GUIDELINES

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on valuation of technical provisions

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European Insurance and
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GUIDELINES ON VALUATION OF TECHNICAL PROVISIONS

INTRODUCTION

1. According to Article 16 of Regulation (EU) 1904/2010 of 24 November 2010 (hereafter, EIOPA Regulation)[1] and Articles 76 to 86 as well as Article 48 of Directive 2009/138/EC of the European Parliament and of the Council of 25 November 2009 on the taking-up and pursuit of the business of Insurance and Reinsurance (Solvency II)[2] as further developed Commission Delegated Regulation (EU) 2015/35 of 10 October 2014 supplementing Directive 2009/138/EC (hereafter, Commission Delegated Regulation 2015/35) and in particular by Articles 17 to 42 on the rules relating to technical provisions, EIOPA is issuing Guidelines on the valuation of technical provisions[3].
2. The Guidelines on valuation of technical provisions are formulated to increase consistency and convergence of professional practice for all types and sizes of undertakings across Member States and to support undertakings in calculating their technical provisions under Solvency II.
3. It is recognised that expert judgment is a key component of the calculation of technical provisions and it should be applied in setting assumptions to be used in the valuation of technical provisions for insurance and reinsurance undertakings. These guidelines on the valuation of technical provisions should be read together with Chapter 4 on assumption setting and expert judgment of the Guidelines on the use of internal models, which is based on Article 2 of Commission Delegated Regulation 2015/35.
4. These Guidelines are addressed to national competent authorities under Solvency II.
5. The Guidelines will be ultimately applied both by actuaries and by other professionals who may be appointed to carry out the tasks of the actuarial function.
6. The relevant steps to ensure a reliable calculation of technical provisions should be done by the responsible persons for the calculation. The actuarial function should carry out the coordinating and validating task. Undertakings should require the actuarial function – also when not explicitly mentioned - to carry out its tasks where appropriate taking into account the requirements defined in the Guidelines for the valuation of technical provisions and in accordance with the Guidelines on the system of governance and the requirements defined in article 272 of Commission Delegated Regulation 2015/35.
7. These Guidelines are divided in different sections. Section 1 on Data Quality explores the ways data quality issues should be taken into account in the process of calculating technical provisions and ensuring that deficiencies have been appropriately dealt with.
8. Section 2 on Segmentation and Unbundling explores the ways how to segment the insurance and reinsurance obligations. The purpose of segmentation is to achieve an accurate valuation of technical provisions.
9. Section 3 on Assumptions sets out requirements for the choice of methodologies to calculate technical provisions. This relates to the general proportionality assessment process which

[1] OJ L 331, 15.12.2010, p. 48–83

[2] OJ L 335, 17.12.2009, p. 1-155

[3] OJ L 12, 17.01.2015, p. 1-797

undertakings are expected to carry out when selecting a calculation method, as well as to specific methodological aspects of the calculation.

10. Section 4 on the Methodologies to calculate Technical Provisions, contains relevant guidelines when calculating technical provisions as a whole. It also provides a non-exhaustive list of potential approaches for simplifications, taking account of the fact that methodologies and techniques for the valuation of technical provisions are subject to continuous development. The proportionality assessment outlined in these guidelines is not only relevant for the selection of the methodologies for the calculation of technical provisions. Its resolutions should also be convenient to support other steps necessary for the calculation of technical provisions, such as data quality, segmentation, assumptions setting and validation.
11. Given that a closed list would not be in line with a principle-based approach to proportionality and might not provide proportionate calculation methods for all risk profiles, the simplified methods proposed in this paper are not to be interpreted as a closed list, but as possible methodologies to be applied.
12. Section 5 on Validation focuses on the types and selection of validation approaches and processes, timing, extent and documentation and also the assessment of controls which should be carried out by the undertakings to validate the technical provisions. The purpose of these guidelines is to ensure a consistent approach to the process of validating the technical provisions across Member States. The technical annexes present some standard validation approaches and processes and suggest when it may be appropriate to use them.
13. If not defined in these Guidelines the terms have the meaning defined in the legal acts referred to in the introduction.
14. The Guidelines apply from 1 April 2015.

PROPORTIONALITY

15. Insurance and reinsurance undertakings should apply the Guidelines on valuation of technical provisions in a manner that is proportionate to the nature, scale and complexity of the risks inherent in their business. This should not result in a material deviation of the value of the technical from the current amount that 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

SECTION 1: DATA QUALITY

CLARIFICATION OF THE CONCEPTS OF COMPLETENESS AND APPROPRIATENESS OF DATA

GUIDELINE 1 – COMPLETENESS OF DATA

16. Insurance and reinsurance undertakings should ensure that data used in the calculation of technical provisions cover a sufficiently large period of observations that characterise the reality being measured.
17. To perform the calculation of premium provisions for non-life obligations, undertakings should ensure that sufficient historical information is available on the total cost of claims and their actual trends at a sufficiently granular level.
18. To perform the calculation of provisions for claims outstanding, undertakings should ensure that sufficient data are available to allow for the identification of relevant patterns on the claims development, and with sufficient granularity, in order to permit analysis of such patterns within homogeneous risk groups.

GUIDELINE 2 – APPROPRIATENESS OF DATA

19. Insurance and reinsurance undertakings should ensure that data relating to different time periods is used consistently.
20. Undertakings should apply adjustments to historical data, if necessary, to increase its credibility or enhance its quality as an input to determine more reliable estimates of technical provisions and to better align it with the characteristics of the portfolio being valued and with future expected development of risks.

REVIEW AND VALIDATION OF DATA QUALITY

GUIDELINE 3 – DATA CHECKS

21. Insurance and reinsurance undertakings should ensure that the actuarial function assesses the accuracy and completeness of data through a sufficiently comprehensive series of checks to meet the criteria set out in the previous Guidelines and to allow the detection of any relevant shortcomings.
22. Insurance and reinsurance undertakings should ensure that the actuarial function carries out this assessment at an appropriately granular level.

GUIDELINE 4 – CONSIDERATION OF OTHER ANALYSIS CONDUCTED

23. Insurance and reinsurance undertakings should ensure that the actuarial function takes into account the conclusions of any relevant analysis performed in an external review, where data quality in the context of calculating technical provisions is reviewed.

GUIDELINE 5 - CONSIDERATION OF THE METHODOLOGIES TO BE APPLIED

24. Insurance and reinsurance undertakings should ensure that the actuarial function takes into account the relation between the conclusions of the analysis of the data quality and the selection of the methodologies to be applied to value the technical provisions.

25. Undertakings should ensure that the actuarial function analyses the extent to which data used is adequate to support the assumptions underlying the methodologies to be applied to value the technical provisions. If data does not adequately support the methodologies, then the undertaking should select an alternative methodology.
26. In the assessment of completeness of data, undertakings should ensure that the actuarial function considers whether the number of observations and granularity of available data is sufficient and adequate to meet the input requirement for the application of the methodology.

GUIDELINE 6 – SOURCE AND USE OF DATA

27. Insurance and reinsurance undertakings should require the actuarial function to take into account the source and the intended use of data in the data validation process.

GUIDELINE 7 – SOURCE AND USE OF DATA

28. Insurance and reinsurance undertakings should ensure that the use of expert judgment in assessing accurate, appropriate and complete data for use in the calculation of technical provisions does not replace the appropriate collection, processing and analysis of data but supplements these where required.

