risk arising from the underwriting of life insurance contracts, associated with both the perils covered and the processes followed in the conduct of the business.

Experience from QIS2

5.193 For QIS2, SCR_{life} was comprised of capital requirements from the following modules:

$Life_{mort}$ = Mortality risk

$Life_{long}$ = Longevity risk

$Life_{morb}$ = Morbidity risk

$Life_{dis}$ = Disability risk

$Life_{exp}$ = Expense risk

$Life_{lapse}$ = Lapse risk

5.194 Within mortality, morbidity and disability risk, surcharges for CAT risks were considered. The capital requirements for the individual sub-risks were combined using a correlation matrix.

5.195 Participants raised the concern that this matrix would not present a consistent set of assumptions on correlations between pairs of risks:[91] whereas morbidity risk and disability risk were assumed to be 100% correlated, the correlation assumptions for these risks with respect to the remaining risks were not identical. Also, some participants pointed out that for some contracts the distinction between morbidity and disability risk would be problematic.

5.196 Concerning the CAT risks surcharges within the mortality, disability and morbidity modules, concerns were raised whether the simple factor-based treatment of such risks would be adequate. Also, it was pointed out that adding these CAT surcharges to the other sub-charges for mortality (respectively, disability/morbidity) risk would not adequately reflect that CAT risks could be assumed to be independent from the other sources of risk.

Further development

[91] I.e. the matrix is not positive definite.

5.197 For QIS3, CEIOPS suggests combining disability and morbidity risk into one module (with invalidity/morbidity probability as the underlying risk driver, see below). Also, CEIOPS proposes to comprise the treatment of CAT risks in life underwriting risk into a new 'CAT risk' module (see below).

5.198 Thus SCR_{life} would be comprised of capital requirements from the following modules:

$Life_{mort}$ = Mortality risk

$Life_{long}$ = Longevity risk

$Life_{dis}$ = Disability/Morbidity risk

$Life_{exp}$ = Expense risk

$Life_{lapse}$ = Lapse risk

$Life_{CAT}$ = CAT risk

5.199 The capital charges for the sub-risks could be combined using a correlation matrix as follows:

$$SCR_{life} = \sqrt{\sum_{rxc} CorrLife_{r,c} \bullet Life_r \bullet Life_c}$$

where

SCR_{life} = the capital charge for life underwriting risk

$CorrLife_{r,c}$ = the cells of the correlation matrix CorrLife

$Life_r$, $Life_c$ = capital charges for individual life underwriting sub-risks according to the rows and columns of correlation matrix CorrLife

and the correlation matrix *CorrLife* is defined as:

CorrLife	$Life_{mort}$	$Life_{long}$	$Life_{dis}$	$Life_{lapse}$	$Life_{exp}$	$Life_{CAT}$
$Life_{mort}$	1	0	0.25	0	0.5	0
$Life_{long}$	0	1	0[92]	0.5	0.5	0
$Life_{dis}$	0.25	0	1	0	0.5	0
$Life_{lapse}$	0	0.5	0	1	0.5	0
$Life_{exp}$	0.5	0.5	0.5	0.5	1	0
$Life_{CAT}$	0	0	0	0	0	1

[92] This correlation factor may require further consideration.

The following analysis reflects these proposed structural changes to the treatment of life underwriting risk.

Also in this context CEIOPS welcomes comments regarding the alternative approach included in Annex A.

5.200 With regards to the calculation method to derive the capital charge for life underwriting risk, CEIOPS'advice proposes the use of a scenario based approach to modelling the individual life sub-risks (except life CAT risk), to allow a better recognition of the risk characteristics of the undertaking's portfolio. This approach will be tested in QIS 3, and to encourage the participation of small and medium sized undertakings, this will be supplemented by guidance on simplified, factor-based treatments that may be used by undertakings with a less complex risk profile.

$Life_{mort}$ mortality risk

5.201 Life mortality risk is defined as the risk arising from a change in mortality rates. The treatment of mortality risk is split into the risk components volatility risk and uncertainty risk.

5.202 Volatility risk is defined as the risk of random fluctuations of actual mortality rates during the solvency time horizon around the expected mortality rates.

5.203 Uncertainty risk is defined as the risk that the models used to estimate mortality rates are misspecified or that the parameters within the models are misestimated. It also comprises the risk that the risk structure (i.e., parameters) can change over time or be uncertain for other reasons. For example, a new medical breakthrough (e.g. cure for cancer) could change the assumptions on future mortality rates.[93]

5.204 The life mortality risk charge should capture volatility and uncertainty risk only to the extent these risks have not already been addressed in the valuation of technical provisions.

Experience from QIS2

5.205 In QIS2, the placeholder capital charge for mortality risk was calculated by a factor-based approach. For volatility risk, this approach derived an estimate of the standard deviation in the loss distribution for mortality risk. This estimate used the average probability of death and the number of contracts in the portfolio as input parameters. For uncertainty risk, the placeholder capital charge was derived by multiplying the volume of technical provisions with a market-wide risk factor.

5.206 Participants raised the following concerns regarding these treatments:

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[93] For the definition of volatility and uncertainty risk, cf. section 5 of the IAA report.

- The risk capital charge for mortality uncertainty should be calculated by reference to sum at risk rather than provisions, since a higher savings component of the contract should not automatically lead to an increase in the capital charge;

- Outstanding duration is an important element in assessing the uncertainty and trends in future mortality rates, however it does not impact the capital charge;

- The risk charge for volatility risk does not reflect the part of volatility in the result that is driven by variations in policy size. However, this effect may be material in relation to the volatility arising from the number of lives component; and

- For the volatility risk capital charge, the number of insured heads (rather than the number of contracts) should be used;

5.207 The formula should reflect that volatility risk and uncertainty risk could be assumed to be independent.

5.208 QIS2 also tested a scenario-based treatment for mortality risk. For volatility risk, this assumed a (non-permanent) 10% increase in mortality rates for each age during the solvency time horizon. For uncertainty risk, a (permanent) 20% increase in mortality rates for each age was considered.

5.209 Participants raised the following concerns regarding the scenario-based treatment:

- Some insurers did not have the capacity to perform the necessary calculations;

- It was questioned whether a separate scenario calculation for volatility would be necessary, if this would always be a small proportion of the scenario calculation for uncertainty risk (as the former assumes a change in experience only during the solvency time horizon, while the latter assumes a permanent change);

- Volatility risk will depend on the degree of diversification within the portfolio, which can be expected to be significantly higher in large portfolios than in small portfolios. However, the assumed shock for volatility risk makes no allowance for portfolio size; and

- For contracts with reviewable rate options,[94] an assumption of a permanent shock to assumed future mortality rates may not be appropriate.

5.210 Concerning the quantitative results, the following observations could be made:

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[94] Which regularly increase premiums on the basis of the insurer's overall claims experience.

- On average, the capital charges for mortality risk under the scenario-based approach were significantly higher than under the factor-based approach;

- In the factor-based treatment for volatility risk, changes in the average probability of death had far less impact on the estimation of the standard deviation (and hence on the capital charge) than changes in portfolio size; at the same time, the calculations to derive estimates for average death probabilities were relatively complex.

Further development

5.211 In light of the feedback from QIS2, the following improvements could be implemented in a factor-based approach to **volatility risk**:

- to also allow for the part of volatility that is driven by variations in policy size, the estimation of the standard deviation used to derive the capital charge should be increased by a market wide factor (e.g., 50%);

- to simplify the calculations (without materially impacting the results), the supervisor should set assumptions on the average probability of death; and

- for the portfolio size, the number of insured heads rather than the number of contracts should be used.

5.212 A scenario-based approach to volatility risk which assumes a shock that is constant across all undertakings does not seem appropriate, because it would not take into account the size of the portfolio of the undertaking, which can be expected to have a material impact on the degree of diversification, and hence on the level of volatility risk.

5.213 Therefore, the scenario-based approach should be better aligned with the factor-based approach by choosing the shock in the scenario so that it is compatible with the estimation of the standard deviation in the loss distribution for mortality risk under the factor-based approach.[95]

5.214 Alternatively to explicitly modelling volatility risk under a factor-based or scenario-based approach, it could also be chosen to implicitly address volatility risk in the other risk sub-modules of life underwriting risk.

5.215 With regards to **uncertainty risk**, the following improvements could be made to a factor-based approach:

- The risk capital charge for mortality uncertainty could be calculated by reference to sum at risk rather than provisions;

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[95] For example, assume that (using the formula in the factor-based approach) the standard deviation of the probability distribution is estimated at 2%. Assuming that the distribution is normal and that the level of confidence is set to be 99.5%, this corresponds to a shock of 2.58*2% ≈ 5%, which could then be used for the scenario-based approach.

- The contracts could be classified into different buckets, depending on their outstanding duration; for each bucket[96], a different factor could apply (although, a trade-off between computational complexity and the risk sensitivity of the formula needs to be established).

5.216 For uncertainty risk, there is no obvious formulaic relationship between the size of the shock assumed in the scenario-based approach and the choice of parameters in the factor-based approach. Therefore, it seems difficult to align these two approaches.

5.217 Whereas a scenario-based approach to uncertainty risk will allow a better recognition of the individual risk characteristics of the undertakings' portfolio, the calculations under this approach can be significantly more complex than under the factor-based approach, leading to a higher operational burden on undertakings. A scenario-based approach may also lead to an additional work load for the supervisor to check the validity and appropriateness of the calculations.

5.218 A choice between the factor- and scenario-based treatments will need to reflect the impact of the life underwriting risk capital charge on the overall SCR. If this impact is generally low, an increase in accuracy for the measurement of life underwriting risk will only marginally increase the quality of the overall SCR estimate.

5.219 In QIS2, the scenario-based approach to uncertainty risk assumed a mortality shock of a 20% permanent increase in mortality rates for each age. A question was raised whether this size of shock adequately reflects that, under the solvency valuation of technical provisions, the risk margin will, to some extent, take account of the uncertainty in the valuation of the best estimate.[97] The size of this shock will be reviewed. It needs to be remembered though that it might be expected that the risk margin in the provisions would continue to exist and might even have increased following an adverse mortality event.

5.220 It is suggested that the overall charge for mortality risk should be derived by assuming independence between volatility and uncertainty risk, so that

$$Life_{mort} = \sqrt{Life_{mort,vol}^{2} + Life_{mort,unc}^{2}}$$

$Life_{long}$ longevity risk

5.221 Life longevity risk is defined as the risk to contracts contingent on survival arising from a potential decrease in mortality rates. The treatment of

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[96] For example, one might group together contracts with outstanding durations less than 5 years, between 5 and 10 years and over 10 years, respectively.

[97] See CfA 7.5, where it was noted that the risk margin in technical provisions needs to address uncertainty in the valuation of the 'best estimate'.

longevity risk is split into the risk components volatility risk and uncertainty risk, where these two risk types are defined as for the mortality risk.

5.222 For longevity risk, the risk arising from a potential misestimation of assumed future trends in mortality improvements (as part of uncertainty risk) is of particular importance.

5.223 The life longevity risk charge should capture uncertainty risk only to the extent this risk has not already been addressed in the valuation of technical provisions.

Experience from QIS2

5.224 The feedback arising from QIS2 on longevity risk was similar to that for mortality risk. Specific to longevity risk, participants pointed out that, in the scenario approach for longevity, an assumption of an X% per annum improvement in longevity (i.e. reduction in mortality rates) might be more suitable than a one-off permanent decrease in mortality rates.

Further development

5.225 In light of the feedback from QIS2, for longevity risk the same potential amendments could be considered for

- the modelling of volatility risk; and
- the aggregation method for volatility and uncertainty risk

as for mortality risk.

5.226 Under a factor-based approach to uncertainty risk, as for mortality risk, the contracts could be classified into different buckets, depending on their outstanding duration. For each bucket, a different factor to derive the capital charge could apply.

5.227 A scenario-based approach could be improved by specifying, instead of a (permanent) decrease of mortality rates for each age, a decrease in the longevity factors

$$\lambda_{x,t} = -\ln\left(\frac{q_{x,t+1}}{q_{x,t}}\right),$$

where the mortality rates $q_{x,t}$ are assumed to be dependent on both age x and calendar year t. However, further technical work is necessary to assess whether this would lead to a practicable and more risk-sensitive treatment.

Life_{dis} disability and morbidity risk

5.228 Life disability and morbidity risk is defined as the risk arising from a change in disability/morbidity rates, including probabilities of recovery. The treatment of disability/morbidity risk is split into the risk components

volatility risk and uncertainty risk, where these two risk types are defined as for the mortality risk.

5.229 The life disability and morbidity risk charge should capture uncertainty risk only to the extent this risk has not already been addressed in the valuation of technical provisions.

Experience from QIS2

5.230 The feedback from QIS2 described in the analysis of mortality risk generally also applies to disability and morbidity risk.

Further development

5.231 In light of the feedback from QIS2, for morbidity and disability risk the same potential amendments could be considered as for mortality risk.

5.232 In a factor-based approach to uncertainty risk, as for mortality risk, the contracts could be classified into different buckets, depending on their outstanding duration. For each bucket, a different factor to derive the capital charge could apply.

$Life_{lapse}$ lapse risk

5.233 Lapse risk is defined as the risk of an unanticipated (higher or lower) rate of policy lapses, terminations, changes to paid-up status (cessation of premium payment) and surrenders.

Experience from QIS2

5.234 In QIS2, the placeholder capital charge for lapse risk was calculated by a factor-based approach. This approach used technical provisions and the total amount of claims against policyholders and insurance agents as volume measures.

5.235 Participants raised the following concerns regarding this approach:

- It can be expected that under the future solvency valuation of technical provisions, no 'Zillmerising' will be allowed, so that the materiality of claims against insurance agents should diminish;
- The treatment is unsuitable for certain types of product, for example annuity business where there is no lapse option; and
- Technical provisions would not seem to be an appropriate exposure measure for lapse risk.

5.236 QIS2 also tested a scenario-based treatment of lapse risk. This required undertakings to assess the impact of the most adverse of a 50% increase or 50% decrease in assumed rates of lapsation at each duration, subject to a minimum change of 3% per annum.

5.237 Participants commented that the specification of this scenario was not sufficiently clear, [98] and questioned the appropriateness of requiring minimum absolute changes.

Further development

5.238 In light of the feedback from QIS2, the following improvements to the modelling of a factor-based approach for lapse risk could be made:

- instead of technical provisions, the difference between the technical provisions and the surrender value may be used as a volume measure, although the practicability of such an approach would require further considerations;
- the term relating to the total amount of claims against policyholders and insurance agents could be dropped; and
- the treatment could be restricted to contracts which are exposed to lapse risk.

5.239 For lapse risk, there is no obvious formulaic relationship between the choice of the stress under the scenario-based approach and the choice of parameters in the factor-based approach. Therefore, it seems difficult to align these two approaches.

5.240 Moreover, the scale of lapse risk will vary greatly depending on product mix, existing lapse rates, and, where relevant, the extent to which any guarantee is in the money. Calibrating this to a factor level will be very difficult. Hence CEIOPS suggests testing in QIS3 a scenario based approach to life lapse risk[99], supplemented by guidance on simplified, factor-based treatments that may be used by undertakings with a less complex risk profile.

$Life_{exp}$ expense risk

5.241 Expense risk is defined as the risk that expenses associated with insurance contracts, or with the undertaking as a whole, are higher than expected.

Experience from QIS2

5.242 In QIS2, the placeholder capital charge for lapse risk was calculated by a factor-based approach. This approach used the total annual amount of the fixed expenses of the undertaking as volume measure.

5.243 Participants raised the following concerns regarding this approach:

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[98] For example, the specification to apply the changed lapse rates 'at each duration' led to different interpretations.

[99] As well as to the other life sub-risks (with the exception of life CAT risk), cf. para. 5.200.

- it would seem spurious to consider only fixed expenses, as variable expenses are just as likely to suffer from cost inflation. A restriction of considerations to fixed expenses would only be appropriate if a closed book scenario is predicted and hence diseconomies of scale need to be considered; and

- Considering the long term nature of life insurance business, a risk charge of 10% of one year's expenses may underestimate the true expense risk.

5.244 QIS2 also tested a scenario-based treatment of lapse risk. This required undertakings to consider the scenario that all future expenses are higher than best estimate anticipations by 10% and the rate of expense inflation is 1.5% per annum higher than anticipated.

Further development

5.245 In light of the feedback from QIS2,, the following improvements to the modelling of a factor-based approach for expense risk could be made:

- instead of just fixed expenses, the total annual amount of the all expenses of the undertaking could be used as a volume measure[100];

- to take into account that expense risk will continue to be associated with the existing book of business until this has expired;

- to take into account that, for certain types of business, contract loadings may be adjusted by the insurance undertaking, thus mitigating the expense risk.

5.246 Under a factor-based approach, a capital charge could be calculated as

$$Life_{\exp} = 0.1 \bullet f_{fixed} \bullet E_{fixed} + 0.025 \bullet f_{adj} \bullet E_{adj},$$

where f_{fixed} and f_{adj} denote the average outstanding duration of the undertaking's life business with fixed or adjustable loadings, and E_{fixed} and E_{adj} denote the annual amount of expenses for the business with fixed or adjustable loadings. $E = E_{fixed} + E_{adj}$ represents the total annual amount of expenses for the business.

5.247 For prudence as well as simplicity, only contracts where expense loadings may be adjusted within the next 12 months would be considered contracts with adjustable loadings.

5.248 As for lapse risk, there is no obvious formulaic relationship between the choice of the stress under the scenario-based approach and the choice of parameters in the factor-based approach. Therefore, it seems difficult to align these two approaches.

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[100] The choice of an appropriate volume measure for expense risk will require further consideration.

$Life_{CAT}$ catastrophe risk

5.249 CAT risks stem from extreme or irregular events that are not sufficiently captured by the charges for the biometric risks, lapse risk and expense risk.

5.250 These are one-time shocks from the extreme, adverse tail of the probability distribution that are not adequately represented by extrapolation from more common events and for which it is usually difficult to specify a loss value, and thus an amount of capital to hold. For example, a contagious disease process or a pandemic may affect many persons simultaneously, nullifying the usual assumption of independence among persons.

Rationale

5.251 When considering possible catastrophe losses over the following 12 months, the intention is that the CAT charge should represent the average effect on the net asset value of the undertaking of the 1% of scenarios, including multiple catastrophes, that cause the greatest fall in net assets.

Scenarios

5.252 A number of catastrophe scenarios will be agreed by supervisors. The catastrophes may include catastrophes concerning biometric risks (e.g., a pandemic) and possibly also events that can have retrospective effect on existing liabilities: for example, a sudden increase in prices or an increase in inflationary expectations. A clear outline of the range of the scenarios to be considered would need to be defined in order to ensure a consistent approach.

Calculation

5.253 The charge for each scenario may be estimated by the insurer by evaluating the effect of it, taking into account the peculiarities of its business.

5.254 Insurers should also have the opportunity to estimate the impact of a specified scenario by using a market-loss approach, i.e. by estimating the market-wide loss for the scenario (which may be specified by the supervisor) and deriving the entity-specific capital charge by using its market share. However, they would then need to check that they are not disproportionately exposed to the catastrophe.

Further development

5.255 CEIOPS investigate further whether a scenario-based treatment for life CAT risk as outlined above would be appropriate in the context of a standard formula calculation. This would require:

- the specification of one, or several, scenarios to be considered;
- a specification of how the capital charges for the individual scenarios could be combined to derive an overall charge for $Life_{CAT}$.

5.256 For a simplified, factor-based treatment of life CAT risk, the cat risk charges for mortality and morbidity risk as tested under QIS2 would seem an

appropriate starting point. It should also be considered whether an aggregate treatment of life and non-life CAT risk within one module would be appropriate.

SCR_{nl} non-life underwriting risk

5.257 Underwriting risk is the specific insurance risk arising from insurance contracts. These risks are based on the technicalities of the insurance business: the insurance undertaking has to ensure future payment commitments and the volume of such payments must be calculated in advance.

5.258 The underwriting risk relates to the uncertainty about the results of the insurer's underwriting. This includes uncertainty about:

- the amount and timing of the eventual claim settlements in relation to existing liabilities;
- the volume of business to be written and the premium rates at which it will be written; and
- the premium rates which would be necessary to cover the liabilities created by the business written.

5.259 The non-life underwriting risk component of the SCR is intended to cover the excess losses that might occur over the twelve months following the date as at which it is evaluated (insert cross-ref to EPNL) on existing provisions and new business. By excess losses is meant the underwriting losses in excess of those expected or the expected profit less the actual outcome at the end of the period.[101]

Experience from QIS2

5.260 Under QIS2, SCR_{nl} was comprised of capital requirements from the following modules:

NL_{prem} = Premium risk

NL_{res} = Reserve risk

NL_{CAT} = CAT risk

5.261 The capital charges for the sub-risks were combined using a correlation matrix as follows:

CorrNL	NL_{prem}	NL_{res}	NL_{CAT}
NL_{prem}	1	0.5	0

[101] This definition ensures compatibility with QIS2.

NL_{res}	0.5	1	0
NL_{CAT}	0	0	1

5.262 Following CfA 10.147, QIS2 used a factor-based approach to non-life underwriting risk as the base model, supplemented with simple scenario techniques to take account of catastrophic events.

5.263 For each of premium risk and reserve risk, the QIS2 formula first assesses the risk for individual lines of business, and then aggregates the results of the per lines of business analysis by means of a correlation matrix.

5.264 Participants have raised the following concerns with this approach:

- The separate calculation of premium and reserve risk requires to set an overall assumption on the correlation between premium and reserve risk (in QIS2, this was 0.5). This does not seem appropriate, since the correlation between these two risks can be expected to vary between different lines of business;
- The approach does not adequately reflect that, at least for some lines of business, the premium risk and the reserve risk are more closely correlated with each other than with the premium or reserve risk of other lines of business.

Further development

5.265 For QIS3, CEIOPS proposes to extend the approach under QIS2 by deriving a capital charge NL_{pr} for the combined premium and reserve risk in a single calculation, based on separate analyses of premium and reserve risk at the level of individual lines of business. This charge is then aggregated with the CAT risk charge to an overall non-life underwriting SCR using a correlation matrix as follows:

CorrNL	NL_{pr}	NL_{CAT}
NL_{pr}	1	0[102]
NL_{CAT}	0	1

5.266 The following analysis assumes that this approach is followed.

NL_{pr} premium & reserve risk

5.267 This module combines a treatment for the two main sources of underwriting risk, **premium risk** and **reserve risk**.

5.268 **Premium risk** is understood to relate to future claims arising during and after the period until the time horizon for the solvency assessment. The risk

[102] This correlation factor may require further consideration.

is that expenses plus the volume of losses (incurred and to be incurred) for these claims (comprising both amounts paid during the period and provisions made at its end) is higher than the premiums received (or if allowance is made elsewhere for the expected profits or losses on the business, that the profitability will be less than expected).

5.269 Premium risk is present at the time the policy is issued, before any insured events occur (CfA 10.69). Premium risk also arises because of uncertainties prior to issue of policies during the time horizon. These uncertainties include the premium rates that will be charged, the precise terms and conditions of the policies and the precise mix and volume of business to be written.

5.270 Premium risk relates to policies to be written (including renewals) during the period, and to unexpired risks on existing contracts.

5.271 **Reserve risk** stems from two sources: on the one hand, the absolute level of the claims provisions may be mis-estimated. On the other hand, because of the stochastic nature of future claims payouts, the actual claims will fluctuate around their statistical mean value.

5.272 Some of the stochastic effects relate to individual claims so that they are generally less significant for large portfolios. Others relate to economic conditions and other factors that affect the whole portfolio so the law of large numbers does not apply to them

Experience from QIS2

5.273 In QIS 2, CEIOPS tested a factor based model for premium and reserve risk. For each of these two risks, the assessment was based on an estimation of the standard deviation of the underlying risk driver: for premium risk, this was considered to be the combined ratio; for reserve risk, it was considered to be the run-off result over the year as a proportion of the provision.

5.274 For each of premium risk and reserve risk, the capital charge was computed as

$$\rho(\sigma) \bullet V$$

where

V = volume measure

σ = standard deviation of the underlying risk driver

$\rho(\sigma)$ = a function of the standard deviation

and the function $\rho(\sigma)$ was specified to deliver a capital charge corresponding to a TailVaR 99.0% standard, under the assumption that the risk was log-normally distributed.

5.275 The volume measures V were chosen as:

- for premium risk, as an estimate of the net earned premium of the overall business in the forthcoming year

- for reserve risk, as the net provision for claims outstanding for the overall business

5.276 For each of premium risk and reserve risk, the standard deviation σ for the overall business was determined in two steps.

5.277 In a **first step**, the standard deviations for each individual line of business (LoB) was estimated as

$$\sigma_{lob} = sf_{lob} \bullet f_{lob}$$

where

sf_{lob} = the size factor

f_{lob} = the (market-wide) volatility factor specific for the LoB

5.278 In a **second step**, the standard deviations for the individual lines of business were combined by means of a correlation matrix; for this, the same correlation matrix was used for both premium and reserve risk.

5.279 For premium risk, a more sophisticated approach using company-specific information was also tested. Under this approach, the standard deviation on the level of an individual line of business was determined as a credibility mix of the standard deviation estimated under the placeholder approach and an estimate of the standard deviation on the basis of historic combined ratios of the undertaking.

5.280 In some markets, undertakings supported the more sophisticated version of the premium risk charge insofar as this allows for a more company-specific assessment of premium risk. They pointed out that the market-wide assumptions set in the 'placeholder approach' for premium risk would have several deficiencies:

- They could only imperfectly take into account the risk-reducing effect of the company-specific reinsurance program, especially in the case of non-proportional reinsurance; and
- They would not adequately reflect the company-specific business mix. For example, an insurer writing private liability can be expected to have a significantly lower degree of volatility of its business than an insurer writing industrial liability insurance, although the same factor would be applied to these businesses under the 'placeholder approach.'

5.281 However, participants also pointed out that the technique used in this approach was purely retrospective, and questioned the credibility of the resulting estimates.

