

**CEIOPS' Advice for  
Level 2 Implementing Measures on Solvency II:  
  
Technical provisions  
Article 86 a  
  
Actuarial and statistical methodologies to  
calculate the best estimate**

(former CP 39)

**October 2009**

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# 1. Introduction

- 1.1. In its letter of 19 July 2007, the European Commission requested CEIOPS to provide final, fully consulted advice on Level 2 implementing measures by October 2009 and recommended CEIOPS to develop Level 3 guidance on certain areas to foster supervisory convergence. On 12 June 2009 the European Commission sent a letter with further guidance regarding the Solvency II project, including the list of implementing measures and timetable until implementation.<sup>1</sup>
- 1.2. This Paper aims at providing advice with regard to actuarial and statistical methodologies for the calculation of the best estimate as requested in Article 86 (a) of the Solvency II Level 1 text.<sup>2</sup> A first part of the advice on this Article has been consulted on in March 2009.<sup>3</sup> This Paper should be read in conjunction with the other advices released regarding technical provisions
- 1.3. The objective of this Paper is further elaborate on the appropriate methodologies for the calculation of the best estimate.

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

<sup>2</sup> Latest version from 19 October 2009 available at <http://register.consilium.europa.eu/pdf/en/09/st03/st03643-re01.en09.pdf>

<sup>3</sup> For final advice, see CEIOPS-DOC-21/09 available under <http://www.ceiops.eu/index.php?option=content&task=view&id=574>

## 2. Extract from Level 1 Text

### Legal basis for the implementing measure

Article 86 - Implementing measures

*The Commission shall adopt implementing measures laying down the following:*

*(a) Actuarial and statistical methodologies to calculate the best estimate referred to in Article 77(2) [...]*

### Other relevant Level 1 text for providing background to the advice

#### Recitals

*(53) In order to allow insurance and reinsurance undertakings to meet their commitments towards policyholders and beneficiaries, Member States should require those undertakings to establish adequate technical provisions. The principles and actuarial and statistical methodologies underlying the calculation of those technical provisions should be harmonised throughout the Community in order to achieve better comparability and transparency.*

*(54) The calculation of technical provisions should be consistent with the valuation of assets and other liabilities, market consistent and in line with international developments in accounting and supervision.*

*(55) The value of technical provisions should therefore correspond to the amount an insurance or reinsurance undertaking would have to pay if it transferred its contractual rights and obligations immediately to another undertaking. Consequently, the value of technical provisions should correspond to the amount another insurance or reinsurance undertaking (reference undertaking) would be expected to require to take over and meet the underlying insurance and reinsurance obligations. The amount of technical provisions should reflect the characteristics of the underlying insurance portfolio. Undertaking-specific information should therefore only be used in their calculation insofar as that information enables insurance and reinsurance undertakings to better reflect the characteristics of the underlying insurance portfolio, such as information regarding claims management and expenses.*

*(58) It is necessary that the expected present value of insurance liabilities is calculated on the basis of current and credible information and realistic assumptions, taking account of financial guarantees and options in insurance or reinsurance contracts, to deliver an economic valuation of insurance or reinsurance obligations. The use of effective and harmonised actuarial methodologies should be required.*

## Articles

### Article 76 – General provisions

*2. The value of technical provisions shall correspond to the current amount insurance and reinsurance undertakings would have to pay if they were to transfer their insurance and reinsurance obligations immediately to another insurance or reinsurance undertaking.*

*3. The calculation of technical provisions shall make use of and be consistent with information provided by the financial markets and generally available data on underwriting risks (market consistency).*

### Article 77(2) – Calculation of the technical provisions

*The best estimate shall correspond to the probability-weighted average of future cash-flows, taking account of the time value of money (expected present value of future cash-flows), using the relevant risk-free interest rate term structure.*

*The calculation of the best estimate shall be based upon up-to-date and credible information and realistic assumptions and be performed using adequate, applicable and relevant actuarial and statistical methods.*

*The cash-flow projection used in the calculation of the best estimate shall take account of all the cash in- and out-flows required to settle the insurance and reinsurance obligations over the lifetime thereof.*

*The best estimate shall be calculated gross, without deduction of the amounts recoverable from reinsurance contracts and special purpose vehicles. Those amounts shall be calculated separately, in accordance with Article 81.*

### Article 79 – Valuation of financial guarantees and contractual options included in insurance and reinsurance contracts

*[...] Any assumptions made by insurance and reinsurance undertakings with respect to the likelihood that policyholders will exercise contractual options, including lapses and surrenders, shall be realistic and based on current and credible information. The assumptions shall take account, either explicitly or implicitly, of the impact that future changes in financial and non-financial conditions may have on the exercise of those options.*

### Article 83 – Comparison against experience

*Undertakings shall have processes and procedures in place to ensure that best estimates, and the assumptions underlying the calculation of best estimates, are regularly compared against experience.*

*Where the comparison identifies systematic deviation between experience and the best estimate calculations [...], the undertaking [...] shall make appropriate adjustments to the actuarial methods being used or the assumptions being made.*

Article 84 - Appropriateness of the level of technical provisions

*Upon request from the supervisory authorities, insurance and reinsurance undertakings shall demonstrate the appropriateness of the level of their technical provisions, as well as the applicability and relevance of the methods applied, and the adequacy of the underlying statistical data used.*

## 3. Advice

### 3.1 Introduction

#### 3.1.1 What is an adequate best estimate?

- 3.1. The Level 1 text states that the best estimate shall be equal to the probability weighted average of future cash-flows taking account of the time value of money, using the relevant risk-free interest rate term structure. This in effect acknowledges that the best estimate by definition takes into account uncertainty in the future cash-flows.
- 3.2. CEIOPS-DOC-21/09 (former CP 26) provided advice on the quality and selection of valuation techniques in order to produce an adequate best estimate.
- 3.3. This paper will further develop the requirements for ensuring the adequate calculation of the best estimate. This includes advice on the elements that need to be taken into account when estimating the future cash-flows, the assumptions underlying the valuation of the best estimate in order to ensure the market consistency of the valuation and the validation methods for ensuring the quality of the valuation process.
- 3.4. The advice on the valuation of the best estimate will be further supplemented by advice on the choice of the risk free interest rate for discounting the best estimate (former CP 40; Article 86 b) and data quality (former CP 43; Article 86 f). The advice should be read in conjunction with previous advice delivered on the segmentation applied for the calculation of technical provisions (former CP 27; Article 86 e).<sup>4</sup>

#### 3.1.2 Definitions of terms

In this paper the terms have the following meaning:

- 3.5. Market consistency: consistent with information provided by the financial markets and generally available data on underwriting risks (Article 76 Level 1 text).
- 3.6. Undertaking specific: Specific to the undertaking and thus with potential to differ from that of other market participants holding an obligation that is identical in all respects.
- 3.7. Portfolio specific: Depending on the characteristics of the insurance portfolio, i.e. that the characteristic would apply irrespective of which undertaking holds the liability.

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<sup>4</sup> See CEIOPS-DOC-34-09 at <http://www.ceiops.eu/index.php?option=content&task=view&id=591>, CEIOPS-DOC-37/09 at <http://www.ceiops.eu/index.php?option=content&task=view&id=594> and CEIOPS-DOC-22/09 at <http://www.ceiops.eu/index.php?option=content&task=view&id=575>.

- 3.8. Realistic: Aiming at identifying scenarios or parameters as they are or will be in the future, without distorting the situations and by neither underestimating nor overestimating the value of the parameters.
- 3.9. Stochastic asset model: A stochastic asset model is a tool for producing meaningful future projections of market parameters. It is based on detailed studies of how markets behave, looking at statistic properties of various market and non market factors. The model estimates correlated probability distributions of potential outcomes by allowing for random variation in one or more inputs over time. It then produces economic scenario files (ESF's), economic scenario generator (ESG) files, which are inputs for stochastic asset-liability modelling.
- 3.10. Deep, liquid and transparent financial market: See the definition in CEIOPS-DOC-35/09 Advice on circumstances in which technical provisions shall be calculated as a whole.<sup>5</sup>
- 3.11. Validation techniques: The tools and processes used by the (re)insurance undertaking to ensure valuation methods, assumptions and results of the best estimate calculation are appropriate and relevant.
- 3.12. Up-to-date (or current) information: Recent or the latest available information which reflects the situation at the valuation date.
- 3.13. Credible information: information for which it can be reasonably believed that they are not manipulated nor distorted in any other way so that they could be used for valuation purposes
- 3.14. Methodology: In this paper, the term *valuation methodology* (or *methodology*) is understood as a set of principles, rules or procedures for carrying out a valuation of technical provisions. A valuation methodology would include all stages of a valuation process, such as gathering and selecting the data, determining the assumptions, selecting an appropriate model for quantifying the technical provisions, assessing appropriateness of estimations and documentations and controls.
- 3.15. Method(s): The term valuation method(s) or method(s) is used to denote a procedure or technique which is applied for calculating technical provisions.
- 3.16. Projection horizon: The length of the time used in the projection of cash-flows starting from the date the valuation refers to.
- 3.17. Undertakings: This term used in singular or plural referee to reinsurance undertakings or insurance undertakings.
- 3.18. Homogenous risk group: Homogenous risk group is a set of (re)insurance obligations which are managed together and which have similar risk characteristics in terms of, for example, underwriting policy, claims settlement patterns, risk profile of policyholders, likely policyholder behaviour, product features (including guarantees), future management

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<sup>5</sup> Former CP41. See <http://www.ceiops.eu/index.php?option=content&task=view&id=592>.



actions and expense structure. The risks in each group should be sufficiently similar and the group sufficiently large that a meaningful statistical analysis of the risks can be done. The classification is undertaken specific.

- 3.19. Model points: One of the important inputs of most life actuarial model is information about policies/policyholders. Examples of such data items include age of policyholder, original term of policy, outstanding term of policy, amount of benefit on maturity, amount of benefit on surrender etc. Information about similar policies can be grouped into single representative data vector known as model point.
- 3.20. Going concern: The assumption that undertaking is going to continue in operation for the foreseeable future and that it has neither the intention nor the necessity of liquidation.
- 3.21. Best estimate: The technical provisions shall be equal to the sum of a best estimate and a risk margin. The best estimate is calculated gross, without deduction of the amounts recoverable from reinsurance contracts and special purpose vehicles. Where best estimate is mentioned without further detail, it is the gross best estimate.

## **3.2 Valuation process**

### **3.2.1 Explanatory text**

- 3.22. Valuation of the technical provisions requires the analysis of the underlying liabilities and the collection of qualitative and quantitative information. It is a process which requires expert judgement about the credibility to assign to historical data, to what extent one should rely on prospective modelling given the knowledge about experience, and needs to consider the estimation uncertainty. Sometimes there are situations where an assessment needs be done on inadequate and scarce data and on information which could not be treated as reliable. Therefore the value of technical provisions should not rely solely on models. It should rely on a variety of techniques including the application of judgement based on sound reasoning and business logic.
- 3.23. To be able to produce judgement base on sound reasoning and business logic the valuation process of valuation of technical provisions could not be performed by anyone but require the person with sufficient knowledge how to use actuarial and financial mathematics, understand the nature and complexity of the insurance risk and have adequate experience in performing valuation assessment. Further considerations on the actuarial function in (re)insurance undertakings are included in CEIOPS-DOC-29/09 Advice on the system of governance.<sup>6</sup>
- 3.24. The valuation of technical provisions includes different stages, such as the collection and analysis of the data, disclosing the nature and complexity of the insurance risk and identifying main risk drivers underlying the

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<sup>6</sup> Former CP 33. See <http://www.ceiops.eu/index.php?option=content&task=view&id=581>.

insurance obligations. Based on these the assumptions needed for valuation of technical provisions could be determined (see section on assumptions).

To determine the value of technical provisions the methods which are appropriate regarding the nature and complexity of the underlying risk should be selected (see CEIOPS-DOC-21/09 referred to before). The appropriateness of the value of the technical provision should be assessed. The whole process of validation shall be carried out according to the advice on validation in section 3.11.

- 3.25. The stage of collecting and analysing the data requires compilation of appropriate data from internal operational system and compiled with relevant external data. Data used in the valuation of technical provisions should be checked for the criteria of appropriateness, completeness and accuracy, in line with the advice on standards for data quality contained in CEIOPS-DOC-37/09 (referred to above).

The whole process of the collection of the data should be overseen by the expert who fulfils requirements specified for providing expert judgment in order to insure that this will be done correctly. Verification of the quality of data used is part of the task of the review mentioned in the section on validation process.

- 3.26. The assumptions are determined based on internal or external data collected by the undertakings. The assumptions should be consistent with information provided by the financial markets and generally available data on insurance and reinsurance risks. These assumptions should be based on external data, portfolio specific data and undertaking-specific data or on a combination of those data. The assumptions should adequately reflect the uncertainty underlying the cash-flows. It is also important to consider the impact of changes of the assumptions from one year to another which can be achieved if the changes of the assumptions are traced. Furthermore, the impact of changes of assumptions from one period to another should also be quantified, explained and documented. This will be explained in the section concerning the assumptions underlying the calculation of the technical provisions.

- 3.27. The next step is the calculation of the best estimate which should be done using an appropriate valuation method. The selection of an appropriate valuation method is crucial because only an appropriate valuation method will ensure that the nature and complexity of the insurance technical risks are appropriately addressed. Therefore, the limitations of the method should be known. The selection of the appropriate method should be based on the choice of expert judgement which should consider, among other things, the quality, quantity and reliability of the available data and analyse all important characteristics of the business. The method should be designed in such a way as to ensure that the assumptions and parameters used in the method will be clear and explicit; key influencing factors should be identified, mainly the sensibility of the best estimate regarding influencing factor and its variability. The key drivers and uncertainties associated with the best estimate should be explored and

described. This could be done for example by the application of stress and scenario testing. Further advice on the methods and statistical techniques for calculation of the best estimate has been provided in the previously cited CEIOPS-DOC-21/09.

- 3.28. In assessing the appropriateness of the estimate made, one should consider whether the relevant method was applied. Undertakings should consider if the method used was appropriate to take into account the uncertainty associated with the underlying insurance obligations and whether appropriate assumptions and parameters were selected. The appropriateness of assumptions and parameters should be supported by an adequate number of underlying data. Furthermore, the assessment of the appropriateness of the estimate could be carried out through a comparison against experience. This is further explained in the section on the validation process.
- 3.29. Article 83 of the Level 1 text requires that undertakings should have processes and procedures in place to ensure that the best estimate and assumptions are regularly compared against experience. Where the comparison would identify a systematic deviation between experience and the best estimate calculation of insurance and reinsurance undertakings, the undertaking shall make appropriate adjustments to the actuarial methods being used or the assumptions being made.
- 3.30. The analysis made under the steps described above should be documented and the results of experience analysis should be shared with other areas of businesses such as underwriting, claims, pricing. Views from other areas of business should be captured and included in feedback loop where necessary.<sup>7</sup>
- 3.31. Article 84 of the Level 1 text requires that upon request from the supervisory authority undertakings shall demonstrate the appropriateness of the level of their technical provisions, as well as the applicability and relevance of the methods applied, and the adequacy of the underlying statistical data used. To the extent that the calculation of technical provisions of insurance and reinsurance undertakings does not comply with Articles 76 to 83, the supervisory authorities may require insurance and reinsurance undertakings to increase the amount of technical provisions so that they correspond to the level determined pursuant to those Articles.