GUIDELINE 8 – VALIDATION AND FEEDBACK PROCESS

29. Insurance and reinsurance undertakings should ensure that the actuarial function, within the remits of the coordination of technical provisions, also coordinates the assessment and validation of relevant data to be used in the valuation process.
30. The coordination task should include at least:
    a) the selection of data to be used in the valuation, having regard to the criteria of accuracy, appropriateness and completeness of data considering the methodologies which are most appropriate to be applied in the calculation. For this purpose, relevant tools should be used to check any material differences that may be found in data from a single year and within other relevant analysis;
    b) the reporting of any recommendations on the implementation of improvements in the internal procedures that are considered relevant to improve the compliance with the criteria as set out in point a);
    c) the identification of cases where additional external data are needed;
    d) an assessment of the quality of external data, as performed for internal data, focusing on whether market data are required or when they should be used to improve the quality of internal data and if and how enhancements to the available data should be applied;
    e) an assessment of whether any adjustments need to be applied to available data, as part of actuarial best practice, to improve the goodness-of-fit and the reliability of the estimates derived from actuarial and statistical provisioning methodologies based on these data;
    f) the recording of any relevant insights that have been gained in the assessment and validation process that may become relevant to the other steps of calculation of technical

provisions, and that relate to the understanding of the underlying risks and also to the knowledge of the quality and limitations of available data.

LIMITATIONS OF DATA

GUIDELINE 9 – IDENTIFICATION OF THE SOURCE OF MATERIAL LIMITATIONS

31. Insurance and reinsurance undertakings should ensure that the actuarial function assesses the data accuracy, completeness and appropriateness in order to identify any material limitations of the data. If material limitations are identified, the sources of those limitations should also be identified.

GUIDELINE 10 – IMPACT OF SHORTCOMINGS

32. In order to identify and assess the impact of any possible shortcomings that could affect the compliance with the requirements of data quality, insurance and reinsurance undertakings should ensure that the actuarial function considers all relevant available documentation related to internal processes and procedures of collection, storage and validation of data used for the valuation of technical provisions and, where necessary, search for more specific information by contacting the personnel involved in these processes.
33. Additionally, undertakings should ensure that the actuarial function coordinates any relevant task that may be performed in order to assess the impact of the shortcomings identified on the available data to be used in the calculation of technical provisions to obtain findings on whether the available data should be used for the intended purpose or if alternative data should be sought.

GUIDELINE 11 – DATA ADJUSTMENTS

34. Where data deficiencies are identified, insurance and reinsurance undertakings should ensure that the actuarial function assesses whether the quality of data considering its purpose can be improved by adjusting or supplementing it.
35. Insurance and reinsurance undertakings should ensure that they implement appropriate measures to overcome limitations of data arising from the exchange of information with business partner.
36. When external data is used, undertakings should ensure that data remain compliant with the standards set in these guidelines regarding the quality of data.
37. Undertakings should decide whether it is possible to adjust data to overcome the shortcomings which affect the quality of data and, if applicable, what specific adjustments should be introduced.
38. Undertakings should ensure that the adjustments are limited to the level strictly necessary to enhance compliance with the criteria set out in the previous guidelines and do not distort the identification of trends and any other characteristics regarding the underlying risks reflected in the data.

GUIDELINE 12 – RECOMMENDATIONS OF THE ACTUARIAL FUNCTION

39. Insurance and reinsurance undertakings should ensure that the actuarial function delivers recommendations to the management body on the procedures that could be performed in order

to increase the quality and the quantity of available data. To accomplish this task, the actuarial function should identify the sources of material limitations and propose possible solutions considering their effectiveness and the time necessary to implement them.

GUIDELINE 13 – APPLICATION OF EXPERT JUDGMENT UPON MATERIAL LIMITATIONS

40. Where there are material limitations to the data that cannot be remedied without undue complexity, insurance and reinsurance undertakings should ensure that expert judgment is applied to overcome these limitations to ensure that technical provisions are appropriately calculated. The calculation of technical provisions should not be impaired as a result of inaccurate or incomplete data.

GUIDELINE 14 – VALIDATION AND FEEDBACK PROCESS

41. Insurance and reinsurance undertakings should ensure that the actuarial function documents data limitations, including at least:
    a) A description of the shortcomings comprising its causes and any references to other documents where they were identified;
    b) A summary explanation on the impact of the shortcomings in the scope of the calculation of technical provisions regarding its materiality and how it affects this process;
    c) A description of the actions taken by the actuarial function to detect the shortcomings, complementarily or not with other sources and documents;
    d) A description of how such situations can be remedied in a short term for the intended purpose and any relevant recommendations to be applied to enhance data quality in the future.

MARKET DATA

GUIDELINE 15 – USE OF MARKET DATA

42. When valuing liabilities which depend directly on the behaviour of financial markets or in cases where the calculation of technical provisions requires the input of data from an external source, insurance and reinsurance undertakings should be able to demonstrate that external data are more suitable than internal data for the intended purpose. Undertakings should ensure that external data supplied by third parties or market data complement the internal data available.
43. Notwithstanding the level of dependencies of the liabilities on market conditions or the level of quality regarding the available internal data, undertakings should consider relevant external benchmarks where appropriate. External data should be part of the analysis to assess the general compliance with requirements on data quality.

GUIDELINE 16 – CONDITIONS ON MARKET DATA

44. To carry out the assessment of the level of accuracy, appropriateness and completeness of external data, insurance and reinsurance undertakings should ensure that the actuarial function knows and

considers in its analysis the reliability of the sources of information and the consistency and stability of its process of collecting and publishing information over time.

45. Moreover, undertakings should ensure that the actuarial function considers all the realistic assumptions and relevant methodologies applied to derive data, including any adjustments or simplifications applied to raw data. The actuarial function should be aware of and take into consideration if any changes that have been applied over time to external data, whether those changes relate to assumptions or associated methodologies or any other procedures regarding the collection of external data.
46. Moreover, whenever it is accessible and adequate, undertakings should ensure that the actuarial function measures the quality of available data in the context of provisioning analysis in regard to available industry or market data which is deemed comparable, and in particular to the requirements set in Article 76(3) of Solvency II. Any material deviations should be identified and understood by the actuarial function. This analysis could refer to the specificities of the particular homogeneous risk group being valued.

SECTION 2: SEGMENTATION AND UNBUNDLING

GUIDELINE 17 – SEGMENTATION OF INSURANCE OR REINSURANCE OBLIGATIONS STEMMING FROM HEALTH AND OTHER NON-LIFE INSURANCE CONTRACTS

47. Insurance and reinsurance undertakings should ensure that insurance or reinsurance obligations stemming from health and other non-life insurance contracts should be segmented to life lines of business where such obligations are exposed to biometrical risks (i.e. mortality, longevity or disability or morbidity) and where the common techniques that are used to assess such obligations explicitly take into consideration the behaviour of the variables underlying these risks.
48. Where health insurance or reinsurance obligations are calculated according to the conditions set out in Article 206 of Solvency II, insurance and reinsurance undertakings should ensure that these obligations are considered to be pursued on a similar technical basis to that of life insurance and therefore assigned to life lines of business.

GUIDELINE 18 – CHANGE IN THE SEGMENTATION OF NON-LIFE INSURANCE OR REINSURANCE OBLIGATIONS

49. Insurance and reinsurance undertakings should ensure that insurance or reinsurance obligations that were originally segmented into non-life lines of business and, as a result of the occurrence of an insured event turn into life insurance or reinsurance obligations, should be assessed using life techniques that explicitly take into consideration the behaviour of the variables underlying biometrical risks and assigned to the relevant life lines of business as soon as there is sufficient information to assess those obligations using life techniques.

GUIDELINE 19 – DETERMINING AND ASSESSING APPROPRIATENESS OF A HOMOGENEOUS RISK GROUP

50. Insurance and reinsurance undertakings should calculate technical provisions using homogeneous risk groups in order to derive assumptions.
51. A homogeneous risk group encompasses a collection of policies with similar risk characteristics. In selecting a homogeneous risk group, undertakings should achieve an appropriate balance between the credibility of data available, to enable reliable statistical analyses to be performed, and the homogeneity of risk characteristics within the group. Undertakings should define homogeneous risk groups in such a manner that those are expected to be reasonably stable over time.
52. Where necessary, undertakings should for the derivation of risks inter alia take into account the following items:
    a) underwriting policy;
    b) claims settlement pattern;
    c) risk profile of policyholders;
    d) product features, in particular guarantees;
    e) future management actions.
53. Undertakings should ensure consistency between the homogeneous risk groups it uses to assess its gross of reinsurance technical provisions and its reinsurance recoverables.