Calculation

5.282 Analogously to the computation of the risk capital charges for premium and reserve risk under QIS2, the capital charge NL_{pr} for the combined risk would be calculated as

$$\rho(\sigma) \bullet V$$

where

V	=	volume measure
σ	=	standard deviation of the underlying risk driver
$\rho(\sigma)$	=	a function of the standard deviation

5.283 As under QIS2, the function $\rho(\sigma)$ could be specified to deliver a capital charge corresponding to a TailVaR 99.0% standard, under the assumption that the risk was log-normally distributed.

5.284 The overall volume measure V would be calculated as

$$V = \sum_{lob} \left(P_{lob} + C_{lob} \right)$$

where, for each individual line of business lob,

P_{lob}	=	volume measure for premium risk
C_{lob}	=	volume measure for reserve risk

5.285 The standard deviation σ of the combined premium and reserve risk (for the overall business) would be determined in two steps:

- in a **first step**, for each individual line of business standard deviations for both premium risk and reserve risk are estimated;
- in a **second step**, the standard deviations for the premium risk and the reserve risk in the individual lines of business are aggregated in a single calculation.

5.286 The aggregation could be performed as follows:

$$\sigma = \sqrt{\frac{1}{V^2} \sum CorrLob_{rxc} \bullet V_r \bullet V_c \bullet \sigma_r \bullet \sigma_c}$$

where the summation runs over all indices r, c of the form (prem,lob) or (res,lob) and where

$CorrLob_{rxc}$	=	the cells of the correlation matrix CorrLob for the combined premium and reserve risk
$\sigma_{(prem,lob)}$	=	estimate of the standard deviation for premium risk in the individual lob
$\sigma_{(res,lob)}$	=	estimate of the standard deviation for reserve risk in the individual lob
$V_{(prem,lob)}$	=	volume measure for premium risk in lob

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

Further development

5.287 For QIS3, CEIOPS will consider revisions to the non-life underwriting risk charge concerning the following points:

- the choice of **volume measure for premium risk**;
- the definition of the **standard deviation for premium risk**;
- the **modelling approach for premium risk**;
- the design of the **size factor**;
- the choice of an appropriate level of **granularity**; and
- the treatment of **reinsurance ceded**.

5.288 The following sets out a first analysis on these topics.

- *Choice of volume measure for premium risk*

5.289 In QIS2, the volume measure P_{lob} for premium risk for an individual line of business was defined as the insurer's estimate of premiums to be earned over the following 12 months, subject to certain restrictions. This subsection discusses whether a different choice of volume measure would be more appropriate.

5.290 As described in above, there are two main sources of uncertainty that the premium risk charge should cover. One is uncertainty about the margins that future premiums will contain (that is the difference between the premiums actually charged and the expected claims and expenses[103] at the time of sale). An appropriate volume measure for this is the amount of premiums the insurer expects to write over the period.

5.291 The other is that the estimate of the liabilities at the end of the period (including any amounts paid in the period) may differ[104] from that expected at the point of sale (or, in relation to unexpired risks at the start of the period, from the premium reserve[105]). This difference can arise from direct information on claims incurred and from indirect information (for instance economic conditions or claims information on other contracts). The indirect information may materially affect the premium reserves and the IBNR at the end of the period. An appropriate volume measure for this might be the amount of premiums the insurer expects to write over the period plus the premium reserve.

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[103] Discounted at the risk-free rate.

[104] The calculation of this difference should bring into account the time value of money.

[105] Or, where this may be higher than the 'best estimate' plus risk margin, from the 'best estimate' plus risk margin.

5.292 In theory a complicated formula is needed to allow for all the effects noted above. While the possibility should not be excluded for at least some lines of business, and while more complicated or different formulae may be developed in the fullness of time, it is desirable to keep the formula simple initially. This recognises the difficulty in calibrating any formula and the fact that the heterogeneity of the lines of business means that any improvement in accuracy from a more sophisticated formula is likely to be slight. The precise choice of volume measure is of secondary interest, provided the data used to calibrate the formula is consistent with the volume measure.

5.293 To keep things simple, it is suggested that for each line of business the volume measure P_{lob} for premium risk should normally be the premiums (net of reinsurance) the insurer expects to write over the period (in line with the first source of uncertainty discussed above).[106] However, alternative volume measures should not be excluded from consideration.

5.294 To avoid underestimation when business is declining, it is suggested that P_{lob} should be a minimum of the premiums (net of reinsurance) the insurer expects to earn over the period. To prevent insurers gaming the SCR by underestimating prospective premiums, P_{lob} should not be less than 105% of the premiums (net of reinsurance) written over the preceding 12 months, unless the insurer has committed to its regulator that it will restrict premiums written over the period so that the premiums written [or earned] over the period will not exceed P_{lob}.[107] There may need to be sanctions against insurers who breached such a commitment without the prior consent of their regulator. These sanctions would need to be adequate to discourage insurers from using this as a device to artificially reduce their SCR. Alternatively, the prior consent of the regulator to P_{lob} being less than 105% of premiums over the preceding 12 months might be required.

- *Definition of standard deviation for premium risk*

5.295 For premium risk, the key variable is profitability as a proportion of premium (see below for a more precise formulation), but the variability with which we are concerned is not the variability of this ratio over a period of years but the variation from what was anticipated when the SCR is calculated. If the standard deviation of this is $\sigma = \sigma(prem,lob)$, then, on the assumption that the distribution is log-normal, the capital charge would be $Plob \bullet \rho(\sigma)$, where ρ is specified as above.

5.296 A major source of variability is variation in premium rates (and terms and conditions) as a result of competition. Therefore it is more appropriate to consider variability in profitability from one year to the next, than variation over an extended period (as in QIS2).

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[106] See Annex B of the second wave answers for a justification for using the expected premiums to be earned.

[107] It is not expected that many insurers would wish to make such a commitment as it would reduce their flexibility if circumstances change. The supervisor could release the insurer from such a commitment if it was satisfied that the insurer would be adequately capitalised for the increased volume of business, but the insurer would need to be aware that it might be neither easy nor quick to convince its supervisor.

5.297 More precisely, the variation considered should be between the assumption of profitability included in EP_{NL} and the actual outturn.

- *Modelling approach for premium risk*

5.298 In addition to the 'placeholder' approach which used market-wide assumptions on the volatility of the business in individual lines of business, QIS2 also tested a 'more sophisticated' approach to premium risk using company-specific information. Under this approach, the standard deviation on the level of an individual line of business was determined as a credibility mix of the standard deviation estimated under the placeholder approach and an estimate of the standard deviation on the basis of historic combined ratios of the undertaking. QIS2 results need to be evaluated further to help assess whether the 'more sophisticated' approach provides a better measure of the risk than the other approach.

5.299 However this approach used relatively few data points (up to 15 years of historic data) and the credibility, relevance and reliability of the resulting estimates are unclear, especially when the insurer's reinsurance program and the nature of its business written have changed over time. Differences between the factor-based approach in QIS2 and the "more sophisticated" approach may be based on differences that existed in the past but no longer exist, because of changes in the nature of the insurer's business. The approach may also need adjustment to take account of changes in the size of the portfolio over time.

5.300 A further difficulty with the 'more sophisticated' approach is that the philosophy underlying the provisions should be constant over time. If it is to be used, the historical estimates of the combined ratio may need to be re-evaluated on Solvency II principles, at least until the Solvency II system would have been in place for a sufficiently long period of time.

5.301 Disregarding the specific methodology tested in QIS2, CEIOPS recognises the merits of an approach to premium risk which permits undertaking-specific information to take account of the divergence of the risk profiles of individual insurers. Therefore, such a 'personalised' approach to premium risk should be developed for QIS3. To ensure comparability of results, this should be implemented in a 'mechanical' and non-discretionary formula.

5.302 Further work and careful analysis is needed to develop such a 'personalised' approach incorporating a suitable blend of undertaking specific and market data to ensure that the resulting capital charge is soundly based. There also need to be suitable safeguards to ensure that the undertaking specific historical data remains relevant to the business currently being written and the associated reinsurance programme.

5.303 Clearly, a simple, objective and reliable standardised formula (even when it takes company-specific data into account) will not always be able to fully capture the risk profile of each individual insurer. However, where an insurer can demonstrate that the uncertainty is significantly lower than that indicated by the standard formula, then it should be able to produce a partial internal model of appropriate sophistication for its premium risk.

- *Size factor*

5.304 Under QIS2, the standard deviation σ (on the level of an individual line of business) was determined as

$$\sigma = sf \bullet f$$

where sf was a size factor (dependant on the size of the volume measure), and f was a constant factor (specific for the line of business).

5.305 The design of the size factor assumed that the standard deviation of the outturn of a line of business was proportionate to the square root of the premium income or the claims provision (with very small and very large accounts being treated differently). This is appropriate if the portfolios of small and large insurers are similar and the risks are all independent.

5.306 Both these assumptions are false. Small insurers, for the most part, do not write the larger risks and they generally need and therefore tend to buy more reinsurance protection. The risks are not independent. They may be affected by, for example, economic conditions (such as inflation), the weather, changes in society, changes in legislation or judicial decisions (some of these risks apply after the claims have been incurred as well as before). Such risks are largely not diversifiable within a line of business.

5.307 The risk that is not diversifiable would be expected to be directly proportional to the size of the portfolio, while the diversifiable risk should be proportional to the square root (at least if the risks are similar). That is the standard deviation of the outturn

$$\sqrt{s^2 \bullet V^2 + n \bullet V}$$

where

V	=	volume measure (such as total premiums or provisions)
s,n	=	factors depending on line of business and whether premium or reserve risk is being considered

While the assumption that all risks are similar does not hold, this might still be a reasonable approximation. Then:

$$\sigma_{(prem,lob)} = \sqrt{s^2_{(prem,lob)} + \frac{n_{(prem,lob)}}{P_{lob}}}$$

and

$$\sigma_{(res,lob)} = \sqrt{s^2_{(res,lob)} + \frac{n_{(res,lob)}}{C_{lob}}}$$

where

$s_{(prem,lob)}$	=	systematic standard deviation for premium risk

$n_{(prem,lob)}$ = non-systematic factor for premium risk

$s_{(res,lob)}$ = systematic standard deviation for reserve risk

$n_{(res,lob)}$ = non-systematic factor for reserve risk

5.308 If this formula were adopted, it would seem logical to aggregate the components $s^2 \bullet V^2$ across lines of business and premium and reserve risk with a covariance matrix and the components $n \bullet V$ assuming independence. This has the advantage that it allows the "law of large numbers" to apply across lines of business as well as within them. The resulting expression for the variance of the outturn would be as follows:

$$\sigma = \sqrt{\frac{1}{V^2}\left[\sum_{r,c} CorrLob_{r,c} \bullet V_r \bullet V_c \bullet s_r \bullet s_c + \sum_r n_r \bullet V_r\right]}$$

where the summation runs over all indices r, c of the form (prem,lob) or (res,lob).

5.309 When selecting correlation coefficients, allowance should be made for tail correlation. To allow for this, the correlations used should be higher than simple analysis of relevant data would indicate. If the formula above is adopted, the correlations should be increased to reflect the diversification implicit in the second summation.

5.310 An alternative approach might be to assume that the standard deviation is proportionate to V^r, where $0.5 < r < 1$. The power r might depend on line of business and on whether premium or reserve risk was in question, reflecting the fact that, in general, the standard deviation is expected to increase rather more slowly than the volume parameter. However, there is no obvious explanation for the r parameter and it is not easy to see how diversifiable risks can be aggregated across lines of business. Then:

$$\sigma_{(prem,lob)} = a_{lob} \bullet P_{lob}^{r-1}$$

and

$$\sigma_{(res,lob)} = b_{lob} \bullet C_{lob}^{r-1}$$

5.311 CEIOPS considers that the approach described above can be developed further. The QIS3 exercise could be used to collect data for this purpose.

5.312 Other data held by supervisors or published by insurers may be available. If so it may be used to supplement the QIS3 data. Further data should be gathered periodically to refine the calibration and to enable it to be kept under review so as to ensure that the parameters are kept up to date.

- *Granularity*

5.313 The lines of business used for QIS2 are very heterogeneous. It is therefore to be expected that subdivision of these lines would result in an improved

formula. However we can only subdivide lines if the industry is prepared to supply data for the separate sublines. Where the data cannot confirm that separate factors will improve the formula, sublines should be kept together or merged in the interests of simplicity.

5.314 It is proposed to retain the lines of business for direct insurance used in QIS2, and only to consider subdivision if we receive representations from stakeholders that subdivision is desirable, and an indication from the industry that it would be prepared to supply the necessary data. Where QIS3 data confirms that subdivision improves the formula, either because different factors are appropriate to the sublines or because the lines are imperfectly correlated so that correlation coefficients of less than unity are appropriate, lines of business should be subdivided. Furthermore, the position should be kept under review so that, in future, lines of business can be subdivided or merged when it is demonstrated that this will improve the standard formula.

5.315 This is an area where the interests of the industry and those of regulators are reasonably well aligned. An insurer using the standard formula for the SCR has an interest in ensuring that the SCR does not overestimate its capital requirements. All insurers (whether using the standard formula or internal models) have an interest in ensuring that the SCR does not underestimate the capital requirements of its competitors. Therefore it is appropriate to be guided in this by the views of the industry, although the final decision is a regulatory one, requiring co-ordination between regulators.

5.316 For reinsurance, a single reinsurance class does not appear appropriate. While it might be assumed that most professional reinsurers will be on an internal model approach, the standard formula may be needed for direct insurers who write some reinsurance and for those professional reinsurers whose internal models do not meet the criteria for recognition. At the very least, reinsurance needs to be split between proportional and non-proportional reinsurance and between property and casualty reinsurance.

5.317 For proportional reinsurance, the same lines of business could be used as for direct insurance. This will be re-examined in the light of QIS3, as will the appropriateness of the direct insurance factors for reinsurance.

5.318 For non-proportional reinsurance, the factors used for direct insurance are unlikely to be appropriate and direct insurance classes may not always be relevant. Subject to comments from stakeholders, it is suggested that QIS3 should examine the following two possibilities: that the direct insurance classes should be used, and that non-proportional reinsurance should be subdivided between property and casualty business.

- *Treatment of reinsurance ceded*

5.319 Reinsurance is a vital tool for insurers. Adequate reinsurance and proper selection of reinsurers is essential if they are to manage their risks properly. However, there is a wide variety of types of reinsurance and there is no simple parameter that can be used to measure the effects of a reinsurance program.

5.320 It is suggested to follow QIS2 by basing the capital charge on premiums and claims net of reinsurance, because reinsurers themselves will have to hold capital for the risks they will assume. The approach to use net premiums is a reasonable and pragmatic allowance for the risk mitigation of proportional reinsurance arrangements. For non-proportional reinsurance, the mitigating effect is non-linear and could not be captured in a market-wide factor. However, where the reinsurance program remains unchanged this effect may be taken into account by the use of entity-specific net combined ratios in assessing the factors in the more sophisticated version of premium risk.

5.321 The credit risks associated with reinsurance are largely captured by the SCR_{def} module, though the contingent increase in credit risk when the recoveries increase as a result of claims deterioration may not be fully covered.

5.322 CfA 10.168 said that where risks are insufficiently captured by the Pillar 1 calculation, an 'adjusted SCR' may also be envisaged. This should include the risks arising out of a reinsurance program providing less protection than would be consistent with the SCR standard formula.

- *Other further development work for premium risk*

5.323 It is necessary to gather data in order to calibrate the parameters of the SCR for each line of business (and each subline that may be treated separately in the standard formula), to assess whether any lines of business should be subdivided and to assist in setting correlation coefficients. We propose that QIS3 should be the main tool for this although QIS3 may be supplemented by analysis of data held by supervisors or other data published by insurers. Further data should be gathered periodically to refine the calibration and to enable it to be kept under review so as to ensure that the parameters are kept up to date.

5.324 The parameter of interest depends on the precise scope of premium risk. If premium risk relates just to the adequacy of the premiums written, then the parameter is the profitability [108] of the business written in a year, as assessed at the end of the year. If premium risk also relates to the adequacy of the premium reserve, then the parameter is the profit from the business written in a year plus any profit emerging from the premium reserve, again as assessed at the end of the year.

5.325 This needs to be compared to the best estimate made by the insurer at the end of the previous year of the profit that would emerge over the year if EP_{NL} is based on the insurer's assessment of prospective profitability. If instead EP_{NL} were based on the preceding year's profitability then this needs to be compared to the previous year's profit. These difference items are the

[108] For the avoidance of doubt, profitability is intended to refer also to loss-making situations. A loss is simply a negative profit.

quantities whose standard deviation needs to be estimated for the purpose of deriving the premium charge in the SCR standard formula.[109]

Premium profit =

premium written

- reinsurance premiums payable
+ [premium reserve at start of year (net of reinsurance)]
- expenses of writing the business
- claims paid
+ reinsurance recoveries payable
- premium reserve[110] at year end (net of reinsurance)
- claims provision at year end (net of reinsurance)
+ interest earned (at risk-free rate)

ignoring changes in interest rates over the year where all the items relate just to the business written in the year [and the unexpired risks at the start of the year].[111]

5.326 Since the market risk charge covers changes in interest rates, average interest rates over the year should be used for all items relating to business written in the year, and the interest rates at the start of the year for items relating to unexpired risks at the start of the year; in each case these interest rates should be used to calculate the year end reserves.[112] All these items need to be calculated on a consistent basis and therefore the historic figures need to be recalculated, to be on a solvency 2 basis. Figures should be supplied assuming no floor to the premium provision with additional information on unearned premiums.[113]

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[109] EP_{NL} should be based on some estimate of current or prospective profitability. Ideally, this should be prospective profitability, if there are sufficient safeguards against reckless over-optimism by insurers. Otherwise EP_{NL} might be based on the latest available data.

[110] For the purpose of this calculation, any deferred acquisition costs (DAC) should be subtracted from the premium reserve so that DAC can be ignored in calculating expenses.

[111] Items in square brackets assume premium risk is defined to include the risks relating to the adequacy of the premium reserve.

[112] So these will differ from the actual year end reserves calculated at year end rates. The difference will be offset by changes in the value of investments as a result of interest rate movements.

[113] The main focus should be on the downside. Even if unearned premiums are a floor to the premium provisions, there could be situations where this provides no buffer to cover other losses, so separate information on unearned premiums and the premium provision need to be considered before applying the floor.

5.327 Such recalculation of historic information is bound to be problematic. Not all the necessary data may be available and where judgement is required the judgements made today may differ from those that would have been made a year or two ago. For QIS3, the premium reserves (on a Solvency II basis) at the start of 2006 can probably be assessed with reasonable accuracy to enable premium profit in 2006 to be estimated.

5.328 For the purpose of seeing how profit changes from year to year, estimates of the premium profit in 2005 will also be needed, which requires premium reserves at the end of 2004 to be estimated. It is likely that most insurers will be unable to recalculate historic provisions at earlier dates on a Solvency II basis.

5.329 For the purpose of seeing how actual profit diverges from expectation, estimates are needed (by line of business) of profitability at the start of the year. To reduce the risk that estimates made at the start of 2007 of the anticipated profit in 2006 that would have been expected at the start of the year will be contaminated with hindsight, insurers should be asked to reconcile such estimates with their business plans at the time. It is likely that most insurers will be unable to re-estimate anticipated profits by line of business on a Solvency II basis for earlier periods. The anticipated profit in 2007 could be requested to provide a firmer base for subsequent QIS exercises.

5.330 The data will therefore be deficient in that it will all relate to one year's movements in profit. In other years with different market conditions the overall direction and extent of movement could be quite different.

5.331 To supplement the above data, historic information on profitability on the current reserving basis going back several years should be requested. This will provide information on changes in profitability over time but it may not be directly applicable because of changes in the reserving basis. In particular, insurers in some Member States currently smooth their provisions (explicitly or implicitly) so that they contain additional margins when business is highly profitable and lower margins (possibly even negative margins) when business is loss-making. Where insurers had explicit margins they can be asked to remove them. Also the unearned premium floor that currently applies distorts things since, at most times, it acts as a variable buffer. Insurers should be asked to estimate what their provisions would have been had there not been an unearned premium floor.

5.332 To avoid double-counting, the effects of catastrophes should be eliminated. If the insurer has been subject to a catastrophe, it should estimate the effect of that catastrophe on its figures and present results before and after eliminating the effect of that catastrophe. While this should include any catastrophes corresponding to the catastrophe scenarios, the insurer should include other catastrophes that it considers relevant. This may allow extension of the list of catastrophe scenarios; if such an additional catastrophe is not to be included within the list of catastrophe scenarios, then analysis of the data would use the results before eliminating the catastrophe.

5.333 The data can be used to assess, for each line of business, the variability of the outturn and how it varies with the amount of the premium income. This

will enable the parameters in the formulas to be estimated. The information can also be used to estimate correlation coefficients, although the actual coefficients used need to be increased, as noted above, to allow for tail correlation.

- *Other further development work for reserve risk*

5.334 Profit emerging on provisions over the year is

	provisions (net of reinsurance) at the start of the year
-	claims paid (including expenses)
+	reinsurance recoveries payable
-	reinsurance premiums payable
+/-	premium adjustments
+	interest earned (at risk-free rates)
-	provisions (net of reinsurance) at the end of the year

5.335 For QIS3, the above data should be requested for each line (or subline) of business on the Solvency II basis for the 2006 year. All items relate to claims provision at the start of the year [or claims provisions plus the premium reserve]. The end year provisions should be calculated using interest rates applicable at the start of the year.

5.336 It is likely that most insurers will be unable to provide reliable data for earlier years. However, they should to be asked to provide similar data, for 2006 and earlier years on the Solvency I basis. Provisions should be undiscounted and interest should be omitted.

5.337 To avoid double-counting the effects of catastrophes should be eliminated. However re-estimation of the effect of past catastrophes should not be eliminated. It should be noted that some potential catastrophes can affect claims reserves (e.g. inflation shocks or judicial rulings).

NL_{cat} CAT risk

5.338 CAT risks stem from extreme or irregular events that are not sufficiently captured by the charges for premium and reserve risk.

5.339 When considering possible catastrophe losses over the following 12 months, the intention is that the CAT charge should represent the effect on the net asset value of the insurer of scenarios (including multiple catastrophes) that cause a fall in net assets that is expected to occur one year in 200 (i.e. 0.5% VaR).

Experience from QIS2

5.340 For QIS2, national regulators specified one or more severe Nat-CAT events. Participants needed to calculate a capital charge consistent with a TailVaR risk measure, calibrated to a confidence level of 99.0%.

5.341 They were allowed to use either one of the following two methods:

- a market-loss approach, that derived the capital charge from an assumption of the overall market loss, and an assumption on the market share of the undertaking; or

- a scenario-based approach, where the participants needed to directly estimate the impact of the specified scenarios on the net asset value of their portfolio.

Further development

- *Choice of scenarios*

5.342 A number of catastrophe scenarios will be agreed by supervisors. They are intended to be representative scenarios for 1/200 events, that is a cost that is likely to be exceeded on average once in 200 years (i.e. 0.5% VaR).

5.343 The catastrophes will include both natural catastrophes and man-made catastrophes. The man-made scenarios may include aircraft colliding, major marine pollution events, motor losses causing train crashes, major fires, economic conditions causing major credit losses (affecting credit insurers), etc. In addition, there are events that can have retrospective effect on existing liabilities: these include a sudden increase in prices or an increase in inflationary expectations (including judicial drift – the tendency for court awards to increase faster than underlying inflation), unexpected legal decisions that affect a whole class of liabilities, an increase in the number or amounts of claims for asbestos exposure, etc.

5.344 A clear outline of the range of the scenarios to be considered would need to be defined in order to ensure a consistent approach. Some of the scenarios would be set on a European level but others would need to be set on a regional basis (and, where material, apply to insurers based elsewhere). This because it will generally be difficult to find a design for CAT risk on a European level that would be adequate for each regional market, considering the wide variety of relevant CAT scenarios in Europe. There is therefore a need to have the freedom to modify the overall design for CAT risk if this seems necessary to adequately reflect the kind of CAT events that are relevant for the regional market, as well as the characteristics of the typical reinsurance protection in the market.

- *Combination of scenarios and aggregate charge*

5.345 If an insurer is exposed to more than one type of catastrophe scenario (A and B, say) then the worst 0.5% of scenarios includes some scenarios of type A and some of type B, and the charge should be greater than the charge for either Cat A or Cat B, but is likely to be less than the charge for A and B together.

5.346 In addition there is the possibility that catastrophes of both types will occur together. Because many insurers buy low level catastrophe cover to protect themselves against fluctuations in profitability rather than to protect their solvency,[114] the cost of a catastrophe at the 10% probability may be similar to that at the 0.5% level. If so the combined charge may be very close to the sum of the charges for Cat A and Cat B.

5.347 How an insurer is affected by the possibility of more than one scenario depends critically on the detail of its reinsurance program and on the probability distribution of the cost of each individual scenario. To ensure that it can generate the appropriate charge it would need, for each type of catastrophe, a model to generate scenarios. The advantages of such a partial internal model are that it can evaluate the effect of its reinsurance program on catastrophe costs and that the supervisor can be confident that it has done so.

5.348 In the absence of such a partial internal model, the charges for the different scenarios could be accumulated using the root sum square approach, ignoring scenarios that have minimal effect. For instance:

$$NL_{CAT} = \sqrt{\sum_i CAT_i^2}$$

where the summation is over those catastrophes in which CAT_i, the cost of catastrophe i, exceeds 25% (say) of the highest CAT_i.

5.349 However, where specified scenarios are deemed not to be independent, an alternative method of aggregating them would be specified.

- *Calculation for scenario approach*

5.350 The charge for each scenario may be estimated by the insurer by evaluating the effect of it, taking into account the peculiarities of its business and erring on the side of prudence if there is material uncertainty.