### **3.2.2 CEIOPS' advice**

3.32. Valuation of technical provisions is a process which requires expert judgement in a number of areas, for example, regarding the credibility to assign to historical data, to what extent reliance should be placed on prospective models and the requirement to consider uncertainty in the estimation. Valuation of technical provisions requires analysis of the underlying liabilities and the collection of qualitative and quantitative information.

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<sup>7</sup> See also CEIOPS-DOC-29/09 cited previously.

- 3.33. The valuation of technical provisions (i.e. best estimate referred in Article 77(2)) should therefore not rely solely on models but take into account a variety of techniques including the application of judgement based on sound reasoning and business logic.
- 3.34. The valuation of the technical provisions is a process that includes:
- collection and analysis of data;
  - determination of assumptions for valuation of technical provisions;
  - modelling, parameterisation the model and running the model (quantification of technical provisions);
  - assessment and appropriateness of estimations;
  - controls
  - and documentation.
- 3.35. The valuation process should be carried out by a person who has knowledge of actuarial and financial mathematics, commensurate with the nature, scale and complexity of the risks inherent in the business of the insurance and reinsurance undertakings, and who are able to demonstrate their relevant experience with applicable professional and other standards.
- 3.36. All steps in the process of valuation of technical provisions referred to in paragraph 3.34 should be documented and results of experience analysis should be shared where appropriate with persons from other business areas such as underwriting, pricing, and claims. Views of these persons should be captured and included in the feedback loop where necessary. The whole process of valuation should also be revised and verified by person who has adequate knowledge and skills and is independent of the process of valuation.
- 3.37. Upon request from the supervisory authority the undertaking shall demonstrate the robustness of the valuation process including the appropriateness of the level of its technical provisions, as well as the applicability and relevance of methods applied, and the adequacy of underlying statistical and financial data used.

## 3.3 Cash-flow projections

### 3.3.1 Explanatory text

- 3.38. The objective of this section is to give advice on which items should be taken into account to determine the future cash in- and out-flows required to settle the insurance and reinsurance obligations. It also provides advice on specific elements which should be considered when valuating life and non-life insurance obligations. CEIOPS also considers different valuation principles which could be used when assessing the expenses in the future cash-flow projection.
- 3.39. According to Article 77(2) the best estimate shall correspond to the probability-weighted average of future cash-flows taking into account the time value of money. Expected present value of future cash-flows (i.e. the best estimate) should be the average of the discounted cash flows and not the discounted average of probability weighted cash-flows.
- 3.40. The best estimate should be calculated gross, without deduction of the amounts recoverable from reinsurance contracts and special purpose vehicles. Reinsurance and Special Purpose Vehicles' recoverables shall be calculated separately. Therefore in this advice all the future cash-flows should be understood as gross, as the fulfilment of insurance obligations.
- 3.41. To calculate the best estimate of technical provisions, all potential future cash-flows that would be incurred in meeting liabilities to policyholders from existing insurance and reinsurance contracts need to be identified and valued.
- 3.42. Undertakings should take into account the fact that the values of all the items of potential future cash-flows that would be incurred in meeting liabilities to policyholders could change due to the demographic, legal, medical, technological, social or economic developments. Apart from these the appropriate assumptions for future inflation should also be built into the cash-flow projection. Different types of inflations could be appropriate for different items of potential future cash-flows, such as consumer price index for benefits, salary inflation for expenses, etc.
- 3.43. Where relevant the cash in-flows should among other cash in-flows include:
- a) future premiums from existing insurance and reinsurance obligations and
  - b) recoverables for salvage and subrogation.

The cash in-flow should not include investment returns (i.e. interests earned, dividends...).

- 3.44. The cash out-flows could be divided between benefits to the policyholders or beneficiaries, expenses that will be incurred in servicing insurance and reinsurance obligations, and other cash-flow items such as taxation payments which are charged to policyholders.
- 3.45. Benefits to the policyholders or beneficiaries could include: claims payments, maturity benefits, death benefits, disability benefits, surrender benefits, annuity payments ...
- 3.46. When calculating technical provisions, all future expenses that will be incurred in servicing existing insurance and reinsurance obligations should be taken into account. This would include:
- administrative expenses,
  - investment management expenses,
  - claims management expenses including claims handling expenses,
  - acquisition expenses including commissions.
- 3.47. Expenses include both allocated and unallocated expenses. Allocated expenses are assignable to individual claims. Other expenses which the insurer incurs in settling its obligations may not be directly assignable to individual claims. Such overhead expenses would include, for example, expenses which are related to general management and service departments which are not directly involved in new business or policy maintenance activities and which are insensitive to either the volume of new business or the level of in-force business.
- 3.48. Expenses which could not be directly allocated (overhead) shall be allocated according to professional judgment and realistic assumptions which will predefine the split of those expenses between different lines of business and also between premium provisions and claim provisions in the case of non-life (re)insurance obligations. This predefined split could be changed only if the new split will better fit the current situation.
- 3.49. Expenses which could be directly allocated to the premium provisions such as:
- administrative expenses including commissions connected with ongoing administration of the in-force policies,
  - claims management expenses connected with future claims events
- should be allocated to premium provisions.
- 3.50. Expenses that could be directly allocated to claims provisions such as:
- claims management expenses connected with claims that have occurred at or before valuation date and are not settled
- should be allocated to claims provisions.
- 3.51. Undertakings should consider their own analysis of expenses and any relevant market data. For the valuation of technical provisions undertakings should make assumptions with respect to future expenses arising from commitments made on or prior to valuation date. Expense assumptions should include an allowance for future cost increases. These

should take into account the types of costs involved. The allowance for inflation should be consistent with the economic assumptions made.

- 3.52. Assumptions about expenses based on their own analysis of expenses should not allow for future cost reductions where these have not yet been realised. Newly established insurance or reinsurance undertakings may anticipate an expected cost reduction relating to the first five years after the licensing of the undertaking. The assumptions about the expected cost reduction should be realistic, objective and based on verifiable data/information.
- 3.53. According to the Level 1 text the value of technical provisions shall correspond to the current amount insurance and reinsurance undertaking would have to pay if they were to transfer their obligations immediately to another undertaking and technical provisions are equivalent to the amount that undertakings would be expected to require in order to take over and meet the insurance and reinsurance obligations.
- 3.54. Due to the fact that the insurance and reinsurance obligations could be transferred to another undertaking, the expenses that should be taken into account are those which are directly related to the ongoing administration and management of (re)insurance contracts and those which are related to overhead expenses which should be assessed on the assumption that the undertaking continues to write further new business unless a decision has been made to cease writing further business.
- 3.55. CEIOPS believes that the option based on the "going concern" assumption is consistent with the concept of the transfer of the portfolio to a reference undertaking unless the risk of closure of the undertaking is imminent and is therefore appropriate for valuation of technical provisions.
- 3.56. CEIOPS considers that a "run-off" assumption should apply when an undertaking is in run-off or it is very likely that an undertaking will be in the near future.
- 3.57. Different taxation regimes exist across Member States, giving rise to a broad variety of tax rules applicable to insurance contracts. The assessment of the expected cash-flows underlying the technical provisions should allow for any taxation payments which are charged to policyholders, or which would be required to be made to settle the insurance obligations. All other tax payments should be taken into account under other balance sheet items.
- 3.58. The following tax payments should be included in the best estimate: transaction-based taxes (such as premium taxes, value added taxes and goods and services taxes) and levies (such as fire service levies and guarantee fund assessments) that arise directly from existing insurance contracts, or that can be attributed to the contracts on a reasonable and consistent basis.
- 3.59. When valuing potential future cash-flows, different features should be taken into account. The undertakings should take account of the value of financial guarantees and any contractual options included in the existing

insurance and reinsurance policies. The policyholders' behaviour could materially change the economic nature of the risk covered under the terms of the contract. Future discretionary bonuses, which are expected to be made, whether or not those payments are contractually guaranteed, unless those payments fall under Article 91(2) of the Level 1 text (i.e. surplus funds) should be taken into account. Furthermore, future management actions may be reflected in the projected cash-flows.

- 3.60. The calculation of technical provisions should be segmented according to CEIOPS-DOC-22/09 advice on segmentation mentioned before.
- 3.61. The cash-flow projection of life insurance obligations and health insurance obligations pursued on similar technical basis to that of life insurance should be based on a policy-by-policy approach because the future cash-flow depends on the biometrical risk of each policyholder. A negative best estimate is acceptable and undertakings should not set to zero the value of the best estimate with respect to those individual contracts. No surrender value floor should be assumed for the market consistent value of liabilities for a contract. This means that if the sum of a best estimate and a risk margin of a contract is lower than the surrender value of that contract there is no need to increase the value of insurance liabilities to the surrender value of the contract
- 3.62. To reduce undue burden on the undertaking the policies could be grouped and the projection of future cash-flows based on suitable model points can be permitted under following conditions. Grouping the policies and their representation by model points is acceptable provided it can be demonstrated that the grouping does not misrepresent the underlying risk and does not significantly misstate the costs. The grouping should also not distort the valuation of technical provisions by for example forming groups containing life policies with guarantees that are "in the money" and those that are "out of money". Grouping of the policies should not result in the loss of any significant attributes of the portfolio being valued.
- 3.63. The value of non-life insurance obligations should be valued separately for provisions for claims outstanding and premium provisions.
- 3.64. Premium provisions relate to claims events occurring after the valuation date and during the remaining in-force period of existing policies held by the undertaking. The cash-flow projections should comprise all future claims payments and claims management expenses arising from those events, cash-flows arising from ongoing administration of the in-force policies and expected future premiums stemming from existing policies.
- 3.65. The best estimate of premium provisions should be calculated as the expected present value of future in- and out-going cash-flows, being a combination of, inter alia:
  - cash-flow from future premiums;
  - cash-flows resulting from future claims events;
  - cash-flows arising from allocated and unallocated claims management expenses;



- cash-flows arising from ongoing administration of the in-force policies.
- 3.66. Premium provisions should be calculated in accordance with the general provisions for the determination of technical provisions as set out in Articles 75 to 78 of the Level 1 text. Such a valuation recognise the possibility that cash in-flow could exceed cash out-flow i.e. expected profit during remaining periods on risk. In such circumstances the best estimate may be negative. This is acceptable and undertakings are not required to set to zero the value of the best estimate. The valuation should take account of the time value of money where risks in the remaining period would give rise to claims settlements into the future.
- 3.67. Additionally, the valuation of premium provisions should take account of future policyholder behaviour such as the likelihood of policy lapse during the remaining period. This is further described in the section on policyholder behaviour.
- 3.68. Provisions for claims outstanding relate to the claims events that have occurred before or at the valuation date – whether the claims arising from those events have been reported or not. The cash-flows projected should comprise all future claims payments as well as claims management expenses arising from these events.
- 3.69. Where non-life insurance policies give rise to the payment of annuities, following the principles of substance over form, the annuity obligations should be treated as life insurance obligations. Therefore, the value of the technical provision for such annuity obligations should be calculated separately using appropriate life actuarial techniques, and should be included as part of the life insurance obligations or health insurance obligations pursued on similar technical basis to that of life insurance. For premium provisions, its assessment should include an appropriate calculation of annuity obligations if a material amount of incurred claims is expected to give rise to the payment of annuities.<sup>8</sup>
- 3.70. Where the calculation produces negative best estimates, the undertaking shall assess this feature appropriately, since CEIOPS considers that the existence of negative best estimates should be considered on the assessment of the risks and solvency position of the undertaking.

### **3.3.2 Principle of substance over form**

- 3.71. When discussing valuation techniques for calculating technical provisions, it is common to refer to a distinction between a valuation based on life techniques and a valuation based on non-life techniques. The distinctions between life and non-life techniques are aimed towards the nature of the liabilities (substance), which may not necessarily match the legal form (form) of the contract that originated the liability. The choice between life or non-life actuarial methodologies should be based on the nature of the liabilities being valued and from the identification of risks which materially

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<sup>8</sup> How provisions for annuity payments should be included in the calculation of SCR is defined in the CEIOPS-DOC-41/09 advice on the SCR standard formula for non-life underwriting risk. See <http://www.ceiops.eu/index.php?option=content&task=view&id=599>.

affect the underlying cash-flows. This is the essence of the principle of substance over form.

- 3.72. Such distinction is applicable for liabilities which are materially exposed to underwriting risk. Products of a strong financial risk and little to none insurance risk are out of the scope.
- 3.73. Traditional life actuarial techniques to calculate the best estimate can be described as techniques that based on discounted cash-flow models, generally applied on a policy-by-policy basis, which take into account in an explicit manner risk factors such as mortality, survival and changes in the health status of the insured person(s).
- 3.74. On the other hand, traditional non-life actuarial techniques include a number of different approaches. For example some of the most common being:
- Methodologies based on the projection of run-off triangles, usually constructed on an aggregate basis;
  - Frequency/severity models, where the number of claims and the severity of each claim is assessed separately;
  - Methodologies based on the estimation of the expected loss ratio or other relevant ratios;
  - Combinations of the previous methodologies;
- 3.75. There is one key difference between life and non-life actuarial methodologies: life actuarial methodologies consider explicitly the probabilities of death, survival, disability and/or morbidity of the insured person(s) as key parameters in the model, while non-life actuarial methodologies do not.
- 3.76. The choice between life or non-life actuarial methodologies should be based on expert judgement of the nature of the liabilities valued and on the identification of risks which materially affect the underlying cash-flows. This is the essence of the principle of substance over form. The legal classification of life and non-life contracts is a separate subject.
- 3.77. In practice, in the majority of cases the form will correspond to the substance. However, there are important situations where this is not the case. For example:
- Claims covered by non-life contracts such as motor and workers' compensation can give rise to the payment of life annuities, whose estimation clearly requires the use of appropriate life actuarial techniques. This is also the case of burial insurance providing services.
  - Certain supplementary covers included in life contracts (e.g. accident) may be better suited for an estimation based on non-life actuarial methodologies.

### 3.3.3 Obligations in different currencies

3.78. The probability-weighted average cash-flows should take into account the time value of money. The time value of money of future cash-flows in different currencies is calculated using risk-free term structure for relevant currency. Therefore the best estimate should be calculated separately for obligations of different currencies.

### 3.3.4 CEIOPS' advice

3.79. The cash-flow projection used in the calculation of the best estimate should take into account of all the cash in- and out-flows required to settle the obligations over their lifetime.