GUIDELINE 20 – CALCULATIONS AT THE LEVEL OF GROUPED POLICIES

54. In order to calculate the technical provisions and carry out cash-flow projections, insurance and reinsurance undertakings should apply the assumptions derived at the level of homogeneous risk groups to individual policies or grouped policies, where the groupings may be more granular than homogeneous risk groups.

GUIDELINE 21 – UNBUNDLING OF INSURANCE OR REINSURANCE CONTRACTS COVERING MULTIPLE RISKS

55. Where an insurance or reinsurance contract covers risks across different lines of business, unbundling of the obligations is not required where only one of the risks covered by the contract is material. In this case, the obligations relating to the contract should be segmented according to the major risk driver.

GUIDELINE 22 – GRANULARITY OF SEGMENTATION

56. Insurance and reinsurance undertakings should analyse whether the granularity of the segmentation of insurance or reinsurance obligations adequately reflects the nature of the risks. This segmentation should consider the policyholder's right to profit participation, options and guarantees embedded in the contracts and the relevant risk drivers of the obligations.

GUIDELINE 23 – SEGMENTATION IN RESPECT OF PREMIUM PROVISIONS AND CLAIMS PROVISIONS

57. Insurance and reinsurance undertakings should consider both the nature of the underlying risks being evaluated together and the quality of data in selecting the homogeneous risk groups for the calculations of the premium provisions and claims provisions.

SECTION 3: ASSUMPTIONS

GUIDELINE 24 – CONSISTENCY OF ASSUMPTIONS

58. Insurance and reinsurance undertakings should ensure that assumptions used in the determination of technical provisions, own funds and solvency capital requirement are consistent.

EXPERT JUDGEMENT

GUIDELINE 24A – MATERIALITY IN ASSUMPTIONS SETTING

59. Insurance and reinsurance undertakings should set assumptions and use expert judgment, in particular taking into account the materiality of the impact of the use of assumptions with respect to the following Guidelines on assumption setting and expert judgement.
60. Insurance and reinsurance undertakings should assess materiality taking into account both quantitative and qualitative indicators and taking into consideration binary events, extreme events, and events that are not present in historical data. Insurance and reinsurance undertakings should overall evaluate the indicators considered.

GUIDELINE 24B – GOVERNANCE OF ASSUMPTIONS SETTING

61. Insurance and reinsurance undertakings should ensure that all assumption setting and the use of expert judgement in particular, follows a validated and documented process.
62. Insurance and reinsurance undertakings should ensure that the assumptions are derived and used consistently over time and across the insurance or reinsurance undertaking and that they are fit for their intended use.
63. Insurance and reinsurance undertakings should approve the assumptions at levels of sufficient seniority according to their materiality, for most material assumptions up to and including the administrative, management or supervisory body.

GUIDELINE 24C – COMMUNICATION AND UNCERTAINTY IN ASSUMPTIONS SETTING

64. Insurance and reinsurance undertakings should ensure that the processes around assumptions, and in particular around the use of expert judgement in choosing those assumptions, specifically attempt to mitigate the risk of misunderstanding or miscommunication between all different roles related to such assumptions.

65. Insurance and reinsurance undertakings should establish a formal and documented feedback process between the providers and the users of material expert judgement and of the resulting assumptions.
66. Insurance and reinsurance undertakings should make transparent the uncertainty of the assumptions as well as the associated variation in final results.

GUIDELINE 24D – DOCUMENTATION OF ASSUMPTIONS SETTING

67. Insurance and reinsurance undertakings should document the assumption setting process and, in particular, the use of expert judgement, in such a manner that the process is transparent.
68. Insurance and reinsurance undertakings should include in the documentation the resulting assumptions and their materiality, the experts involved, the intended use and the period of validity.
69. Insurance and reinsurance undertakings should include the rationale for the opinion, including the information basis used, with the level of detail necessary to make transparent both the assumptions and the process and decision-making criteria used for the selection of the assumptions and disregarding other alternatives.
70. Insurance and reinsurance undertakings should make sure that users of material assumptions receive clear and comprehensive written information about those assumptions.

GUIDELINE 24E – VALIDATION OF ASSUMPTIONS SETTING

71. Insurance and reinsurance undertakings should ensure that the process for choosing assumptions and using expert judgement is validated.
72. Insurance and reinsurance undertakings should ensure that the process and the tools for validating the assumptions and in particular the use of expert judgement are documented.
73. Insurance and reinsurance undertakings should track the changes of material assumptions in response to new information, and analyse and explain those changes as well as deviations of realisations from material assumptions.
74. Insurance and reinsurance undertakings, where feasible and appropriate, should use validation tools such as stress testing or sensitivity testing.
75. Insurance and reinsurance undertakings should review the assumptions chosen, relying on independent internal or external expertise.
76. Insurance and reinsurance undertakings should detect the occurrence of circumstances under which the assumptions would be considered false.

BIOMETRIC RISK FACTORS

GUIDELINE 25 – MODELLING BIOMETRIC RISK FACTORS

77. Insurance and reinsurance undertakings should consider whether a deterministic or a stochastic approach is proportionate to model the uncertainty of biometric risk factors.
78. Insurance and reinsurance undertakings should take into account the duration of the liabilities when assessing whether a method that neglects expected future changes in biometrical risk factors is proportionate, in particular in assessing the error introduced in the result by the method.

79. Insurance and reinsurance undertakings should ensure, when assessing whether a method that assumes that biometric risk factors are independent from any other variable is proportionate, and that the specificities of the risk factors are taken into account. For this purpose, the assessment of the level of correlation should be based on historical data and expert judgment.

GUIDELINE 26 – EXPENSES FOR HEDGING

80. For insurance and reinsurance undertakings using a hedging program to mitigate risks, the expenses of the hedging program should be taken into account in the valuation of technical provisions. The expected incurrence of such expenses should be reflected in the projected cash in-flows and cash outflows required to settle the insurance and reinsurance obligations.

GUIDELINE 27 – AVAILABILITY OF MARKET DATA

81. Insurance and reinsurance undertakings should assess the availability of relevant market data on expenses by considering the representativeness of market data relative to the portfolio of insurance or reinsurance obligations, and the credibility and reliability of data.

GUIDELINE 28 – EXPENSES TAKEN INTO ACCOUNT ON CONTRACTUAL TERMS

82. Insurance and reinsurance undertakings should ensure that expenses that are determined by contracts between the undertaking and third parties are taken into account based on the terms of the contract. In particular, commissions arising from insurance contracts are considered based on the terms of the contracts between the undertakings and the sales persons, and expenses in respect of reinsurance are taken into account based on the contracts between the undertaking and its reinsurers.

GUIDELINE 28A – INVESTMENT MANAGEMENT EXPENSES

83. Insurance and reinsurance undertakings should include in the best estimate administrative and trading expenses associated with the investments needed to service insurance and reinsurance contracts.
84. In particular, for products whose terms and conditions of the contract or the regulation requires to identify the investments associated with a product (e.g. most unit linked and index linked products, products managed in ring-fenced funds and products to which matching adjustment is applied), insurance and reinsurance undertakings should consider the investments.
85. For other products, insurance and reinsurance undertakings should base the assessment on the characteristics of the contracts.
86. As a simplification, insurance and reinsurance undertakings may also consider all investment management expenses.
87. Reimbursements of investment management expenses that the fund manager pays to the undertaking should be taken into account as other incoming cash flows. Where these reimbursements are shared with the policyholders or other third parties, the corresponding cash out flows should also be considered.