5.351 For the calculation, a choice between a market loss approach and a scenario based approach should be allowed on a geographical basis. For example, it could be specified that SMEs may use the market-loss approach for natural catastrophes and some man-made ones where they do not have the ability to estimate the effect of the specified scenarios directly. For some scenarios the market-loss approach will not be practical and the scenario needs to be specified in a way that enables SMEs to make a reasonable estimate of the cost of the scenario.

5.352 As a general rule, it is proposed that all insurers may use the market-loss approach to establish that a particular scenario has minimal effect in cases where the market-loss approach may be appropriate. However, they should check that they are not disproportionately exposed to the catastrophe (e.g.

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[114] This was evident in QIS2: for a number of insurers, the catastrophe charge was the same for the MCR as the SCR.

by having an unusually large proportion of their exposure in the river basin affected).

- *Extending and reviewing the list of appropriate scenarios*

5.353 A number of catastrophe scenarios will be agreed by supervisors in advance of QIS3. They should include national scenarios determined by the local supervisor in line with the principles above. The list of scenarios will be reviewed periodically to ensure that they include the most important catastrophe risks to which European insurers are subject and that the specification is kept up-to-date. As stated above, they are intended to be representative scenarios for 1/200 events, that is a cost that is likely to be exceeded on average once in 200 years (i.e. 0.5% VaR).

5.354 It is desirable to specify the scenarios in such a way that they are automatically updated for inflation and exposure changes (such as increased building on a flood plain).

5.355 The QIS2 scenarios will provide a starting point for the list of natural catastrophes, though they will need to be reviewed, and other natural and man-made scenarios added. Stakeholders and relevant experts will be consulted when preparing and reviewing the list of scenarios.

CEIOPS' Advice

PART A – STRUCTURAL ISSUES

Modular approach

5.356 CEIOPS recommends that the standard formula adopts a modular approach to enable a transparent allocation of capital requirements to individual risks and to facilitate the transition to internal models[115].

Calculation methods within the standard formula

5.357 The following advice for harmonised SCR sub-modules is based on their needing to be submitted to regular review in the light of market developments; consequently, this should be addressed in the implementing measures.

5.358 For the sub-risks of market risk (equity risk, property risk, currency risk and interest rate risk), as well as for the sub-risks of life underwriting risk except life CAT risk, the standard formula should use a scenario based approach.

5.359 Scenarios are prescribed. Insurers should be responsible for calculating the

[115] Some CEIOPS Members do not agree on the use of a modular approach to calculate the SCR corresponding life insurance activities, after having obtained unreliable and excessively disperse results in QIS2. These members support the use of simple scenario techniques since they capture more precisely the SCR associated to the specific ALM position of each insurer. Annex A describes this alternative to facilitate external stakeholders' comments.

impact of these scenarios, including the choice of the most appropriate calculation method. This may be supplemented by guidance on possible calculation methods (including simplified, formula-based treatments) in an effort to establish 'good practice'.

5.360 In order to guarantee the harmonisation goal contained in the Framework for Consultation, appropriate principles on the applicability of possible calculation methods should be developed at the necessary level.

5.361 Supervisory acceptance of such calculation methods needs to be governed by the Principle of Proportionality, to avoid subjecting insurers with non-complex risk profiles to unnecessary system costs for compliance with regulatory requirements.

5.362 For non-life CAT risks, a choice between a market loss approach and a scenario based approach should be allowed on a geographical basis.

5.363 For concentration risk, credit spread risk, life CAT risk, non-life underwriting risk (except non-life CAT risk), default risk and operational risk, the standard formula should use a factor based approach.

Aggregation

5.364 CEIOPS recommends that the capital requirements for individual risks should be aggregated such that cross-risk diversification effects are taken into account.

5.365 Initially, linear correlation techniques should be used to combine the modular requirements of the standard formula into an estimate for the SCR. CEIOPS recommends a two-step approach whereby

- firstly, risks belonging to the same major risk category are

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[116] This position is supported by a qualified majority of CEIOPS Members as defined by Article 9 (3) of its Articles of Association. However, a minority of CEIOPS Members are opposed to the idea that there should be a reduction for future profit sharing in the assessment of the SCR. They doubt whether such recognition could be implemented in a reliable and objective manner within the confines of the standard formula. They argue that the loss-absorbing ability of these provisions could be seen as a part of the available capital requiring supervisory approval.

[117] This position is supported by a qualified majority of CEIOPS Members as defined by Article 9 (3) of its Articles of Association. However, a minority of CEIOPS Members considers that the analysis on market risk correlations performed for the Dutch Financial Assessment Framework is broadly consistent with the need for a simple, robust approach to aggregation and calibration identified earlier in this section and favour the use of the QIS2 market risk correlation assumptions as a starting point for QIS3.

[118] This position is supported by a qualified majority of CEIOPS Members as defined by Article 9 (3) of its Articles of Association. However, a minority of CEIOPS Members advocate a different solution to the treatment of equity risk. They note that, in the long run, equities typically provide better returns than bonds and provide good cover against various types of inflation. It would therefore be appropriate to consider equity risk in conjunction with the liabilities that the assets are being used to match.

[119] This position is supported by a qualified majority of CEIOPS Members as defined by Article 9 (3) of its Articles of Association. However, a minority of CEIOPS Members advocate an approach where the magnitude of the property risk shock depends on the average duration of the insurer's liabilities and the overall concentration of its investments in property.

combined using correlation matrices; then

- secondly, the major risk categories are combined using a further correlation matrix.

Calibration

5.366 The factors or scenarios applied to estimate capital requirements for individual risk modules should be calibrated to meet the same objectives as the SCR. In principle, this means they should reflect the same risk measure, confidence level, time horizon, definition of ruin and valuation basis for assets and liabilities as the SCR.

5.367 To address the model error introduced by using linear correlation techniques, and to provide incentives for insurers to improve their assessment of diversification effects between risks, the correlation assumptions used to aggregate risk modules in the standard formula should be set cautiously. But care should be taken to ensure the assumptions are not excessively conservative.

PART B – STANDARD FORMULA RISK MODULES

Treatment of profit-sharing business

5.368 CEIOPS [116] believes that the standard formula should provide adequate recognition for the risk mitigating effect of profit-sharing business. However, the approach finally chosen needs to balance a number of different, potentially competing, concerns:

- Any reduction to capital requirements needs to be conducted in a clear and objective manner, and must avoid multiple recognition (double-counting) of the same risk mitigation.
- But to the extent possible, the charges for individual risks should themselves reflect risk mitigation, so as to avoid crude, one-off adjustments, and to allow a transition to (partial) internal models.
- It needs to be a mathematically consistent approach, compatible with the overall modular structure of the SCR standard formula.
- The calculation should not represent an undue operational burden on insurers and must be compatible with both factor-based and scenario-based approaches to modelling SCR risks.

5.369 As it develops proposals for QIS3, CEIOPS will consider replacing the QIS2 top-level 'Reduction for Profit Sharing' module with appropriate adjustments at the level of individual SCR risks.

SCR_{op} operational risk

5.370 CEIOPS recommends the inclusion of an explicit requirement for operational risk under the standard formula. SCR_{op} should produce capital requirements sufficient (consistent with the objectives of the SCR) to sustain operational risk losses that could occur during the next year. But SCR_{op} should address risks only to the extent that they have not already been recognised in the

assessment of other risk modules in the standard formula.

5.371 Operational risk is defined as the risk of loss arising from inadequate or failed internal process, people, systems or from external events.

5.372 SCR_{op} should be calculated using a simple function that uses technical provisions and earned premiums as proxies for the scale of an insurance undertaking's operations, and therefore the likely scale of operational risk exposure. Given the relative simplicity of this approach, SCR_{op} should be limited so as to avoid dominating the overall SCR.

BSCR basic Solvency Capital Requirement

5.373 The BSCR is defined as the Solvency Capital Requirement before adjustments for the expected profitability of non-life business, the potential risk-mitigating effect of profit sharing liabilities and operational risk.

5.374 BSCR should be calculated using linear correlation techniques which combine the capital requirements for

- market risk;
- counterparty default risk;
- life underwriting risk; and
- non-life underwriting risk,

together with requirements for any special types of business.

SCR_{mkt} market risk

5.375 The market risk module should reflect the risk arising from the level or volatility of the market prices of financial instruments.

5.376 SCR_{mkt} should be calculated using linear correlation techniques which combine the capital requirements for

- interest rate risk;
- equity risk;
- property risk;
- spread risk;
- risk concentrations; and
- currency risk.

SCR_{mkt} market risk correlations

5.377 CEIOPS[117] recognises that on market risk the QIS2 approach did not give due recognition for diversification effects and that some of the correlation assumptions will need to be revised downwards. CEIOPS would welcome

evidence from stakeholders that could be used to justify the use lower correlation assumptions (bearing in mind that the SCR should reflect stressed conditions).

Mkt_{int} interest rate risk

5.378 CEIOPS recommends the inclusion of an explicit requirement for interest rate risk under the standard formula. Mkt_{int} should produce capital requirements sufficient (consistent with the objectives of the SCR) to sustain losses that could occur during the next year because of interest rate risk.

5.379 Interest rate is defined as the risk arising from the sensitivity of asset and liability values to changes in the term structure of interest rates or interest rate volatility.

5.380 Mkt_{int} should be calculated by means of an approach that simulates both upward and downward shocks to the yield curve.

Mkt_{eq} equity risk

5.381 CEIOPS[118] recommends the inclusion of an explicit requirement for equity rate risk under the standard formula. Mkt_{eq} should produce capital requirements sufficient (consistent with the objectives of the SCR) to sustain losses that could occur during the next year because of equity risk.

5.382 Equity risk arises from the level or volatility of market price for equities. Exposure to equity risk refers to all assets and liabilities whose value is sensitive to changes in equity prices.

5.383 Mkt_{eq} should be calculated by simulating a downward shock to the market value of equities, while taking account of the offsetting effect on the value of derivatives and short positions.

Mkt_{prop} property risk

5.384 CEIOPS[119] recommends the inclusion of an explicit requirement for property risk under the standard formula. Mkt_{prop} should produce capital requirements sufficient (consistent with the objectives of the SCR) to sustain losses that could occur during the next year because of property risk.

5.385 Property risk arises from the level or volatility of market prices of real estate.

5.386 Mkt_{prop} should be calculated by simulating a downward shock to the market value of property exposures.

Mkt_{fx} currency risk

5.387 CEIOPS recommends the inclusion of an explicit requirement for currency risk under the standard formula. Mkt_{fx} should produce capital requirements sufficient (consistent with the objectives of the SCR) to sustain losses that could occur during the next year because of currency risk.

5.388 Currency risk arises from the level or volatility of currency exchange rates.

5.389 Mkt_{fx} should be calculated by simulating a shock to exchange rates.

Mkt_{sp} spread risk

5.390 CEIOPS recommends the inclusion of an explicit requirement for spread risk under the standard formula. Mkt_{sp} should produce capital requirements sufficient (consistent with the objectives of the SCR) to sustain losses that could occur during the next year because of movements in spreads.

5.391 Spread risk is the part of risk that is explained by the volatility of credit spreads over the risk-free curve.

5.392 Mkt_{sp} should be calculated by simulating a widening of credit spreads, using a function that depends on the market value, rating and effective duration of credit exposures.

Mkt_{conc} market risk concentrations

5.393 CEIOPS recommends the development of an explicit requirement for market risk concentrations under the standard formula, reflecting the additional volatility that arises from the accumulation of exposures with the same counterparty.

5.394 CEIOPS will investigate a formulaic approach where exposures in excess of predefined thresholds would be subject to an additional capital requirement.

SCR_{def} counterparty default risk

5.395 CEIOPS recommends the development of an explicit requirement for counterparty default risk under the standard formula.

5.396 Counterparty default risk is the risk of default of a counterparty to risk mitigating contracts like reinsurance and financial derivatives.

5.397 CEIOPS will investigate a formulaic approach where the capital requirement depends on the replacement cost of the exposure and an estimated probability of default.

SCR_{life} life underwriting risk

5.398 The life underwriting risk module should reflect the risk arising from the underwriting of life insurance contracts, associated with both the perils covered and the processes followed in the conduct of the business.

5.399 SCR_{life} should be calculated using linear correlation techniques which combine the capital requirements for

- mortality risk;
- longevity risk;
- disability/morbidity risk;

- expense risk;
- lapse risk; and
- catastrophe risk.

$Life_{mort}$ mortality risk

5.400 CEIOPS recommends the inclusion of an explicit requirement for mortality risk under the standard formula. $Life_{mort}$ should produce capital requirements sufficient (consistent with the objectives of the SCR) to sustain losses that could occur during the next year because of mortality risk.

5.401 Mortality risk is defined as the risk arising from a change in mortality rates. The treatment of mortality risk is split into the risk components volatility risk and uncertainty risk.

$Life_{long}$ longevity risk

5.402 CEIOPS recommends the inclusion of an explicit requirement for longevity risk under the standard formula. $Life_{long}$ should produce capital requirements sufficient (consistent with the objectives of the SCR) to sustain losses that could occur during the next year because of longevity risk.

5.403 Longevity risk is defined as the risk to contracts contingent on survival arising from a decrease in mortality rates. The treatment of longevity risk is split into the risk components volatility risk and uncertainty risk.

$Life_{dis}$ disability and morbidity risk

5.404 CEIOPS recommends the inclusion of an explicit requirement for disability and morbidity risk under the standard formula. $Life_{dis}$ should produce capital requirements sufficient (consistent with the objectives of the SCR) to sustain losses that could occur during the next year because of disability and morbidity risk.

5.405 Disability/morbidity risk is defined as the risk arising from a change in disability/morbidity rates. The treatment of disability and morbidity risk is split into the risk components volatility risk and uncertainty risk.

$Life_{lapse}$ lapse risk

5.406 CEIOPS recommends the inclusion of an explicit requirement for lapse risk under the standard formula. $Life_{lapse}$ should produce capital requirements sufficient (consistent with the objectives of the SCR) to sustain losses that could occur during the next year because of lapse risk.

5.407 Lapse risk arises from unanticipated (higher or lower) rate of policy lapses, terminations, changes to paid-up status (cessation of premium payment) and surrenders.

$Life_{exp}$ expense risk

5.408 CEIOPS recommends the inclusion of an explicit requirement for expense

risk under the standard formula. $Life_{exp}$ should produce capital requirements sufficient (consistent with the objectives of the SCR) to sustain losses that could occur during the next year because of expense risk.

5.409 Expense risk arises from the level of expenses associated with insurance contracts and with the undertaking as a whole.

$Life_{CAT}$ catastrophe risk

5.410 CEIOPS recommends the inclusion of an explicit requirement for life catastrophe risk under the standard formula.

5.411 CAT risk arises from extreme or irregular events that are not sufficiently captured by the charges for the biometric risks, lapse risk and expense risk.

SCR_{nl} non-life underwriting risk

5.412 CEIOPS recommends the inclusion of an explicit requirement for non-life underwriting risk under the standard formula. SCR_{nl} should produce capital requirements sufficient (consistent with the objectives of the SCR) to sustain losses arising from non-life insurance underwriting risk that could occur during the next year.

5.413 Non-life insurance underwriting risk is defined is the risk arising from the underwriting of non-life insurance contracts. The underwriting risk relates to the uncertainty about the results of the undertaking's underwriting. This includes uncertainty about:

- the amount and timing of the eventual claim settlements in relation to existing liabilities;
- the volume of business to be written and the premium rates at which it will be written; and
- the premium rates which would be necessary to cover the liabilities created by the business written.

5.414 The SCR_{nl} component should cover the excess losses that might occur over the twelve months following the date at which it is evaluated on existing provisions and new business. By excess losses is meant the underwriting losses in excess of those expected or the expected profit less the actual outcome at the end of the period.

5.415 SCR_{nl} should be calculated using linear correlation techniques which combine the capital requirements for

- premium and reserve risk; and
- catastrophe risk.

NL_{pr} premium & reserve risk

5.416 CEIOPS recommends the inclusion of an explicit and objective requirement for premium and reserve risk under the standard formula. NL_{pr} should produce capital requirements sufficient (consistent with the objectives of

the SCR) to sustain losses arising from premium and reserve risk that could occur during the next year.

5.417 Premium risk is understood to relate to future claims arising during and after the period until the time horizon for the solvency assessment. The risk is that expenses plus the volume of losses (incurred and to be incurred) for these claims (comprising both amounts paid during the period and provisions made at its end) is higher than the premiums received (or if allowance is made elsewhere for the expected profits or losses on the business, that the profitability will be less than expected.

5.418 Reserve risk concerns the risk of losses emerging on claims provisions over the solvency time horizon.

5.419 NL_{pr} should be calculated using a factor based approach, which is based on the assessment of both premium and reserve risk per line of business.

NL_{CAT} catastrophe risk

5.420 CEIOPS recommends the inclusion of an explicit requirement for non-life catastrophe risk under the standard formula.

5.421 CAT risk arises from extreme or irregular events that are not sufficiently captured by the charges for premium and reserve risk.

Section 6

Solvency Capital Requirement: full internal models

Background

6.1 This section generally builds on and expands CEIOPS' answer to CfA11. Its purpose is twofold: adding details to and explaining practical consequences of the principles of supervising internal models as laid out in CEIOPS' answer to CfA11. It is inspired by comments received from other stakeholders since the second wave answers were published. The level of detail added to CfA11 is targeted at the further clarification of level 1 principles as well as level 2 implementing measures.

6.2 The text deliberately excludes a complete discussion of industry practice, which may be useful for level 3 guidance. Examples from observed internal modelling are presented for illustrational purposes only. They are neither a requirement nor do they express a supervisory preference unless explicitly stated.

6.3 This section develops the general approaches to the supervision of internal models in the simple case of the solo supervision of full internal models, while the specifics of the supervision of internal models at group level are discussed in other documents (including the response to CfA20) and the specifics of the supervision of partial internal models are discussed in the next section. This means that the requirements discussed in this section literally apply to full internal models only at solo level. However, section 7 needs to be read in conjunction with this section in order to see the full set of requirements on partial internal models.

Objectives

6.4 CEIOPS has identified a number of objectives and potential benefits of basing the SCR on the internal risk modelling of an undertaking as an alternative to the standard formula approach.

6.5 The major supervisory objectives can be summarized as (CfA 11.64):

- better risk management, which also improves policyholder protection (CfA 11.4),
- continual upgrading and encouragement of innovation in risk management methodology (CfA 11.2 and 11.4) and
- improved risk sensitivity of the SCR, especially for undertakings with non-standard risk profiles (CfA 11.2-11.3).

6.6 The development of internal models can potentially deliver a wide range of benefits to supervisors, undertakings and, ultimately, policyholders (CfA 11.7 and 11.65):

- higher competitiveness through better risk management and hence lower costs of capital;
- more adequate modelling of non-standard, especially non-linear, contracts;
- more effective Pillar 2 discussion and familiarity of the supervisor with more detailed exposure data than is generally available in accounting records; and
- realization of cost efficiencies through re-use of risk modelling infrastructure for discussion with supervisors, rating agencies, analysts and shareholders.

Conceptual framework

6.7 CEIOPS has separated three major components of an internal model submitted for regulatory approval (CfA 11.14-11.16):

Internal risk management	**Regulatory capital requirement**
use test: Is the actuarial model genuinely relevant for and used within risk management?	**calibration test:** Is the SCR computed by the undertaking a fair, unbiased estimate of the risk as measured by the common SCR target criterion?
Base methodology / 'actuarial model'	
statistical quality test: Are the data and methodology underlying both internal and regulatory applications sound and sufficiently reliable to support both satisfactorily?	

6.8 Firstly, there is a methodological basis comprising the gathering of data, the aggregation of data, the statistical modelling assumptions, the estimation of statistical parameters and the prediction of future gains and losses, usually in the form of a probability distribution. This methodological basis is called the '**actuarial model**.' Its appropriateness is assessed in the '**statistical quality test**,' which will include some form of comparing predictions with actual losses. On top of this methodological basis, there are two applications: internal risk management and the estimation of the regulatory capital requirement: the SCR.

6.9 **Internal risk management** comprises the whole system of internal control measures, including, among other things, the aggregation of the output of the actuarial model across business units, the reporting of risk numbers and other risk exposure information, the control of risk taking via exposure limits, risk-adjusted performance measurement. The application of

the 'actuarial model' for internal risk management is assessed in the '**use test**.'

6.10 The regulatory **capital requirement**, the SCR, is either derived directly from the probability distributions provided by the actuarial model or via a re-scaling of the risk measures used for internal risk management. The appropriateness of either way of deriving the regulatory capital requirement from the internal data is assessed in the '**calibration test**.'

6.11 The combination of the actuarial model and the risk management function built on top of it is called the '**internal model in a wider, risk management sense**' (CfA 11.14).

6.12 The requirements of the three 'tests,' which are further specified below, must be met on an ongoing basis.

Practical implications of the conceptual framework and cross-sectoral comparisons

6.13 The practical implications of considering statistical quality, use and calibration requirements separately require, inter alia, a response to the following issues:

- how to achieve comparability of the SCR in a sector that uses a multitude of risk measures for risk management purposes;
- how to assess the bias of an SCR estimate that is defined in terms of events well beyond normal experiences (the 200-year-event loss in the case of 99.5%-VaR and the average of the losses beyond the 100-year-event in the case of 99%-TailVaR);
- how to assess that a model is realistic, reliable and actually used in the daily risk management of the insurer; and
- how to optimize the resources needed for the validation of internal models by both supervisors and undertakings.

6.14 While the goals and principles for the regulatory approval of internal models in Solvency II are similar to the goals and principles of the regulatory approval of internal models for the market risk in the trading books of banks, there are significant differences in the risk management practices of the two sectors.

6.15 After JPMorgan introduced RiskMetrics in 1994, almost all banks used VaR as *the* risk measure for market risk. VaR quickly became the common denominator used to make previously incomparable risks comparable across the banking industry.

6.16 In contrast, a variety of risk measures are used by different insurance undertakings. For internal economic capital purposes, VaR and TailVaR risk measures are used at varying levels of confidence, depending on the level of capitalisation that the undertaking intends to attain. Often, this level of capitalisation is targeted to achieve a specific financial strength rating, and

would then typically be significantly higher than under a Solvency II SCR standard. Also, variants of the 'pure' VaR or TailVaR risk measure are used for risk management purposes. For example, a multiplier may be applied to VaR to reflect the potential occurrence of multiple rare events. Such a 'VaR with a multiplier' risk measure could e.g. quantify the capital that is needed to cover the amount of two times the 100-year-event loss (in case the multiplier is 2 and VaR is calibrated to 99%).

6.17 Among the 13 respondents to the CRO-Forum benchmarking study on internal models, three use TailVaR as a risk measure, and some of the 10 VaR users use VaR with a multiplier.[120] A multiplier is also used in the context of internal models for market risk in banking supervision. Note that the qualitative difference between VaR with a multiplier (e.g. calibrated to two times the 100-year-event loss) and 'plain' VaR (e.g. calibrated to the 1400-year-event loss) is as material as the qualitative difference between TailVaR and 'plain' VaR.

6.18 Yet another difference between banks and insurers is that insurers frequently report potential losses for a sequence of scenarios, say the 50-year-event, the 100-year-event and the 250-year-event, or more specifically, for the layers that are common for excess-of-loss reinsurance contracts. In other words, insurance undertakings frequently use *several* risk measures in their internal risk reporting.

6.19 It can be seen that the banking regime[121] did not have to deal with the problem of the multitude of risk measures used by insurance undertakings, which Solvency II faces. However, CEIOPS' solution to this problem is to

- allow individual risk measures, potentially several, in the internal reporting and risk management throughout all hierarchical levels, subject to the general use test requirements; but
- require the computation of the regulatory capital requirement calibrated to the objectives for the Solvency II SCR[122] at the legal entity level for solo supervision and at group level for group supervision, subject to calibration test requirements.

This requires the insurer to make explicit the difference between the economic risk capital resulting from the full internal model and the regulatory SCR obtained by applying the prescribed risk measure.

6.20 The solution originally suggested by the EU Commission in Call for Advice 11 was to require the calibration of the SCR computed by the undertaking to a level *at least as* conservative as the calibration objectives for the Solvency II SCR. However, this solution would result in undertakings publishing SCR numbers that are not easily comparable. While they are

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120 Chief Risk Officer Forum (2005) – *Principles for regulatory admissibility of internal models*

121 Basel Committee on Banking Supervision (1996) – *Amendment to the capital accord to incorporate market risks*

122 The 'key aspects' outlined in section 2, e.g. the prescribed risk measure, confidence level, time horizon etc.

required to be prudent enough, the additional degree of prudence compared to the SCR calibration standard is not made transparent. CEIOPS' calibration test, on the other hand, requires undertakings to quantify the relation between their own internal economic capital calibration and the Solvency II SCR calibration objectives. This is in line with the general goal of Solvency II of making the degree of prudence in both valuation and capital buffers explicit. Moreover, without this re-scaling requirement it will be difficult for the Solvency II SCR calibration objective to establish itself as an industry benchmark among the capital benchmarks defined by rating agencies.

6.21 The second major difference between banking and insurance supervision is that profits and losses are computed daily for the trading book of banks, while only quarterly or, more commonly yearly, profit and loss data are available for insurance undertakings. VaR models for market risk can easily be 'back-tested' by directly comparing the VaR risk numbers and the actual profits and losses on a daily basis. Using modern statistical techniques, the quality of 99%-VaR models, which predict the 100-day-event, can be assessed using about 100 daily data points. For insurance undertakings with yearly data this would mean about 200 years are needed to assess the quality of a model that predicts the 200-year-event. Thus, a completely different solution to back-testing needs to be found for Solvency II.

6.22 CEIOPS' solution to this problem is to decouple the 'back-testing' from the risk measure that defines the SCR calibration objectives. The assessment of the methodological basis in the 'statistical quality test' needs to be based on actually observed losses. Consider natural catastrophe losses as an example. The worst-ever NatCat event (Katrina) might be considered as roughly equivalent to a 35-year-event, which means that any form of 'back-testing' for NatCat models needs to be based, for example, on 10 to 30-year-events, which have been observed. if expressed as a risk measure, this corresponds to the 90%- to 97%-VaR. The specific form of back-testing will depend on the loss data available in different areas.