3.80. The best estimate should be calculated gross, without deduction of the amounts recoverable from reinsurance contracts and special purpose vehicles. In the case of co-insurance the cash-flows of each co-insurer should be calculated as their proportion of the expected cash-flows without deduction of the amounts recoverable from reinsurance and special purpose vehicles.

3.81. Cash-flow projections should reflect expected realistic future demographic, legal, medical, technological, social or economical developments.

3.82. Appropriate assumptions for future inflation should be built into the cash-flow projection. Care should be taken to identify the type of inflation to which particular cash-flows are exposed (i.e. consumer price index, salary inflation).

#### **Time horizon**

3.83. The projection horizon used in the calculation of best estimate should cover the full lifetime of all obligations related to existing insurance and reinsurance contracts on the date of the valuation.

3.84. The determination of the lifetime of insurance and reinsurance obligations shall be based on up-to-date and credible information and realistic assumptions about when the existing insurance and reinsurance obligations will be discharged or cancelled or expired.

#### **Gross cash in-flows**

3.85. To determine the best estimate the following non-exhaustive list of cash in-flows should be included:

- Future premiums; and
- Receivables for salvage and subrogation.

The cash in-flows should not take into account investment returns (i.e. interests earned, dividends...).

### **Gross cash out-flows**

3.86. To determine the best estimate the following non-exhaustive list of cash out-flows should be included:

- Benefits; and
- Expenses
- other gross cash-flow items

### **Benefits**

3.87. The benefit cash out-flows (non-exhaustive list) should include:

- Claims payments,
- Maturity benefits,
- Death benefits,
- Disability benefits,
- Surrender benefits,
- Annuity payments.

### **Expenses**

3.88. In determining the best estimate, the undertaking shall take into account all cash-flows arising from expenses that will be incurred in servicing all obligations related to existing insurance and reinsurance contracts over the lifetime thereof. This should include (non-exhaustive list):

- administrative expenses,
- investment management expenses,
- claims management expenses / handling expenses,
- acquisition expenses including commissions which are expected to be incurred in the future.

3.89. Expenses include both allocated and unallocated expenses. Allocated expenses are directly assignable to individual claims, policies or transactions. Unallocated (or overhead) expenses comprise all other expenses which the insurer incurs in settling its obligations.

3.90. Overhead expenses shall be allocated according to professional judgment and realistic assumptions.

3.91. The allocation of overhead expenses to lines of business, homogeneous risk groups or any other segments of the best estimate should be done on an economic basis following realistic and objective principles. The principles and their application should be documented and the undertaking should be able to explain changes in the principles or their application over time.

3.92. The predefined split of expenses which could not be directly allocated

should only be changed if the new split will better fit the current situation.

- 3.93. For non-life insurance obligations, the undertaking will further need to allocate expenses between premium provisions and claims provisions where such allocation is appropriate.
- 3.94. For premium provisions, the valuation of the best estimate could take into account the following non-exhaustive list of expenses:
- administrative expenses including commissions connected with ongoing administration of the in-force policies,
  - claims administration expenses connected with future claims events stemming from in-force policies.
- 3.95. For claims provisions, the valuation of best estimate could take into account the following non-exhaustive list of expenses:
- claims administration expenses connected with unsettled claims that have occurred before the valuation date.
- 3.96. To the extent that future premiums from existing insurance and reinsurance contracts are taken into account in the valuation of the best estimate, expenses relating to these future premiums should be taken into consideration.
- 3.97. Undertaking should consider their own analysis of expenses and any relevant market data. Expense assumptions should include an allowance for the expected future cost increase. These should take into account the types of cost involved. The allowance for inflation should be consistent with the economic assumptions made.
- 3.98. For the assessment of the future expenses, undertakings should take into account all the expenses that are directly related to the ongoing administration of obligations related to existing insurance and reinsurance contracts, together with a share of the relevant overhead expenses. The share of overheads should be assessed on the basis that the undertaking continues to write further new business unless a decision has been made to cease writing further business.
- 3.99. Assumptions about expenses based on their own analysis of expenses should not allow for future cost reductions where these have not yet been realised. Notwithstanding this principle, undertakings may anticipate an expected cost reduction relating to the first five years after licensing of the undertaking. Any assumptions about the expected cost reduction should be realistic, objective and based on verifiable data/information.

#### **Other gross cash-flow items**

- 3.100. Undertakings should also consider other cash-flow items such as:
- Taxation payments which are charged to policyholders;

### **Taxation payments which are charged to policyholders**

3.101. Different taxation regimes exist across Member States giving rise to a broad variety of tax rules in relation to insurance contracts. The assessment of the expected cash-flows underlying the technical provisions should take into account any taxation payments which are charged to policyholders, or which would be required to be made to settle the insurance obligations. All other tax payments should be taken into account under other balance sheet items.

3.102. When valuing the best estimate, the recognition of taxation in relation to insurance contracts and compulsory contributions charged to the policyholders excluding contributions which were already included in companies' expense assumptions (i.e. levies paid by insurance companies to industry protection schemes) should be consistent with the amount and timing of the taxable profits and losses that are expected to be incurred in the future.

3.103. In cases where changes to taxation requirements are substantially enacted, the pending adjustments should be reflected.

### **Different cash-flow features**

3.104. When valuing potential future cash-flows, the following features of existing insurance and reinsurance contracts need to be taken into account:

- Options and guarantees;
- Policyholders behaviour;
- Management actions;
- Distribution of extra benefits.

### **Life insurance obligations**

3.105. As a starting point, the cash-flow projection should be based on a policy-by-policy approach, but reasonable actuarial methods and approximations may be used. In particular the projection of future cash-flows based on suitable model points can be permitted if the following conditions are met:

- a) The grouping of policies and their representation by model points is acceptable provided that it can be demonstrated by the undertaking that the grouping does not misrepresent the underlying risk and does not significantly misstate the costs.
- b) The grouping of policies should not distort the valuation of technical provisions, by for example, forming groups containing life policies with guarantees that are "in the money" and life policies with guarantees that are "out of the money".
- c) Sufficient validation should be performed by the undertaking to be reasonably sure that the grouping of life policies has not resulted in the loss of any significant attributes of the portfolio being valued.

Special attention should be given to the amount of guaranteed benefits and any possible restrictions (legislative or otherwise) for an undertaking to treat different groups of policyholders fairly (e.g. no or restricted subvention between homogeneous groups).

d) The projection on a policy-by-policy basis would be an undue burden on the undertaking compared to the projection based on suitable model points.

3.106. In certain specific circumstances, the best estimate element of technical provisions may be negative (e.g. for some individual contracts). This is acceptable and undertakings should not set to zero the value of the best estimate with respect to those individual contracts.

3.107. No implicit or explicit surrender value floor should be assumed for the amount of the market consistent value of liabilities for a contract. This means that if the sum of a best estimate and a risk margin of a contract is lower than the surrender value of that contract there is no need to increase the value of insurance liabilities to the surrender value of the contract.

#### **Non-life insurance obligations**

3.108. The valuation of the best estimate for provisions for claims outstanding and for premium provisions should be carried out separately.

3.109. With respect to the best estimate for premium provisions, the cash-flow projections relate to claim events occurring after the valuation date and during the remaining in-force period (coverage period) of the policies held by the undertaking (existing policies). The cash-flow projections should comprise all future claim payments and claims administration expenses arising from these events, cash-flows arising from the ongoing administration of the in-force policies and expected future premiums stemming from existing policies.

3.110. The best estimate of premium provisions from existing insurance and reinsurance contracts should be given as the expected present value of future in- and out-going cash-flows, being a combination of, inter alia:

- cash-flows from future premiums;
- cash-flows resulting from future claims events;
- cash-flows arising from allocated and unallocated claims administration expenses;
- cash-flows arising from ongoing administration of the in-force policies.

There is no need that the listed items should be calculated separately.

3.111. Premium provisions should be calculated in accordance with the general provisions for the determination of technical provisions as set out in Articles 75 to 78 of the Level 1 text. Such a valuation recognise the possibility that cash in-flow could exceed cash out-flow i.e. would take account of expected profit (premiums exceeding costs) during remaining

periods on risk. In such circumstances the best estimate may be negative. This is acceptable and undertakings are not required to set to zero the value of the best estimate. The valuation would take account of the time value of money where risks in the remaining period would give rise to claims settlements into the future.

3.112. Additionally, the valuation of premium provisions should take account of future policyholder behaviour such as likelihood of policy lapse during the remaining period.

3.113. With respect to the best estimate for provisions for claims outstanding, the cash-flow projections relate to claim events having occurred before or at the valuation date – whether the claims arising from these events have been reported or not (i.e. all incurred but not settled claims). The cash-flow projections should comprise all future claim payments as well as claims administration expenses arising from these events.

#### **Substance over form**

3.114. The choice between life and non-life actuarial methodologies should be based on the nature of the obligation being valued and from the identification of the risks which materially affect the underlying cash-flows (principle of substance over form).

#### **Health obligations**

3.115. In CEIOPS-DOC-43/09 advice on SCR Standard Formula - Health underwriting risk<sup>9</sup>, CEIOPS defines health insurance obligations as all types of insurance compensating or reimbursing losses (e.g. loss of income) caused by illness, accident or disability (income insurance), or medical expenses due to illness, accident or disability (medical insurance).

3.116. Health insurance obligations:

- pursued on a similar technical basis to that of life insurance (SLT Health) should be valued in accordance with sub-section "Life insurance obligations"; and
- health insurance obligations not pursued on a similar technical basis to that of life insurance (Non-SLT Health) should be valued in accordance with sub-section "Non-life insurance obligations".

#### **Currency of the insurance obligations**

3.117. The best estimate should be calculated separately for obligations of different currency.

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<sup>9</sup> See <http://www.ceiops.eu/index.php?option=content&task=view&id=601>.



## 3.4 Valuation of options and guarantees

### 3.4.1 Explanatory text

3.118. The present section addresses the topic of the valuation of options and financial guarantees embedded in insurance contracts.

3.119. Embedded options and guarantees are important components of technical provisions which need to be continuously monitored by the insurer. The potential for non-linear behaviour, existence of path dependencies and inherent complexity and uncertainty requires the use of relatively sophisticated valuation methodologies to deliver accurate results. The development of such methodologies constitutes a practical challenge for several insurers, as evident in the QIS exercises launched so far. Thus, guidance on how to perform the calculation of such items is needed as well as specific requirements that ensure that the methods employed deliver results which are appropriate and robust in face of the underlying risks.

3.120. The explicit reference to the valuation of financial guarantees and contractual options included in insurance and reinsurance contracts is set out in Article 79 of the Level 1 text:

*When calculating technical provisions, insurance and reinsurance undertakings shall take account of the value of financial guarantees and any contractual options included in insurance and reinsurance policies.*

*Any assumptions made by insurance and reinsurance undertakings with respect to the likelihood that policyholders will exercise contractual options, including lapses and surrenders, shall be realistic and based on current and credible information. The assumptions shall take account, either explicitly or implicitly, of the impact that future changes in financial and non-financial conditions may have on the exercise of those options.*

3.121. Article 86 lists the issues for which implementing measures shall be adopted. Although there is not an explicit implementing measure foreseen for the valuation methodologies for 'options and guarantees', such item is part of technical provisions. Thus, the following implementing measures need to cover the treatment of options and guarantees:

*(a) actuarial methods and statistical techniques to calculate the best estimate referred to in Article 76(2);*

*[...]*

*(c) the circumstances in which technical provisions shall be calculated as a whole, or as a sum of a best estimate and a risk margin, and the methods to be used in the case where technical provisions are calculated as a whole.*

### 3.4.2 Definition of contractual options and financial guarantees

3.122. A contractual option is defined as a right to change the benefits<sup>10</sup>, to be taken at the choice of its holder (generally the policyholder), on terms that are established in advance. Thus, in order to trigger an option, a deliberate decision of its holder is necessary.

3.123. Some (non-exhaustive) examples of contractual options which are pre-determined in contract and do not require again the consent of the parties to renew or modify the contract include the following:

- Surrender value option, where the policyholder has the right to fully or partially surrender the policy and receive a pre-defined lump sum amount;
- Paid-up policy option, where the policyholder has the right to stop paying premiums and change the policy to a paid-up status;
- Annuity conversion option, where the policyholder has the right to convert a lump survival benefit into an annuity at a pre-defined minimum rate of conversion;
- Policy conversion option, where the policyholder has the right to convert from one policy to another at pre-specific terms and conditions;
- Extended coverage option, where the policyholder has the right to extend the coverage period at the expiry of the original contract without producing further evidence of health.

3.124. A financial guarantee is present when there is the possibility to pass losses to the insurer or to receive additional benefits<sup>11</sup> as a result of the evolution of financial variables (solely or in conjunction with non-financial variables) (e.g. investment return of the underlying asset portfolio, performance of indices, etc.). In the case of guarantees, the trigger is generally automatic (the mechanism would be set in the policy's terms and conditions) and thus not dependent of a deliberate decision of the policyholder / beneficiary. In financial terms, a guarantee is linked to option valuation.

3.125. The following is a non-exhaustive list of examples of common financial guarantees embedded in life insurance contracts:

- Guaranteed invested capital;
- Guaranteed minimum investment return;
- Profit sharing (i.e. future discretionary benefits).

3.126. There are also non-financial guarantees, where the benefits provided would be driven by the evolution of non-financial variables, such as reinstatement premiums in reinsurance, experience adjustments to future premiums following a favourable underwriting history (e.g. guaranteed no-claims discount). Although Article 79 only refers explicitly to financial

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<sup>10</sup> This should be interpreted as also including the potential for reduction of the level of premiums that would be charged in the future.

<sup>11</sup> This should be interpreted as also including the potential for reduction of the level of premiums that would be charged in the future.

guarantees, the calculation of technical provisions should also, by definition, take into account the value of any non-financial guarantees.

### **3.4.3 Valuation requirements**

- 3.127. Insurers are required to identify all contractual options and financial guarantees embedded in their contracts.
- 3.128. For each type of contractual option insurers are required to identify the risk drivers which have the potential to materially affect (directly or indirectly) the frequency of option take-up rates considering a sufficiently large range of scenarios, including adverse ones.
- 3.129. For each type of contractual option or financial guarantee insurers are required to identify the risk drivers which have the potential to materially affect (directly or indirectly) the level of moneyness considering a sufficiently large range of scenarios, including adverse ones.
- 3.130. The best estimate of contractual options and financial guarantees must capture the uncertainty of cash-flows, taking into account the likelihood and severity of outcomes from multiple scenarios combining the relevant risk drivers.
- 3.131. The best estimate of contractual options and financial guarantees should reflect both the intrinsic value and the time value.
- 3.132. Without prejudice to the advice in CEIOPS-DOC-21/09 referred to previously in this paper, the best estimate of contractual options and financial guarantees may be valued by using one or more of the following three methodologies:
- a stochastic approach using for instance a market-consistent asset model (includes both closed form and stochastic simulation approaches);
  - a series of deterministic projections with attributed probabilities; and
  - a deterministic valuation based on expected cash-flows in cases where this delivers a market-consistent valuation of the technical provision, including the cost of options and guarantees.
- 3.133. For the purposes of valuing the best estimate of contractual options and financial guarantees, a stochastic simulation approach would consist of an appropriate market-consistent asset model for projections of asset prices and returns (such as equity prices, fixed interest rate and property returns), together with a dynamic model incorporating the corresponding value of liabilities (incorporating the stochastic nature of any relevant non-financial risk drivers) and the impact of any foreseeable actions to be taken by management.
- 3.134. For the purposes of the deterministic approach, a range of scenarios or outcomes appropriate to both valuing the options or guarantees and the underlying asset mix, together with the associated probability of occurrence should be set. These probabilities of occurrence should be

weighted towards adverse scenarios to reflect market pricing for risk. The series of deterministic projections should be numerous enough to capture a wide range of possible out-comes (and, in particular, it should include very adverse yet possible scenarios) and take into account the probability of each outcome's likelihood (which may, in practice, need to incorporate judgement). The costs will be understated if only relatively benign or limited economic scenarios are considered.