EXPENSE ALLOCATION

GUIDELINE 29 – GRANULARITY OF ALLOCATION OF EXPENSES

88. Insurance and reinsurance undertakings should allocate the expenses into homogeneous risk groups, as a minimum by line of business, according to the segmentation of their obligations used in the calculation of technical provisions.

GUIDELINE 30 – APPORTIONEMENT OF EXPENSES

89. Insurance and reinsurance undertakings should allocate and project expenses in a realistic and objective manner and should base the allocation of these expenses on their long-term business strategies, on recent analyses of the operations of the business, on the identification of appropriate expense drivers and on relevant expense apportionment ratios.
90. Without prejudice to the proportionality assessment and the first paragraph of this guideline, insurance and reinsurance undertakings should consider using, in order to allocate overhead expenses over time, the simplification outlined in Technical Annex I, when the following conditions are met:
    a) the undertaking pursues annually renewable business;
    b) the renewals must be reputed to be new business according the boundaries of the insurance contract;
    c) the claims occur uniformly during the coverage period.

GUIDELINE 31 – CHANGING THE APPROACH TO THE SPLIT OF OVERHEAD EXPENSES

91. Insurance and reinsurance undertakings should allocate overhead expenses to existing and future business on a consistent basis over time, and should only change the basis of allocation if a new approach better reflects the current situation.

PROJECTION OF EXPENSES

GUIDELINE 32 – CONSISTENCY OF EXPENSES WITH OTHER CASH-FLOWS

92. Insurance and reinsurance undertakings should allocate expenses in the cashflow projection so that the timing of expense cash-flows is consistent with the timing of other cash in-flows and cash out-flows required to settle the insurance and reinsurance obligations.

GUIDELINE 33 – CHANGES IN EXPENSES

93. Insurance and reinsurance undertakings should ensure that assumptions with respect to the evolution of expenses over time, including future expenses arising from commitments made on or prior to the valuation date, are appropriate and consider the nature of the expenses involved. Insurance and reinsurance undertakings should make an allowance for inflation that is consistent with the economic assumptions made and with dependency of expenses on other cash flows of the contract.

GUIDELINE 34 – SIMPLIFICATIONS IN RESPECT OF EXPENSES

94. When assessing the nature, scale and complexity of risks underlying the expenses which are taken into account in the calculation of the technical provisions, insurance and reinsurance undertakings should take into account, inter alia, the uncertainty of future expense cash-flows, and any event that can change the amount, frequency and severity of expense cash-flows.
95. Undertakings should also take into account the type of expenses and the degree of correlation between different types of expenses.
96. When using a simplification for the projection of expenses based on a model which uses information on current and past expense loadings to project future expense loadings including inflation, undertakings should analyse current and historical expenses, giving consideration to, inter alia, where expenses occur and the factors that influence the expenses. Undertakings should include in the proportionality assessment an analysis of how the expenses are related to the size and nature of insurance portfolios. Undertakings should not apply the simplification where expenses have substantially changed or are expected not to cover all but only part of the expenses required to service insurance and reinsurance obligations.

TREATMENT OF FINANCIAL GUARANTEES AND CONTRACTUAL OPTIONS

GUIDELINE 35 – CHARGES FOR EMBEDDED OPTIONS

97. Insurance and reinsurance undertakings should explicitly take into account amounts charged to policy holders relating to embedded options.

GUIDELINE 36 – APPROPRIATENESS OF ASSUMPTIONS

98. Insurance and reinsurance undertakings should ensure that the assumptions used in the valuation of contractual options and financial guarantees are consistent with current market data, current market practice, policyholder and management behaviour specific to the characteristics of the business and the undertaking. Undertakings should also consider the impact of adverse market conditions and trends and establish a regular process for updating and ensuring that those assumptions are still realistic taking into account all additional information since the last calculation of technical provisions.

GUIDELINE 37 – ASSUMPTIONS ON POLICYHOLDER BEHAVIOUR

99. Insurance and reinsurance undertakings should ensure that the assumptions relating to policyholder behaviour are founded in statistical and empirical evidence, where available. Undertakings should consider the extent to which policyholders exercise contractual options in a financially rational manner when deriving such assumptions. For this purpose, undertakings should give consideration to policyholders' awareness of the value of policy options and to policyholders' possible reactions to the changing financial position of the undertaking.

GUIDELINE 37A – DYNAMIC POLICYHOLDER BEHAVIOUR

100. Insurance and reinsurance undertakings should base their assumptions on the exercise rate of relevant options on:

101. statistical and empirical evidence, where it is representative of future conduct, and

102. expert judgment on sound rationale and with clear documentation.

103. The lack of data for extreme scenarios should not be considered alone to be a reason to avoid dynamic policyholder behaviour modelling and/or the interaction with future management actions.

GUIDELINE 37B – BIDIRECTIONAL ASSUMPTIONS

104. When setting the assumptions on dynamic policyholder behaviour, insurance and reinsurance undertakings should consider that the dependency on the trigger event and the exercise rate of the option is usually bidirectional, i.e. both an increase and a decrease should be considered depending on the direction of the trigger event.

GUIDELINE 37C – OPTION TO PAY ADDITIONAL OR DIFFERENT PREMIUMS

105. Insurance and reinsurance undertakings should model all relevant contractual options when projecting the cash flows, including the option to pay additional premiums or to vary the amount of premiums to be paid that fall within contract boundaries.

FUTURE MANAGEMENT ACTIONS

GUIDELINE 38 – ALLOWANCE FOR FUTURE MANAGEMENT ACTIONS

106. Insurance and reinsurance undertakings should be able to provide adequate justification where future management actions are ignored on the grounds of materiality.

GUIDELINE 39 – CONSISTENCY OF MANAGEMENT ACTIONS WITH OTHER ASSUMPTIONS

107. Insurance and reinsurance undertakings should take into account the impact of assumed management actions on other assumptions within a certain valuation scenario. In particular, undertakings should take into account the effects of a certain management action on policyholder behaviour or on the related expenses. Undertakings should take account of relevant legal or regulatory constraints on management action. Moreover, for a given scenario undertakings should ensure that the assumed future management actions reflect the balance, which is consistent with the corporate planning, between the degree of competitiveness and the risk of dynamic lapses.

GUIDELINE 40 – INTERRELATION WITH CEDANT UNDERTAKING

108. Insurance and reinsurance undertakings should consider the future management actions of the cedant undertaking as policyholder behaviour, and estimate its technical provisions based on reasonable assumptions for the cedant's behaviour.

GUIDELINE 40A – COMPREHENSIVE MANAGEMENT PLAN

109. Insurance and reinsurance undertakings should ensure that the comprehensive future management actions plan that is approved by the administrative, management or supervisory body is either:
- a single document listing all assumptions relating to future management actions used in the best estimate calculation; or
- a set of documents, accompanied by an inventory, that clearly provide a complete view of all assumptions relating to future management actions used in best estimate calculation.

GUIDELINE 40B – CONSIDERATION OF NEW BUSINESS IN SETTING FUTURE MANAGEMENT ACTIONS

110. Insurance and reinsurance undertakings should consider the effect of new business in setting future management actions and duly consider the consequences on other related assumptions. In particular, the fact that the set of cash-flows to be projected through the application of Article 18 of the Delegated Regulation on contract boundaries is limited should not lead insurance and reinsurance undertakings to consider that assumptions only rely on this projected set of cash-flows without any influence of new business. This is particularly the case for assumptions on the allocation of risky assets, management of the duration gap or application of profit sharing mechanisms.