6.23 The gap between observable losses and the extreme events defining the SCR is bridged by assumptions on the shape of the probability distribution of (gross) losses. If pooled industry data is still not sufficient to reliably establish the shape in the SCR-relevant area of the tail, then supervisors need to constrain the relation between the observable losses and the extreme losses (the shape). This can be achieved by either constraining the calibration of models to achieve a certain shape factor ('constrained calibration') or directly controlling the shape parameters of a specific model ('supervisory control of key parameters').

6.24 The third major difference between banking and insurance supervision is the difference in the roles of Pillar 1 and Pillar 2. For historic reasons, Pillar 1 has a more bottom-up approach to risk measurement in banking supervision, with the effect that important and quantifiable risks like interest rate risk in the banking book are not treated by Pillar 1 of Basel II. Because of this, the Pillar 2 requirements on the internal capital adequacy assessment process have significant quantitative aspects. In practice, this tends to lead to the parallel assessment of 'real internal models' (in Pillar 2) and 'regulatory internal models' (in Pillar 1).

6.25 Since insurance undertakings

- face insurance risks on top of all the risks banks face (market, credit, operational); and

- insurance risks (like long-term mortality trends) tend to be more difficult to assess than market and credit risks

the validation of the holistic internal models envisioned by Solvency II is a more difficult task compared to the validation of market risk models for the trading book of banks.

6.26 CEIOPS' solution to the problem of performing a more difficult validation with comparable resources is to design the combined Pillar 1 and Pillar 2 requirements on internal risk management such that there is, as far as possible, no difference between the general Pillar 2 requirements on the internal risk and capital assessment on the one hand and the internal model 'use test' on the other hand in the case of undertakings that apply for regulatory approval of their internal model.

6.27 The internal risk and capital assessment (IRCA) should be done in a plausible way, but may be more qualitative rather than quantitative. This assessment does not oblige any insurer to have an internal model (CfA 19.168).

6.28 If this can be achieved, then there is little extra effort for the internal model 'use test' on top of the Pillar 2 SRP, which will be performed regardless of whether the undertaking applies for regulatory approval of its internal model.

Comparability

6.29 Any regulation based on internal models faces the problem how to achieve *"a balance between giving insurers the flexibility to develop models that genuinely reflect the risk profile and fit their risk management processes on the one hand and setting a minimum level of prescription to ensure comparability of the SCR estimates on the other hand"* (CfA 11.70).

6.30 While "there should, in principle, be no limitation on the range of model approaches an undertaking might adopt for its actuarial model, subject to meeting validation and approval constraints" (CfA 11.68), the supervision of internal models must not be entirely 'laissez faire.'

6.31 Comparability has both quantitative (Pillar 1) and qualitative (Pillar 2) aspects. For the qualitative aspects, it may be instructive to look at how rating agencies achieve comparability of their assessments across time, across sectors and across geographic regions. While rating agencies publish about their approaches and criteria[123], they maintain that their assessment is a professional, but always subjective opinion. Their impact on the market

[123] For example, Standard & Poor's (2006) – *Insurance Criteria: Refining the Focus of Insurer Enterprise Risk Management Criteria*

is not achieved by detailed prescriptions on how to manage risk and capital, but by consistency and transparency in the assessment processes.

6.32 Accordingly, the supervisory assessment of the quality of risk management in Pillar 2 will always be a subjective (though professional) opinion by a national supervisor. In contrast to rating agencies, the impact of supervisory authorities on the market is determined by acting on a legal, sovereign basis. Comparability across EU member states will be achieved more by the intensive dialogue between national supervisors in the context of group supervision (see the response to CfA 20) and the general peer review between supervisors (CfA 11.67, CfA17), as opposed to very detailed, prescriptive rules on how to manage risk and capital or how to build actuarial models.

6.33 The quantitative aspects of comparability can be further broken down into the question of the proper *ranking of risks* versus the proper *calibration* of the SCR. For these quantitative aspects of comparability it is instructive to look at weather forecasting.

6.34 Risk measurement in an undertaking is like predicting the probability of rain at a certain location in the next time period. A skilled forecaster distinguishes himself from a less skilled forecaster primarily by his ability to distinguish different 'weather profiles' and to assign the proper ranking (sunny, small likelihood of rain, high likelihood of rain etc.) to these different situations. Such a forecast is called *refined* in the literature on weather forecasting. If the forecast is expressed quantitatively, i.e. the probability of rain tomorrow is 25%, then the forecast is called *well-calibrated*, if a 25% forecast of rain is followed by 1 out of 4 days raining on average. Note that the forecast "It will rain in Frankfurt tomorrow with probability 173/365" is well-calibrated, since 173/365 is the climatologic probability of raining in Frankfurt.[124] It is almost useless, however, since it does not help in decisions that depend on weather.

6.35 Analogously, the rating of issuers of debt by a rating agency provides a ranking of risks. Such a ranking of risks is called 'refined' if it has predictive power – in the sense that it can distinguish the good from the bad risks. The rating itself does not say how likely the default of a certain issuer is. An estimate p% of the 1-year probability of default (PD) associated with a rating class is called 'well-calibrated' if p% of the issuers in this rating class default during the following year. Note that a system with only one rating class may be well-calibrated, if the overall PD is estimated correctly. But a rating system with only one rating class is almost useless since it does not help any decisions that depend on creditworthiness.

6.36 In summary, it is primarily the proper ranking of risks, which is important for the internal risk management, rather than the proper calibration. Since risk-ranking is so closely related to internal risk management, this suggests applying as little prescription as possible to the ranking implied by the actuarial model in the statistical quality test. However, there are limits to

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[124] www.bbc.co.uk/weather/world/city_guides/results.shtml?tt=TT003710

the flexibility awarded to risk ranking. For example, the ranking of risks should be at least compatible with first-order stochastic dominance.

6.37 Moreover, the fact that diverse risk measures are used in the insurance sector means that different risk-rankings are used. Requiring comparability of risk-ranking would amount to requiring the same risk measure across the sector.

6.38 The ultimate supervisory reason for not requiring comparability in risk-ranking is systemic risk. If all undertakings use the same ranking of risks, then all undertakings will shun the same types of risk at the same time and exacerbate market disruptions. From this financial stability point of view, diversity in risk rankings – related to diversity in the risk measures used for internal risk management – should be encouraged.

6.39 The comparability of the regulatory capital requirements derived from internal models across undertakings as well as comparability between standard formula and internal models is achieved by requiring undertakings to calibrate their estimate of the SCR to the Solvency II calibration objectives. The SCR is derived either directly from the probability distribution provided by the 'actuarial model' or from the internally used risk measure via re-calibration. Either way is assessed in the 'calibration test.'

6.40 In order to achieve comparability of the SCR, calibration test requirements need to include some supervisory control over those variables and parameters which have such an influence that tiny changes result a huge impact on the SCR calculated.

6.41 In summary, CEIOPS' solution to achieving the twin goals of flexibility and comparability is to carefully distinguish the more principle-based requirements on undertakings in the context of the internal use of the model ('use test' and the risk-ranking aspects of statistical quality) and the more prescriptive requirements on undertakings in the context of the regulatory use of the model ('calibration test'). The first achieves the goal of flexibility in the internal use of the model; the second achieves the goal of comparability in the regulatory use of the model.

Statistical quality test

6.42 *"The aim of the 'statistical quality test' is to ensure that the actuarial internal model has sufficient accuracy and reliability to support internal risk management and computation of the SCR"* (CfA 11.35). An undertaking should be able to justify its model choices to its supervisor (CfA 11.29).

Calibration test

6.43 *"The aim of the 'calibration test' is to assess whether the SCR derived from the model has the appropriate level of prudence. The burden of performing the computations that underlie the calibration test could be assigned to the undertaking, with the obligation of the supervisor to [review] the results. Due to the statistical uncertainties associated with 200-year-events, and difficulties in estimating and validating correlations, the desired absolute*

level of prudence can only be a target. It is more important to check whether the manner in which the SCR is derived from the internal model is comparable across undertakings" (CfA 11.36).

Qualitative risk management application standards specific for internal models (use test requirements)

6.44 *"The overall aim of the use test is to assess whether the control loops associated with risk management work properly. The undertaking has to demonstrate that the actuarial model is genuinely relevant for and used within risk management and is in line with the overall policy on solvency capital. Furthermore, the undertaking has to demonstrate that proper business processes are established, which ensure that the model remains useful, and that these are applied consistently over time"* (CfA 11.39).

6.45 All the general requirements set out in CEIOPS' answers to CfA 1 and 11 should constitute the framework for the risk management application standards of internal models. Some qualitative requirements may possibly have a different impact on the implementation of internal models, but do not justify sufficiently a completely different treatment on the application of the qualitative requirements already mentioned for undertakings which use the standard formula. Therefore the following additional qualitative requirements should supplement and confirm the answers already given to CfA 1 and 11:

- The board of directors shall document and communicate its strategic goals of risk management (risk strategy) which is an integral, consistent part of an undertaking's business strategy. The risk strategy shall document amongst other matters how the actuarial internal model is used to achieve these goals. The objectives should be broken down hierarchically to the responsible business unit. If there is not a centralised risk management function and the single model is used for more than one legal entity in a group, the qualitative review of it may be undertaken on a group basis.

- The organisational framework for the application of the internal model shall be documented in a 'risk policy'. The risk policy shall document work flows to and from the model as well as lines of responsibilities for data inputs, actuarial model computations, the production of risk reports, the controlling of risk limits and risk steering actions. The risk policy shall also show per business unit and for the undertaking as a whole how the available capital intended for the coverage of losses is composed and illustrate the adequacy of the available capital when compared with the economic capital and the SCR.

- To be able to implement the overall business strategy with the corresponding partial strategies chosen for achieving the economic capital and the SCR, the board of directors has to determine the assumptions under which the undertakings' required risk capital for all types of risks will be assessed. The methodology chosen for the internal model has to be compatible with the overall framework set

by the board of directors via the risk strategy and risk policy. The information provided by the model should actually be used for risk management.

- Whereas undertakings using the standard formula are expected to have an internal risk and capital assessment process in place in order to control their business. Undertakings with an internal model are supposed to control their business and establish their actual risks as well as their internal capital requirements via the use of the internal model. Risk capital numbers should be consistent with additional risk metrics and risk limits used by the management.

- The insurance undertaking shall document the design and operational details of its internal model in order to prove compliance with statistical quality test, use test and calibration test requirements. The documentation shall provide an outline of the theory, assumptions and the mathematical and empirical bases underlying the internal model. If the internal model uses external technology (e.g. simulation technologies and scenario generators), the insurance undertaking shall document the general framework of this technology. The documentation shall indicate which units and risks of the insurer are covered by the internal model and the different circumstances under which the internal model does work robust. The insurance undertaking shall document all major changes to the internal model.

- The board of directors as a whole shall have a good understanding of the consequences of the internal model's design and operations for risk management decisions. Senior management shall have the technical expertise to ensure, on an on-going basis that the capital assessment based on the internal model is operating properly (sign-off procedure for their risk units, budgets etc). Solvency II is expected to improve risk management practices and raise standards applied by the board of directors as well as the senior management.

- The allocation of financial, human and technical resources to risk management, as well as the system of incentives for risk management shall be adequate to ensure properly functioning business processes (CfA 11.74).

- The internal model shall be properly embedded in the operational and organisational structure, particularly concerning responsibilities and work flows. The contingency plan of the undertaking shall ensure the functioning of the internal control system.

- Proper business processes shall be in place ensuring that the internal model and its embedding in risk management are adapted to changes in the environment and the risk strategy.

- The insurance undertaking shall have a risk management and control function responsible for its internal model that is appropriately independent from functions with P/L responsibility and free from undue influence. In particular its areas of responsibility shall include:

- Producing and analysing on a regular basis summary reports from the internal model and

- Informing on a regular basis the board of directors about the performance of the internal model, areas needing improvement, and the status of efforts to improve previously identified weaknesses, especially about material risks in sub-units, the comparison of available and required capital and key risk indicators in the 'risk report.' The risk report shall also include an estimation of the impact of important model assumptions and potential model errors ('stability analyses').

- These reports should comprise information on the extent to which the particular risk limits are utilized and the degree to which the risk management objectives described in the risk strategy has been met.

- Calculating the risk bearing capacity based on the internal model.

- The risk figures generated by the model shall be consistent with other figures of management reports.

- The appropriateness of the model referring to the above outlined requirements should be examined regularly. The examination should be documented and the model adapted, if necessary. The burden is on the insurance undertaking to satisfy pertaining demands of the supervisory authorities.

The audit function shall review all the above outlined requirements on a regular basis according to the level of risk and the frequency of major changes.

6.46 The validation of the internal model needs to include a proper analysis and understanding of the undertaking's past loss experience. In this context, a distinction is necessary between the presumed causes of the triggers of loss events and the contractual obligations which gave rise to actual monetary losses. As an example, NatCat losses can be structured by event types (e.g. European storm, Caribbean hurricane, Californian earthquake) and by organisational structures (e.g. business units like marine, aviation, retail, property). The undertaking should attribute the losses incurred by each major business unit to the appropriate type of causes and events. This leads to a decomposition of the profits and losses of each business unit, which enables an explanation of the causes and sources of profits and losses.

6.47 Very different structures and categorisation of loss databases are currently used in the insurance industry. In principle, it can therefore be stated that an appropriate categorisation of losses serves as a basis for comprehensive identification, analysis and control of risks in the undertaking. However, no prescribed classification appears to be fit for all purposes (supervision, internal control, quantification of Pillar 1 requirements) and for every corporate structure.

6.48 For that reason, it does not seem appropriate in a principles-based system like Solvency II to prescribe a certain loss categorisation. For the special case of operational risk, this implies differing from banking regulation, in which the Capital Requirements Directive gives a specific loss categorisation by event (e.g. internal fraud, external fraud, employment practices and workplace safety etc.) and by organisational structure (functional areas).[125] Undertakings which used a loss classification different from such a prescribed classification would need to map their losses across to the prescribed classification at additional administrative cost, but without any benefit from enhanced safety.

6.49 The 'use test' requirements set out in this section shall apply to partial use of internal models accordingly.

Qualitative elements of the approval process within the SRP

6.50 An insurance undertaking may develop an internal model on a voluntary basis or may be required by the supervisors to develop a partial or full internal model instead of using the standard formula in order to capture its actual risk profile in a better way. In both cases, insurance undertakings may be subject to prior supervisory approval, calculate the SCR using an internal model. Approval shall be given only if the supervisory authorities are satisfied that the insurance undertaking's systems for identifying, quantifying, monitoring and managing risk are sound and implemented with integrity and, in particular, that the internal model meets the standards on the risk management application. The supervisory authority has on a sovereign basis the full responsibility for the whole approval process. This responsibility cannot be delegated to a third party (e.g. a ratings agency).

6.51 Models should be allowed to evolve over time in line with developments in individual undertakings. Major changes made to the internal model after the initial supervisory approval has been given shall also be subject to prior supervisory approval. (CfA 11.77 and 11.81).

6.52 Before approval shall be given by the supervisory authorities to use an internal model, an insurance undertaking shall submit an application to the supervisory authorities which as a minimum should include documentary evidence that the internal model meets the minimum statistical quality, calibration and use test standards named above. Supervisory authorities shall have the power to reject or accept the application subject to conditions including requiring improvements to be made to the model or requiring that a capital add-on be applied to the output of the internal model. When testing the internal model on-site, supervisors may challenge underlying hypotheses and may require insurers to run different stress test scenarios.

6.53 If the internal model uses external technology, the approval process of the internal model could include an assessment of this technology by the

[125] Table 3, Part 5, Annex X, Capital Requirements Directive

supervisor. For risks which are not captured at all by the internal model, the undertaking has to use the standard formula. The conditions for such partial use of internal models are given in section 7. An insurance undertaking which has already submitted an application to the supervisory authority, but which has not yet received the official approval by the supervisory authority (due to the assessment process) should continue to use the standard formula to compute the SCR.

6.54 An insurance undertaking shall not revert to calculating the SCR in accordance with the rules set out for the SCR Standard formula except for demonstrated good cause and subject to the approval of the supervisory authorities.

6.55 Supervisors may withdraw approval for the model's use, if the afore-mentioned requirements and the requirements of CfA 1 and 11 are no longer met; or they may demand substantial changes to the model in order to adapt it to the new risk profile. Significant change in the nature, scale and complexity of the activities, e.g. after a merger might lead to a new application for approval of the internal model.

Capital add-on

6.56 When an undertaking uses or wants to use an internal model to calculate the SCR, the following possibilities have been identified as beneficial solutions for both undertakings and supervisors in the context of the approval process. Setting a Pillar II capital add-on could help to:

- compensate for deficiencies in the internal model ('model error'), which although of concern are not so severe as to call into question the reliability of the whole model itself;

- smooth an undertaking's transition to an internal model. Rather than making the model approval process a binary yes/no decision, this would allow some flexibility by approving it partially, together with an add-on or subject to other conditions; there is a minority view that there should be no add-on when a full internal model has been accepted by a supervisor, even if the model makes simplifying assumptions to best reflect the risk profile of the insurer. Supervisors should not approve internal models unless they feel that the models do not have deficiencies;

- in a group context if after a controversial approval of an internal model by the group supervisor a capital add-on required on the solo level proves not be sufficient, the national supervisor by way of a rare exception may impose a standard model at solo level until its supervisory concerns are eliminated. A parallel use of standard model and internal model in a group should be avoided if at all possible (CfA 20.115)

- Over time or as a result of mergers and acquisitions, the insurers business may change such that the existing model no longer captures all of the risks to which the insurer is exposed. In this case, a temporary capital add-on is appropriate in order to protect

policyholders from financial risk whilst amendments are being made to the internal model. The aim of the capital add-on is to increase the level of the solvency capital requirement given by the internal model approved by the supervisory authority to calculate the SCR, so as to match the actual risk profile of a specific insurance undertaking. An add-on should however not exempt the undertaking from quickly adapting its internal model to its new risk profile and situation.

CEIOPS' Advice

Conceptual framework

6.57 *"CEIOPS recommends that the approval of an internal model for an undertaking's SCR calculation should be subject to a statistical quality test, a calibration test and a use test"* (CfA 11.79).

Statistical quality requirements

6.58 The **actuarial model**[126] is *"the system that transforms risk exposure data (how many contracts of which type are written) and risk driver data (historic information on the likelihood of certain events) to forecasts of profit and loss (P&L[127]) distributions. In practice, an undertaking may use a collection of models that make predictions for the P&L at different levels of aggregation"* (CfA 11.14).

6.59 The methods used to calculate the probability distribution forecast should be based on sound actuarial techniques and shall be broadly consistent with the methods used to calculate technical provisions. In particular, the methods used to calculate the probability distribution forecast should be based upon current and credible information and realistic assumptions. An undertaking should be able to justify its model choices to its supervisor.

6.60 No particular method for the calculation of the probability distribution forecast is prescribed so long as the risk-ranking powers of the actuarial model are high enough to be useful for risk management. This requires that the actuarial model captures all of the material risks to which the insurance undertaking is exposed. This means that the very same model may be appropriate for undertaking A and inappropriate for undertaking B.

6.61 Insurance undertakings should accurately capture the particular risks associated with financial guarantees and options in their actuarial model if material. Similarly, insurance undertakings should capture the risks associated with policyholder options to change the terms of the contract in

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126 The 'actuarial model' is used as a short-hand for 'the internal model in a narrower, quantitative, statistical sense'. The use of the attribute 'actuarial' does, however, not imply that the actuarial model is solely within the responsibility of the actuarial function.

127 'P&L' shall mean the change in economic value (plus any intermediate cash flows) of assets minus liabilities over the time horizon that is the basis for the SCR.

their actuarial model. In particular, the impact of future changes in the take-up of options by policyholders shall be captured.

6.62 Insurance undertakings should be permitted to recognise dependencies within broad risk categories as well as across broad risk categories, provided that the supervisory authorities are satisfied that the insurance undertaking's system for measuring diversification effects is sound and implemented with integrity.

6.63 Insurance undertakings should be permitted to fully recognise the effect of risk mitigation techniques in their actuarial model as long as counterparty credit, including contingent credit risk, and other risks arising from the use of risk mitigation techniques are adequately captured by the actuarial model.

6.64 In the context of with-profit life business, insurance undertakings should be permitted to take account of future management actions that they would reasonably expect to carry out under specific circumstances, such as making changes to bonus rates. When taking account of future management actions in their actuarial model, insurance undertakings shall make allowance for the time taken to implement such actions as well as their obligations to policyholders, whether through policy wording, marketing literature or other statements.

6.65 Proper processes should be in place, which ensure that the data used by the actuarial model is accurate and appropriate. Insurance undertakings shall review the data sets used in the calculation of the probability distribution forecast no less frequently than once a year.

6.66 *"Standardization of contract terms and pooling of risk driver data should help undertakings improve the quality of the input data they use in their actuarial models. But the availability of richer external data should also help facilitate a greater understanding of the risks to which an individual undertaking is exposed and therefore act as a stimulus to the development of internal models"* (CfA 11.26).

6.67 The internal risk and capital assessment needs to include a proper analysis and understanding of the undertaking's past loss experience. In this context, a distinction needs to be drawn between the presumed causes or triggers of loss events and the contractual obligations which gave rise to actual monetary losses. The undertaking should attribute the losses incurred by each major controlling unit to appropriate types of causes and events. This leads to a decomposition of the losses of each business unit, which enables an explanation of the causes and sources of profits and losses.

6.68 No prescribed loss classification appears to be fit for all purposes. The undertaking should demonstrate that the structure and categorisations of its loss databases are adapted to the risk management processes and serve as a basis for the identification, analysis and control of risks in the undertaking.

6.69 The insurance undertaking shall have a regular cycle of model validation that includes monitoring the performance of the actuarial model, reviewing

the on-going appropriateness of its specification, and testing its forecasts against outcomes ('back-testing').

6.70 As a general rule, the evaluation of forecast performance should be based on the statistical methodology for the evaluation of the quality of distributional forecasts. This means that the model is tested not only against losses that exceed a high threshold, but against all losses. The QQ-plot is a one of the more powerful tools that compare predicted and realized losses. This kind of back-testing the whole distribution shall be performed up to the highest level of aggregation where it is still practically feasible.

6.71 The frequency and type of loss data across the insurance industry is so diverse that no specific back-testing methodology can be optimal in all cases. However, back-testing the 80%-TailVaR or the 90%-VaR of losses occurring over a suitably chosen time interval is likely to be a useful tool across a variety of risk classes and business lines. It requires the comparison of the predicted and the realized average of all losses beyond the 5-year-event in the first case and the comparison of the predicted and realized 10-year-event in the second case.

6.72 The model validation process shall also include analysis of the actuarial model's stability and in particular testing of the sensitivity of the outputs of the actuarial model to changes in key underlying assumptions.

6.73 *"A number of possible techniques shall be used for performing the stability analysis, including"* (CfA 11.34), for example:

- analysis of the relationship between a full valuation using scenarios and an approximation using sensitivities;
- analysis of the effect of the inclusion or deletion of risk drivers;
- analysis of the effect of different estimation procedures;
- analysis of the effect of the observation period of risk drivers; or
- analysis of the effect of alternative model assumptions.

6.74 The insurance undertaking should document the design and operational details of its actuarial model. The documentation shall evidence compliance with these quantitative and qualitative standards. The documentation should provide a detailed outline of the theory, assumptions and/or mathematical and empirical basis underlying the actuarial model. The documentation shall indicate any circumstances under which the actuarial model does not work effectively. The insurance undertaking should document all major changes to the actuarial model.

6.75 Use of a model or data obtained from a third-party vendor that claims proprietary technology is not a justification for exemption from documentation or any other requirements for the actuarial model. The burden is on the insurance undertaking to satisfy the supervisory authorities.

Calibration requirements

6.76 In parallel to the economic risk capital computed according to the internal calibration objectives, undertakings should compute the regulatory capital requirement calibrated to the Solvency II SCR objectives at the legal entity level for solo supervision and at group level for group supervision. This may be achieved by applying the prescribed SCR risk measure to the probability distribution forecast provided by the actuarial model.

6.77 Not all undertakings will be able to just 'read off' the SCR from a probability distribution, either because they use a different time horizon, or they do not have a probability distribution at the top level of aggregation. In these cases, the general requirement above applies as well, but the burden of this parallel computation is reduced by:

- requiring the computation of risk capital consistent with the Solvency II calibration objectives only once a year and only at the top level of aggregation (i.e. legal entity level in solo supervision and group level in group supervision); and

- allowing approximations in the process of deriving the SCR estimate from the internal risk capital, provided they ensure that the SCR estimate is conservative.

In summary, the undertaking may use risk capital numbers calibrated to its own objectives in day-to-day operations, but it needs to demonstrate a good understanding of the relation between its own numbers and the SCR calibration objectives.

6.78 Key parameters, which potentially influence the final capital requirement a lot, or are difficult to estimate (or both) are:

- shape parameters of parametric distributions, which determine the relationship between the actually observed losses and the 200-year-event, which is the basis of the SCR calibration, and

- parameters that determine probabilities in the far future and which are not liquidly traded (like long-term mortality trends).

Note that parameters that determine probabilities in the far future only affect the value of liabilities, not the SCR directly.

6.79 In the case of these key parameters, undertakings should generally use external, pooled data for estimation. Parameter estimation can be outsourced. Examples of such aggregated external data are the life tables and economic scenario generators provided by model vendors and other organisations.

6.80 If an undertaking wants to use both external and internal data for estimation it has to provide evidence on the proper weighting in order to balance bias and variance along the lines of credibility theory.

6.81 Internal models should make optimal use of and be consistent with information provided by the financial markets and generally available data

on insurance technical risks. Consistency should be tested by applying the internal model to a series of pre-defined test cases and requiring a limited deviation from the benchmark results ('constrained calibration').