- 3.135. When valuing the best estimate of contractual options and financial guarantees, the segmentation considered should not inappropriately distort the underlying risks by, for example, forming groups containing policies which are "in the money" and policies which are "out of the money".
- 3.136. Regarding contractual options, the assumptions on policyholder behaviour should be appropriately founded in statistical and empirical evidence, to the extent that it is deemed representative of the future expected behaviour. However, when assessing the experience of policyholders' behaviour appropriate attention should be given to the fact that when an option is out of or barely in the money, the policyholders' behaviour should not be considered a reliable indication of likely policyholders' behaviour when the option is heavily in-the-money.
- 3.137. Appropriate consideration should also be given to an increasing future awareness of policy options as well as policyholders' possible reactions to a change of financial position of a firm. In general, policyholders' behaviour should not be assumed to be independent of financial markets, a firm's treatment of customers or publicly available information unless proper evidence to support the assumption can be observed.

### 3.4.4 CEIOPS' advice

- 3.138. Insurers are required to identify all contractual options and financial guarantees embedded in their contracts.
- 3.139. For each type of contractual option insurers are required to identify the risk drivers which have the potential to materially affect (directly or indirectly) the frequency of option take-up rates considering a sufficiently large range of scenarios, including adverse ones.
- 3.140. For each type of contractual option and financial guarantee insurers are required to identify the risk drivers which have the potential to materially affect (directly or indirectly) the level of moneyness considering a sufficiently large range of scenarios, including adverse ones.
- 3.141. The best estimate of contractual options and financial guarantees must capture the uncertainty of cash-flows, taking into account the likelihood and severity of outcomes from multiple scenarios combining the relevant risk drivers.
- 3.142. The best estimate of contractual options and financial guarantees should reflect both the intrinsic value and the time value.
- 3.143. When the valuation of the best estimate of contractual options and financial guarantees is not being done on a policy-by-policy basis, the segmentation considered should not distort the valuation of technical provisions by, for example, forming groups containing policies which are "in the money" and policies which are "out of the money".
- 3.144. Regarding contractual options, the assumptions on policyholder behaviour should be appropriately founded in statistical and empirical evidence, to the extent that it is deemed representative of the future expected behaviour. However, when assessing the experience of policyholders' behaviour appropriate attention based on expert judgements should be given to the fact that when an option is out of or barely in the money, the behaviour of policyholders should not be considered to be a reliable indication of likely policyholders' behaviour when the options are heavily in-the-money.
- 3.145. Appropriate consideration should also be given to an increasing future awareness of policy options as well as policyholders' possible reactions to a changed financial position of an undertaking. In general, policyholders' behaviour should not be assumed to be independent of financial markets, a firm's treatment of customers or publicly available information unless proper evidence to support the assumption can be observed.
- 3.146. Where relevant, non-financial guarantees should be treated like financial guarantees.

## 3.5 Policyholders' behaviour

### 3.5.1 Explanatory text

3.147. The present section considers the topic of future policyholders' behaviour.

3.148. When valuing future cash-flows, future policyholders' behaviour should be taken into account. Policyholders' behaviour is taken into account in the valuation of the future cash-flow by for example making assumptions about contractual option exercise rates including surrender rates and paid-up rates.

3.149. The implicit reference to policyholders' behaviour can be found in Article 79 of the Solvency II Level 1 text:

*Any assumptions made by insurance and reinsurance undertaking with respect to the likelihood that policyholders will exercise contractual options, including lapses and surrenders, shall be realistic and based on current and credible information. [...]*

3.150. Policyholders' option to surrender is often dependent on financial markets and undertaking-specific information, in particular the financial position of the undertaking.

3.151. Policyholders' option to lapse and also in certain cases to surrender are mainly dependent on the change of policyholders' status such as the ability to further pay the premium, employment, divorce, etc.

3.152. Policyholder' options to exercise other contractual options are based on the risk drivers which have the potential to materially affect the level of money.

3.153. It is important to consider whether the presence of policyholder options could materially change the economic nature of the risk covered under the terms of the contract if exercised, i.e. where they have an option enabling this. In such circumstances the cash-flows projection should take account of the proportion of policyholders that is expected to take up the options.

3.154. Expectations should be founded on appropriate statistical analysis and based on expert judgement. This may depend on financial conditions at the time when 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.

3.155. When credible and relevant discontinuance experience is available undertakings should make use of it. Where a discretionary surrender value is paid on discontinuance, the estimates should allow for the payment the undertaking would reasonably make in the scenario under consideration.

3.156. When assessing past policyholders behaviour, appropriate attention should be given to whether the option is out of or barely in the money or is in the money.

3.157. Appropriate consideration should also be given to an increasing future awareness of policy options as well as policyholders' possible reactions to a changed financial position of the undertaking.

3.158. In general, policyholders' behaviour should not be assumed to be independent of financial markets, an undertaking's treatment of customers or publicly available information unless proper evidence to support the assumption can be observed.

### **3.5.2 CEIOPS' Advice**

3.159. Undertakings are required to identify policyholders' behaviour.

3.160. Policyholders' behaviour which could change the expected future cash-flows of the contract if exercised in line with options contained in the policy should be taken into account in the cash-flow projection. The projection should allow for the probability that policyholders exercise the option.

3.161. Expectations should be founded on appropriate statistical analysis and based on expert judgement.

3.162. When credible and relevant discontinuance experience is available undertakings should make use of it.

3.163. When assessing past policyholders behaviour, appropriate attention should be given to whether the option is out of or barely in the money or is in the money.

3.164. When identifying policyholders' behaviour appropriate consideration should also be given for an increasing future awareness of policy options.

3.165. In general policyholders' behaviour should not be assumed to be independent of financial markets, an undertaking's treatment of customers or publicly available information unless proper evidence to support the assumption can be observed.

## **3.6 Management actions**

### **3.6.1 Explanatory text**

See CEIOPS-DOC-27/09 advice on assumptions about future management actions.<sup>12</sup>

### **3.6.2 CEIOPS' advice**

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<sup>12</sup> Former CP 32. See <http://www.ceiops.eu/index.php?option=content&task=view&id=580>

3.166.Future management actions may be reflected in the projected cash-flows in accordance with CEIOPS-DOC-27/09 advice on assumptions about future management actions.

## **3.7 Distribution of discretionary benefits**

### **3.7.1 Explanatory text**

3.167.The present section addresses the topics of the valuation of future discretionary bonuses. Future discretionary bonuses should be understood as future discretionary benefits which include discretionary features and participation features.

3.168.According to the Article 78(3) of the Level 1 text, technical provisions shall take account of all payments to policyholders and beneficiaries, including future discretionary bonuses, which (re)insurance undertakings expect to make whether or not those payments are contractually guaranteed, unless those payments fall under Article 91 (surplus fund).

3.169.Future cash-flows also need to be split into guaranteed and discretionary benefits because, as stated in Article 108 of the Level 1 text, the loss absorbing capacity of technical provisions is limited by the technical provisions relating to the future discretionary benefits. The risk mitigation effect provided by future discretionary benefits shall be no higher than the sum of technical provisions and deferred taxes relating to those future discretionary benefits.

3.170.IFRS 4 defines “discretionary participation features” as a “contractual right to receive, as a supplement to guaranteed benefits (i.e. payments or other benefits to which a particular policyholder has an unconditional right that is not subject to the contractual discretion of the insurer) additional benefits:

- a. that are likely to be a significant portion of the total contractual benefits;
- b. whose amount or timing is contractually at the discretion of the issuer; and
- c. that are contractually based on:
  1. the performance of a specified pool of contracts or a specified type of contract
  2. realised and/or unrealised investment return on a specified pool of assets held by the issuer; or
  3. the profit or loss of the company, fund or other entity that issues the contract.

3.171.Member States differently define guaranteed and discretionary benefits. Some Member States define as guaranteed what the policyholders are already entitled to at the valuation date, and what they will be entitled to



due to contractual or legislative obligations. Guaranteed benefits at the valuation date are those benefits that cannot be reduced whatever the future state of the world.

3.172. Other Member States define guaranteed as what policyholders are entitled to (liabilities defined on the policy increased by benefits to which the policyholders are entitled at the valuation date) at the valuation date. One Member State defines guaranteed as a minimum amount that is mentioned in the insurance policy.

3.173. For the valuation of liabilities it is not so important to distinguish the value of technical provisions for the guaranteed and discretionary part. The distinction between the guaranteed and discretionary part of technical provisions is important only from in view of the comparability between different undertakings.

3.174. The definition of guaranteed and discretionary bonuses is mostly important for taking into account loss absorbing capacity of technical provisions (Article 108).

3.175. For these reasons, the following definitions are proposed:

- a. **“guaranteed benefit”** – This represents the value of future cash-flows which does not take into account any future declaration of future discretionary bonuses. The cash-flows take into account only those liabilities to policy holders or beneficiaries to which they are entitled at the valuation date. Guaranteed benefits at the valuation date are those benefits that cannot be reduced whatever the future state of the of the world.
- b. **“conditional discretionary benefit”** – This is a liability based on declaration of future benefits influenced by legal or contractual declarations and performance of the undertaking/fund. “Discretionary participation features” are defined as additional benefits that are contractually based on:
  - i. the performance of a specified pool of contracts or a specified type of contract
  - ii. realised and/or unrealised investment return on a specified pool of assets held by the issuer; or
  - iii. the profit or loss of the company, fund or other entity that issues the contract.
- c. **“pure discretionary benefit”** – This represents the liability based on the declaration of future benefits which are at the discretion of the management. “Discretionary participation features” are defined as additional benefits whose amount or timing is contractually at the discretion of the issuer.

“Discretionary benefits” - These correspond to the sum of the “conditional discretionary benefit” and “pure discretionary benefit” items. The definitions of “conditional discretionary benefit” and “pure discretionary benefit” should not be understood as requirement that

they should be valued separately. Only a distinction between guaranteed benefits and discretionary benefits should be required.

3.176. The terms of the contract usually stipulate how the future profits are determined and what share the policyholders are entitled to.

3.177. For the purpose of determining the loss absorbing capacity of the technical provisions the value of the loss absorbing capacity should never be bigger than the sum of the "conditional discretionary benefit" and the "pure discretionary benefit". Due to the fact that "conditional discretionary benefit" is based on legal or contractual obligations, the volume/amount of risk mitigation effect should be based on proper valuation of different stress scenarios.

### **3.7.2 Valuation of future discretionary benefits**

3.178. The large influence of management discretion in the valuation of technical provision for with-profits business raises a number of important issues that need to be given appropriate attention in order to have sufficient confidence in the valuation and achieve efficient supervision of the valuation.

3.179. An accurate assessment and a sufficiently detailed documentation of the mechanism for the distribution of discretionary benefits form the cornerstones. Since the distribution of discretionary benefits plays a central role for firms with a significant amount of with-profits business this mechanism will probably encompass a significant amount of the spectrum of principles and practices a undertaking has adopted to run the business. Furthermore, the mechanism is also strongly related to the financial position of the firm, which is often set as a primary restriction for distribution of discretionary benefits.

3.180. Some key issues (not necessary mutually exclusive) in the mechanism for distributing discretionary benefits are the following (should in most cases be set for a homogenous group of policyholders even if not explicitly stated):

- What constitutes a homogenous group of policyholders and what are the key drivers for the grouping?
- How is a profit divided between owners of the undertaking and the policyholders and furthermore between different policyholders?
- How is a deficit divided between owners of the undertaking and the policyholders and furthermore between different policyholders?
- How will the mechanism for discretionary benefits be affected by a large profit or loss?
- How will policyholders be affected by profits and losses from other activities?

- What is the target return level set by the firm's owners on their invested capital?
- What are the key drivers affecting the level of discretionary benefits?
- What is an expected level (inclusive any distribution of excess capital, unrealised gains etc.) of discretionary benefits?
- How are the discretionary benefits made available for policyholders and what are the key drivers affecting for example the split between reversionary and terminal discretionary benefits, conditionality, changes in smoothing practise, level of discretionary by the undertaking, etc.
- How will the experience from current and previous years affect the level of discretionary benefits?
- When is an undertaking's solvency position so weak that declaring discretionary benefits is considered by the undertaking to be jeopardizing a firm-owner's or/and policyholders' interest?
- What other restrictions are in place for determining the level of discretionary benefits?
- What is an undertaking's investment strategy?
- What is the asset mix driving the investment return?
- What is the smoothing mechanism if used and what is the interplay with a large profit or loss?
- What kind of restrictions are in place in smoothing extra benefits?
- Under what circumstances would one expect significant changes in the crediting mechanism for discretionary benefits?
- To what extent is the crediting mechanism for discretionary benefits sensitive to policyholders' actions?

3.181. In some cases valuation of discretionary benefits are intrinsic to the assets held by the firm. The assets assumed in such circumstances may be chosen accordingly to one or several combinations of the following principles:

- the actual assets held to back a specific liability (assuming a segmented investment portfolio);
- the assets considered most reasonable to back the specific liability and that attribute future investment returns to that fund;
- a proportion of the assets allocated in accordance with the cover of technical provisions; or

- a proportion of the assets allocated in accordance with the general investment portfolio.

3.182. The valuation of discretionary benefits, including any projections or assumptions on future returns of the firm's asset portfolio, should be consistent with the choice of the risk-free interest rate curve used for discounting. The assumptions on future asset returns underlying the valuation of discretionary benefits should not exceed the level given by the forward rates derived from the risk-free interest rates.

### 3.7.3 CEIOPS' advice

3.183. When calculating technical provisions, participants should take account of all payments to policyholders and beneficiaries, including future discretionary bonuses, which they expect to make, whether or not these payments are contractually guaranteed, unless those payments fall under Article 91(2) of the Level 1 text (surplus funds).