FUTURE DISCRETIONARY BENEFITS

GUIDELINE 41 – ALLOWANCE FOR FUTURE DISCRETIONARY BENEFITS

111. Insurance and reinsurance undertakings should take into account future discretionary benefits which are expected to be made, whether or not such payments are contractually guaranteed. Undertakings should ensure that the assessment of the value of future discretionary benefits considers all relevant legal and contractual restrictions, existing profit participation arrangements as well as any plans for distribution of profits.

GUIDELINE 42 – ASSUMPTIONS ON FUTURE DISCRETIONARY BENEFITS

112. Insurance and reinsurance undertakings should ensure that assumptions regarding the distribution of future discretionary benefits are derived in an objective, realistic and verifiable manner encompassing the principles and practices adopted by the undertaking to provide insurance contracts with profit participation. Where the distribution of future discretionary

benefits is related to the financial position of the undertaking, the assumptions should reflect the interaction between the assets and liabilities of the undertaking.

GUIDELINE 43 – ASSUMPTIONS IN RESPECT OF MODELLING DISTRIBUTION OF FUTURE DISCRETIONARY BENEFITS

113. Insurance and reinsurance undertakings should consider a comprehensive analysis of past experience, practice and distribution mechanism when assessing the proportionality of a simplified method used for determining the future discretionary benefits.

SECTION 4: METHODOLOGIES TO CALCULATE TECHNICAL PROVISIONS

PROPORTIONALITY ASSESSMENT

GUIDELINE 44 – GENERAL PRINCIPLE OF PROPORTIONALITY

114. Insurance and reinsurance undertakings should, in order to have an overall assessment of the risks underlying their insurance and reinsurance obligations, take into account the strong interrelation among the nature, scale and complexity of these risks.

115. Undertakings should ensure that the actuarial function is able to explain which methods are used to calculate the technical provisions and the reason why such methods have been selected.

GUIDELINE 45 – ASSESSMENT OF NATURE AND COMPLEXITY OF THE RISKS

116. When assessing the nature and complexity of the risks underlying the insurance contracts as referred to in Article 56 (2)(a) of Commission Delegated Regulation 2015/35, insurance and reinsurance undertakings should take into account, at least, the following characteristics, where applicable:

a) the degree of homogeneity of the risks;
b) the variety of different sub-risks or risk components of which the risk is comprised;
c) the way in which these sub-risks are interrelated with one another;
d) the level of uncertainty i.e. the extent to which future cash flows can be estimated;
e) the nature of the occurrence or crystallisation of the risk in terms of frequency and severity;
f) the type of the development of claims payments over time;
g) the extent of potential loss, including the tail of the claims distribution;
h) the type of business from which the risks originate, i.e. direct business or reinsurance business;
i) the degree of dependency between different risk types, including the tail of the risk distribution;
j) the risk mitigation instruments applied, if any, and their impact on the underlying risk profile.

GUIDELINE 46 – IDENTIFICATION OF COMPLEX RISK STRUCTURES

117. Insurance and reinsurance undertakings should identify factors which indicate the presence of complex risks. This should be at least the case where:
    a) the cash-flows are highly path dependent;
    b) there are significant non-linear inter-dependencies between several drivers of uncertainty;
    c) the cash-flows are materially affected by the potential future management actions;
    d) risks have a significant asymmetric impact on the value of the cash-flows, in particular if contracts include material embedded options and guarantees or if there are complex reinsurance contracts in place;
    e) the value of options and guarantees is affected by the policyholder behaviour;
    f) the undertaking uses a complex risk mitigation instrument;
    g) a variety of covers of different nature are bundled in the contracts;
    h) the terms of the contracts are complex, inter alia, in terms of franchises, participations, inclusion and exclusion criteria of the cover.

GUIDELINE 47 – ASSESSMENT OF SCALE OF THE RISKS

118. Insurance and reinsurance undertakings should identify and use an interpretation of scale which is best suited to the specific circumstances of the undertaking and to the risk profile of its portfolio. Nevertheless, the assessment of "scale" should lead to an objective and reliable assessment.

119. To measure the scale of risks undertakings should establish an undertaking-specific benchmark or reference level which leads to a relative rather than an absolute assessment number. For this purpose, risks may be considered in a range from small to large relative to the established benchmark.

GUIDELINE 48 – GRANULARITY OF MATERIALITY ASSESSMENT

120. Insurance and reinsurance undertakings should determine the most appropriate level at which an assessment of materiality for the purposes of the calculation of the technical provisions is to be carried out, which could be the individual homogeneous risk groups, the individual lines of business or the business of the insurer as a whole.

121. Undertakings should consider when assessing the materiality that a risk which is immaterial with regard to the business of the insurer as a whole may still have a significant impact within a smaller segment.

122. In addition, undertakings should not analyse technical provisions in isolation but any effect on own funds and thus on the total solvency balance sheet as well as on the Solvency Capital Requirement should be taken into account in this assessment.

GUIDELINE 49 – CONSEQUENCES OF MATERIAL ERROR IDENTIFIED IN THE PROPORTIONALITY ASSESSMENT

123. Where it is unavoidable for the insurance and reinsurance undertaking to use a method which leads to material level of error, the undertaking should document this and consider the implications

with regard to the reliability of the calculation of technical provisions and its overall solvency position. In particular the undertaking should assess whether the material level of error is adequately addressed in the determination of the Solvency Capital Requirement and hence in the setting of the risk margin in technical provisions.

METHODS APPLIED FOR CALCULATIONS OF TECHNICAL PROVISIONS DURING THE YEAR

GUIDELINE 50 – SIMPLIFIED CALCULATION OF TECHNICAL PROVISIONS DURING THE YEAR

124. Insurance and reinsurance undertakings may use simplifications, subject to proportionality assessment, in the quarterly calculations of technical provisions. For example, it can be appropriate to base the simplified calculation of the risk margin during the year on the risk margin calculated at the beginning of the year *inter alia* by using the ratio of the best estimate at the valuation date to the best estimate at the beginning of the year.

GUIDELINE 51 – COMPUTATION OF THE BEST ESTIMATE FOR LIFE AND NON-LIFE QUARTERLY TECHNICAL PROVISION

125. For the quarterly calculation of the best-estimate of technical provisions, insurance and reinsurance undertakings can perform a roll-forward calculation, taking into account the cash-flows that have occurred during the quarter and the new obligations arising during the quarter. The undertaking should update assumptions of the roll-forward calculation method when the actual versus expected analysis indicates that significant changes have occurred during the quarter.

GUIDELINE 52 – COMPUTATION OF THE BEST ESTIMATE FOR LIFE QUARTERLY TECHNICAL PROVISION

126. For the quarterly roll-forward calculation of the best-estimate of life technical provisions for index-linked, unit-linked, with-profit contracts or contracts with financial guaranties, insurance and reinsurance undertakings should make use of the sensitivity analysis as required in Article 272(5) of Commission Delegated Regulation 2015/35 to assess the sensitivity of the best estimate to the relevant financial parameters. They should document the choice of the set of financial parameters and their on-going adequacy to their portfolio of assets, as well as the relevance and the accuracy of the sensitivity analysis.

METHODOLOGIES FOR THE VALUATION OF CONTRACTUAL OPTIONS AND FINANCIAL GUARANTEES

GUIDELINE 53 – DECISION ON METHODOLOGY

127. Insurance and reinsurance undertakings should ensure that the valuation of contractual options and financial guarantees is based on adequate, applicable and relevant actuarial and statistical methodologies taking into account the developments in this field.

128. Undertakings should ensure that at least the following aspects are considered when deciding on a methodology to determine the value of contractual options and financial guarantees:
    a) The nature, scale and complexity of the underlying risks and their interdependence during the lifetime of the contracts;
    b) Possible insights into the nature of options and guarantees and their main drivers;
    c) A thorough examination on the necessity to include additional and intricate computational complexity;
    d) Justification on the appropriateness of the method.