6.82 The supervisor should have the power to apply typical parameters of the industry instead of the undertaking's estimate of the key parameters named above, if the undertaking fails to present convincing evidence for deviation from general industry practice. In the case there is no industry standard, the supervisor should have the power to prescribe the parameter ('supervisory control of key parameters'). However, there is a tension between prescribing parameters and avoiding constraints on modelling methodology, so this should be considered a fall-back solution if 'constrained calibration' does not lead to sufficient comparability.

6.83 Supervisors should have the power to ask undertakings to subject their models to test problems, which will allow supervisors to perform a 'peer review' of internal models and identify questionable model assumptions ex-post.

Use Test Requirements

6.84 Insurance undertakings should be required to apply the internal model in risk management top-down, alongside the hierarchically broken down strategic goals mentioned in para 6.45. The insurance undertaking shall examine the control loops associated with risk management, particularly those using the output of the model, e.g. risk reporting and decision making based on that reporting. The undertaking has to demonstrate that the actuarial model is genuinely relevant for and used within risk management and is in line with the overall policy on solvency capital.

6.85 Insurance undertakings shall examine strengths and weaknesses of the operational and organisational structure and their impact on the functioning of the internal model and their impact on the use of the internal model for risk management purposes. This part of the top-down approach will in its last and major step concern responsibilities, work flows and IT-Processes regarding the internal model as well as risk management.

Qualitative elements of the approval process within the SRP

6.86 The supervisory authority has on a sovereign basis the full responsibility for the whole approval process. This responsibility cannot be delegated to a third party (e.g. rating agencies).

6.87 Approval shall be given only if the supervisory authorities are satisfied that the insurance undertaking's systems for identifying, quantifying, monitoring and managing risk are sound and implemented with integrity and, in particular, that the internal model meets the standards on the risk management application. If the internal model uses an external technology, the approval process of the internal model could include an assessment of this technology by the supervisor.

6.88 For risks which are not captured at all by the internal model, the undertaking has to use the standard formula. The conditions for such partial use of internal models are given in section 7. An insurance undertaking

which has already submitted an application to the supervisory authority, but which has not yet received the official approval by the supervisory authority (due to the assessment process) should continue to compute the SCR using the standard formula.

6.89 Major changes made to the internal model after the initial supervisory approval has been given shall also be subject to prior supervisory approval.

6.90 An insurance undertaking shall not revert to calculating the SCR in accordance with the rules set out for the SCR Standard formula except for demonstrated good cause and subject to the approval of the supervisory authorities.

6.91 Supervisors may withdraw approval for the model's use, if the afore-mentioned requirements and the requirements of CfA 1 and 11 are no longer met; or they may demand substantial changes to the model in order to adapt it to the new risk profile.

Solvency Capital Requirement: partial use of internal models

Background

7.1 This section generally builds on and expands CEIOPS' answer to CfA11. Its purpose is adding details to the principles of supervising partial internal models as laid out in CEIOPS' answer to CfA11, with a particular focus on the interaction between internal and standard formula risk components. The level of detail added to CfA11 is targeted at the further clarification of level 1 principles as well as level 2 implementing measures.

7.2 This section contains several references to the previous section, since both sections need to be read in conjunction in order to see the full set of requirements on partial internal models.

7.3 Since partial use of internal models will be especially prevalent in group supervision, the general requirements in this section apply to group supervision as well, unless overruled by more specific advice given in the context of group supervision.

Objectives

7.4 *"In principle, partial [use of] internal models should be permitted for the calculation of the SCR. Aims and benefits are:*

- *to ease transition from the standard formula to 'full' internal models;*
- *to encourage innovation and specialization to certain business areas;*
- *to deal with exceptional cases, like the merger of two undertakings (one with an approved model, the other using the standard formula) in a pragmatic way."* (CfA 11.85)

Conceptual framework

7.5 *"A partial internal model is to be considered as an internal model in the sense of the conceptual framework of the previous section… The approval of [the use of] partial models should be governed by the same principles as any other internal model. The same set of compliance and validation criteria – statistical quality test, use test and calibration test – should be required, enhanced by tests for 'cherry-picking'"* (CfA 11.86).

7.6 *"Proposed enhancements to the standard model must prove their economic benefit for both an undertaking and its supervisor through individually passing the full array of tests – statistical quality, use and calibration – applied to internal models. Insurance undertakings should present a clear rationale for proposing any enhancements to the standard formula. Enhancements should provide both an undertaking and its supervisor with a better understanding of the risks to which the undertaking is exposed. Use of data specific to the undertaking is not in itself sufficient for this purpose"* (CfA 11.88).

7.7 The introduction of internal modelling by an undertaking should be planned in a detailed and consistent way, expressing clearly the final aim of introducing internal models, the full roll-out plan and the relationship with risk management. Unless the undertaking already uses an acceptable model for internal purposes, a transition plan should be presented to the supervisor, allowing the supervisor to understand the schedule, the efforts needed to implement the schedule, and the impact that each step will have on the risk management of the undertaking. If an undertaking presents such a transition plan for moving to a full internal model within the next five years, then the partial use of internal modelling will be called 'transitional,' otherwise 'non-transitional.'

7.8 The partial use of an internal model has as essential pre-requisite the necessity of consistency of SCR standard formula. This means that an application for the partial use of an internal model should:

- identify clearly which components of the SCR standard formula are affected by the use of the internal model,
- how their replacement by internal SCR estimates impacts on the rest of the standard formula and
- how the general consistency and confidence level is maintained.

7.9 *"Conceptually a grid could be drawn by categorizing risk exposure data across lines of business and risk driver [type] data across risk categories. Each combination is referred to as a segment:"* (CfA 11.47)

Portfolio subdivision		SCR standard formula categories				
		SCR_{mkt}	SCR_{def}	SCR_{op}	SCR_{nl}	…
Controlling Units	Accident					
	Sickness					
	Aircraft					
	Motor					
	Marine					
	General liability					
	Credit					
	...					

7.10 *"If internal modelling is confined to rows, columns or segments of the matrix, and it is used to substitute parts of the standard formula for the computation of the SCR, then this will be called a partial [use of an] internal model"* (CfA 11.47).

7.11 The columns of the matrix represent SCR modules.

7.12 The rows of the matrix represent 'controlling units' of the specific undertaking at hand. A 'controlling unit' is a functional structure of an undertaking that plays a distinctive role in risk management. The undertaking has to provide evidence that these 'controlling units' have a function in the risk management processes. Specifically, a 'controlling unit' should have a function responsible for the profit and loss of the unit as well as a function responsible for the assessment of the risk capital of the unit.

7.13 The matrix presents the maximal granularity for both transitional and non-transitional partial use of internal models. While full flexibility should be allowed for transitional partial use, suitable restrictions should be applied to non-transitional partial use, in order to prevent cherry picking.

Restrictions

7.14 *"In principle, a partial model could apply to any line of business (row), risk category (column) or combination (segment). In practice, any partial approach might present considerable validation difficulties. If the partial model applies to a complete row, then risk driver types in the model for the business unit need not be the same as those of the standard formula. Conservative assumptions on diversification should be used to aggregate the SCR derived from the partial model with the SCR of the other business units as computed by the standard formula"* (CfA 11.49).

7.15 *"The benefit of 'simple enhancements to the standard formula' should be considered. CEIOPS must avoid regulation that invites every European insurance undertaking to bargain with their supervisor on every parameter of the standard formula. Gaming the supervisor on the parameters of the standard formula is neither beneficial for the companies nor for the supervisor (representing society). There should be a clear distinction between adjustments to the standard formula and partial internal models. Bargaining the parameters of the standard formula should not be done at the company level"* (CfA 11.54).

7.16 A number of CEIOPS Members consider that non-transitional partial use of internal modelling should generally be allowed if the undertaking provides evidence that the partial use is in line with better risk management ('use test') and is not due to cherry picking. As a broad rule, non-transitional partial use may be allowed under the condition that the risk-contribution of the non-modelled part to the total SCR is less than 20%. Notwithstanding this, the supervisor always has the power to reject or withdraw the approval of an internal model. Nevertheless, the above–mentioned conditions are not required when partial modelling is agreed by or made at the request of the supervisor (e.g. because the standard formula is insufficiently risk–sensitive, etc).

7.17 However, some CEIOPS Members think that as a principle, full internal models be the rule, and partial use of internal models, the exception. Accordingly, partial modelling is allowed under the conditions that the risk–contribution of the non–modelled part to the total SCR is less than 20%, and that the insurer justifies why such part of its activity are not modelled (e.g. launching a new activity / acquisition of a subsidiary or of a portfolio for which data or modelling is not yet available, etc). Nevertheless, the above–mentioned conditions are not required when partial modelling is at the request of the supervisor (e.g. because the standard formula is insufficiently risk–sensitive, etc.).

7.18 Other CEIOPS Members believe that partial use of internal modelling should in general be allowed if the undertaking provides evidence that the partial use is in line with better risk management (use test), is not due to cherry picking and provides a better reflection of the risk profile than the standard formula. Additionally, partial modelling may be at the request of the supervisor (e.g. because the standard formula is insufficiently risk–sensitive, etc).

Statistical quality, calibration and use tests

7.19 The aim of the statistical quality test of partial models is identical to the aim of the statistical quality test of full internal models, but it needs special consideration in the case of partial modelling along risk driver types (columns).

7.20 *"Partial [use of internal] modelling along columns is more challenging to validate, but needed, for example, for the approval of ALM-systems that model the influence of interest rates on P&L across business lines. A pre-requisite for such partial models is that risk driver types of the partial model have a certain degree of consistency with the risk driver types of the standard formula. Moreover, a natural decomposition of the P&L is needed, such that the appropriate part of the P&L can be attributed to the influence of the modelled risk driver type. This is necessary to enable application of the statistical quality test to the decomposed P&L"* (CfA 11.50).

7.21 The aim of the calibration test for partial models is identical to the aim of the calibration test for full internal models, but the techniques are applied at different levels. The SCR for all partial model components needs to be computed to the SCR calibration objectives.

7.22 Using the same aggregation method for 'mixed' components as for the standard formula ensures that the calibration of the partial model is comparable to the calibration of the standard formula.

7.23 Insofar as the use test requirements defined in the previous section go beyond general Pillar 2 requirements on risk management, these requirements are applicable to all controlling units that are affected by partial modelling. The undertaking has to show that the partial internal modelling is useful for the risk management of the corresponding controlling unit (the whole 'row' of the matrix).

CEIOPS' Advice

Restrictions

7.24 In principle, partial use of internal modelling is allowed across SCR components (the columns in the above matrix) and across controlling units of an undertaking (the rows in the above matrix).

7.25 The maximal granularity for partial use of internal models with respect to SCR components is

- the special component 'operational risk;'
- the first level risk categories of the standard formula: non-life underwriting risk, credit default risk, life underwriting risk, special treatments; and
- the sublevel risk categories of the market risk component of the SCR: equity market risk, interest market risk together with credit spread risk, property risk, FX risk.

If interest market risk is modelled, then credit spread risk must be modelled as well and vice versa. If any of the first four market risk components is modelled, then risk concentration must be modelled as well.

7.26 The maximal granularity for partial use of internal models with respect to business lines is a 'controlling unit.' The undertaking has to provide evidence that these 'controlling units' have a function in the risk management processes. Specifically, a 'controlling unit' should have a function responsible for the profit and loss of this controlling unit as well as a function responsible for the assessment of the risk capital of this controlling unit.

7.27 If an undertaking presents a transition plan to move to a full internal model, or to a state of partial use of internal modelling that is acceptable as non-transitional within 5 years, then the partial use is called 'transitional.' If an undertaking applies for partial use without a transition plan, or the period of the transition plan is completed, then the partial use is called 'non-transitional'. No further restriction than the maximal granularity described above is placed on transitional partial use of internal modelling.

7.28 The partial use of an internal model by an insurance undertaking shall be subject to supervisory approval.

7.29 Where an undertaking is implementing a full internal model in an incremental or staged manner, it shall draw up a transitional plan for the period until it has implemented the full model and agree it with the supervisor.

7.30 Non-transitional partial use of an internal model should be allowed if the general requirements for internal models are met and if the undertaking provides evidence that use of the partial model:

- is in line with better risk management (use test);
- is not due to cherry picking, namely by explaining the reasons why other risks are not included in the partial model; and
- better reflects the undertaking's risk profile than the SCR standard formula.

7.31 In addition, the risk contribution of the non-modelled part to the total SCR shall be less than 20%. Though, on presentation of a valid reasoned case by the undertaking a supervisor may void this restriction.

7.32 Where an undertaking uses a partial internal model at the request of the supervisor (for example where the standard formula does not adequately reflect the firm's risk profile) the restriction on the non-modelled proportion of the SCR shall not apply..

7.33 In principle, the requirements on partial use of internal modelling apply in the group context as well, unless the balance between group supervision and solo supervision as defined by the CEIOPS' advice on group supervision is affected.

Statistical quality, calibration and use test requirements

7.34 Statistical quality requirements as defined in the previous section apply to each segment modelled internally.

7.35 Additionally, the undertaking should perform a P&L decomposition for all portfolios that are subject to partial use of internal modelling of SCR components. The undertaking should identify which part of the profits and losses can be attributed to the modelled component. The decomposed P&L is subject to the back-testing requirements defined in the previous section.

7.36 Calibration test requirements apply to the highest level of aggregation under internal modelling, and to all those components that are combined with standard formula components.

7.37 The aggregation method defined by the standard formula is applied to any aggregation step[128] that contains non-modelled parts. Aggregation steps that do not include non-modelled, standard-formula parts have the same flexibility as full internal models. The SCR emanating from those controlling units that contain standard formula components is added to the SCR from those controlling units that are fully internally modelled.

7.38 Requirements on the 'use test' for full internal models are applicable to all

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[128] In the context of the standard formula, an aggregation step is where risks of a similar type are combined using linear correlation techniques. For example, equity, property and other market risks are combined into SCR_{mkt}. In the context of partial internal models, the standard formula aggregation steps must be used unless all of the constituent risk modules are calculated using a model. So, if equity risk and property risk were calculated using an a model, but the standard formula was used for interest rate risk, an insurer would need to combine the capital requirements for the different market risks using the appropriate standard formula correlation matrix (CorrMkt)

controlling units that are affected by partial use of internal modelling. The undertaking should document how the partial use of internal modelling improves the risk management of the corresponding business unit (the whole 'row' of the matrix).

Section 8

Minimum Capital Requirement

8.1 This section revisits CEIOPS' advice on the MCR, the level of capital below which ultimate supervisory action is triggered.

8.2 The analysis is divided into four parts:

- a description of the **context** for the MCR – specifically, CEIOPS' objectives for the requirement and how these were represented in QIS2;
- based on this experience, an outline of a **revised 'modular proposal' for the MCR**;
- an **alternative, 'compact' proposal** favoured by some CEIOPS members; and
- a short discussion of **transitional arrangements**.

PART A - CONTEXT

8.3 In its Framework for consultation on Solvency II, the European Commission noted that the Minimum Capital Requirement (MCR) reflects a level of capital below which ultimate supervisory action would be triggered. It recommended:

- that the MCR shall be calculated in a more simple and robust manner than the SCR as this kind of action may need authorisation by national courts;
- to facilitate the transition to the new system, that the MCR should be constructed in a straightforward manner such as the present Solvency 1 Directives (while maintaining a sufficient level of prudence);
- that the MCR had an absolute floor; and
- that the risk addressed in the capital requirements be based on the IAA risk classification (with possible additions and adjustments provided reasons are given).

8.4 In its response to CfA 9, CEIOPS acknowledged a number of the Commission's design priorities for the MCR, namely:

- *"[a] simple and straightforward calculation;*
- *robustness;*

- *objectivity;*
- *smooth transition."* (CfA 9.3)

8.5 CEIOPS advised that:

"The MCR should be a simple, robust and objective measure. (…) It should be calculated by a factor–based formula suitable for interim calculations, and its data requirement is auditable and reasonably simple. It should include an absolute floor expressed in Euros" (advice, § 9.114)

8.6 CEIOPS also noted that:

"while a combination of factor–based and scenario approaches is feasible for the calculation of the SCR, a factor–based approach is more suitable for the purposes of the MCR" (CfA 9.5).

"To provide an effective safety net, internal models would not be allowed to replace, or affect, the calculation of the MCR" (CfA 9.7).

8.7 In addition to the priorities set by the Commission, CEIOPS suggested the need to also consider the following aspects:

- *"risk sensitivity;*
- *suitability for interim calculations;*
- *reference to audited/auditable data only;*
- *consistency with the valuation standards for assets and liabilities and the calculation of the SCR."* (CfA 9.9)

8.8 Reflecting over the "familiar trade–off between risk sensitivity and the need for simplicity", CEIOPS noted that *"the MCR could be optimised for simplicity while the SCR could be optimised for risk–sensitivity"* (CfA 9.10)

8.9 As a working hypothesis, CEIOPS explored the possibility that the MCR should adopt a formulaic structure. The basis would be a simplified version of the standard formula, *"possibly by retaining its most significant items, by using a more straightforward technique for aggregation and by calibrating the factors to a lower level of confidence"* (CfA 9.120).

8.10 In QIS2 itself, the MCR largely followed the same modular approach as the standard formula, but with the following key differences:

- to retain a degree of simplicity, there were no adjustments for the risk-absorbing capacity of profit-sharing liabilities or the expected profitability of non-life business;
- to support the use of audited/auditable data only factor-based approaches were tested in each of the modules;
- there was no explicit charge for operational risk; and
- all correlation assumptions were prescribed.

8.11 The initial calibration of the MCR in QIS2 was set using two methods:

- in most cases, the output from the equivalent modules of the standard formula was reduced by 50%;
- in some cases, factors in the standard formula approaches were recalibrated to the equivalent of 90% TVaR.

8.12 CEIOPS acknowledges that this approach was driven by pragmatic considerations and that a more coherent approach to calibration would be required for the final MCR. Generally, the preference would be for calibrating the MCR to an explicit confidence level. For example, the 99.5% one-year VaR assumption used by the Commission in the *Amended Framework for Consultation* for the SCR is broadly reflective of an investment grade rating, which, in turn, should give *"reasonable assurance to policyholders that payments will be made as they fall due"* (CfA 10.121). However, the choice of confidence level where the insurer's operations represent an 'unacceptable risk to policyholders' is not immediately obvious.

8.13 Calibration challenges might eventually be overcome. But the experience from QIS2 suggests that either the MCR or the SCR or both suffer from a number of structural problems. In too many cases, the MCR proved significantly higher than the result of the SCR, in spite of the adjusted calibration – largely because of the effect of the 'k factor' or EP_{nl} adjustments in the SCR. Also, there were difficulties resulting from the interaction between the NatCat scenarios and the reinsurance programme for non-life in the MCR.

8.14 Of course, CEIOPS could improve the risk sensitivity of the MCR by bringing in adjustments for the risk-absorbing capacity of profit-sharing liabilities. The expected profitability of non-life business is no longer included in the SCR so it will not affect this interplay problem in the future. Should it be reintroduced further discussion will be undertaken by CEIOPS.. Closely replicating the design of the standard formula (at a lower confidence level) would clearly reduce instances of the MCR dominating the SCR, but at the price of significant extra complexity. It would also mean that

- any flaws in the design of the SCR standard formula would be duplicated in the MCR, with the risk that 'ultimate supervisory action' is taken prematurely – or too late;
- the MCR could cause particular difficulties for innovative or niche players who cannot use the SCR standard formula because it is incapable of reflecting properly the particular risks of their business; and
- insurers using internal models for their SCR would face the costs of maintaining parallel systems.

8.15 In total, this analysis has led CEIOPS to conclude that different MCR proposals should be considered for future QIS exercises.

PART B – REVISED MODULAR PROPOSAL FOR THE MCR

Purpose of the MCR

8.16 In the new solvency system, the quantitative requirements will consist of three main elements: the technical provisions, the Minimum Capital Requirement (MCR), and the Solvency Capital Requirement (SCR).

8.17 The technical provisions should ensure that there is a reasonable prospect that liabilities will be run-off successfully;

8.18 The capital requirements (the MCR and the SCR) should address all quantifiable risks faced by an insurer. However, their purposes are different:

- the SCR is the level of capital that enables undertakings to absorb significant losses. It should be calibrated to a consistent level to act as an alarm bell; and
- the MCR is a safety net. It is defined as the threshold, which triggers ultimate action by the supervisor.

8.19 Most CEIOPS Members believe that, as the MCR and the SCR have different purposes, they should be calculated differently; whereas the SCR should be risk-sensitive in order to reflect the risk profile of the undertaking, the MCR should be robust enough, so as to be defendable in front of a national court.

8.20 The MCR has legal consequences as it is the level of capital below which ultimate supervisory action will be triggered. As a result, it is essential that it be auditable, suitable for interim calculation, and not over-engineered.

8.21 This suggests the MCR should have the following features:

- in order to ensure some measure of objectivity for action by the supervisor, it should be simple and unquestionable;
- to retain a degree of sensitivity to the risk profile of an insurer, it should include loadings for the more significant risks faced by the insurer, e.g. underwriting risk and market risk. These items are, at large, those proposed by the IAA. For the sake of simplicity, no explicit loading is suggested for credit risk and operational risk.
- it should have an absolute floor to provide a minimum safeguard to policyholders in the event that the SCR and technical provisions do not function normally.

8.22 In each risk module, simple factor-based approaches with a level of complexity comparable to the Solvency I requirements could be developed and tested. However, CEIOPS does not envisage that the full sub-modular structure of the SCR standard formula would need to be mirrored in the MCR, as this could lead to undue complexity.

Interplay with the SCR

8.23 There needs to be a sufficient gap between the MCR and the SCR, in order to allow the ladder of supervisory actions elaborated in Pillar 2.

8.24 The MCR will be a floor for the SCR. However the results of QIS 2 show that in some member states the SCR result may be lower in too many cases than the MCR. In other cases the SCR might be above, but very close to, the MCR. This was largely because, unlike the QIS2 version of the MCR, the SCR included adjustments for reduction for profit sharing in life insurance and expected profitability in non-life insurance.

8.25 Under QIS2, the standard SCR included a reduction for profit sharing (RPS), expressed as $k \cdot TP_{benefits}$, where $TP_{benefits}$ is the technical provision relating to future discretionary benefits, and k is a factor between 0 and 1 that is intended to reflect the extent to which future discretionary profit sharing may be used to absorb future losses under adverse circumstances. Generally, this depends on a range of aspects specific to the country and the insurer.

8.26 No adjustment for the loss reduction potential of discretionary profit sharing was included in the QIS2 version of the MCR.

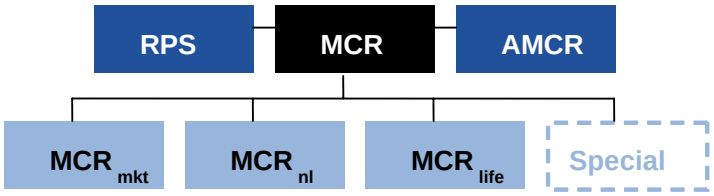
8.27 QIS2 experience suggests that, while the reduction for profit sharing may be zero or negligible in some member states, at the same time it is quite significant in other member states, effectively closing the gap between the MCR and the SCR. Therefore, most CEIOPS Members believe that ignoring the *k*-factor in the MCR could lead to unacceptable differences in the shape of the 'supervisory ladder' in different countries. However, some CEIOPS Members consider that including the *k*-factor in the MCR would make it complex and difficult to present before a court. In order to ensure that the SCR remains above the MCR, these Members consider that the *k*–factor should be retained as an eligible element of capital rather than being deducted from the SCR.

8.28 As with the SCR, most CEIOPS' Members believe that the recognition of the loss reduction potential of discretionary profit sharing could be resolved in an overall framework including the capital requirements and available capital. However, the approach used for the MCR would need to be sufficiently simple, robust and objective suggesting a degree of simplification is necessary. A suggested approach to including a reduction for profit sharing (RPS) adjustment is set out in this section.

8.29 As noted above, the inclusion of an adjustment for the expected profitability of non-life business is no longer suggested. If the adjustment is included in the SCR, the corresponding treatment would need to be sufficiently simple, robust and objective for consideration in the MCR.

Structure

8.30 The following structure for the MCR might be consistent with these considerations:



8.31 The MCR would be calculated as the sum of simple loadings corresponding to the main risks the insurer is exposed to. It would combine capital charges for two major sources of risk: market risk and underwriting risk (life and non-life and special, e.g. health). As envisaged by the Commission's *Amended Framework for Consultation*, there would be an absolute floor in Euros.

Composition

8.32 The MCR would use the results of the following modules as input information:

MCR_{mkt}	=	Market risk
MCR_{nl}	=	Non-life underwriting risk
MCR_{life}	=	Life underwriting risk
MCR^{s}_{health}	=	Special risk component, i.e. Health underwriting risk
AMCR	=	Absolute minimum capital requirement

together with any 'special treatments' such as health insurance.

8.33 Note that three of the main risk categories from the SCR standard formula are omitted from this structure:

- **Counterparty default risk:** Taking into consideration the QIS2 results, CEIOPS considers that **counterparty default risk** is not of material importance for the MCR; therefore it should not be explicitly reflected in the MCR as long as it is correctly addressed in the SCR.

- **Operational risk:** CEIOPS suggests that operational risk is not explicitly reflected in the MCR as a separate risk module. While operational risk may not be considered immaterial in the context of the MCR, it is also a risk that is difficult to quantify by way of a standardised, simple and objective calculation. It is therefore suggested that in the MCR, operational risk is taken into account via implicit loadings.

- **Non-life catastrophe risk:** Given that the objectives of the MCR include having a simple, factor-based approach, CEIOPS considers that a non-life catastrophe test is difficult to construct to meet these objectives. In addition, the Probable Maximum Loss (PML) is difficult to specify in an objective and auditable way. CEIOPS therefore

suggests that catastrophe risk is not included in the MCR as a separate risk module.

8.34 The following paragraphs indicate how CEIOPS might develop each module included in the MCR. However, the suggested treatment should not be read as a closed proposal. CEIOPS intends to further refine and develop the proposals, taking into account QIS results, stakeholder feedback and the future development of the SCR standard formula.