3.184. To distinguish between guaranteed and discretionary benefits the following distinction is proposed:

- "Guaranteed benefit": This represents the value of future cash-flows which does not take into account any future declaration of future discretionary bonuses. The cash-flows take into account only those liabilities to policy holders or beneficiaries to which they are entitled at the valuation date. Guaranteed benefits at the valuation date are those benefits that cannot be reduced.
- "Conditional discretionary benefit": This is a liability based on declaration of future benefits influenced by legal or contractual declarations and performance of the undertaking/fund. "Discretionary participation features" are defined as additional benefits that are contractually based on:
  - a) the performance of a specified pool of contracts or a specified type of contract or a single contract
  - b) realised and/or unrealised investment return on a specified pool of assets held by the issuer; or
  - c) the profit or loss of the company, fund or other entity that issues the contract.
- "Pure discretionary benefit": This represents the liability based on the declaration of future benefits which are at the discretion of the management. "Discretionary participation features" are defined as additional benefits whose amount or timing is contractually at the discretion of the issuer.

3.185. Discretionary benefits correspond to the sum of the "conditional discretionary benefit" and "pure discretionary benefit" items. The definitions of "conditional discretionary benefit" and "pure discretionary benefit" should not be understood as requirement that they should be valued separately. Only a distinction between guaranteed benefits and

discretionary benefits should be required.

3.186. Due to the large influence of management discretion in the valuation of technical provision for with-profits business the assessment of technical provisions should be based on detailed documentation of the mechanism for distributing discretionary benefits.

3.187. Mechanisms for distribution of discretionary benefits should encompass a significant amount of the spectrum of principles and practices that an undertaking has adopted to run the with-profit business. Furthermore, the mechanism would also be strongly related to the financial position of the undertaking, which is often set as a primary restriction for the distribution of discretionary benefits.

3.188. There are cases where the valuation of discretionary benefits depends intrinsically on the assets held by the firm. The assets assumed in such circumstances should be the assets held by the undertaking at the valuation date. Future changes in the asset allocation should be taken into account if the requirements on management actions are met (cf. CEIOPS-DOC-27/09 referred to previously). If the future discretionary benefits depend on a sub-portfolio of the undertaking assets, only the relevant sub-portfolio should be taken into account.

3.189. Where a risk neutral approach is used, the valuation of discretionary benefits, including any projections or assumptions on future returns of the firm's asset portfolio, should be consistent with the choice of the risk-free interest rate curve used for discounting. The set of assumptions on returns of future investments underlying the valuation of discretionary benefits shall be consistent with the principle that they shall not exceed the level given by the forward rates derived from the risk-free interest rates. Where another approach is used, the returns of the future investments shall be also considered in a consistent manner with the assumptions underlying the approach.

## **3.8 Recoverable from reinsurance contracts and special purpose vehicles**

### **3.8.1 Explanatory text**

3.190. The best estimate which corresponds to the probability-weighted average of future cash-flows, taking account of the time value of money using the relevant risk-free interest rate, shall be calculated gross, without deduction of amounts recoverable from reinsurance contracts and special purpose vehicles.

3.191. The amounts recoverable from reinsurance contracts and special purpose vehicles shall be calculated separately, in accordance with Article 81.

3.192. The present section addresses how to determine the amounts recoverable from reinsurance contracts and special purpose vehicles.

3.193. The calculation of recoverable from reinsurance contract and special purpose vehicles is defined in Article 81 of Solvency II Level 1 text:

*The calculation of insurance and reinsurance undertakings of amounts recoverable from reinsurance contracts and special purpose vehicles shall comply with Articles 76 to 80. When calculating amounts recoverable from reinsurance contracts and special purpose vehicles, insurance and reinsurance undertakings shall take account of the time difference between recoveries and direct payments.*

*The result from the calculation shall be adjusted to take account of expected losses due to default of the counterparty. The adjustment shall be based on an assessment of the probability of default of the counterparty and the average loss resulting there from (loss-given default).*

3.194. The amounts recoverable from reinsurance contracts and special purpose vehicles should be shown separately on the asset side of undertakings' balance sheet as "recoverable from reinsurance contracts and special purpose vehicles".

3.195. The calculation of amounts recoverable from special purpose vehicles should be done separately. Moreover, the calculation of recoverable from finite reinsurance<sup>13</sup> should be done separately.

3.196. Separate figures for the premium and claims provisions contained within amounts recoverable shall be calculated. In the claims provisions, part of the recoverable should comprise the compensation payments for the claims accounted for in the gross claims provisions excluding debt the cessionary owes to the ceded undertaking and is not held as a part of the gross technical provisions at the ceded undertaking. All other payments should be considered in the premium provisions part of the recoverable.

3.197. The calculation of amounts recoverable from reinsurance contracts and special purpose vehicles shall comply with Articles 76 to 80 of the Level 1 text. This means that for the calculation of amounts recoverable from reinsurance contracts and special purpose vehicles the same principle as for the calculation of best estimate of the technical provisions should be applied. There is no need to calculate a risk margin for amounts recoverable from reinsurance contracts and special purpose vehicles because the single net calculation of the risk margin should be performed, rather than two separate calculations (i.e. one for the risk margin of the technical provisions and one for the risk margin of recoverables from reinsurance contracts and special purpose vehicles). Where undertakings calculate a risk margin using an internal model, they can either perform one single net calculation or two separate calculations.

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<sup>13</sup> See Article 210 of Level 1 text for a definition.

3.198. In addition, where for certain types of reinsurance and special purpose vehicles, the timing of recoveries and for direct payments markedly diverge, this should be taken into account in the projection of cash-flows. Where such timing is sufficiently similar to that for direct payments, the undertaking shall have the possibility of using the timing of direct payments.

3.199. Some special purpose vehicles do not compensate directly the claims made on the undertaking. Instead payments are made according to certain external indicators, for example an earthquake index or general population mortality. In this case the estimation of future recoverables should consider the basis risk of these arrangements. A compensation for past and future policyholder claims should only be taken into account to the extent it can be verified in a deliberate, reliable and objective manner.

3.200. The amounts of recoverable from reinsurance contracts and special purpose vehicles should be adjusted in order to take account of expected losses due to counterparty default, whether this arises from insolvency, dispute or another reason. Further advice on how to adjust amounts recoverable from reinsurance contracts and special purpose vehicles, can be found in CEIOPS-DOC-38/09 Level 2 advice on counterparty default adjustments to recoverable from reinsurance contract and SPV's<sup>14</sup>.

3.201. The amounts of recoverable from reinsurance contract and special purpose vehicles should be calculated as a probability-weighted average of future cash-flows, taking account of the time value of money, which shall be adjusted to take account of expected losses due to default of the counterparty. As mentioned in CEIOPS Level 2 advice on simplifications it is possible to assess amounts of recoverable from reinsurance contract and special purpose vehicles in an indirect manner as the difference between the best estimate and the net best estimate, taking into account adjustments for the expected losses due to the default of the counterparty, provided that it is expected that the simplification method will deliver a sufficiently similar amount to the default method.<sup>15</sup> In both cases the adjustment for the expected losses due to the default of the counterparty needs to be calculated separately.

3.202. When valuing the probability-weighted average of future cash-flows of recoverable from existing reinsurance contracts and special purpose vehicles the following cash in- and out-flows should be taken into account.

3.203. Cash in-flows should include at least:

- recoverables from reinsurance contracts and special purpose vehicles for claims payments or benefits and recoverables for related expenses,
- revenues from reinsurance commissions and shares in profit from technical sources relevant to individual reinsurance contracts.

3.204. Cash out-flows should include at least:

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<sup>14</sup> Former CP 44. See <http://www.ceiops.eu/index.php?option=content&task=view&id=595>.

<sup>15</sup> See CEIOPS-CP-76/09 at <http://www.ceiops.eu/index.php?option=content&task=view&id=658>.

- future premiums for reinsurance contracts and special purpose vehicles,
- if relevant, shares in profit due to the reinsurance contract.

3.205.No allowance for expenses relate to the internal processes should be made in the recoverables. Expenses that relate to the internal processes of the insurer for reinsurance and special purpose vehicles should be taken into account in the best estimate.

3.206.In order to avoid a distortion of the calculation, undertakings shall distinguish between events that relate to market risk and events that relate to underwriting risk. Only payments made in relation to compensation of insurance events shall be accounted for in the recoverables. All payments that relate to market risk and do not compensate insurance events should not be accounted as amounts recoverable from reinsurance contracts and special purpose vehicles.

3.207.Where a deposit has been made for above mentioned cash-flows, the corresponding assets and liabilities should be shown separately in the balance sheet outside of the recoverable. The recoverable should be adjusted accordingly to avoid a double counting of assets or liabilities.

3.208.Debtors and creditors that relate to settled claims of policyholders or beneficiaries should not be included in the recoverables, but shown as separate items in the balance sheet.

3.209.The net best estimate which takes into account adjustments for the expected losses due to the default of the counterparty is given by the best estimate which takes into account deduction of amounts recoverable from reinsurance contracts and special purpose vehicles adjusted for expected losses due to default of the counterparty. Hence, the net best estimate corresponds to the probability-weighted average of all future cash-flows including cash-flows related to recoverable from reinsurance contracts and special purpose vehicles, taking account of the time value of money, using the relevant risk-free interest rate, and the adjustment for the expected losses due to the default of the counterparty.

### **3.8.2 CEIOPS' advice**

3.210.The amounts recoverable from reinsurance contracts and special purpose vehicles should be shown separately, on the asset side of undertakings' balance sheet as "recoverables from reinsurance contracts and special purpose vehicles".

3.211.The calculation of amounts recoverable from special purpose vehicles should be done separately. Moreover, the calculation of recoverable from finite reinsurance<sup>16</sup> should be done separately.

3.212.The amounts recoverable from reinsurance contracts and special purpose

<sup>16</sup> See Article 210 of Level 1 text for a definition



vehicles for non-life insurance obligations shall be calculated separately for "premium provisions" and "claims provisions". The claims provision part of the recoverable should comprise the compensation payments for the claims accounted for in the gross claims provision excluding debt the cessionary owes to the ceded undertaking and is not held as a part of the gross technical provisions at the ceded undertaking. All other payments should be considered in the premium provision part of the recoverable.

3.213. For the calculation of amounts recoverable from reinsurance contracts and special purpose vehicles the same principle as for the calculation of best estimate of the technical provisions should be applied.

3.214. Where for certain types of reinsurance and special purpose vehicles, the timing of recoveries and that for direct payments of undertaking markedly diverge, this should be taken into account in the projection of cash-flows. Where such timing is sufficiently similar to that for direct payments, the undertaking shall have the possibility of using the timing of direct payments.

3.215. If payments of special purpose vehicles do not directly depend on the claims made on the undertaking by policyholders and beneficiaries but on external indicators, a compensation for past and future claims on the undertaking should only be taken into account to the extent it can be verified in a deliberate, reliable and objective manner.

3.216. The amounts recoverable from existing reinsurance contracts and special purpose vehicles should be adjusted in order to take account of expected losses due to counterparty default, whether this arises from insolvency, dispute or another reason.

3.217. The amounts recoverable from reinsurance contracts and special purpose vehicles should be calculated:

- As default method, as a probability-weighted average of future cash-flows, taking account of the time value of money, which shall be adjusted to take account of expected losses due to default of the counterparty.
- As a simplification: As mentioned in CEIOPS Level 2 advice on simplifications (CEIOPS-DOC-76/09) it is possible to assess amounts recoverable from reinsurance contract and special purpose vehicles in an indirect manner as the difference between the best estimate and net best estimate, taking into account adjustments for the expected losses due to the default of the counterparty provided that it is expected that the simplification method will deliver sufficient similar amount than the default method

In both cases the adjustment for the expected losses due to the default of the counterparty needs to be calculated separately.

3.218. For the probability-weighted average of future cash-flows of recoverables from existing reinsurance contracts and special purpose vehicles the following cash in- and out-flows should be taken into account:

Cash in-flows should include at least

- recoverables from reinsurance contracts and special purpose vehicles for claims payments or benefits and recoverable for related expenses; and
- revenues from reinsurance commission and from shares in profit from technical sources relevant to individual reinsurance contracts.

Cash out-flows should include at least

- future premiums for reinsurance contracts and special purpose vehicles,
- if relevant, shares in profit due to the reinsurance contract.

3.219. Expenses which the undertaking incurs in relation to the management and administration of reinsurance and special purpose vehicle contracts should be allowed for in the best estimate, calculated gross, without deduction of the amounts recoverable from reinsurance contracts and special purpose vehicles.

3.220. Undertakings shall distinguish between events that relate to market risk and events that relate to underwriting risk. Only payments made in relation to compensation of insurance events shall be accounted for in the recoverables. All payments that relate to market risk and do not compensate insurance events should not be accounted as amounts recoverable from reinsurance contracts and special purpose vehicles.

3.221. Where a deposit has been made for the above mentioned cash-flows, the corresponding assets and liabilities should be shown separately in the balance sheet. The recoverable should be adjusted accordingly to avoid a double counting of assets or liabilities.

3.222. Debtors and creditors that relate to settled claims of policyholders or beneficiaries should not be included in the recoverable.

3.223. The net best estimate which takes into account adjustments for the expected losses due to default of the counterparty is given by the best estimate which takes into account the deduction of amounts recoverable from reinsurance contracts and special purpose vehicles adjusted for expected losses due to default of the counterparty. Hence, the net best estimate corresponds to the probability-weighted average of all future cash-flows including cash-flows related to recoverable from reinsurance contracts and special purpose vehicles, taking account of the time value of money, using the relevant risk-free interest rate, and the adjustment for the expected losses due to the default of the counterparty.

## **3.9 Assumptions underlying the calculation of the technical provisions**

- 3.224. Recital 54 of the Level 1 Text stipulates that the calculation of the technical provisions should be consistent with the valuation of assets and other liabilities, market consistent and in line with international developments in accounting and supervision.
- 3.225. Data comprises numerical, census or classification information but no qualitative information. Assumptions are not regarded as data but it is noted that the use of data is an important basis in the development of assumptions.
- 3.226. Among others the reliability of the amount of best estimate of technical provisions relies on the quality of the assumptions made. The degree of realism of the assumptions relies especially, but not only, on the quality of data used. This section will set out the principles which should govern the quality of the assumptions. Detailed advice on quality of the data will be covered in the advice on Article 86 f (CEIOPS-DOC-37/09 mentioned previously).

### **3.9.1 High level classification of assumptions**

- 3.227. Article 76 of the Level 1 text stipulates that the calculation of technical provisions shall make use of and be consistent with information provided by the financial markets and generally available data on underwriting risks (market consistency).
- 3.228. Based on previous article, two classes of assumptions can be identified:
- a) Assumptions consistent with information provided by financial markets;
  - b) Assumptions consistent with generally available data on insurance and reinsurance technical risks.
- 3.229. In the case of assumptions consistent with generally available data on insurance and reinsurance technical risks, generally available data refers to a combination of:
- a) Internal data,
  - b) External data sources such as industry or market data.
- 3.230. Internal data refers to all data which is available from internal sources. Internal data may be either:
- Undertaking-specific data: Data which is specific to the insurer and thus with potential to differ from that of other market participants holding an obligation that is identical in all respects.