GUIDELINE 53A – USE OF STOCHASTIC VALUATION

129. Insurance and reinsurance undertakings should use stochastic modelling for the valuation of technical provisions of contracts whose cash flows depend on future events and developments, in particular those with material options and guarantees.
130. When assessing whether stochastic modelling is needed to adequately capture the value of options and guarantees, insurance and reinsurance undertakings should, in particular but not only, consider the following cases:
    - any kind of profit-sharing mechanism where the future benefits depend on the return of the assets;
    - financial guarantees (e.g. technical rates, even without profit sharing mechanism), in particular, but not only, where combined with options (e.g. surrender options) whose dynamic modelling would increase the present value of cash flows in some scenarios.

GUIDELINE 54 – METHODOLOGIES FOR THE VALUATION OF CONTRACTUAL OPTIONS AND FINANCIAL GUARANTEES

131. Insurance and reinsurance undertakings should apply the proportionality assessment referred to in Article 56 of Commission Delegated Regulation 2015/35 when considering the use of a closed formula approach or a stochastic approach for the valuation of contractual options and financial guarantees included in the insurance contracts.
132. Whenever neither method is possible, undertakings may use as a last resort an approach consisting in the following steps:
    a) Analysis of the characteristics of the option or guarantee and of how it would affect the cash-flows;
    b) Analysis of the amount the option or guarantee is expected to be currently in-the-money or out-of-the-money;
    c) Determination of the cost of the option or guarantees is expected to vary with time;
    d) Estimation of the probability that the option or guarantee would become more or less costly in the future.

ECONOMIC SCENARIO GENERATORS (ESG)

GUIDELINE 55 – DOCUMENTATION OF THE ESG

133. Insurance and reinsurance undertakings should stand ready to share the following documents with supervisors on request:
    a) the mathematical models on which the ESG is based and the reason for their choice;
    b) the assessment of quality of data;
    c) the calibration process;
    d) the parameters resulting from the calibration process (especially those corresponding to the volatility and correlation market risk drivers);

GUIDELINE 56 – GENERAL UNDERSTANDING OF THE ESG

134. Where the ESG is outsourced, insurance and reinsurance undertakings should ensure that they have an appropriate understanding of the mathematical models on which the ESG is based and of the calibration process, with a particular emphasis on the methods and assumptions used and its limitations and they should be informed of any material changes on an on-going basis.

GUIDELINE 57 – CALIBRATION PROCESS: MARKET DATA AND CHOICE OF THE FINANCIAL INSTRUMENTS

135. Insurance and reinsurance undertakings should ensure that the calibration process of an ESG used for a market consistent valuation is based on data from financial markets that are deep, liquid and transparent as defined in Article 1 of Commission Delegated Regulation 2015/35 and that reflect the current market conditions. Where this is not possible, undertakings should use other market prices paying attention to any distortions and ensuring that adjustments to overcome those distortions are made in a deliberate, objective and reliable manner.

136. Insurance and reinsurance undertakings should be able to demonstrate that the choice of financial instruments used in the calibration process is relevant given the characteristics of the insurance or reinsurance obligations (e.g. embedded options and financial guarantees).

GUIDELINE 57A – MARKET RISK FACTORS NEEDED TO DELIVER APPROPRIATE RESULTS

137. When assessing whether all the relevant risk factors are modelled with respect to the provisions of Articles 22(3) and 34(5) of the Delegated Regulation, insurance and reinsurance undertakings should be able to demonstrate that their modelling adequately reflects the volatility of their assets and that the material sources of volatility are appropriately reflected (e.g. spreads and default risk).

138. In particular, insurance and reinsurance undertakings should use models that allow for the modelling of negative interest rates.

GUIDELINE 58 – TESTS (ACCURACY, ROBUSTNESS AND MARKET-CONSISTENCY)

139. When insurance or reinsurance undertakings use an ESG for the stochastic modelling of the technical provisions, they should be able to demonstrate to the relevant supervisory authorities the accuracy, robustness and market consistency properties of the ESG. A measure of the accuracy of the ESG (at least a Monte Carlo error analysis) should be assessed.

140. To demonstrate the robustness of the ESG, insurance and reinsurance undertakings should test the sensitivity of the valuation of some typical liabilities to the variation of some parameters in the calibration process.

141. To demonstrate the market consistency properties of the ESG, at least some of the following tests should be carried out on the set of scenarios generated by the ESG used for valuation:

a) Calibration tests: verify that the requirements set out in Article 22(3) of Commission Delegated Regulation 2015/35 are met;

b) Martingale tests: verify the Martingale test for the asset classes (equity, bonds, property, exchange rates, etc.) that have been used in the calibration process of the ESG, and for some simple portfolio investment strategies;

c) Correlation tests: comparison of the simulated correlations with the historical correlations.

142. Insurance and reinsurance undertakings should ensure that the tests of accuracy, robustness and market consistency of the ESG are performed on a regular basis and at least annually.

GUIDELINE 59 – RANDOM AND PSEUDO RANDOM NUMBER GENERATORS

143. Insurance and reinsurance undertakings should ensure that (pseudo)random number generators used in an ESG are properly tested.

GUIDELINE 60 – ON-GOING APPROPRIATENESS OF AN ESG

144. Insurance and reinsurance undertakings should have adequate procedures in place to ensure that an ESG remains appropriate for the calculation of the technical provisions on an ongoing basis.

CALCULATION OF THE RISK MARGIN

GUIDELINE 61

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GUIDELINE 62 – HIERARCHY OF METHODS FOR THE CALCULATION OF THE RISK MARGIN

145. When deciding whether a full projection of all future Solvency Capital Requirements is performed or another method is used, insurance and reinsurance undertakings should use as a basis for their decision the hierarchy set out below. Insurance and reinsurance undertakings should ensure that the method chosen is adequate to reflect the nature, scale and complexity of the risks underlying the reference undertaking's insurance and reinsurance obligations in a proportionate manner.

146. Whether a full projection of all future Solvency Capital Requirements is performed or another method is used, insurance and reinsurance undertakings should calculate the future Solvency Capital Requirements in such a manner that double counting the effects concerning the time dependency of risks, which are captured in the exponential and time-dependent element referred to in Article 77(5) of Solvency II (lambda factor), is avoided.

Method 1

147. To approximate the individual risks or sub-risks within some or all modules, sub-modules and other components to be used for the calculation of future Solvency Capital Requirements as referred to in Article 58(a) of Commission Delegated Regulation 2015/35.

Method 2

148. To approximate the whole Solvency Capital Requirement for each future year as referred in Article 58 (a) of Commission Delegated Regulation 2015/35, *inter alia* by using the ratio of the best estimate at that future year to the best estimate at the valuation date.

149. This method is not appropriate when negative best estimate values exist at valuation date or subsequent dates.

150. This method takes into account the maturity and the run-off pattern of the obligations net of reinsurance. Consequently, some considerations should be given regarding the manner in which the best estimate of technical provisions net of reinsurance has been calculated. Further consideration should be given as to whether the risk profile of the undertaking (and hence also the risk profile of the reference undertaking) can be assumed to be unchanged over time. In particular, the undertaking should consider whether it can be assumed that the composition and the proportions of the risks, sub-risks and other components of the Solvency Capital Requirement do not change, and that the main risk drivers remain the same over the years as well as in relation to the net best estimates.

151. An undertaking that intends to use this method should consider to what extent these assumptions are fulfilled. If some or all of these assumptions are not fulfilled, the undertaking should carry out at least a qualitative assessment of how material the deviation is, in particular looking at the main risk drivers, the composition and the proportion of the risks, sub-risks and other components of the Solvency Capital Requirement and their relation to the net best estimates. If the impact of the deviation is not material compared to the risk margin as a whole, then this method can be used. Otherwise the undertaking should either adjust the formula appropriately or use a more sophisticated method.