Aggregation

8.35 The MCR risk components could be aggregated via a correlation matrix technique, derived from the top-level aggregation approach of the SCR standard formula. This would ensure a degree of consistency with the standard formula, while the complexity cost of this approach is still limited. The aggregation of sub-components within each module could follow a simpler approach (full additivity or full independence).

8.36 The aggregation of the MCR modules could proceed as follows:

$$\mathrm{MCR} = \max\left\{\mathrm{AMCR};\quad \sqrt{\sum_{r\times c}\mathrm{CorrMCR}_{r,c}\cdot\mathrm{MCR}_r\cdot\mathrm{MCR}_c} - \mathrm{RPS}\right\}$$

Where:

$CorrMCR_{r,c}$	=	the cells of the correlation matrix CorrMCR
MCR_r, MCR_c	=	capital charges for the individual MCR risks according to the rows and columns of the correlation matrix CorrMCR

and where *CorrMCR* is derived from the correlations of the parallel top-level SCR standard formula modules.

Interplay with the valuation of technical provisions

8.37 Wherever the modular MCR calculation makes a reference to technical provisions volume measures, it should be considered whether the full technical provisions including the risk margin are used as an input or, alternatively, the risk margin is excluded.

8.38 To avoid circularity of the cost-of capital calculation, the SCR standard formula will possibly exclude the risk margin from its inputs. A similar approach in the MCR would then provide better consistency with the standard formula. Therefore it is suggested that the risk margin is excluded from the technical provision inputs of the MCR.

8.39 This approach would also avoid indirect reference to the SCR via the cost-of-capital margin.

AMCR Absolute Minimum Capital Requirement

8.40 As envisaged by the Commission's *Amended Framework for Consultation,* the AMCR is an amount in Euros that serves as an absolute floor to the MCR.

8.41 As a starting point, the existing minimum guarantee fund could be used to calibrate the AMCR.

MCR_{mkt} market risk[129]

8.42 The MCR market risk charge could be calculated by the following simple formula:

$$MCR_{mkt} = (\alpha \bullet EQU) + (\beta \bullet RE) + (\chi \bullet FI)$$

where

EQU = the market value of the overall equity and UCITS exposure

RE = the market value of the property exposure

FI = the market value of fixed income assets

and α, β and *X* are fixed coefficients.

8.43 The calculation would be performed on the basis of the total balance sheet, but assets covering unit-linked liabilities would be excluded.

MCR_{nl} non-life underwriting risk

8.44 For the calculation of the MCR non-life underwriting risk charge, a simplified factor-based formula, aligned to the SCR standard formula non-life premium and reserve risk capital charge could be suggested. However, a component based on the technical provisions might also be included to address situations where the existing requirements do not always provide a good risk proxy.

8.45 The calculation could proceed as follows:

$$MCR_{NL} = \max\left(\sqrt{H_P}; K\right) \cdot \left[\sum_i \alpha_i \cdot P_i\right] + \max\left(\sqrt{H_{PCO}}; K\right) \cdot \left[\sum_i \beta_i \cdot PCO_i\right]$$

where

[129] CEIOPS will further consider whether the simple factor-based formula presented here, taking into account asset-side volume measures, can yield an adequate interplay with the SCR market risk module. An alternative approach, taking into account the asset side, the liability side, and durations, is also under consideration in QIS3. Furthermore, the aggregation of the sub-components in the simple formula; and the treatment of UCITS exposures are further under discussion

PCO_i = the MCRNL technical provision volume measure for QIS3 purposes: total provisions for claims outstanding for line of business i

P_i = Earned premiums in line of business i during the previous year

H_{PCO} and H_P are the Herfindahl indices for claims provisions and premiums, respectively, that serve as a proxy measure for diversification between lines of business:

$$H_{PCO} = \frac{\sum_i PCO_i^2}{\left(\sum_i PCO_i\right)^2};\ H_P = \frac{\sum_i P_i^2}{\left(\sum_i P_i\right)^2}$$

and α_i, β_i and K are fixed coefficients.

MCR_{life} life underwriting risk

8.46 For the calculation of the MCR life underwriting risk charge, a factor-based formula similar to the Solvency I capital charge could be applied.

8.47 The calculation would proceed as follows:

$$MCR_{life} = \sqrt{MCR_{long}^2 + MCR_{mort}^2} + MCR_{UL}$$

where a distinction is made between mortality risk, longevity risk and unit linked contracts.

8.48 The calculation of the sub-components is as follows:

$MCR_{mort} = \rho \cdot CAR$

$MCR_{long} = \eta \cdot TP_{long}$

$MCR_{UL} = \alpha \cdot Exp_{UL}$

where:

TP_{long} = sum of net technical provisions net of any benefits payable on immediate death in respect of contracts which give rise to a financial surplus on immediate death of the insured

CAR = the sum of the net of reinsurance capital at risk in the portfolio i.e. the sum of the amounts currently payable on death less the net of reinsurance technical provision held for each policy that gives rise to a financial strain on immediate death of the insured

Exp_{UL} = Net annual administrative expenses relating to unit linked

business

and ρ, η, α are fixed coefficients.

8.49 The precise definition of the technical provisions that serve as input data may require further clarification before testing under QIS3.

RPS Reduction for profit sharing

8.50 This component reflects the loss reduction potential of future non-guaranteed bonuses. Following the Supplement to CP 20, the modular MCR should reflect in a robust manner the risk absorption properties of future non-guaranteed bonuses included in technical provisions. It should remain an auditable, robust and simple requirement, calculated by means of a factor-based approach.

8.51 The approach specified below does not represent a final position on part of CEIOPS. The calculation assumes that, in the context of the MCR, a risk reduction factor (k-factor) of 100% can be assumed; however, on the other hand, the reduction is capped by a surrender value limit.

8.52 Depending on the treatment of RPS in the SCR, the scope of the reduction could include both life and health insurance business.

8.53 The calculation would proceed as follows:

$$RPS = \sum_i \min\left[\max\left(TP_{wp,i} - TP_{surrender}; 0\right), TP_{benefits,i}\right]$$

where:

$TP_{wp,i}$ = sum of technical provisions for with-profits fund *i;* including the element relating to guaranteed benefits and the element relating to future non-guaranteed bonuses.

$TP_{surrender,i}$ = surrender value of benefits guaranteed under contracts (i.e. excluding any discretionary benefits) for with-profits fund *i*

$TP_{benefits,i}$ = the element of technical provisions relating to future non-guaranteed bonuses for with-profits fund *I*, as calculated within QIS3

8.54 The RPS calculation should be calculated as the sum of the reductions on the different relevant funds of the undertakings.

PART C – ALTERNATIVE, 'COMPACT' PROPOSAL FOR THE MCR

8.55 Some CEIOPS Members are concerned that the 'modular' approach described above will not deliver a clear hierarchy of regulatory requirements (with an associated ladder of supervisory actions), in which – for most insurers – the SCR should be above the MCR. They are also concerned that the specific 'modular' proposal outlined above oversimplifies the relationship between asset and liability risks. These members advocate a 'compact' MCR for development and testing under QIS3.

8.56 It is important to note that other CEIOPS members are strongly opposed to the specific 'compact' proposal suggested, which they consider to be inconsistent with the MCR's role as a safety net and the design criteria set by the Commission's *Amended Framework for Consultation* – in particular, the need for a robust, objective capital requirement. Nevertheless, the analysis supporting the 'compact' approach is presented here to show the full range of views within CEIOPS.

8.57 It is suggested that the MCR needs to play a distinct role from the other elements of Pillar 1. It should be recognised that:

- the **SCR** should address all material, quantifiable risks, thereby providing reasonable assurance to policyholders (on a going concern basis) that losses will be met as they fall due; and

- valuation standards for **technical provisions** (including the risk margin) should mean that there is a reasonable prospect that liabilities will be run-off successfully or transferred to a well-capitalised third party.

8.58 It is important that the MCR does not try simply to duplicate either of these functions. Within the constraints of a 'simple' approach, it could be said that the MCR is not capable of delivering any informational value beyond that achieved when valuing assets and liabilities, or when calculating the SCR. Furthermore, the MCR is a 'safety measure' – it is not intended to interfere with the proper operation of the SCR, which would be difficult to avoid if the two requirements shared similar functions.

8.59 There are, however, some important aspects that neither the SCR nor valuations standards can fully address. These include:

- **timing error:** the risk that the insurer and the supervisor are unable to identify the breach (or potential breach) of a requirement sufficiently quickly in order to successfully execute restorative measures; and

- **other special circumstances:** technical provisions and/or the SCR may be artificially or temporarily low, such as during start-up.

8.60 This suggests the MCR could have the following features:

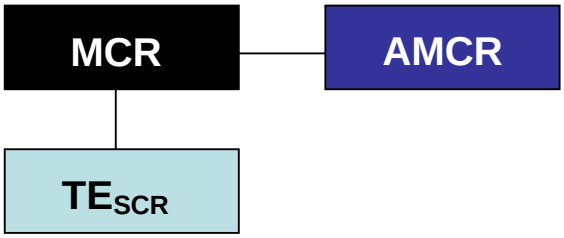
- given that it aims to address aspects that are more judgemental than those covered by the (more complex) SCR and estimation of

technical provisions, the functional form of the MCR should not be over-engineered and should be kept simple, robust and objective. This may include the use of simple loadings for the MCR;

- to retain a degree of sensitivity to the risk profile of an insurer and to ensure the effective operation of the 'supervisory ladder' (CfA 15.31), it should, where possible, draw upon the results of the SCR as last calculated (and technical provisions) so that the 'usual' relationship is SCR > MCR > 0; and
- it should have an absolute floor to provide a minimum safeguard to policyholders in the event that the SCR and technical provisions do not function normally.

Structure

8.61 The following simple structure might be consistent with the considerations presented above:



Composition

8.62 The MCR would use the following modules as input information:

AMCR = Absolute Minimum Capital Requirement (see modular approach)

TE_{SCR} = timing error

8.63 AMCR would be calculated in the same way as the 'modular' approach described earlier in this section. TE_{SCR} is described further below.

1.8.1.1. Calculation

8.64 Under this approach, the MCR would be calculated by the following simple function:

$$MCR = \max\{AMCR; TE_{SCR}\}$$

TE_{SCR} Timing error

8.65 An additional buffer above technical provisions could allow for timing error by means of a simple formula.

8.66 The calculation could proceed as follows:

$$TE_{SCR} = g \bullet SCR_{t-1}$$

where:

SCR_{t-1} = the most recent SCR result calculated by means of the standard formula (by default, the standard formula result at the end of the previous financial year)

g = a pre-specified coefficient with a value less than 1

8.67 Effectively, the approach approximates for possible timing error by applying a simple loading to all other risks. It therefore incorporates the risk sensitivity of the SCR while minimising the burden necessary to calculate the MCR.

8.68 The rationale for using SCR_{t-1} (rather than the current SCR) is to secure the 'auditability' of the MCR. Clearly this is at the expense of accuracy – in particular, this approach is less well suited to cases where, for example an insurer's business is growing rapidly, or the insurer has taken steps to de-risk its business, thereby reducing its current SCR

8.69 Since the ultimate supervisory action may need authorisation by national courts in certain jurisdictions, the definition of the MCR – including interim assessments – should be objective and unambiguous. Under this proposal, to relieve the burden of interim calculations, an interim assessment of the MCR would normally refer to SCR_{t-1} as a reasonable proxy for an insurer's overall risk profile. In certain cases, however, a full interim assessment of the SCR and the MCR would be required:

- when (a part of) an insurance portfolio is transferred; or
- when an insurer reports to the supervisor that it is no longer in breach of the MCR (i.e. it successfully completed its short-term financial plan to restore its MCR).

8.70 Where necessary, supervisors could request further interim MCR calculations on the basis of more up-to-date SCR estimates, or the insurer might choose to report an interim SCR to reflect any de-risking of the business.

8.71 CEIOPS welcomes views from stakeholders on an appropriate initial calibration for g, if this proposal was to be tested under QIS3.

PART D – TRANSITIONAL ARRANGEMENTS

8.72 CEIOPS considered the merits of an approach where the Solvency I required solvency margin (RSM) would serve as a basis for a transitional MCR; either directly, or by way of an interpolation between the RSM and the long-term MCR.

8.73 In QIS2 and after that, CEIOPS made an effort to technically specify, and assess the working of, such a transitional requirement. However, on the final balance, CEIOPS is of the opinion that the supposed benefits of such an approach do not outweigh its difficulties.

8.74 These difficulties include the following:

- The fundamental differences between the two regimes make it difficult to import elements of Solvency I into Solvency II. In particular the RSM and MCR are designed to be compared to different eligible elements, and so are not directly comparable.

- A stable relationship between the RSM and the SCR, or between the RSM and the MCR cannot be expected. Therefore in some cases the transitional requirement may prove too low, while in other cases it could be too high; unless capped at the level of the long-term MCR, it could even lead to an undesirable descending capital requirement.

- Finally some technical difficulties inevitably arise from redefining and recalculating the RSM under the new valuation standards.

8.75 CEIOPS therefore suggests a more direct transition to the MCR, without reference to the RSM in the intervening years. A two to three year-long transitional period could be set, during which those firms who had complied to the Solvency I requirement but did not have sufficient eligible capital to cover the MCR, would be required to gradually reduce the initial MCR shortfall in two or three equal steps.

CEIOPS' Advice

8.76 The MCR is a safety net. The MCR should be an auditable, robust and simple requirement, calculated by means of a factor-based approach.

8.77 There is a trade-off between simplicity and risk-sensitivity and the MCR is to be optimized for simplicity.

8.78 In this context, the MCR should address the main risks that the insurer is exposed to. It should therefore be calculated in a modular approach, which will reflect the main risk modules of the SCR in a simplified way, so as to ensure auditability and robustness.

8.79 Conceptually, it should follow the same one-year time horizon as the SCR, but with a lower level of confidence, e.g. 90%, to reflect the ultimate supervisory intervention in case of its breach. The calibration should be adjusted through further quantitative impact studies taking into account as a benchmark the current Solvency I capital requirement.

8.80 The modular MCR should reflect in a robust manner the risk absorption properties of future non-guaranteed bonuses included in technical provisions as well as any other significant design differences between the MCR and the standard SCR that come to light in QIS testing.

8.81 The MCR should include an absolute minimum floor.

Transitional arrangements

8.82 CEIOPS suggests that a simple transitional rule that would apply to those undertakings that had complied to the Solvency I requirements but did not have sufficient eligible capital to cover the MCR at the entry into force of Solvency II. During a two to three-year long transitional period, these undertakings could be required to gradually reduce the initial MCR shortfall in two or three equal steps.

Safety measures

9.1 This section builds on CEIOPS' answers to the Commission on Call for Advice (CfA) 9 on safety measures. In its response, CEIOPS said:

"CEIOPS suggests a future regulation based on a combination of overall eligibility criteria, or principles, and/or a list of eligible asset classes." (CfA 9.125)

"CEIOPS advises using the current list of eligible asset classes as a starting point." (CfA 9.130)

"One precondition of extending the list with a new asset class is the possibility of a risk charge in the SCR standard formula to address the risks of that class." (CfA 9.131)

9.2 To be eligible, an asset must be both listed as eligible and meet the principles. It is envisaged that the principles would be permanent, whereas the list of eligible asset classes would need to be capable of timely update.

9.3 CEIOPS believes that prescribing the list of eligible assets will not involve double counting but will create a necessary safety net to address risks not covered by the SCR standard formula. In addition, CEIOPS will consider carefully the market developments as well as the improvements of the SCR sub-modules and will timely update the list of eligible asset classes.

9.4 This section does not cover limits on concentrations in covering assets and diversification requirements, as Pillar 2 consultations cover the safety net in terms of additional limits on eligible assets.

Role of safety measures

9.5 CEIOPS has termed the combination of high-level principles, establishing that insurers should manage their assets appropriately, and rules governing assets as a "prudent person plus" approach[130]. CEIOPS prepared further advice on additional limits on assets in its Consultation Paper on safety measures (limits on assets).[131]

9.6 A principles-based approach would give insurers total flexibility to determine how to achieve the set principles. But, in practice, more is needed than the prudent person principle for the following reasons:

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[130] See para. 104 of CEIOPS' Answer to the First Wave of Calls for Advice, available at: http://www.ceiops.org/content/view/14/18/#cp4.

[131] See CEIOPS-CP-05/05 Consultation Paper on safety measures available at: http://www.ceiops.org/content/view/14/18/

- The principle requires judgement so there is a risk that it will be subject to different interpretations. Greater clarity could be provided by adding practical guidance on how the principle should be interpreted.

- Objective and clearly enforceable rules on eligible assets as a safety measure would support the principle, provided that sufficient flexibility is retained to permit the industry to take advantage of new developments,

- The SCR standard formula has limited ability to capture adequately the risks corresponding to the different asset classes.

9.7 Prudent asset and liability management would be supported by risk-sensitive capital requirements. The SCR should be a risk-sensitive capital requirement. Prudent person principles for eligible assets should be consistent with methods for calculating asset risk in the SCR standard formula. However, some risks are too complex to address in a simple and mechanistic way within the context of the SCR standard formula.

Risks not covered by the SCR

9.8 The risks not covered (wholly or partly) by the factor-based SCR in QIS2 include the following:

9.9 **Non-linearity:** The value of derivatives and most forms of reinsurance is not proportional to the value of the underlying assets or the insured liabilities. In the specific case of equity derivatives, the factor-based approach in QIS2 5.53 allowed for this. However, any factor-based approach, as in QIS2 5.53, may provide a misleading measure of the risk. This is because of the great variety of derivatives and the fact that, in practice, some of an insurer's equities will fall further than the general fall in the market and others a lot less.

9.10 **Undertaking-specific risk characteristics of assets (and liabilities) not captured by the SCR:** For example, the factor-based approach in QIS2 5.53 does not allow for the relative riskiness or volatility of the equities held by an insurer. The scenario approach in QIS2 5.54 does so, but the calculation is performed by the insurer. The credit risk treatment described in QIS2 5.72 specification allowed, to some extent, for the relative volatility of the instruments.

9.11 The factor-based approach to premium risk in non-life insurance only partially reflected the undertaking-specific risk profile of its non-life business (which is impacted e.g. by the specific type of products sold, or the sales policy of the undertaking).

9.12 **Complex relationships between different risks:** The most obvious of these is the relationship between non-life underwriting risk and contingent credit risk. The circumstances that cause increased insurance losses and therefore an increase in reinsurance recoveries may make the insolvency of the reinsurer more likely, e.g. it may receive unexpected claims from many of its clients.

9.13 Another example concerns the relationship between underwriting risk and market risk - an inappropriate investment policy may expose certain types of insurer to increased investment losses (from holdings in bonds or equities) at a time of increased claims, if the causes of the claims affect the value of the investments.

9.14 The proposals tested under QIS2 made only limited allowance for these and other such complex interactions, by using the linear correlation technique to aggregate risk capital charges across risks. Within the bounds of this technique, more complex interactions between risks cannot be explicitly addressed except perhaps implicitly through cautious choice of 'correlation' factors. Any allowance made by a more refined SCR formula is unlikely to be more than approximate.[132]

9.15 **Liquidity risk:** For life business, increases in lapse rates will be reflected in the SCR. Also the market risk and credit risk charges will, to some extent, reflect the liquidity of the assets. However, there is no intention to allow explicitly for other aspects of liquidity risk in the SCR.

9.16 **Contagion risk:** The QIS2 SCR formula did not allow for contagion risk within a group, nor the risk that debts from intermediaries (and policyholders) may become increasingly difficult to collect when an insurer is getting into financial difficulty. However, this aspect is under consideration as CEIOPS develops proposals for testing under QIS3.

9.17 **Concentration risk:** This can arise in a number of forms:

- Too much invested in a single asset
- Too much invested in a single company
- Too much invested in a number of companies that may perform similarly: e.g. companies belonging to the same group or where there are other ownership links; companies in the same industry; or companies located in the same country or geographic area. It would be difficult to deal with all concentrations of this type in the SCR.
- Too much invested in a single asset class. The design of the SCR standard formula, with separate submodules and an allowance for diversification, may have an impact on the limits to be applied to investment in a single asset class. The need for limits or other controls would be much reduced if the asset classes considered to pose the highest risk had appropriately high risk charges. The level of granularity in the SCR formula would be relevant.

Development of the SCR post-QIS2 – implications for the use of safety measures

9.18 The SCR can be improved and refined in numerous ways. The version of the standard formula that is eventually implemented may be very different from

[132] The refinement of the SCR standard formula is part of CEIOPS' continuing work.

the formulae used in QIS2. Post implementation, the standard formula may be modified further to reflect changing circumstances or rectify any deficiencies identified. Possible enhancements noted in section 5 of this paper include:

- increased granularity;
- a charge for concentration risk; and
- the incorporation of scenario tests.

9.19 Increased granularity would allow the standard formula to more accurately reflect the risks of the particular portfolio of assets and liabilities of an insurer. Combined with appropriate allowance for diversification, it would allow insurers that have a greater proportion of their assets in risky asset classes to be appropriately penalised.

9.20 A charge for concentration risk in the standard formula is under consideration. This would accumulate the entire exposure (both credit and equity risk) to individual counterparties (and groups) and include a charge if the exposure exceeded a given threshold.

9.21 Scenario tests could be developed within the standard formula to cover more complex situations and so reflect various types of complex relationships - including a number of non-linearities.

9.22 Such enhancements to the SCR might enable CEIOPS to reduce the relative emphasis on safety measures. However, they would not completely address all the risks described earlier in this section. In particular, they are unlikely to address liquidity risk, except indirectly because some of the more illiquid asset subclasses are likely to attract higher charges.

Eligible assets covering technical provisions, the MCR and the SCR

9.23 CfA 9.123 states that in principle the same eligibility criteria and the same classes of eligible assets should be applied for the coverage of technical provisions, the MCR and the SCR unless filed testing showed that availability of eligible cover for the capital requirements would cause a difficulty.

9.24 The eligibility criteria outlined in this section apply for assets covering technical provisions, the MCR and the SCR. At any time, a sufficient amount of eligible assets should be available to cover all these liability components. CEIOPS considers that these eligibility criteria should also apply to other liabilities that, in case of insolvency, rank ahead of policyholder obligations.

9.25 However it is not envisaged that Solvency II should restrict the assets backing unit-linked liabilities. They should be invested in accordance with contractual obligations.

9.26 CEIOPS has considered whether any non-eligible assets that might become a liability may need a safety net. Examples would include derivatives, e.g. an interest rate swap whose purpose is neither to reduce risk nor efficient

portfolio management, but is not counted as part of the assets covering the SCR, MCR and technical provisions. Where an insurer does not have adequate systems and controls to manage the risks of such assets, particularly derivatives, they may cause material loss to the insurer. It is therefore necessary to address these risks through the supervisory system. This can be done through a combination of:

- monitoring by the supervisor of the use of assets that might become liabilities (whether or not they are admissible assets) with supervisory intervention when necessary to protect policyholders;[133] and

- scenario tests included within the SCR.

9.27 The issue of whether safety measures should be applied equally to direct insurers and reinsurers is not addressed in this paper.

9.28 In line with the advice in CfA 9.124, CEIOPS suggests applying in principle the same eligibility criteria and the same classes of eligible assets, regardless of whether the standard SCR formula or an internal model is used.

9.29 However, if a particular approved internal model (partial or full) is considered by the supervisor as adequate to capture additional type of risks, extensions to the eligible assets can be allowed by the supervisor on a case-by-case basis, reflecting the improvement on the risks captured by the internal model. In any case, the "approved" assets have to meet the general principles.

9.30 CfA 9.125 states that a combination of overall eligibility criteria, or principles, and a list of eligible asset classes should be adopted. In a combined approach, to be eligible, an asset must be both listed as eligible and meet the principles.

9.31 CEIOPS envisages that the principles would be permanent, whereas the list of eligible asset classes would need to be capable of timely update.

9.32 Principles should be enduring. If something needs amendment to deal with changing circumstances or to reflect improved knowledge, it is not a principle. On the other hand, detailed rules will need to be changed from time to time to reflect new instruments and changes to market practice. It is therefore appropriate that the detailed rules should be capable of being updated regularly. These detailed rules will include the list of eligible assets and may include other rules that augment and expand on the principles.

9.33 Both supervisors and insurers are likely to want guidance. Insurers may seek comfort that their interpretation of the principle is correct, so that they can minimise the risk that they will be penalised for breaching the principle. Supervisors may seek guidance so that they know what it is they are meant

[133] The scope of the monitoring and the appropriate use of supervisory powers will be addressed in later consultation

to do. As well as providing greater clarity, guidance expanding on the principle may make it easier to monitor compliance with the principle.

9.34 Any guidance will need to encourage insurers to manage their assets on a prudent basis so as to protect policyholders. It needs to allow insurers as many sensible options as possible, within the competence of their management, to diversify their investments.

Criteria or principles for eligible assets

9.35 In its second wave answers, CEIOPS listed the following principles for asset eligibility as a starting point for further elaboration:

- *"an asset portfolio is acceptable only if and to the extent that the assets can be realised before the liabilities need to be met. That is, the assets covering the technical provisions and the capital requirement should be able to generate an expected net cash flow (asset income less liability outgo) that is always positive;*[134]
- *"in order for an asset to be admissible its value needs to be ascertainable; and*
- *"intangibles should be excluded."* (CfA 9.128)

9.36 However, CEIOPS stated that it will need to consider the practicability of these principles and whether additional requirements would be necessary. Suggestions for additional requirements are presented below.

9.37 **Suitability to cover liabilities and capital resources:** Article 22 of the Life Assurance Directive[135] states that:

"The assets covering the technical provisions shall take account of the type of business carried on by an assurance undertaking in such a way as to secure the safety, yield and marketability of its investments, which the undertaking shall ensure are diversified and adequately spread."