- Portfolio-specific data: Data which depends on the characteristics of the insurance portfolio irrespective of which undertaking holds the liability.

3.231. Recital 55 stipulates: [...] *the amount of technical provisions should reflect the characteristics of the underlying insurance portfolio. Undertaking-specific information should therefore only be used in their calculation insofar as that information enables insurance and reinsurance undertakings to better reflect the characteristics of the underlying insurance portfolio, such as information regarding claims management and expenses.*

### 3.9.2 Principles for setting the assumptions

3.232. CEIOPS considers that it is not advisable to prescribe in detail the process by which an undertaking should derive the realistic assumptions underlying the calculation of its technical provisions because in practice such processes could vary between undertakings and furthermore best practice may evolve over time. However it is advisable to set out general principles which shall be taken into account in determining the appropriateness of a realistic assumption:

- a) Assumptions should be set in a realistic manner (see Article 77 (2) and the definition in paragraph 3.8).
- b) Assumptions shall be derived consistently from year to year without arbitrary changes.
- c) Expert judgment may be taken into account under the conditions set out in section 3.10 of this advice (see below).
- d) Assumptions shall be adequately documented including:
  - i. the suitability of data sources,
  - ii. the derivation of the assumptions and
  - iii. any limitations in the results.
- e) The materiality of the assumption shall be taken into account when determining the level of supporting documentation required.
- f) The data on which assumptions are based should be credible for the purpose used and meet the standards with respect to the appropriateness, completeness and accuracy of data (as defined by Article 86 (f); see CEIOPS-DOC-37/09 mentioned before). In the case of data deficiencies the assumptions could be based on approximations. This includes situations where the insurer's portfolio is too small to allow a sufficient amount of data to be gathered, the portfolio gives rise to high-severity-low-frequency claims, the extent to which historical claims data is available is insufficient (e.g. in the case of new undertaking, or a new line of business).

- g) Where assumptions are based on external data, the external data source should satisfy the following criteria:
- i. Both the external data and the documentation of any assumptions or methodologies underlying the data should be available to the insurer so that the external data source may be validated. In particular, it should be possible to assess the relevance of the data given the characteristics of the underlying insurance portfolio. Undertakings should be able to demonstrate that external data of the underwriting risk is more suitable in order to better reflect the risk profile thereof.
  - ii. Where relevant, the external data should be produced sufficiently frequently to permit an analysis of the data, for example to identify any trends in the underlying data, the variation of the data over time and the variation of the data between different observations. Depending on the results of the analysis, an adjustment to the data may be required.
  - iii. Assumptions or data supplied by external providers should be validated using appropriate validation methods as described in the section on validation.
- h) Consideration shall be given to both the explicit and implicit assumptions required throughout the different stages of the best estimate calculation. These stages may include data, analysis, modelling and validation.

### **Data assumptions**

- 3.233. Assumptions are being set at the stage of the data collection in order to improve the quality and completeness of the information and the judgement underlying the actuarial or statistical valuation.
- 3.234. For example, firms may have a portfolio with historical data but supplement this with a study on the firm's underwriting/claims handling practices and/or information taken from an external benchmark. Alternatively, the insurer may consider a study on how longevity experience or medical expenses could evolve in the future. Both of these examples would make the assumption setting process more complete.

### **Analysis assumptions**

- 3.235. Assumptions are being set during the stage of analysis in order to improve the relevance and credibility of past experience as well as to highlight key features within the data to inform how experience may evolve in the future.
- 3.236. For example, insurers may assume that any differences in the past claims experience on two motor portfolios can be attributed to a small number of fixed factors or that the insurer's past mortality experience should be similar to a fixed proportion of a standard table.

### **Modeling assumptions**

- 3.237. Assumptions are being set during the projection or modelling process, allowing for the projection of past experience into the future. These assumptions represent a model input or justify the use of a specific technique, distribution or define the interaction between variables in the model. Assumptions that are being set during the modelling stage should appropriately reflect the nature of the cash-flows and the potential sources of uncertainty.
- 3.238. For example, the insurer may assume that a gamma distribution adequately explains the future claims experience and/or assume that future expense/claims inflation will be a fixed percentage above retail price inflation.
- 3.239. Future management actions may be considered as a specific example of modelling assumptions.

### **Validation of the assumptions**

- 3.240. During the validation process, undertakings may need to compare assumptions against other possible alternatives, in order to test the sensitivity of the result and so endorse the adequacy of the assumptions chosen.

## **3.9.3 Assumptions consistent with information provided by financial markets**

- 3.241. Assumptions consistent with information about or provided by financial markets include (non exhaustive list):
- relevant risk-free interest rate term structure,
  - currency exchange rates,
  - market inflation rates (consumer price index or sector inflation) and
  - economic scenario files (ESF).

As a general principle, the information should allow for the estimation of reliable assumptions when it is observed in deep, liquid and transparent markets.

Nevertheless, information observed in other type of markets may be used provided, to the extent possible, that appropriate tests or adjustments can be applied to guarantee its reliability.

- 3.242. The assumptions underlying the risk free rate are being covered in a separate consultation paper covering the implementing measure for Article 86 (b) (CEIOPS-DOC-34/09 mentioned previously).
- 3.243. Where future cash-flows depend on the future economic environment, economic scenario files are a key assumption in the calculation of the best

estimate. Such scenario files are produced by market consistent asset models or economic scenario generators which must in turn be calibrated appropriately.

### **Results from QIS4**

3.244. The QIS4 Technical Specifications contained the following advice on the calibration of market consistent asset models:

#### Calibration of stochastic asset models

*TS.II.D.57 If a stochastic asset model is being used, it should be calibrated to reflect the nature and term of the liabilities giving rise to significant guarantee and option costs. The option features reproduced should generally be for options where no significant credit risk is taken on.*

*TS.II.D.58 The stochastic asset model should also be calibrated to the current risk-free interest rate term structure.*

*TS.II.D.59 It should be noted that few (if any) asset models can replicate all the observable market values for a wide range of asset classes.*

*TS.II.D.60 Professional judgements need to be applied in order to determine suitable estimates of those parameters which cannot be implied from observable market prices (due to incomplete markets, long-term volatility etc.). In this situation it is acceptable to calibrate a model to the longest available price data, or the closest available moneyness, or the nearest available credit quality of issuer. This parameterisation of the model should then be adjusted to the term, moneyness or desired credit quality of the calibration. A range of reliable parameters which to be used in the valuation should be determined. (See guidance on implied volatility in paragraph TS.II.D.62)*

*TS.II.D.61 Where a undertaking has large cohorts of guarantees and uses stochastic or deterministic approaches, a undertakings hould have regard to whether the cost of the guarantees determined under those approaches bears a reasonable relationship to the market cost of hedging similar guarantees (where it exists).*

#### Implied volatility versus historical volatility

*TS.II.D.62 For the valuation of technical provisions the implied volatility is the relevant volatility measure for financial instruments. Total return (as opposed to price return) financial instruments should be used where insurers will receive the total return achieved on their underlying assets, with price return instruments being used where no income/dividend will be received on the underlying assets.*

*TS.II.D.63 For non-hedgeable financial risks, the valuation is commonly outside the scope of tradable financial instruments (maturities outside the range of tradable instruments, non-tradable or ill-liquid assets etc.) and therefore appropriate implied volatility assumptions cannot be derived from currently tradable instruments. In such cases the historical volatility (if available) should be used corrected with any observable differences from past historical volatilities. If no volatility data is available an asset*

*which may share some similar characteristics with the original asset may be used, however appropriately adapted to the original asset.*

- 3.245. Qualitative feedback from QIS4 did not contain any criticism of the above advice. However, QIS4 was conducted under relatively benign market conditions and the application of the QIS4 Technical Specifications to the current extreme market conditions may raise concerns, which have not been anticipated in QIS4.
- 3.246. Furthermore, informal feedback from the industry has indicated that further guidance in this area would be helpful, leading also to greater convergence between (re)insurance undertakings.
- 3.247. While CEIOPS agrees that additional guidance is required, it is of the opinion that such guidance would better be developed as Level 3 guidance since this is an area where best practice are likely to evolve over time. Therefore, the advice suggests including high level principles in the Level 2 implementing measures and further highlights areas where additional guidance could be developed at Level 3.

**Assumptions underlying the asset model: Implied or historical volatility**

- 3.248. With regard to the volatility assumptions that are being used to calibrate the asset model, there are two possible approaches. Both approaches have advantages and disadvantages:
- a) The assumptions about the volatility of a market price may be based on an analysis of its historic volatility; or
  - b) Volatility assumptions may be derived from the price of financial instruments where the price of the instrument depends on assumptions regarding future volatility (implied volatility) in a context of deep, liquid and transparent financial market.
- 3.249. The use of historical volatilities has the following advantages:
- a) Experience shows that implied volatilities may misestimate the real volatility. In these cases implied volatilities may not lead to a realistic best estimate.
  - b) Furthermore, implied volatilities tend to be higher than the real volatility in times of crises and lower than real volatility in times of economic well being. Therefore, the value of the financial options and guarantees included in the technical provisions may be underestimated before a crisis and overestimated during the crisis. This mechanism has a pro-cyclical effect. Historical volatilities may be more stable as they are based on long time horizons.
  - c) The derivation of implied volatilities is based on financial models such as the Black-Scholes model which relates market prices to volatility. These models may not be an accurate reflection of reality, particularly in extreme market conditions.



3.250. The use of implied volatilities has the following advantages:

- a) Implied volatilities are based on current information derived from financial markets.
- b) Historical volatilities may not be relevant to current market conditions.
- c) Where an insurer is holding a hedging instrument for which there is a price, using historical rather than implied volatilities will lead to unnecessary balance sheet volatility.
- d) The derivation of implied volatilities based on financial models such as the Black-Scholes is consistent with the way in which market participants analyse the prices of traded financial instruments and price over-the-counter financial instruments

and following disadvantages:

- e) Implied volatility on equity and interest rate are not available for each horizon of cash-flows projection (in practice less than 10 years are potentially available).
- f) Implied volatilities are only available on OTC transactions (i.e. the information is not publicly available). Each trading desk develops its own implied volatility curve regarding the specific market data used. Thus implied volatilities for the same horizon are not harmonised between undertakings.
- g) Implied volatilities for equity is based on the Black-Scholes model which underestimate the tail of distributions as it is based on normal distribution.
- h) Implied volatilities could be affected by undertakings using the market to hedge their risks and could be distorted.

3.251. Implied volatilities seem to be more appropriate for the purpose of a market consistent valuation. However there may be circumstances in which it is appropriate to use historical volatilities. For example, in some cases, it may not be possible to calibrate volatility assumptions to market data. In such cases the calibration should be based on historical analysis of the volatility.

Independent from the choice for either of the volatility assumptions, the risk relating to changes in the volatilities should be addressed either implicitly or explicitly in the SCR.

#### **Assumptions underlying the asset model: principles**

3.252. Where an assumption is produced by a market consistent asset model (e.g. an economic scenario file), to the extent permitted by market conditions, that model shall satisfy the following criteria:

- a) The asset model shall try to reproduce asset prices for the most significant liabilities by nature and term that can be directly verified by the market.
- b) The asset model shall be arbitrage free.

3.253. The following principles shall be taken into account in determining the appropriate calibration of a market consistent asset model:

- a) The asset model shall be calibrated to reflect the nature and term of the liabilities, in particular of those liabilities giving rise to significant guarantee and option costs.
- b) The asset model shall be calibrated to the current risk-free term structure as defined in CEIOPS Level 2 advice on the risk-free term structure (CEIOPS-DOC-34/09 mentioned previously).
- c) The asset model shall be calibrated to a properly calibrated volatility measure.

3.254. In principle, the calibration process should use market prices only from financial markets that are deep, liquid and transparent. If the derivation of a parameter is not possible by means of prices from deep, liquid and transparent markets, other market prices may be used. In this case, particular attention should be paid to any distortions of the market prices. Corrections for the distortions should be made in a deliberate, objective and reliable manner.

A financial market is deep, liquid and transparent, if it meets the requirements specified in the CEIOPS Level 2 advice on circumstances in which technical provisions shall be calculated as a whole (CEIOPS-DOC-35/09 mentioned previously).

3.255. It may not be possible to calibrate to current market data, for example if no market exists, if markets are insufficiently deep and liquid or if there is insufficient reliable market data. The insurer should be capable of demonstrating that the calibration of models where markets are not deep and liquid is appropriate and in line with all the relevant criteria set out in the Level 1 text.

3.256. The calibration of the above mentioned assets models may also be based on adequate actuarial and statistical analysis of economic variables provided they produce market consistent results. For example:

- a) To inform the appropriate correlations between different asset returns.
- b) To determine probabilities of transitions between rating classes and default of corporate bonds.
- c) To determine property volatilities. As there is virtually no market in property derivatives, it is difficult to derive property implied

volatility. Thus the volatility of a property index may often be used instead of property implied volatility.

3.257. Further guidance on the following areas of the calibration may be provided at Level 3:

- The types of assets which reflect the nature and term of different liabilities and to which the asset model may be calibrated.
- The appropriate derivation of correlation assumptions.
- The appropriate volatility measure including how volatility may be estimated in cases where there is limited market data.
- Interpolation or extrapolation of market data, provided that according to this advice there are sufficient reliable points, to base this calculation (i.e. intermediate volatilities, credit derivatives spreads...).
- Calibration in cases where market volatilities and market prices are not consistent.

### **3.9.4 Assumptions consistent with generally available data on insurance and reinsurance technical risks**

3.258. The following general principles shall be taken into account for determining the appropriateness of an assumption consistent with generally available data on insurance and reinsurance technical risks:

- a) Assumptions shall be derived in such a manner they may be applied consistently:
  - Across homogeneous risk groups and lines of business;
  - With the undertaking's knowledge of the business and practices for managing the business.
- b) Assumptions shall be based on credible information which is relevant to the cash-flows.
- c) Undertakings shall consider whether assumptions adequately reflect the uncertainty underlying the cash-flows.
- d) Where relevant, assumptions shall make appropriate allowance for possible trends or future changes in both undertaking and portfolio specific factors as well as legal, social, economic or environmental factors.

3.259. Assumptions relating to insurance and reinsurance technical risks should be based on external data, internal data or combination thereof. Internal data may be either undertaking specific or portfolio specific.

3.260. All relevant available data -whether external or internal data- should be taken into account in order to arrive at the assumption which best reflects

the characteristics of the underlying insurance portfolio. In the case of using external data, only that which the undertaking can reasonably be expected to have access too should be considered.

3.261. The extent to which internal data is taken into account should be based on:

- The availability, quality and relevance of external data.
- The amount and quality of internal data.

3.262. Assumptions should be based solely on external data only if there is no relevant source of internal information which could provide reliable input to the assumption setting process. Similarly assumptions should be based solely on internal data only if there is no relevant source of external data.