Method 3

152. To approximate the sum included in the formula set out in Article 37(1) of Commission Delegated Regulation 2015/35 in a single step, without calculating separately each of the summands of that sum, as referred to in Article 58 (b) of Commission Delegated Regulation 2015/35, *inter alia* by using the modified duration of the insurance liabilities as a proportionality factor.

153. This method is not appropriate when negative best estimate values exist at valuation date or subsequent dates.

154. This method is also not appropriate when the value of options and guarantees imbedded in the insurance contracts are material, especially when a stochastic valuation is used.

155. This method takes into account the maturity and the run-off pattern of the obligations net of reinsurance. Consequently, some considerations should be given regarding the manner in which the best estimate of technical provisions net of reinsurance has been calculated. Further consideration should be given as to whether the risk profile of the undertaking (and hence also the risk profile of the reference undertaking) can be assumed to be unchanged over time. In particular, the undertaking should consider whether it can be assumed that the composition and the

proportions of the risks, sub-risks and other components of the Solvency Capital Requirement do not change and that the main risk drivers remain the same over the years as well as in relation to the net best estimates.

156. An undertaking that intends to use this method should consider to what extent these assumptions are fulfilled. If some or all of these assumptions are not fulfilled, the undertaking should carry out at least a qualitative assessment of how material the deviation from the assumptions is, in particular looking at the main risk drivers, the composition and the proportions of the risks, sub-risks and other components of the Solvency Capital Requirement. If the impact of the deviation is not material compared to the risk margin as a whole, then the simplification can be used. Otherwise, the undertaking should either adjust the formula appropriately or use a more sophisticated method.

157. When deciding on the application of a method based on the modified duration of the insurance liabilities, attention should be paid to the value of the modified duration to avoid meaningless results for the risk margin and whether it can be assumed that it adequately reflects the cash flow pattern of the obligations net of reinsurance.

158. The lambda factor can be accounted for in this method only by adjusting appropriately the formula of the modified duration.

Method 4

159. To approximate the risk margin by calculating it as a fixed percentage of the best estimate technical provisions net of reinsurance at valuation date. When deciding on the percentage to be used for a given line of business, the undertaking should take into account that this percentage is likely to increase if the modified duration of the insurance liabilities – or some other measure of the run-off pattern of these liabilities – increases.

160. Undertakings should give due consideration to the very simplistic nature of this method; it should only be used where it has been demonstrated that none of the more sophisticated risk margin methods in the above hierarchy can be applied.

161. When undertakings use this method for the calculation of the risk margin, they should describe the rationale for choosing the percentages used by line of business, and should justify the choice of those percentages taking into account any specific characteristics of the portfolios being assessed. The percentages and the justifications should be documented and periodically reviewed.

162. As part of that justification, insurance and reinsurance undertakings should be able to demonstrate that the percentage taken of the best estimate technical provisions is unlikely to result in an underestimation of the amount of the risk margin.

163. This method is not appropriate when negative best estimate values exist at valuation date or subsequent dates.

164. This method is also not appropriate when the value of options and guarantees imbedded in the insurance contracts are material, especially when a stochastic valuation is used.

165. Without prejudice to the proportionality assessment and the provisions in Article 58 of Commission Delegated Regulation 2015/35, insurance and reinsurance undertakings may use the simplifications defined in Technical Annex IV when applying the hierarchy of methods.

GUIDELINE 63 – ALLOCATION OF THE OVERALL RISK MARGIN

166. Where it is overly complex to calculate the contribution of the individual lines of business to the overall Solvency Capital Requirement during the lifetime of the whole portfolio in an accurate manner, insurance and reinsurance undertakings should be allowed to apply simplified methods to allocate the overall risk margin to the individual lines of business which are proportionate to the nature, scale and complexity of the risks involved. The methods applied should be consistent over time.

CALCULATION OF TECHNICAL PROVISIONS AS A WHOLE

GUIDELINE 64 – CAPTURING UNCERTAINTY

167. Insurance and reinsurance undertakings should understand by the consideration of the uncertainty in order to reliably replicate the future cashflows associated with insurance or reinsurance obligations that the cash-flows of the financial instruments must not provide only the same expected amount as the cash-flows associated with insurance or reinsurance obligations, but also the same patterns of variability.

GUIDELINE 65 – RELIABLE REPLICATION

168. Insurance and reinsurance undertakings should not consider future cash-flows associated with insurance or reinsurance obligations to be reliably replicated if:

a) One or several features of the future cash-flow, inter alia its expected value, its volatility or any other feature, depend on risks whose specific pattern in the undertaking cannot be found in instruments actively traded in financial markets;

b) Current trade and price information are not normally readily available to the public, due to the fact that one or several features of the future cash-flow depend to any extent on the development of factors specific to the undertakings, such as expenses or acquisition costs; or,

c) One or more features of the future cash-flow depend on the development of factors external to the undertaking for which there are no financial instruments for which reliable market values are observable.

GUIDELINE 66 – SHORT TERM DISRUPTIONS

169. Where an active and transparent market does not temporarily satisfy one or more of the conditions of being deep and liquid and it is reasonably expected to meet again the conditions during the following three months, insurance and reinsurance undertakings should use prices that were observed during that period for the purposes of these Guidelines.

170. Undertakings should asses that the use of these prices does not result in a material error in the valuation of the technical provisions.

GUIDELINE 67 – UNBUNDLING OF OBLIGATIONS VALUED AS A WHOLE

171. Where under the same contract a number of future cash-flows exist which meet all the conditions in order to calculate the technical provision as whole and other future cash-flows which do not meet some of those conditions, insurance and reinsurance undertakings should unbundle both sets of cash-flows. For the first set of cash-flows, no separate calculation of the best estimate and the risk margin should be required but undertakings should be required to carry on a separate calculation for the second set of cash-flows. If the proposed unbundling is not feasible, in particular when there is significant interdependency between the two sets of cash flows, undertakings should be required to carry on separate calculations of the best estimate and the risk margin for the whole contract.

FUTURE PREMIUMS

GUIDELINE 68 – FUTURE PREMIUM CASH-FLOWS VERSUS PREMIUM RECEIVABLE

172. Insurance and reinsurance undertakings should establish the future premium cash-flows contained within the contract boundaries at the valuation date and include within the calculation of its best estimate liabilities those future premium cash-flows which fall due after the valuation date.

173. Insurance and reinsurance undertakings should treat premiums which are due for payment by the valuation date as a premium receivable on its balance sheet until the cash is received.

CALCULATION OF CLAIMS PROVISIONS

GUIDELINE 69 – METHODS TO CALCULATE PROVISIONS FOR OUTSTANDING REPORTED CLAIMS

174. Insurance and reinsurance undertakings should not include the incurred but not reported provision (IBNR) and should not include unallocated loss adjustment expenses (ULAE) in the calculation of the outstanding reported claims provision, which represent the component of the claims provision where events giving rise to the claim have been notified to the insurer.

175. Two possible methods to estimate the provision for outstanding reported claims are:

- consideration of the number of claims reported and their average cost;
- case-by-case estimation.

GUIDELINE 70 – METHODS TO CALCULATE PROVISIONS FOR INCURRED BUT NOT REPORTED CLAIMS

176. Where actuarial techniques (e.g. chain ladder techniques) are used to estimate incurred but not reported provision (IBNR), insurance and reinsurance undertakings should pay a specific consideration to whether the assumptions behind the technique hold, or whether adjustments to development patterns are required to appropriately reflect the likely future development.