9.38 In the light of this Article, the suitability criterion requires the nature of covering assets to be matched to the nature of the liabilities from a variety of perspectives, including duration, currency and liquidity. In particular, the balance between risk and expected investment yield should be in accordance with treating policyholders fairly, having regard to the information given to them and their characteristics. For example, equities may be suitable assets to cover a significant proportion of with-profits liabilities, whereas a different choice of assets would be more suitable to cover liabilities that do not participate in profits.

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[134] Liquidity needs to be considered in stressed conditions and to take account of losses that might arise through the forced sale of volatile or illiquid assets.

[135] Directive 2002/83/EC concerning life assurance ("Life assurance directive")

9.39 **Economic nature over legal form:** The economic nature of an asset is more relevant than its legal form in terms of its suitability to back liabilities or capital resources. Eligibility criteria covering a particular category of assets should relate to assets with the economic characteristics of that category regardless of their legal form.

9.40 **Risk-reducing and/or efficient portfolio management:** Eligibility criteria should permit assets that contribute to a reduction of risk (arising from assets or liabilities) or facilitate efficient portfolio management, for example, derivatives. Given the nature of derivatives, it is for consideration whether they should only be eligible assets if the counterparty is of adequate standing.

Utility to the business as a going concern or in run-off: The utility of assets to the business is especially relevant for assets used in the insurance business, such as buildings owned and occupied by the insurer, furniture and fittings, and office equipment. If the insurer ceases writing new business, these assets may not be realisable for the amount shown in the balance sheet.

9.41 **Transparency:** The insurer should have a good understanding of the nature and the risks associated with its assets and hold sufficient capital to cover those risks. This criterion applies especially to riskier types of assets, such as hedge funds and private equity. Concerning collective investment schemes, their eligibility is directly linked to the eligibility of the underlying assets. To the extent that these underlying assets are eligible, then the collective holding should be eligible. If a collective investment scheme invests in ineligible assets then (possibly subject to *de minimis* criteria) the part of the value attributable to those assets should not be eligible.

List of eligible assets

9.42 In line with CEIOPS' advice (CfA 9.130), the assets permitted by Article 23 of the Life Assurance Directive (and the corresponding Article 21 of the Third Non-life Directive[136]) have been taken as a starting point. However, CEIOPS also considered whether any changes to the list should be made. Any extension to the list will only be made if there can be an appropriate risk charge in the SCR standard formula and the principles for asset eligibility are met.

Extending the current list with additional asset types

9.43 The only changes that have been suggested by CEIOPS members are the following extensions to the list:

- **Loans:** could the restrictions in article 23.3(iii) of the Life Assurance Directive be removed?

[136] Directive 92/49/EEC on the coordination of laws, regulations and administrative provisions relating to direct insurance other than life assurance ("Third Non-life Directive").

- **Derivative instruments:** article 23.3(iv) of the Life Assurance Directive restricts them so that they may be used insofar as they contribute to a reduction of investment risk or facilitate efficient portfolio management. It is not obvious why they may not also be used to reduce risk other than investment risk. For instance, weather derivatives may be used to hedge weather related risks and derivatives on population mortality have been proposed to hedge longevity risk.

- **Transferable securities:** could the restrictions in article 23.3(v) of the Life Assurance Directive relating to securities not dealt in on regulated market be removed?

- **Debts:** could the list be extended to cover all debts and can the restrictions in article 23.3(vii) relating to debts from policyholders and intermediaries be removed?

9.44 It has been suggested that the restrictions on loans, transferable securities and debts are unnecessary in a risk-based system. The additional risks associated with these assets can be reflected in a higher credit or market risk charge. In addition, there is a need for insurers with such assets to have adequate systems to manage them. However, it has also been noted that these items are, for the most part, illiquid and the future SCR standard formula would probably not take full account of the liquidity risk; accordingly it is argued that this illiquidity justifies maintaining restrictions on these assets.

9.45 On the other hand, it is not clear that such restrictions would materially reduce the risk that insurers will not manage their liquidity risk properly given that Pillar 2 measures will address this risk. There is also the possibility that they might adversely affect a material number of insurers who do properly manage their risks.

9.46 In relation to derivatives, the proposed extension relates only to the situation where there is a reduction in risk. Where risk is being reduced by holding a derivative, there is no need for any additional risk charge. However, if the SCR is reduced on account of the derivative, the reduction should take into account any basis risk. This would include an appropriate credit risk charge for the exposure to the counterparty.

9.47 CEIOPS favours extending the current list of eligible assets to include derivative instruments where these reduce risk other than investment risk. Therefore, derivative instruments may be used insofar as they contribute to a reduction of risks or facilitate efficient portfolio management However, on balance, CEIOPS does not consider that sufficient reason has been given to amend the existing restrictions on loans, transferable securities and debts.

Ineligible assets

9.48 CEIOPS advises that the list of eligible assets should be mainly positive, therefore, an asset that does not fit into one of the listed asset classes is automatically ineligible.

9.49 As per CfA 9.128, intangibles are excluded. For example, goodwill arising from the insurer's own business is inappropriate because it is likely to be lost in stressed circumstances. Another example would be intellectual property, such as patents, trademarks and copyrights, as their value can be very volatile; protection of their value is expensive; and liabilities could arise if, say, a patent is found to be invalid and damages may be payable.

9.50 Other assets, such as fine art and commodities are not included in the current list and so are ineligible. It is noted that any expected income would arise purely from changes in market value unrelated to any activity designed to increase value.

CEIOPS' ADVICE

Role of safety measures

Principles for eligible assets and a list of eligible asset classes

9.51 To be eligible, an asset must be both listed as eligible and meet the principles. Principles should be permanent, whereas the list of eligible asset classes should be capable of timely update.

9.52 CEIOPS believes that prescribing the list of eligible assets will not involve double counting but will create a necessary safety net to address risks not covered by the SCR standard formula. In addition, CEIOPS will consider carefully the market developments as well as the improvements of the SCR sub-modules and will timely update the list of eligible asset classes

Possible enhancements to the SCR

9.53 CEIOPS advises reducing the relative emphasis on safety measures where the SCR standard formula, as it is developed after QIS2, is improved and refined to capture or to capture more adequately risks corresponding to different asset classes. Possible enhancements include:

- increased granularity;
- a charge for concentration risk; and
- the incorporation of scenario tests.

Such enhancements would not address all risks and reliance on safety measures would still be necessary. There would also still be a role for Pillar 2 and Pillar 3 measures.

Eligible assets covering technical provisions, the MCR and the SCR

9.54 The same eligibility criteria and the same classes of eligible assets should be applied for the coverage of technical provisions, the MCR and the SCR.

9.55 In line with the advice in CfA 9.124, CEIOPS suggests applying in principle the same eligibility criteria and the same classes of eligible assets, regardless of whether the standard SCR formula or an internal model is

used.

9.56 However, if a particular approved internal model (partial or full) is considered by the supervisor as adequate to capture additional type of risks, extensions to the eligible assets can be allowed by the supervisor on a case-by-case basis, reflecting the improvement on the risks captured by the internal model. In any case, the "approved" assets have to meet the general principles.

9.57 The eligibility criteria outlined in this section applies for assets covering technical provisions, the MCR and the SCR. At any time, a sufficient amount of eligible assets should be available to cover all these liability components. CEIOPS considers that these eligibility criteria should also apply to other liabilities that, in case of insolvency, rank ahead of policyholder obligations.

9.58 Assets backing unit-linked liabilities should not be restricted - they should be invested in accordance with contractual obligations.

Additional safety net in excess of the SCR, MCR and technical provisions

9.59 The risks of assets that might become liabilities need to be addressed through the supervisory system. This can be done through a combination of:

- monitoring the use of such assets (whether or not they are eligible assets) with supervisory intervention when necessary; and
- scenario tests included within the SCR.

Criteria or principles for eligible assets

9.60 Further to the advice in CfA 9.128, liquidity needs to be considered in stressed conditions and to take account of losses that might arise through the forced sale of volatile or illiquid assets.

9.61 CEIOPS also suggests the following additional criteria or principles for asset eligibility:

- Assets should be suitable to cover liabilities and capital resources, such that covering assets are matched to the nature of the liabilities;
- The economic nature of an asset is more relevant than its legal form in terms of its suitability to back liabilities and capital resources. Assets with the economic characteristics of an eligible asset class should be eligible regardless of their legal form;
- Assets that contribute to a reduction of risk or facilitate efficient portfolio management should be permitted;
- Assets used in the insurance business should be eligible.
- The insurer needs to know enough about its investments to understand the risks associated with them. Transparency applies especially but not only to collective investment schemes. To the

extent that the underlying assets are eligible, then the collective holding should be eligible.

List of eligible assets

9.62 Further to its advice in CfA 9.130 and 9.132, CEIOPS favours extending the current list of eligible assets to include derivative instruments where these reduce risk other than investment risk. Therefore, derivative instruments may be used insofar as they contribute to a reduction of risks or facilitate efficient portfolio management.

9.63 On balance, CEIOPS does not consider that sufficient reason has been given to amend the existing restrictions on loans, transferable securities and debts.

Ineligible assets

9.64 At this stage CEIOPS has not discussed the merits of commodities as part of the cover of liabilities and capital requirements in line with a diversified investment policy.

Section 10

Special treatments

10.1 CEIOPS has been recently called to deal with a number of requests for special treatments related to special undertakings and/or special types of business put forward by CEIOPS Members as well as stakeholders.

10.2 As the inclusion of special treatments in the standard formula has clear implications for harmonisation and further requests could be expected a general solution needs to be found.

10.3 It is suggested that a distinction needs to be made between:

- cases which could potentially influence more than one market across Europe; and
- cases that are specific to one single market and only impact on that specific market.

10.4 At this stage, harmonization and simplicity of the standard formula should be given priority. As a consequence, cases that are specific to one single market should be dealt with via a Pillar II add-on or the use of a partial or full internal model rather than in the standard formula.

10.5 In the following, theThis analysis is restricted to cases which could potentially influence more than one market and is divided into two parts:

- a description of how **special types of undertaking** might apply Pillar 1 standards; and
- consideration of **special types of business** that do not fit neatly into the general structure for the treatment of underwriting risk discussed in section 5.

PART A – SPECIAL UNDERTAKINGS

Reinsurers

10.6 In responding to previous Calls for Advice from the Commission, CEIOPS has adopted the general approach that:

"…the term 'insurance undertaking' [includes] direct insurance undertakings and reinsurance undertakings, both life and non-life. However, the

specificities of different types of insurance business are reflected in the answers where appropriate."[137]

10.7 The same broad approach has been adopted in this paper – so, in general, all potential requirements relating to direct insurance business apply equally to reinsurance business,[138] including the SCR standard formula.

10.8 Application of the standard formula to reinsurance business might prove problematic. By comparison, the Swiss Solvency Test (SST) explicitly rejects this approach:

"For reinsurers, no standard model will be developed. Rather, reinsurers have to develop internal models calculating the target capital. The internal models have to follow the methodology of the SST and they will need to be embedded in an appropriate risk management framework."

"The reason that no standard model will be supplied for reinsurers lies in the fact that given the divergent nature of business written by different reinsurers, a standard model would be unduly complicated if it were to capture the risk correctly."[139]

10.9 The current directives refer to 'reinsurance business' rather the 'reinsurers,' reflecting the fact that insurers can write both direct and reinsurance business. This is consistent with the general design of the standard formula using different risks as building blocks, independent of the 'type' of undertaking that is exposed to those risks. But leaving this difference aside, application of the Swiss approach in the Solvency II context would mean that reinsurers would be required automatically to use an SCR internal model. By contrast, a direct insurer would need to apply to use an internal model to calculate its SCR – and would need to continue using the standard formula if approval was not forthcoming (CfA 11.83). The supervisor should have the ability to reject an application if the 'use test,' 'statistical quality test' or 'calibration test' are not met. But these tests would have no meaning if the only possible outcome is acceptance of the model (because there is no other way of calculating the SCR), hence the quality of SCRs generated by models could vary significantly depending on the 'type' of undertaking that made the application.

10.10 CEIOPS also notes that 'reinsurance' is not an homogenous type of business. For example, it would be difficult to assert that proportional reinsurance cannot be addressed by the standard formula. But doubtless there would also be examples of non-proportional reinsurance with relatively simple terms that could also be treated under the standard formula. Drawing an unambiguous dividing line between cases where the standard formula could and could not be used would not be a straightforward task.

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137 Para. 9 in the introduction to the second wave answers

138 One possible exception is the application of safety measures to reinsurers, which will be addressed in separate consultation

139 Swiss Federal Office of Private Insurance (2004) – *White Paper of the Swiss Solvency Test*

10.11 Although CEIOPS recognises that the supervisory benefits of internal model recognition are likely to be significant in the case of reinsurance undertakings (CfA 11.10), there does not seem to be adequate justification for exempting reinsurers from the full requirements for model recognition. In the absence of a successful application to use an SCR internal model, the standard formula remains the default approach to the SCR for all undertakings.

Small undertakings

10.12 CEIOPS continues to believe that:

"…principles can be applied in different ways to achieve an equivalent standard of policyholder protection. There is a cost-benefit decision regarding the complexity of regulation versus the risk-sensitivity of requirements. The Directive might offer simplified requirements in order to reduce the systems cost associated with compliance, provided that the simplification does not result in a lower level of prudence. CEIOPS expects that simplified treatments will be of particular interest to smaller undertakings." (CfA 23.42)

Technical provisions

10.13 When responding to CfA 23, CEIOPS also expressed the following in respect of technical provisions:

"The calculation of technical provisions to a given confidence level will be technically challenging for all insurance undertakings. For insurers with less complex risk profiles, CEIOPS should work with the industry and the actuarial profession to publish guidance on relevant methods. However, an insurance undertaking should remain responsible for selecting the most appropriate method."

10.14 CEIOPS is especially encouraged by the efforts of the Groupe Consultatif and national actuarial associations to consider possible (local) proxy methods for use where data and/or expertise are particular constraints. CEIOPS would welcome continued cooperation with these bodies as Solvency II develops towards the implementation stage.

SCR

10.15 In response to CfA 23, CEIOPS established that:

"In principle… there is a good case for requiring all undertakings (within the scope of the Directive) to calculate the SCR, without any adaptations. The implications of this will become clearer as the SCR standard formula is developed. It is important that QIS captures any practical difficulties that might be encountered specifically by insurers with less complex risk profiles." (CfA 23.44)

10.16 The practicalities of the standard formula will continue to be a focus for QIS3, although it is too early to conclude whether further adaptations to the formula will be necessary to take account of less complex insurers.

MCR

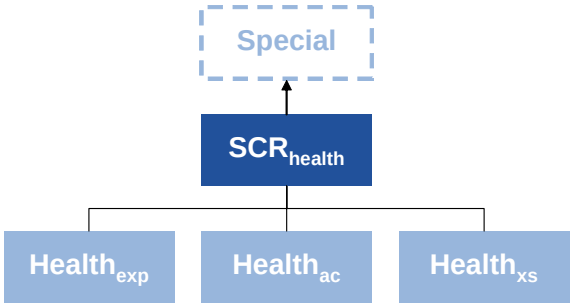
10.17 Because it is the trigger for ultimate supervisory action, CEIOPS continues to believe that the MCR calculation should be the same for all undertakings. (CfA 23.48)

PART B – SPECIAL TYPES OF BUSINESS

SCR_{health} health insurance

10.18 Health underwriting risk is the risk arising from the underwriting of health insurance contracts, associated with both the perils covered and the processes followed in the conduct of the business. It concerns health insurance that is practised on a similar technical basis to that of life assurance.[140]

10.19 The following structure is envisaged, which reflects the proposals tested under QIS2:



10.20 SCR_{health} uses the results of the following modules as input information:

$Health_{exp}$ = Expense risk

$Health_{xs}$ = Excessive loss/mortality/cancellation risk

$Health_{ac}$ = Epidemic/accumulation risk

10.21 In QIS2, SCR_{health} was combined with the results of the other risk modules assuming the following relationships:

CorrSCR	SCR_{mkt}	SCR_{cred}	SCR_{life}	SCR_{nl}	SCR_{health}	SCR_{op}
SCR_{health}	ML	ML	ML	L	1	ML

Experience from QIS2

[140] Health insurance within the meaning of Article 16a (4) of Directive 73/239/EEC (as amended by Directive 2002/13/EC)

10.22 Under QIS2, the capital requirements for expense risk, excessive loss risk and epidemic/accumulation risk were combined using a correlation matrix CorrHealth as follows:

CorrHealth	$Health_{exp}$	$Health_{xs}$	$Health_{ac}$
$Health_{exp}$	1	0.5	1
$Health_{xs}$	0.5	1	1
$Health_{ac}$	1	1	1

10.23 For expense risk, as well as for excessive loss risk, an expected result for these risks was considered. Since the correlation matrix should only apply to the 'volatility-related' parts of the risks, the following aggregation formula was used to derive the overall charge for health underwriting risk:

$$SCR_{health} = \max\left\{0;\ \sqrt{\left[\begin{array}{l}(health_{\exp} + e_{h\exp})^2 + (health_{xs} + e_{hxs})^2 \\ + (health_{\exp} + e_{h\exp}) \bullet (health_{xs} + e_{hxs})\end{array}\right]} + health_{ac} - \left(e_{h\exp} + e_{hxs}\right)\right\}$$

where:

e_{hexp} = Expected result in health expense risk

e_{hxs} = Expected result in health excessive loss/mortality/cancellation risk

and all other terms are as defined previously.

$Health_{exp}$ expense risk

10.24 Expense risk arises if the expenses anticipated in the pricing of a product are insufficient to cover the actual costs occurring in the accounting year. All cost items of private health insurers have to be taken into account.

Experience from QIS2

10.25 Under QIS2, the capital requirement for expense risk was determined using a factor-based approach as follows:

$$health_{\exp} = 2.58 \bullet \sigma_{\exp} \bullet gp_{ay} - e_{h\exp}$$

where

$$e_{h\exp} = \mu_{h\exp} \bullet gp_{ay}$$

and where

σ_{exp} = the standard deviation of the expense result over the previous ten-year period

gp_{ay} = gross premium earned for the accounting year

μ_{hexp} = the mean value of the expense result in the last three financial years

and all other terms are as defined previously.

10.26 This modelling approach was generally supported by the QIS2 participants. However, concerns were raised with respect to the following two points:

- CEIOPS did not specify how the capital charge should be derived in cases where the expense results from the preceding 10 years would not be available; and
- the treatment of expense risk should be confined to the 'volatility-related' part of this risk, whereas the expected result should be used as a 'top-level' adjustment to the SCR (see above).

Further development

10.27 CEIOPS suggests confining the treatment of expense risk to the assessment of excess losses. This would lead to the following simplified formula for determining the capital charge for expense risk (notation as above):

$$health_{exp} = 2.58 \bullet \sigma_{exp} \bullet gp_{ay}$$

10.28 The expected result concerning expense risk should be used as a 'top-level' adjustment to the SCR.

10.29 For QIS3, CEIOPS should develop a specification of how this capital charge should be determined in cases where the expense results from the preceding 10 years would not be available.

$Health_{xs}$ excessive loss / mortality / cancellation risk

10.30 This risk covers:

- **excessive loss risk** or per capita loss risk arising when actual per capita loss is greater than the loss assumed in the pricing of the product;
- **mortality risk** arising when the actual funds from provisions for increasing age becoming available due to death are lower than those assumed in the pricing of the product; and
- **cancellation risk** arising when the actual funds from provisions for increasing age becoming available due to cancellations are lower than those assumed in the pricing of the product.

Experience from QIS2

10.31 Under QIS2, the capital requirement for this risk was determined using a factor-based approach as follows:

$$health_{xs} = 2.58 \bullet \sigma_{xs} \bullet gp_{ay} - e_{hxs}$$

where

σ_{xs} = the standard deviation of the $health_{xs}$ result over the previous ten-year period

μ_{hexp} = the mean value of the $health_{xs}$ result in the last three financial years

and all other terms are as defined previously.

10.32 This modelling approach was generally supported by the QIS2 participants. However, concerns were raised with respect to the following two points:

- CEIOPS did not specify how the capital charge should be derived in cases where the $health_{xs}$ results from the preceding 10 years would not be available; and
- the treatment of this risk should be confined to the 'volatility-related' part of this risk, whereas the expected result should be used as a 'top-level' adjustment to the SCR (see above).

Further development

10.33 CEIOPS suggests confining the treatment of excessive loss/mortality/cancellation risk to the assessment of excess losses. This would lead to the following simplified formula for determining the capital charge for this risk (notation as above):

$$health_{xs} = 2.58 \bullet \sigma_{xs} \bullet gp_{ay}$$

10.34 The expected result concerning excessive loss/mortality/cancellation risk should be used as a "top-level" adjustment to the SCR.

10.35 For QIS3, CEIOPS should develop a specification of how this capital charge should be determined in cases where the $Health_{xs}$ results from the preceding 10 years would not be available.

$Health_{ac}$ epidemic / accumulation risk

10.36 Epidemic/accumulation risk concerns the risks arising from the outbreaks of major epidemics (e.g., a severe outbreak of influenza). Such events typically also lead to accumulation risks, since the usual assumption of independence among persons would be nullified.

Experience from QIS2

10.37 Under QIS2, the capital requirement for this risk was determined using a factor-based "market-share" approach as follows:

$$health_{ac} = claims_{ay} \bullet 0.01 \bullet \frac{gp_{ay}}{mgp_{ay}},$$

where

$claims_{ay}$ = claims expenditure for the accounting year

mgp_{ay} = total gross premium earned for the accounting year in the health insurance market

and all other terms are as defined previously.

10.38 This modelling approach was generally supported by the QIS2 participants. However, concerns were raised whether the 1% risk factor would not be too low, considering e.g. the prospect of a bird flu epidemic.

Further development

10.39 For QIS3, the current approach used under QIS2 should be upheld. However, CEIOPS should consider whether the 1% risk factor should be re-calibrated considering the potential for future epidemics.

CEIOPS' Advice

General issues

10.40 CEIOPS proposes that, at this stage, harmonization and simplicity of the standard formula should be given priority. As a consequence, cases that are specific to one single market should be dealt with via a Pillar II add-on or the use of a partial or full internal model rather than in the standard formula.

10.41 If CEIOPS identifies cases which influence more than one market across Europe, it will recommend an appropriate integration into the formula, by using a Level 2 procedure.

SCR_{health} health underwriting risk

10.42 CEIOPS recommends the inclusion of an explicit requirement for health underwriting risk under the standard formula. This should refer to health insurance that is practised on a similar technical basis to that of life assurance. [141] SCR_{health} should produce capital requirements sufficient (consistent with the objectives of the SCR) to sustain losses arising from health insurance underwriting risk that could occur during the next year.

10.43 Health insurance underwriting risk is defined is the risk arising from the underwriting of health insurance contracts, associated with both the perils

[141] Health insurance within the meaning of Article 16a (4) of the EU-directive 73/239/EEC (as amended by EU-directive 2002/13/EC)

covered and the processes followed in the conduct of the business.

10.44 SCR_{health} should be calculated using linear correlation techniques which combine the capital requirements for

- expense risk;
- excessive loss/mortality/cancellation risk;
- epidemic/accumulation risk.

$Health_{exp}$ expense risk

10.45 CEIOPS recommends the inclusion of an explicit requirement for expense risk under the standard formula. $Health_{exp}$ should produce capital requirements sufficient (consistent with the objectives of the SCR) to sustain losses that could occur during the next year because of expense risk.

10.46 Expense risk is defined as the risk that expenses anticipated in the pricing of a product are insufficient to cover the actual costs accruing in the accounting year. All cost items of private health insurers have to be taken into account.

10.47 $Health_{exp}$ should be calculated by means of a factor-based approach that is based on an estimation of the standard deviation of the undertaking's expense result.

$Health_{xs}$ excessive loss / mortality / cancellation risk

10.48 CEIOPS recommends the inclusion of an explicit requirement for excessive loss/mortality/cancellation risk under the standard formula. $Health_{xs}$ should produce capital requirements sufficient (consistent with the objectives of the SCR) to sustain losses that could occur during the next year because of excessive loss/mortality/cancellation risk.

10.49 This risk covers:

- excessive loss risk or per capita loss risk arising when actual per capita loss is greater than the loss assumed in the pricing of the product;
- mortality risk arising when the actual funds from provisions for increasing age becoming available due to death are lower than those assumed in the pricing of the product; and
- cancellation risk arising when the actual funds from provisions for increasing age becoming available due to cancellations are lower than those assumed in the pricing of the product.

10.50 $Health_{xs}$ should be calculated by means of a factor-based approach that is based on an estimation of the standard deviation of the undertaking's $Health_{xs}$ result.

Health$_{ac}$ epidemic/accumulation risk

10.51 CEIOPS recommends the inclusion of an explicit requirement for epidemic/accumulation risk under the standard formula. Health$_{ac}$ should produce capital requirements sufficient (consistent with the objectives of the SCR) to sustain losses that could occur during the next year because of epidemic/accumulation risk.

10.52 Epidemic/accumulation risk concerns the risks arising from the outbreaks of major epidemics (e.g., a severe outbreak of influenza). Such events typically also lead to accumulation risks, since the usual assumption of independence among persons would be nullified.

10.53 Health$_{ac}$ should be calculated by means of a factor-based 'market share' approach.

Annex A: alternative proposal for an integrated approach to life insurance activities under the standard SCR

Introduction

A1 Insurers should have in place *"…effective procedures for monitoring and managing their asset/liability positions to ensure that their assets and investments activities are appropriate to their liability and risk profile and their solvency positions."*[142] *"For most of insurers, the objective of ALM is not to eliminate risk. Rather, it is to manage risks within a framework that includes self imposed limits as to the type and magnitude of the risks assumed and the adequacy of capital."*[143] Many other references meet on the close relationship among ALM – risk – solvency position.

A2 In fact ALM has become an essential tool to manage properly life insurance activities, in such a way that insurers devote intensive efforts to develop adequate 'asset liability management' (ALM) actions. Due its importance, ALM becomes a necessary reference to measure the risk an insurer is bearing, and therefore to assess its solvency requirements.