### **3.9.5 Need for consistent methodologies across Europe**

3.263. CEIOPS has identified a number of areas in which there appears to be a need for further guidance in order to promote a harmonised approach to the calculation of technical provisions.

3.264. For example (not exhaustive list):

- Calibration of Economic Scenario Generators including the derivation of the appropriate volatility assumption.
- Harmonised principles for construction current and prospective mortality/disability/health tables.
- The construction of market benchmarks, e.g. for loss development patterns, to validate and complement undertaking-specific information.

This list can be refined and expanded as part of the further developments following Level 2 implementing measures.

### **3.9.6 CEIOPS' advice**

#### **General**

3.265. In accordance with the Level 1 text, assumptions shall be set consistently with:

- a) Information provided by financial markets;
- b) Generally available data on insurance and reinsurance technical risks.

3.266. Consideration shall be given to both the explicit and implicit assumptions required throughout the different stages of the best estimate calculation. These stages may include following stages: data, analysis, modelling and validation.

3.267. The following general principles shall be taken into account in determining

the appropriateness of an realistic assumption:

- a) In order to comply with the requirements of the Level 1 text, assumptions should be set in a realistic manner.
- b) Assumptions shall be derived consistently from year to year without arbitrary changes. The changes of assumptions from one period to another should be traced, explained and documented. The impact of all changes of assumptions from one period to another on the value of technical provisions should be quantified, traced, explained and documented.
- c) Expert judgement may be taken into account under the conditions set out in section 3.10 of this advice (see below)
- d) Assumptions shall be adequately documented including the suitability of data sources, the derivation of the assumptions and any limitations in the results.
- e) The materiality of the assumption shall be taken into account in determining the level of supporting documentation required.
- f) The data on which assumptions are based should be credible for the purpose used and meet the standards with respect to the appropriateness, completeness and accuracy of data (as defined by Article 86 (f)).
- g) Where assumptions are based on external data such as industry or market data, the external data source should satisfy the following criteria:
  - i. Both the external data and the documentation of any assumptions or methodologies underlying the external data should be available to the insurer so that the external data source may be validated. In particular, it should be possible to assess the relevance of the data given the characteristics of the underlying insurance portfolio. Undertakings should be able to demonstrate that external data of the underwriting risk is more suitable in order to better reflect the risk profile thereof.
  - ii. Where relevant, the external data should be produced sufficiently frequently to permit an analysis of the data, for example to identify any trends in the underlying data, the variation of the data over time and the variation of the data between different observations. Depending on the results of the analysis, an adjustment to the data may be required.
  - iii. Assumptions or data supplied by external providers should be validated using appropriate validation methods as described in CEIOPS' advice on validation.

### **Assumptions consistent with information provided by financial markets**

3.268. Where an assumption (e.g. an economic scenario file) is produced by a market consistent asset model, that model shall satisfy the following criteria:

- a) The asset model shall try to reproduce asset prices for the most significant liabilities by nature and term that can be directly verified by the market.
- b) The asset model shall be arbitrage free.

3.269. The following general principles shall be taken into account in determining the appropriate calibration of a market consistent asset model:

- a) The asset model shall be calibrated to reflect the nature and term of the liabilities particularly those liabilities giving rise to significant guarantee and option costs.
- b) The asset model shall be calibrated to the current risk-free term structure as defined in CEIOPS Level 2 advice on the risk free term structure (CEIOPS-DOC-34/09).
- c) The asset model shall be calibrated to an appropriate volatility measure.

3.270. In principle, the calibration process should use market prices only from financial markets that are deep, liquid and transparent. If the derivation of a parameter is not possible by means of prices from deep, liquid and transparent markets, other market prices may be used. In this case, particular attention should be paid to any distortions of the market prices. Corrections for the distortions should be made in a deliberate, objective and reliable manner.

3.271. A financial market is deep, liquid and transparent, if it meets the requirements specified in CEIOPS Level 2 advice on circumstances in which technical provisions shall be calculated as a whole (CEIOPS-DOC-35/09).

3.272. It may not be possible to calibrate to current market data, for example if no market exists, if markets are insufficiently deep and liquid or if there is insufficient reliable market data. The insurer should be capable of demonstrating that the calibration of models where markets are not deep and liquid is appropriate and in line with all the relevant criteria set out in the Level 1 text.

3.273. The calibration may be based on adequate actuarial and statistical analysis of economic variables.

### **Assumptions consistent with generally available data on insurance and reinsurance technical risks**

3.274. Generally available data refers to a combination of:

- Internal data
- External data sources such as industry or market data.

3.275. Internal data refers to all data which is available from internal sources and might be undertaking specific or portfolio specific data. Undertaking specific data is specific to insurer and thus with potential to differ from that of other market participant holding an obligation that is identical in all respects. Portfolio specific data depends on the characteristic of the liabilities being measured and need not be undertaking specific data.

3.276. All relevant available data whether external or internal data, should be taken into account in order to arrive at the assumption which best reflects the characteristics of the underlying insurance portfolio. In the case of using external data, only that which the undertaking can reasonably be expected to have access too should be considered.

3.277. The extent to which internal data is taken into account should be based on:

- The availability, quality and relevance of external data.
- The amount and quality of internal data.

3.278. Assumptions should be based solely on external data only if there is no relevant source of internal information which could provide reliable input to the assumption setting process. Similarly assumptions should be based solely on internal data only if there is no relevant source of external data. Where internal and external data are available the most appropriate data, whether internal, external or a blend of both should be used having regard to the judgment and expertise of those using the data and the models to be employed.

3.279. The following general principles shall be taken into account in determining the appropriateness of an assumption:

- a) Assumptions shall be derived consistently:
- b) Across homogeneous risk groups and lines of business.
- c) With the undertaking's knowledge of the business and practices for managing the business.
- d) Assumptions shall be based on credible information which is relevant to the cash-flows.
- e) Undertakings shall consider whether assumptions adequately reflect the uncertainty underlying the cash-flows.
- f) Assumptions shall make appropriate allowance for possible trends or future changes in both undertaking and portfolio specific factors as well as legal, social, economic or environmental factors.
- g) Assumptions should be easy to comprehend by third parties, well

documented and reasons for them should be given sufficiently, considering the internal / external data or qualitative information used as a basis.

## 3.10 Expert judgement

### 3.10.1 Explanatory text

3.280. CEIOPS recognizes that in certain circumstances expert judgement may be necessary when calculating the best estimate. This section develops the requirements to apply to expert judgement in the context of the implementing measure set out in Article 86(a), subject to the principle of proportionality.

3.281. Scope of expert judgement. Expert judgement may apply both in respect of the data used in the calculation of the best estimates, or in respect of the assumptions underlying the calculations, or eventually regarding the method applied to base the calculations. Examples of cases where expert judgement may be applied are (non-exhaustive list):

- in selecting the data to use, correcting its errors and deciding the treatment of outliers or extreme events,
- in adjusting the data to reflect current or future conditions, and adjusting external data to reflect the undertaking's features or the characteristics of the relevant portfolio,
- in selecting the time period of the data
- in selecting realistic assumptions
- in selecting the valuation technique or choosing the most appropriate alternatives existing in each methodology
- in incorporating appropriately to the calculations the environment under which the undertakings have to run its business

3.282. General conditions about the application of expert judgement.

- Expert judgement should be compatible with the full compliance of this advice and other CEIOPS' advices regarding technical provisions. In particular, the use of expert judgement should not be considered to replace appropriate collection, process and analysis of data according to CEIOPS-DOC-37/09 advice on data quality standards mentioned previously.
- Expert judgement should not be applied in isolation, unless there is no reliable alternative, for example because of a scarcity of relevant data.
- Where expert judgement is applied in isolation or applied to an assumption which has a significant impact on the best estimate, undertakings shall be prudent in the selection alternatives considered as similar (i.e. undertakings shall be particularly careful in the selection of alternatives considered as similar and to give appropriate weight to potential adverse outcomes).



- Expert judgement shall only be applied by experts with the relevant knowledge, understanding and comprehension of the subject, and with adequate experience. Furthermore, CEIOPS-DOC-29/09 advice on governance (mentioned previously) shall apply where relevant.

### 3.283. Documentation on the use of expert judgement.

- Expert judgement should be justified, explained and validated.
- According the proportionality principle, the process leading to the use of expert judgement should be documented in such a manner that the documentation makes possible the accountability and verification of the expert judgement. Generally speaking, the documentation will reflect the process of expert judgement, in particular:
  - i the inputs on which expert judgement is based
  - ii the objectives and decisional criteria used,
  - iii any material limitation and the steps taken, if any, to mitigate the effect of such limitations
  - iv the validation and back-testing envisaged or carried out for the expert judgement

### 3.284. Test of the expert judgement.

- Expert judgement should be back-tested with the additional experience gained or any emergent information,
- where possible, should be compared to external information and appropriately tested with sufficiently similar judgments, either internally (provided they are independent from the original expert) or externally (provided there is no commercial link that may endanger the unbiased opinion of the external expert),
- should be accompanied with a sensitivity analysis carried out on parameters or any other significant element derived by expert judgement.

3.285. Users of the result of expert judgement should receive clear and comprehensive information of the existence of expert judgement, any relevant information of its content, degree of reliance and limitations (including appropriate sensitivity analysis).

## 3.10.2 CEIOPS' advice

3.286. Scope of expert judgement. Expert judgement may apply both in respect of the data used in the calculation of the best estimates, or in respect of the assumptions underlying the calculations, or eventually regarding the method applied to base the calculations.

3.287. General conditions about the application of expert judgement.

- Expert judgement should be compatible with the full compliance of

this advice and other CEIOPS' advices regarding technical provisions. In particular, the use of expert judgement should not be considered to replace appropriate collection, process and analysis of data according to CEIOPS-DOC-37/09 advice on data quality standards (mentioned previously).

- Expert judgement should not be applied in isolation, unless there is no reliable alternative, for example because of a scarcity of relevant data.
- Where expert judgement is applied in isolation or applied to an assumption which has a significant impact on the best estimate, undertakings shall be prudent in the selection alternatives considered as similar (i.e. undertakings shall be particularly careful in the selection of alternatives considered as similar and to give appropriate weight to potential adverse outcomes).
- Expert judgement shall only be applied by experts with the relevant knowledge, understanding and comprehension of the subject, and with adequate experience. Furthermore, CEIOPS-DOC-29/09 advice on governance (mentioned previously) shall apply where relevant.

#### 3.288. Documentation on the use of expert judgement.

- Expert judgement should be justified, explained and validated.
- According the proportionality principle, the process leading to the use of expert judgement should be documented in such a manner that the documentation makes possible the accountability and verification of the expert judgement. Generally speaking, the documentation will reflect the process of expert judgement, in particular:
  - v the inputs on which expert judgement is based
  - vi the objectives and decisional criteria used,
  - vii any material limitation and the steps taken, if any, to mitigate the effect of such limitations
  - viii the validation and back-testing envisaged or carried out for the expert judgement

#### 3.289. Test of the expert judgement.

- Expert judgement should be back-tested with the additional experience gained or any emergent information,
- where possible, should be compared to external information and appropriately tested with sufficiently similar judgments, either internally (provided they are independent from the original expert) or externally (provided there is no commercial link that may endanger the unbiased opinion of the external expert),
- should be accompanied with a sensitivity analysis carried out on parameters or any other significant element derived by expert judgement.

#### 3.290. Users of the result of expert judgement should receive clear and

comprehensive information of the existence of expert judgement, any relevant information of its content, degree of reliance and limitations (including appropriate sensitivity analysis).

### **3.11 Assessment of the appropriateness of the valuation: validation process**

3.291. The objective of this section is to give draft advice on how undertakings shall apply validation methods as part of the best estimate calculation to ensure:

- the appropriateness of the level of the best estimate element of provisions and
- the applicability and relevance of the methods applied in calculating the best estimate.

3.292. This section does not include advice on:

- The requirements to ensure the adequacy of the underlying statistical data, which is covered in the advice on Article 86 (f).
- Validation of the risk margin element of the technical provisions.

#### **3.11.1 Validation methods**

3.293. The Level 1 text requires that:

- Undertakings shall be able to demonstrate the applicability and relevance of the methods applied and the appropriateness of the level of technical provisions.
- (Re)insurance undertakings shall be able to demonstrate that the actuarial methods and statistical methodologies are proportionate to the nature, scale and complexity of the risks supported by insurance and reinsurance undertakings.
- The best estimate and the assumptions underlying the calculations are regularly compared against experience.

3.294. This implies that the Level 2 implementing measures referred in Article 86(a) and Article 86(h) should include the requirement to use validation methods throughout the calculation process, in order to ensure the results meet the above criteria.

3.295. This could then be supplemented in due course by more detailed Level 3 guidance on the particular types of validation techniques that may be suitable for insurance undertakings.

3.296. Validation techniques are the tools and processes used by the (re)insurance undertaking to ensure valuation methods, assumptions and results of the best estimate calculation are appropriate and relevant.

3.297. Validation methods will assist (re)insurance undertakings throughout the best estimate calculation by:

- Encouraging understanding of how the cash-flows may emerge in the future and tracing any flaws in the calculation process.
- Justifying the applicability and relevance of methods used in the estimation of the level of the best estimate.
- Validating the appropriateness, completeness and accuracy of the assumptions and modelling used in the calculation of the best estimate.

### **3.11.2 Selection of validation methods**

3.298. The methods used for validation may be quantitative as well as qualitative.

3.299. In line with actuarial best practice, each (re)insurance undertaking shall consider which validation methods and techniques are most appropriate. It would not be appropriate to prescribe the particular tools to be used by all undertakings. All methods have different characteristics and are appropriate for different uses.

3.300. In addition, further validation methods may be developed in the future which may be more effective or more appropriate than the current methods available.

3.301. In line with Article 83 of the Level 1 text, (re)insurance undertakings are required to apply validation methods to ensure that the best estimate and the assumptions underlying the calculation of the best estimate are regularly compared against experience. This method is referred to hereafter as back-testing or comparison against experience and is further described under section 3.11.4.

3.302. Section 3.11.5 provides a non exhaustive list of validation methods that may be applied during and after the calculation of the best estimate.

### **3.11.3 Application of validation methods**

3.303. The validation shall be carried out at least once a year, and in any case where there are indications of substantial changes. The extent of the validation should be proportionate to the nature and purpose of the best estimate calculation.

3.304. Significant changes in the external environment as well as changes to assumptions of goodness of fit of probability distributions may necessitate additional ad hoc checks.

3.305. The validation of the best estimate result shall be carried out at a sufficiently fine granularity to detect insufficiencies in the reserving of sub-

portfolios of insurance obligations. For life insurance obligations, the validation should at least be made at the level of product types. For all other insurance or reinsurance obligations, the validation should be made at least at the level of homogeneous risk groups.

3.306. Furthermore, the validation should be carried out separately for the best estimate and recoverables from reinsurance contract and special purpose vehicles, and in non-life insurance for premium provisions and claims provisions.