A3 The main difficulty to include in the standard SCR the impact of assets-liabilities mismatches comes from the close relationship among all the factors influencing on this issue (mainly, interest rates –which directly influence lapse rates, expenses, etc-, biometric assumptions and, for certain products, other market or financial variables than interest risk).

A4 Experience shows that apparently similar life insurance products (i.e. annuities), demonstrate quite different behaviours to changes in the assumptions involved, and therefore quite different risk profiles. In fact, it is not possible to find a direct formula that may offer a reliable assessment of ALM effects according to the specific characteristics of each life insurance portfolio.

A5 Following the previous rationale and based on widely applied market practices, some supervisors suggest quantifying the SCR associated to life insurance activities using an integrated approach, quite similar conceptually to the stress test used in some financial activities, and aligned with IAIS guidance on this issue.

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[142] Requirement I, IAIS (2006) – *Supervisory Standard on ALM,* 31 May draft

[143] Para. 9, IAIS (2006) – *Supervisory Standard on ALM,* 31 May draft

A6 Within this approach, SCR associated to non-life activities and other risks, different than risks generated in life insurance business, are assessed in the same way as in the full modular approach. This includes technical risks (as non-life underwriting risk), market and credit risks (associated to assets and credits assigned to other activities, different than life insurance) and the related operational risk.

A7 However, SCR associated to life insurance activities would be calculated through a twofold step:

- The **first step** assesses the SCR resulting from specific ALM position of each insurer,
- The **second step** introduces an additional consideration for other risks not included in the previous step (default, concentration and cat risks).

A8 This integrated approach bases as a previous starting point (as modular approach) on the obvious assumption that insurers have calculated the value of their technical provisions.

A9 For life insurance products, this assumption means that each insurer will know the assumptions used as 'best estimate' (mortality tables and other biometric values, lapse rates, future expenses, future participation features, etc) and the associated 'risk margin.'

A10 In the same line, both the modular and integrated approach assumes that each insurer is able to obtain the market value, (or market-consistent model value) of its assets.

First step: SCR resulting from the specific ALM position of each insurer

A11 First step of integrated approach assesses the standard SCR associated to ALM position of each insurer using a scenario technique, in such a way that impacts of all assumptions that may have significant influence in the value of technical provisions and assets, are considered simultaneously.

A12 This scenario technique is widely spread under different names (resilience test, what if tests, stress test, sensitivity test, etc.) and a diversity of features (deterministic - stochastic, financial – holistic, insurance – financial, etc). In fact, IAIS released in October 2003 a guidance recommending the appropriate use of these techniques, UK uses a certain class of this technique as part of its new solvency regulations, European Embedded Value principles recommends, for completion, its use, France requires its insurance entities to include a complete set of scenario analysis as part of their supervisory returns, and eventually the draft recently released by IAIS on enhanced disclosure of life insurance activities (May 2006) includes this type of information. It is not needed to extend on the wide use of these techniques and the generally accepted worthiness of the outputs they offer, as a main piece of information to illuminate the risks surrounding the actual estimates of technical provisions.

A13 The starting point of this approach is the net amount ($\boldsymbol{Life\_Net_0}$) resulting from comparing:

- $\boldsymbol{Life\_AssetV_0}$**:** the supervisory value[144] of all assets covering life insurance technical provisions; less
- $\boldsymbol{Life\_TPV_0}$**:** the supervisory value of life insurance technical provisions.

A14 Four new valuations of assets and technical provisions of life insurance activities would be developed, using the same methodology and procedures of calculation as in the original or supervisory values, but applying four different sets of assumptions. Thus, four comparisons with the original net value are possible:

- $\boldsymbol{Life\_Net_0 - Life\_Net_{esc1}}$
- $\boldsymbol{Life\_Net_0 - Life\_Net_{esc2}}$
- $\boldsymbol{Life\_Net_0 - Life\_Net_{esc3}}$
- $\boldsymbol{Life\_Net_0 - Life\_Net_{esc4}}$

The highest difference (above 0) is taken as the SCR associated with the insurer's ALM position in respect of life business.

A15 The four scenarios above mentioned are structured as the full combination of two scenarios regarding biometric assumptions and two scenarios relating financial assumptions. These assumptions are built on the following rationale:

- **Scenarios for biometric assumptions:** Firstly it is assumed an improvement of longevity expectations above assumptions used as 'best estimate' when calculating original technical provisions ($\boldsymbol{Life\_TPV_0}$). Assumptions on mortality vary in the opposite way. Second set of biometric scenarios assumes an increase in mortality rates above assumptions used as 'best estimate', and a correspondent decrease in longevity expectations. Assumptions on morbidity and disability foresee a consistent development with those used as 'best estimate' for both scenarios, based on medical considerations, market expectances or any other objective evidence.
- One significant feature of biometric scenarios is that changes in biometric rates may be scaled in three different levels, corresponding three groups of sizes of life insurance portfolios, thus reflecting the well-known feature that larger portfolios have a more stable biometric behaviour.

[144] In this annex the expression 'supervisory value' of assets and technical provisions refers to the values obtained according the methodology detailed in the 'Valuation standards' section of this Consultation Paper.

- It is considered that changes in biometric assumptions are independent of changes in financial assumptions, (then, excluding catastrophic scenarios, where both of them tend to interact).

- **Scenarios for financial assumptions:** One set of them assumes an increase in interest rates, and then derives the economic consistent movements in the variables clearly correlated with interest rates (lapse rates, expenses). Besides, additional assumptions on equity, credit spreads, property prices and currencies are also considered. The other scenario reflects a reduction of interest rates and its economic consistent changes in lapse rates, expenses… Also movements in equity, credit spreads, property prices and currencies are considered.

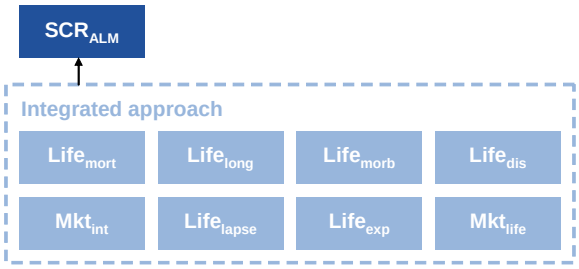
A16 A combination of two described biometric scenarios and two financial scenarios produces the four new sets of assumptions to re-calculate technical provisions and assets (see below for a more detailed description).

Assumptions		Scenario 1	Scenario 2	Scenario 3	Scenario 4
Biometric	Mortality	Increase	Increase	Decrease	Decrease
	Longevity	Decrease	Decrease	Increase	Increase
	Morbidity	Consistent changes according to medical/market exp.			
	Disability	Consistent changes according to medical/market exp.			
Financial	Interest rate	Increase	Decrease	Increase	Decrease
	Lapse rate	Increase	Decrease	Increase	Decrease
	Expenses	Increase	Decrease	Increase	Decrease
	Other[145]	Changes calibrated consistently with the scenario technique applied and the level of confidence targeted			

A17 Although in principle four additional sets of calculation are required, in practice, it will usually only be necessary to run one of them, since most of insurers are (or will be) able to perform approximate estimates and thus determine most of the times which is the most onerous set of assumptions. This would be more likely in the second and following years of application.

A18 A graphic summary of the first step of integrated approach could be expressed in the following way:

[145] Equity, property, currency and credit spreads



In this chart, Mkt_{life} refers to all market risks of any asset covering life insurance technical provisions.

Pros and cons, and practicalities of SCR_{ALM}

A19 Before entering into the pros of the integrated approach for life insurance activities, it may be worthy to clarify that the design of any standard SCR formula points mainly towards small, medium and large (non-advanced) insurers. For this reason, essential requirements of any standard SCR approach should be:

- To avoid complex analytics (difficult to be understood, monitored, managed, internally controlled and supervised)
- To avoid unworkable procedures, that impose unjustified burden on insurers in term of new developments or work required,
- To favour the use of techniques and calculations with real added value for others areas of the managing process related with the solvency assessment. In this way, standard SCR should be as consistent and co-ordinated as possible with the procedures actually applied in insurance business.

Within these restrictions, approaches that capture in a better way the entity specific risk profile seems to be preferable.

A20 The most significant merits of the integrated approach may be summarized as follows:

- Based on its analytical structure, the real relationship and reciprocal influence among all assumptions involved is captured implicitly as a natural consequence of the calculations. The ability of integrated approach to offer outputs based on the real interaction among financial and biometric assumptions is an essential value, having in mind its incentive effect to implement and apply ALM actions, and the fact that each portfolio may have quite different internal interactions. Such diversity of features can not be captured with general assumptions on correlations.
- The use of four different scenarios avoids to asses the relationship between asset and liability sides exclusively on the amounts included in supervisory returns (that is, only on 'best estimates' and current market values). Future will likely diverge from present situation, even from present future estimates. Not only cash-flow streams and actual values may vary to a great extent depending on

the development of interest rates, lapses, biometric behaviours, etc. Also the relationship between assets and liabilities may be quite different from that observable with current values and assumptions. Here is one of the strengths of the scenario approach.

- Some unfavourable deviations in the value of assets are expected to be offset with favourable changes in life insurance liabilities, being the most common case, assets backing with-profit contracts (besides the obvious case of unit-linked products). Integrated approach gives an appropriate consideration to this feature for solvency purposes, consistently with the method used for the valuation of technical provisions of each insurer and portfolio. Thus, the quantification of this effect is more reliable and entity-specific than if we use a general assumption.

- Since the procedure of calculation is the same as for technical provisions, there is no additional burden for insurers in terms of software or development. That means that all insurers, even small and medium sized entities, will be able to apply this method, as it does not require more than the background necessary to calculate technical provisions (best estimate + risk margin).

- At the same time, the supervision of an integrated approach becomes a more objective task, directly linked to the real procedures applied by each entity to value its assets and liabilities. From a supervisory point of view, this advantage has a significant value, since once the supervisor has validated the procedures and calculations of technical provisions, the same verified procedures are applicable in the assessment of SCR, therefore without needing to validate additional procedures

- No additional information is required to obtain the outputs of this approach, others than the four sets of assumptions that define each scenario.

- The integrated approach leads to a better assessment of diversifications benefits among different portfolios of life insurance contracts, to the extent that once the entity has determined the most onerous scenario, this single scenario is applied to all life insurance portfolios and their corresponding assets. Some of them will present a worst result than the original (regulatory) technical provisions, while other group of contracts will produce better results. The cumulated output will derive the SCR associated to entity-specific ALM position.

- Finally, the integrated approach has a specific added value for insurers that currently have not advanced capabilities to derive internal models. Since the analytical structure of this model is quite aligned with the foreseeable shape of most advanced internal models (as currently they are being prepared by largest insurers), not-advanced entities using the integrated approach will have walked in a natural way the first steps necessary if, in a more or less nearby future, they wish to evolve internal models.

A21 Before entering into the cons of the integrated approach, it may be relevant to comment that any standard SCR proposal needs to keep an appropriate balance between simplicity and workability on the one hand, and, on the other hand, the technical excellence and accuracy of the method. This means that any standard approach can not be perfect from a theoretical point of view, as it would be incompatible with the three main requirements stated above.

A22 Therefore the list of flaws of the integrated approach will not include technical criticisms due to the use of proxies to model some complex elements, such as treatment of non-linear effects. Mentioning as a flaw the use of these proxies would not give an unbiased picture, as the same criticisms could be applicable to the any other standard approach. After the previous statement, the main drawbacks of the integrated approach may be summarized, as least, as follows:

- Although the method uses the same procedures applied for the valuation of technical provisions, computational effort (recalculate the technical provisions and assets values at least one additional time) is likely more intensive than in the full modular approach. Nevertheless, as noted above, in practice, insurers will be (or should be) able to perform approximate estimates, identify immaterial assumptions and thus determine most of the times which of the four additional sets of scenarios will be the most onerous.

- The modular approach gives a clearer picture of the impact on final standard SCR amount that is associated to changes in each individual risk module. When using an integrated SCR, to isolate the influence of each assumption is necessary to carry out sensitivity analysis (successive calculations where only one assumption is changed in each step), similarly to the methodology generally applied in other cases (i.e. European Embedded Value or accounting reporting). It is not clear if after some implementation period all the insurers will have sufficient internal knowledge to identify their main risk drivers of SCR.

- Life and non-life activities will follow different formula. One may be seen it both as a mere reflection of the essential differences between both activities and their associated risks, or as a disadvantage or inconsistency of the integrated approach. Besides, if SCR applies different formulas to life and non-life activities, to avoid regulatory arbitrage, insurers should follow objective procedures to identify which assets correspond to life activities and which are allocated to non-life activities. Nevertheless, this requirement is also necessary to calculate certain parts of modular approach where variations of value of assets and liabilities are considered jointly (i.e. market risk or default risk, where the impact of changes in assets values may compensate changes in corresponding liabilities).

A23 **Data requirements:** as mentioned previously, the 'integrated approach' needs neither any additional data requirement nor any different calculation procedure. The new inputs of this approach are limited to the four sets of assumptions to be applied.

A24 **Calculation methods:** By its own analytical structure, the 'integrated approach' uses the same specific calculations applied to value assets and liabilities.

Segmentation

A25 Having in mind its analytical structure, rather than using a legal or commercial segmentation, this integrated approach makes more sense when it applies to homogeneous portfolios of contracts, grouped attending to the nature of risks inherent and the ALM policies that each insurer carries out in practice. The suggested approximation to that disclosure may be as follows:

- life insurance contracts without any participating profit clauses for policyholders (and associated assets)
- life insurance contracts with participating profit clauses for policyholders (and associated assets)
- life insurance contracts where the policyholder bears the investment risk (and associated assets)
- Other technical provisions related life insurance (and associated assets)

A26 A homogeneous classification, even as general as proposed, seems essential to guarantee comparability at EU level and to favour the implementation of a homogeneous set of supervisory returns that may lessen the reporting burden of entities across EU economic area.

A27 Once calculated, the four additional sets of assumptions for each group of contracts (and then derived the excess or deficit of assets compared with technical provisions in each scenario for all groups of contracts), excess and deficit for the same scenario ($Life\_Net_0$ - $Life\_Net_{esci}$) will be added, resulting only four whole amounts (excess or deficit) for the life insurance activities.

Excess / deficit	**Initial**	**Scen 1**	**Scen 2**	**Scen 3**	**Scen 4**
Portfolio 1	20	30	45	-10	25
Portfolio 2	10	5	-15	25	30
Portfolio 3	35	30	40	20	-30
…	…	…	…	…	…
Portfolio n	-10	-25	0	30	10
Total	**55**	**40**	**70**	**65**	**35**
	XS_0	**XS_1**	**XS_2**	**XS_3**	**XS_4**

A28 The comparison of the worst of the four results obtained with the excess/deficit originally existent in supervisory calculations, will give the standard SCR associated to life insurance activities.

$$SCR_{ALM} = \max\{XS_0 - XS_i\}; \quad i = 1,2,3,4$$

In the example above, $SCR_{ALM} = 55 - \min\{40, 75, 65, 35\} = 20$.

A29 Therefore this procedure gives a full (implicit) allowance to diversification benefits between different portfolios.

Second step: addition to SCR_{ALM} of others risks not considered in the first step

A30 For the sake of simplicity, three risks modules have not been included in the assessment of SCR_{ALM}.

A31 The first of them is **default risk**. Although it could be consider in ALM, (by reducing cash flows of corresponding assets, according the probabilities of default of the assets), currently there is not either generally accepted technique to extend this method to medium and long term horizons or easily workable solutions.

A32 Furthermore, we can find an understandable and workable alternative in the default risk module as it is in the 'full modular' approach. Therefore, it seems a practical expedient to use this default risk module, rather than creating a formulaic procedure not sufficiently back-tested.

A33 The same rationale applies to **concentration risk**, where following similar thinking, it is considered clearer and simpler its treatment out of the SCR_{ALM} and with the same formula and method as in the full modular approach.

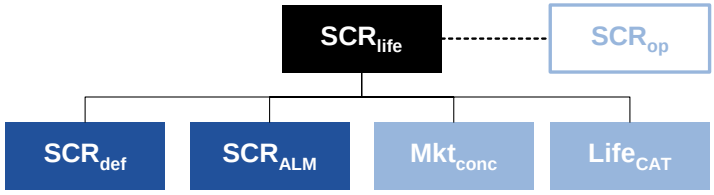
A34 The third risk to add to SCR_{ALM} would be **catastrophic risk**. Once again a consistency with 'full modular' approach seems the best solution.

A35 Summing up, at this stage in the second step we would have four SCR amounts:

- SCR corresponding to the ALM position of the insurer
- SCR corresponding to default risk (as in full modular approach)
- SCR corresponding to concentration risk (as in full modular approach)
- SCR corresponding life catastrophic risks (as modular approach)

Their addition would use some form of correlation matrix, provided that a sufficiently prudent and reliable correlations are achievable.

A36 The following chart shows a graphical description of this second step:



Ceded reinsurance

A37 IFRS4 clearly requires a separated recognition, presentation and measurement of insurance assets on one hand, and insurance liabilities on the other hand. This statement bases on the principle of non-compensation, directly linked with general framework of IFRS. Thus, the separated treatment of insurance assets (mainly, ceded reinsurance) and technical provisions considered as liabilities, is not under reconsideration in phase II of IFRS4.

A38 For consistency, the separated treatment of, on the one hand, direct and accepted business, and on the other hand, ceded reinsurance, will be the general principle to be applied as part of the integrated approach.

A39 For completeness, the formulation would be as follows:

$[\ Life\_Net_0 - Life\_Net_{esc1}\ ] + [\ Life\_Ceded_0 - Life\_Ceded_{esc1}\ ]$

$[\ Life\_Net_0 - Life\_Net_{esc2}\ ] + [\ Life\_Ceded_0 - Life\_Ceded_{esc2}\ ]$

$[\ Life\_Net_0 - Life\_Net_{esc3}\ ] + [\ Life\_Ceded_0 - Life\_Ceded_{esc3}\ ]$

$[\ Life\_Net_0 - Life\_Net_{esc4}\ ] + [\ Life\_Ceded_0 - Life\_Ceded_{esc4}\ ]$

where Life_Ceded refers to the valuation of technical provisions corresponding ceded reinsurance, both on best estimates assumptions and four scenarios involved.

A40 In practice, we can find different situations when considering how to allow the mitigating effect of ceded reinsurance, as part of the integrated approach to life insurance activities:

- Firstly, the insurer obviously is able to re-calculate its insurance liabilities (direct and accepted business) and corresponding assets (others than ceded reinsurance) in the four scenarios required. Nevertheless the insurer can not re-valuate the insurance assets (ceded reinsurance) in the four mentioned scenarios. Then, no reduction for ceded reinsurance would be allowed unless reasonable simplifications may be achievable.

- Second possible situation. The insurer once again is able to re-calculate its insurance liabilities and corresponding assets (others than ceded reinsurance) in the four scenarios required. Besides, the insurer also can estimate separately changes in value of insurance assets (ceded reinsurance) in the four mentioned scenarios. In this

case, reduction for ceded reinsurance would be allowed in the explicit amount obtained.

Definition and calibration of the scenarios

A41 Each of four scenarios used to assess SCR_{ALM} will start from the 'best estimate' assumptions used in the calculation of original or initial supervisory assets and technical provisions. Relative changes in each of those 'best estimates' will be applied simultaneously to re-calculate the net difference among new actual values of assets and liabilities [$Life\_Net_0$ - $Life\_Net_{esc1}$].

A42 Assumptions to be considered are as follows:

A43 **Biometric assumptions:**

- Mortality and longevity rates,
- Disability rates,
- Morbidity rates,

A44 **Financial assumptions and others closely correlated:**

- Interest rates
- Lapse rates
- Expenses
- Equity prices
- Credit spreads
- Property prices
- Currency exchange rates

A45 Having in mind that this approach relies on a stress technique, the analysis of historical data should not aim to extract the correlation among different variables or assumptions, but to isolate the worst scenarios or situations occurred during years analysed, selecting these 'worst cases' according different possible investments profiles of an insurer.

A46 Therefore, although as a general rule falls in a certain assumptions (i.e. interest rates) use to occur with increases in other assumptions (i.e. equity prices), the aim of calibration should be to identify if simultaneous falls/increases in both assumptions have been occurred during a sufficiently large historical period, and then derive the 'worst case' possible with a certain confidence level. Similar reasoning may be applicable to biometric assumptions (i.e. longevity and disability rates relationship).

A47 Chart 1 at the end of this annex illuminates in a graphic way how during last decades almost all of possible developments of interest rates and equity

prices have occurred, and therefore explains why the calibration to be used in a scenario technique should not focus only on deriving correlations.

A48 The following tables contain an illustrative view of the proposed four scenarios, assuming that, except in catastrophic situations, there is no interaction among biometric and financial assumptions. It is important to note that the figures are only illustrative, and therefore need appropriate calibration.

A49 **Biometric assumptions** (figures are only illustrative):

		Scen 1	Scen 2	Scen 3	Scen 4
		Increase	Increase	Decrease	Decrease
Mortality	< 10000 AP	+20%	+20%	-20%	-20%
	10000 – 100000	+15%	+15%	-15%	-15%
	> 100000 AP	+10%	+10%	-10%	-10%
Longevity	< 10000 AP	-20%	-20%	+20%	+20%
	10000 – 100000	-15%	-15%	+15%	+15%
	> 100000 AP	-10%	-10%	+10%	+10%
Morbidity		Changes according to medical and market expectations or other objective evidence			
Disability					

AP: assured persons

A50 **Mortality rates changes:** these changes are intended to capture both trend risk and, mainly, volatility risk. Calibration of these parameters could be done using an appropriate probability distribution and estimating mortality rate when n=5.000, 50.000 and 250.000 for each of the three groups of sizes proposed, and considering a 99.5% confidence level.

A51 Undertakings could use their own entity-specific mortality-longevity changes if:

- firstly, they have sufficient capabilities to carry out this calculation suited to the characteristics of their portfolios; and
- it is possible to verify that the entity has followed the detailed methodological supervisory guidance settled for this purpose (to be developed in level 2-3)

A52 **Longevity rates:** the same rationale as for mortality rates should be applied.

A53 **Financial assumptions:**

		Scen 1	Scen 2	Scen 3	Scen 4
		Increase	Decrease	Increase	Decrease
Interest rates		As Mkt_{int} in the modular approach			
Lapse rates		+50%	-25%	+50%	-25%
Expenses		+10%	-10%	+10%	-10%
Equity prices and similar		As Mkt_{eq} in the modular approach			
Credit spreads		Additional impact on discounting rates depending on credit rating			
Property	Own-occupied	As Mkt_{prop} in the modular approach			
	Investment	As Mkt_{prop} in the modular approach			
Currency exchange rates		As Mkt_{fx} in the modular approach			

A54 **Changes in assets values corresponding market risks:** The simplest solution seems to conceive these changes as they are currently designed in the scenario options of modular approach, although reminding that those changes in the values of assumptions should be calibrated having in mind that there are going to be used in according an integrated stress test technique.

A55 **Lapse rates:** Changes suggested refer to lapse rates considered as best estimates. 50% and 25% figures are merely illustrative, and are inspired in some international practices, although there is no international standard clearly favoured. Further research on most commonly applied practices would be necessary.

A56 **Expenses:** Percentages suggested (merely illustrative) refer to the spread between the 'best estimate' growth of expenses and interest rates used to discount technical provisions.

Example: If the calculation of supervisory technical provision has assumed a level of expenses equivalent, as an average, to 200 pb above 1-year interest rate used to discount, then in scenarios 1 and 3 the spread will be 220 pb., and 180 pb. in scenarios 2 and 4.

A57 **Property prices:** In this case, if it were possible, a disclosure between own occupied premises and held as investments properties, is suggested (as in IAS16 versus IAS40).

A58 In the first case (own occupied premises) the ability of the insurer to face unfavourable developments seems more likely than in the case of properties maintained as investments. For this reason more severe shocks might be proposed for the latest category of these assets.

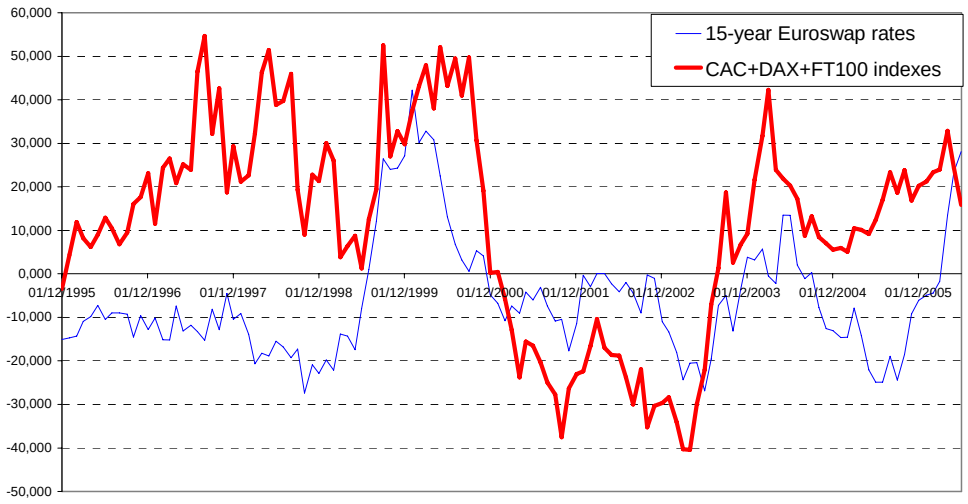
Specific issues

A59 Future participation features. As above mentioned at the beginning of this annex, integrated approach assumes that each insurer is able to calculate

the value of technical provisions corresponding future participation bonuses, both non-discretionary and discretionary. This calculation will necessary take account of the value of corresponding assets, to the extent that this value influence the possibility and amount of such future bonuses. It is expected that the same procedure may be applicable to the four sets (at least, one set) of assumptions without requiring new or additional developments (software, criteria, etc.)

Chart 1

Relative 12-month changes between 1995 and 2006



Source: Bloomberg