3.307. All relevant and material assumptions shall be appropriately validated. To the extent that it is statistically feasible, the validation should be carried out for each assumption separately.

3.308. The validation processes shall include appropriate documentation and should be overseen by the expert who fulfils requirements specified for providing expert judgment in order to insure that this will be done correctly.

#### **3.11.4 Back-testing or comparison against experience**

3.309. Article 82 of the Level 1 text states that companies are required to have processes and procedures in place in order to compare the best estimate, and the assumptions made in the calculation, against experience. This implies the use of back-testing techniques whereby the best estimate and the assumptions made in the calculation are compared against actual realizations.

3.310. Experience investigations which are commonly used in life business to compare actual experience with expected and identify any trends or one-off changes are one example of how back-testing methods may be applied.

3.311. This method is used to indicate possible shortcomings which may not be detected in other ways.

3.312. Many assumptions are set based on an analysis of historical data. There is therefore a presumption that past performance is a good indicator of future performance. Back-testing may be used to assess the validity of this underlying assumption.

3.313. In the case where expert judgment is used, back-testing is the common sense comparison between prediction and realization.

3.314. The back-testing results (any significant deviations between actual and predicted values) shall be analysed to identify the reason behind them.

3.315. Companies shall assess whether the deviation is, for example, the consequence of a random variation in experience or a more systematic effect such as a permanent change in the environment or an assumption error or parameter estimation error.

### 3.11.5 Examples of other validation methods

3.316. As mentioned under section 3.11.2 each (re)insurance undertaking shall consider which validation methods and techniques are the most appropriate.

3.317. Below is a non-exhaustive list of possible validation methods, that (re)insurance undertakings could use to validate their best estimate:

#### **Examples of methods, which can help identify emerging features and trends in the historical data:**

3.318. Percentiles and analysis of residuals can be used to detect influential observations, outliers or clustering of claims.

3.319. Ratios can be used to detect the drivers or causes for certain patterns. For example, we may have noticed an increase in claims. What is driving this - severity or frequency? For example, average cost per claim ratios or adjustments for inflation may give an indication of what the main drivers are.

3.320. Analysis of settled vs. reported or paid over incurred claims ratios, can be used to justify the level of the best estimate.

3.321. Graphs can be used to validate the use of a pattern. For example, the accident year patterns may be plotted against the final selected patterns. If there are any significant deviations, it may be necessary to investigate what is driving this deviation and make some adjustments which should be appropriately documented and justified.

3.322. Identifying the existence of any biases or other distorting effects within data which are not representative of future experience. For example, a company may have recently merged with another. As a result, a specific line of business may produce a distribution of reserves which is significantly skewed in comparison to the distribution prior to the merger. This may suggest the need to separate both portfolios, even if they are within the same line of business

#### **Examples of methods and techniques can help validate underlying assumptions:**

##### Stress and scenario testing

3.323. Stress and scenario testing is one of the quantitative tools used in a validation process by the insurance companies in order to:

- Understand any non-linearity between different assumptions;
- Ensure the estimation is robust and weaknesses/uncertainty has been addressed;
- Get further insight into the tail of the loss distribution.

### Sensitivity analysis

- 3.324. Sensitivity analysis can be used to assess the extent to which results are sensitive to the underlying assumptions and models. This can be performed by introducing small changes to parameters or additional data points.
- 3.325. When an undertaking does not have sufficient relevant and reliable data to be able to analyse its own historical claim development it may use a relevant market or portfolio development pattern as a suitable benchmark. These benchmarks may also be used for comparison, to demonstrate the appropriateness and relevance of specific assumptions.
- 3.326. Investigate the potential change in coverage, higher deductibles, or other external factors that could invalidate the underlying assumption that past development will be repeated in the future.

### **The following methods and techniques can be used to test the quality of fit and/or appropriateness of the valuation model:**

- 3.327. Produce several sets of estimators (curves of distribution of the estimators) and assess how well they describe the data. There are several ways undertakings can do this before they calculate the best estimate of the provisions. For example, they can plot age to age factors against the estimators. From this they will be able to assess which curve fits best.
- 3.328. Test different curves and extrapolate a tail factor if necessary.
- 3.329. Statistical diagnostics techniques such as goodness of fit tests, including analysis of residuals, sum of squares, Akaike information criterion<sup>17</sup> and non parametric smoothing, etc...

### **Some of the tools or procedures that can be used in the validation of the outputs of models are:**

- 3.330. Analysis of movement – this is a comparison of actual surplus over the year with the expected surplus. The analysis can be grouped according to the drivers of surplus such as initial adjustments (impact of changes to model, methodology and data as well as any corrections made), new business effect (this will occur when the best estimate liability of the new business is not the same as the assets backing the new business), economic and insurance variances (impact of difference between best estimate assumption and experience), capital injections and any unexplained movements.
- 3.331. The following process can be used to undertake an analysis of movement:

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<sup>17</sup> Akaike's information criterion is a measure of the goodness of fit of an estimated statistical model. It offers a relative measure of the information lost when a given model is used to describe reality and can be said to describe the tradeoff between bias and variance in model construction, or loosely speaking that of precision and complexity of the model.

- i. Re-run the model used to calculate position at the beginning of this period.
  - ii. Re-run model allowing for any initial adjustments (the difference two runs is impact of opening adjustments)
  - iii. Re-run model updated for changes in non-economic assumption, the difference between subsequent runs is the impact of assumption change.
  - iv. Roll forward model allowing for actual non-economic parameters, the difference between the last two runs is insurance variance.
  - v. Roll forward model allowing for actual economic parameters, the difference between the last two runs is economic variance.
  - vi. Re-run model updated for new business volumes, the difference between the last two runs is the impact of new business.
  - vii. The difference between the results of last run and the previous run is unexplained movements. The undertaking should be able to demonstrate understanding of the causes of any deviation from expected experience and the underlying drivers of this deviation.
- 3.332. Parallel testing – this involves using simple but independent calculations to check the reasonableness of an output. An example of this is using a closed form formula such as Black-Scholes to calculate the cost of guarantee and compare it to the cost of guarantee produced by the model. Another example is independently calculating the value of simple liabilities (such as asset shares) and comparing it with that calculated by the model.
- 3.333. Cash-flow checks – this involves (re)insurance undertaking checks on sample cash-flows for reasonableness.
- 3.334. The assumptions used to estimate best estimate liabilities can be grouped into economic and non-economic (insurance) assumptions. Economic assumptions can be in the form of an Economic Scenario Generator (ESG) file or a set of deterministic scenarios.

**Some of the tools or procedures that can be used in the validation of non-economic assumptions and deterministic economic assumptions are:**

- 3.335. Experience investigation – this may be included in back-testing and is described in section 3.11.4.
- 3.336. Investigation of experience variance identified as part of the analysis of movement.
- 3.337. Where available, the undertaking can compare its assumptions with that of industry and identify if it is an outlier in any assumption. The undertaking should satisfy itself that there are specific features of its business or a valid reason why its assumptions should be significantly different.



**Some of the tools or procedures that can be used in the validation of ESGs are:**

- 3.338. Martingale test – in a market consistent ESG the expected return on all assets is the risk free rate. The martingale test verifies this.
- 3.339. Reproduce the risk free yield curve – the risk free yield curve at the calibration date is compared to the average risk free yield curve calculated from the ESG scenarios.
- 3.340. Reproduce calibration parameters – market data such as equity and swaption implied volatility used to calibrate the ESG is compared to the equity and swaption implied volatility estimated from the ESG scenarios.
- 3.341. Checks on whether the ESG scenarios correctly prices or values out of sample assets or parameters. An example of this is that the implied volatility normally used to calibrate equities are derived from at-the-money equity options, checks can be undertaken to test how accurately the calibrated model prices out-of-the money equity options.
- 3.342. Adequacy of the number of scenarios – This can be checked by comparing the sampling error or confidence interval of a relevant model output (such as cost of guarantees) produced by using different sample sets of ESG files and assessing whether the confidence interval or sampling error is stable. The adequacy of number of scenario can also be checked by comparing the sampling error against a chosen hurdle.

**3.11.6 CEIOPS' advice**

- 3.343. Validation techniques are the tools and processes used by the (re)insurance undertaking to ensure valuation methods, assumptions and results of the best estimate calculation are appropriate and relevant. These methods can be quantitative as well as qualitative.
- 3.344. In line with actuarial best practice (Re)insurance undertakings shall use validation techniques throughout the calculation of the best estimate in order to:
- a) Validate the amounts of technical provisions.
  - b) Ensure the applicability and relevance of the methods and assumptions applied and the appropriateness of the level of technical provisions.
  - c) Ensure that the actuarial methods and statistical methodologies are appropriate to the nature, scale and complexity of the risks supported by insurance and reinsurance undertakings.
  - d) Compare the best estimate and the assumptions underlying the calculations regularly against experience
- 3.345. Validation methods will assist (re)insurance undertakings throughout the best estimate calculation by:
- a) Encouraging understanding of how the cash-flows may emerge in

the future and tracing any flaws in the calculation process.

b) Justifying the applicability and relevance of methods used in the estimation of the level of the best estimate.

c) Validating the appropriateness, completeness and accuracy of the assumptions and modelling used in the calculation of the best estimate.

3.346. (Re)insurance undertakings shall consider the validation methods which are most appropriate in order to ensure the above requirements are met.

3.347. Back-testing techniques shall be applied in order to ensure that the best estimate and the assumptions underlying the calculation of the best estimate are regularly compared against experience.

3.348. The back-testing results (the significant deviations between actual and predicted values) shall be analysed to identify the underlying causes of such deviations.

3.349. Companies shall decide whether the deviation is for example the consequence of a random variation in experience, or a more systematic effect such as a permanent change in the environment, or an assumption error or parameter estimation error. The results of the back-testing may imply that an adjustment to the calculation method of the assumptions is required.

3.350. The validation shall be carried out at least once a year, and in any case where there are indications of substantial changes. The extent of the validation should be proportionate to the nature and purpose of the best estimate calculation.

3.351. Significant changes in the external environment as well as changes to assumptions or goodness of fit of probability distributions may necessitate additional ad hoc checks on the validity of the calculation.

3.352. The validation of the best estimate result shall be carried out at a sufficiently fine granularity to detect insufficiencies in the reserving of sub-portfolios of insurance obligations. For life insurance obligations, the validation should at least be made at the level of product types. For all other insurance or reinsurance obligations, the validation should be made at least at the level of homogeneous risk groups.

3.353. Furthermore, the validation should be carried out separately for best estimate and reinsurance recoverable, and in non-life insurance for premium provisions and claims provisions.

3.354. All relevant and material assumptions shall be appropriately validated. To the extent that it is statistically feasible, the validation should be carried out for each assumption separately.

3.355. The validation processes shall include appropriate documentation and should be overseen by the expert who fulfils requirements specified for providing expert judgment in order to insure that this will be done correctly.

## 3.12 Reporting on the methodology used and the result of the calculation

3.356. The reports which should be submitted to supervision authorities should be prepared in line with CEIOPS-DOC-50/09 advice on supervisory reporting and disclosure.<sup>18</sup>

### 3.12.1 Explanatory text

3.357. This section considers the documentation of the data, assumptions models, results and validations used when determining the amount of best estimate of technical provisions. It also considers the reporting of the methodology used and results of the calculation at request of supervisors.

3.358. This is included in Article 84 of Solvency II Level 1 text which states that:

*Upon request from the supervisory authorities, insurance and reinsurance undertakings shall demonstrate the appropriateness of the level of their technical provisions, as well as the applicability and relevance of the methods applied, and the adequacy of the underlying statistical data used.*

3.359. Article 83 of the Level 1 text requires that undertakings should document and store all documents produced during the valuation process including statistical data used for determining the assumptions used for the valuation of best estimate of technical provisions.

### 3.12.2 CEIOPS' advice

3.360. The undertaking should store all documents produced and used during the process of valuation of the best estimate of technical provisions that enable to assess appropriateness of the level of best estimate, as well as the applicability and relevance of the methods applied, and the adequacy of the underlying statistical data used and make them available to the supervisor at request.

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<sup>18</sup> Former CP 58. See <http://www.ceiops.eu/index.php?option=content&task=view&id=609>.

# ANNEX

## Examples of assumptions consistent with generally available data on insurance and reinsurance technical risks

### A.1. Data assumptions examples:

- If an undertaking has launched a new product, they will not have sufficient historic data to derive best estimate assumptions. The undertaking may use a relevant market benchmark as an alternative to own data or combine the data into a single larger risk group.
- Alternatively, data may be of poor quality. For instance, certain data fields may not be available for every record. The insurer may have to make assumptions based on summarised information or external business related data.
- The undertaking may need to build an inflation index for example cost of care, for which they have no own data. Reference to alternative data may be used instead (for example, NHS or local authorities).

### A.2. Analysis assumptions examples:

- For life business, examples of such assumptions are demographic assumptions (mortality, morbidity, and lapse) and expense assumptions.
- For non life business examples include assumptions regarding relevance of historic data because of changes in product design, target market, distribution network or underwriting.
- An example of where an undertaking may need to take future trends into account is if analysis of historic expense data shows a trend of decreasing expenses as a result of increasing economies of scale. An undertaking will need to determine whether this trend may be expected to continue into the future and as a result should be reflected in the expense assumption. In doing so, the undertaking should take into account factors such as the potential for further reductions in expenses, expected levels of new business etc
- Assumptions may be made regarding the applicability of age to age factors. Some of these factors may have a material affect on the overall valuation result. In order to increase the reliability of the result the insurer may exclude or down weight certain age to age factors or cohorts from the main method and allow for this in a different manner, for example through the tail or curve fitting exercise.
- Another example could be where one or two losses are assumed to be large and do not fit with the rest of the portfolio. The undertaking may

wish to exclude them from the overall modelling process and project them case by case.

- The insurer may need to assess whether it is relevant to include a large loss. They may assume this has been an infrequent event and needs to be taken out of the projection and allowed for separately. Another example would be an analysis of historic expense data that might be distorted by a one off expenditure on IT systems which would not be expected to continue going forward.

#### A.3. Modelling assumptions examples:

- The undertaking may wish to place less credibility on its own claims experience and combine this with an underwriting loss ratio, where this is an efficient use of the available information.
- In the absence of relevant claims data assumptions will need to be made in respect of long tail classes where the insurer needs to decide what tail factor to apply to developing claims.
- The modeller can make assumptions regarding the curve fitting process. May decide to use a more conservative fit, for example a curve with a fatter tail to allow for large claims.
- Application of bootstrap will require prior residual analysis and making assumptions about the applicability of certain residuals.
- Most companies make the assumption that elements of the current environment will continue in the future. This can include tax rates calculations, reinsurance arrangements, business volumes etc...

#### A.4. Validation assumptions examples:

- The assumption that a given market development pattern is a suitable benchmark to validate portfolio and undertaking specific assumptions.