GUIDELINE 71 – METHODS FOR THE VALUATION OF CLAIMS SETTLEMENT EXPENSES – UNALLOCATED LOSS ADJUSTMENT EXPENSES (ULAE)

177. When insurance and reinsurance undertakings apply a simplified method for the provision for claims settlement expenses based on an estimate as a percentage of the claims provision, as outlined in Technical Annex II, this should only be considered when expenses can reasonably be assumed to be proportionate to provisions as a whole, where this proportion is stable in time and where the expenses distribute uniformly over the lifetime of the claims portfolio as a whole.

CALCULATION OF PREMIUM PROVISIONS

GUIDELINE 72 – COVER

178. Insurance and reinsurance undertakings should ensure that premium provisions at the valuation date include the valuation of all recognised obligations within the boundary of insurance or reinsurance contracts, for all exposure to future claims events, where:
    a) Cover has incepted prior to the valuation date;
    b) cover has not incepted prior to the valuation date, but the insurance or reinsurance undertaking has become party to the insurance or reinsurance contract providing the cover.

179. Without prejudice to the Proportionality Assessment and the provisions in Article 36(2) of Commission Delegated Regulation 2015/35, undertakings may apply the simplification outlined in Technical Annex III.

GUIDELINE 73 – CONSIDERATIONS FOR CLAIMS COSTS PROJECTIONS

180. Insurance and reinsurance undertakings should ensure that the assessment of the claims cash-flows included in the premium provisions give appropriate consideration to the expected incidence and cost of future claims, including consideration of the likelihood of infrequent, high severity claims and latent claims.

GUIDELINE 74 – UNCERTAINTY OF POLICYHOLDER BEHAVIOUR

181. Insurance and reinsurance undertakings should ensure that the valuation of premium provisions includes an allowance for the possibility that policyholders will exercise options to extend or renew a contract or to cancel or lapse a contract prior to the end of the cover term provided.

GUIDELINE 75 – NEGATIVE PREMIUM PROVISION

182. Insurance and reinsurance undertakings should ensure that, where the present value of future cash in-flows exceeds the present value of future cash outflows the premium provision, excluding risk margin, is negative.

CALCULATION OF EXPECTED PROFITS IN FUTURE PREMIUMS (EPIFP)

GUIDELINE 76 – SEPARATION OF INSURANCE OBLIGATIONS

183. For the purpose of the calculation set out in Article 260 of Commission Delegated Regulation 2015/35, insurance and reinsurance undertakings should split its insurance obligations into those attributable to already paid-in premiums and those attributable to premiums in respect of business in force which are receivable in the future.

GUIDELINE 77 – ASSUMPTIONS USED TO CALCULATE EPIFP

184. For the purpose of calculating the technical provisions without risk margin under the assumption that the premiums relating to existing insurance and reinsurance contracts that are expected to be received in the future are not received, insurance and reinsurance undertakings should apply the same actuarial method used to calculate the technical provisions without risk margin in accordance with Article 77 of the Solvency II Directive, with the following changed assumptions:

a) policies should be treated as though they continue to be in force rather than being considered as surrendered;

b) regardless of the legal or contractual terms applicable to the contract, the calculation should not include penalties, reductions or any other type of adjustment to the theoretical actuarial valuation of technical provisions without a risk margin calculated as though the policy continued to be in force.

185. All the other assumptions (e.g. mortality, lapses or expenses) should remain unchanged. This means that the insurance and reinsurance undertakings should apply the same projection horizon, future management actions and policyholder option exercise rates used in best estimate calculation without adjusting them to consider that future premiums will not be received. Even if all assumptions on expenses should remain constant, the level of some expenses (e.g. acquisition expenses or investment management expenses) could be indirectly affected.

GUIDELINE 77A – ALTERNATIVE APPROACH TO CALCULATE TO CALCULATE EPIFP

186. Insurance and reinsurance undertakings may identify EPIFP as the part of present value of future profits related to future premiums in case the outcome does not materially deviate from the value that would have resulted from the valuation described in Guideline 77. This approach may be implemented using a formula design.

METHODOLOGIES TO CALCULATE RECOVERABLES FROM REINSURANCE CONTRACTS AND SPECIAL PURPOSE VEHICLES

GUIDELINE 78 – EXTENT OF ALLOWANCE FOR FUTURE REINSURANCE PURCHASE

187. Insurance and reinsurance undertakings should recognise future cash-flows relating to future reinsurance purchasing covering obligations already recognised in the balance-sheet - to the extent

that it is replacing any expiring reinsurance arrangements and if it can be demonstrated that it meets the conditions stated below:

a) the insurance or reinsurance undertaking has a written policy on the replacement of the reinsurance arrangement;
b) the replacement of the reinsurance arrangement does not take place more regularly than every 3 months;
c) the replacement of the reinsurance arrangement is not conditional on any future event which is outside of the control of the insurance or reinsurance undertaking. Where the replacement of the reinsurance arrangement is conditional on any future event, that is within the control of the insurance or reinsurance undertaking, then the conditions should be clearly documented in the written policy referred to in point (a);
d) the replacement of the reinsurance arrangement shall be realistic and consistent with the insurance or reinsurance undertaking's current business practice and business strategy. The insurance or reinsurance undertaking shall be able to verify that the replacement is realistic through a comparison of the assumed replacement with replacements taken previously by the insurance or reinsurance undertaking;
e) the risk that the reinsurance arrangement cannot be replaced due to capacity constraints is immaterial;
f) an appropriate estimate of the future reinsurance premium to be charged is made which reflects the risk that the cost of replacing existing reinsurance arrangements may increase;
g) the replacement of the reinsurance arrangement is not contrary to the requirements that apply to future management actions set out in Article 236 of Commission Delegated Regulation 2015/35.

GUIDELINE 79 – SIMPLIFIED CALCULATION OF RECOVERABLES FROM REINSURANCE CONTRACTS AND SPECIAL PURPOSE VEHICLES – PREMIUM PROVISIONS

188. In order to estimate the amount of reinsurance recoverable from the gross of reinsurance premium provision amount where a simplified calculation is applied, insurance and reinsurance undertakings should apply a separate gross to net factor to the cash outflow and potentially undertakings should apply a different gross to net factor for the cash inflow. Undertakings should base the gross to net factor for the cash outflow on an examination of past claims events with consideration of the future reinsurance programme applicable. The gross to net factor for the cash inflow should be based on consideration of the relative gross and reinsurance premiums expected to be received and paid.

189. Without prejudice to the provisions in the first paragraph of this guideline and the proportionality Assessment undertakings may apply the simplifications outlined in Technical Annex V.

GUIDELINE 80 – SIMPLIFIED CALCULATION OF RECOVERABLES FROM REINSURANCE CONTRACTS AND SPECIAL PURPOSE VEHICLES – PROVISIONS FOR CLAIMS OUTSTANDING

190. With respect to the provisions for claims outstanding for reinsurance recoverables, insurance and reinsurance undertakings should use separate gross-to-net techniques either for each accident year or for each underwriting year not finally developed for a given line of business or homogeneous risk group if appropriate.

GUIDELINE 81 – SIMPLIFIED CALCULATION OF THE COUNTERPARTY DEFAULT ADJUSTMENT

191. The simplified calculation of the adjustment for counterparty default given in Article 61 of Commission Delegated Regulation 2015/35 being based on the assumption that the probability of default of the counterparty remains constant over time, insurance and reinsurance undertakings proposing to use this simplification should consider whether this assumption is realistic, taking into account the credit quality step of the counterparty and the modified duration of the amounts recoverable from reinsurance contracts and special purpose vehicles.

GENERAL PRINCIPLES IN RESPECT OF METHODOLOGIES TO CALCULATE TECHNICAL PROVISIONS

GUIDELINE 82 – THE PROJECTION PERIOD

192. When assessing whether the projection period and the timing of cash-flows to the policyholders during the year is proportionate, insurance and reinsurance undertakings should at least take into account the following characteristics:
    a) the degree of the homogeneity of the cash-flows;
    b) the level of uncertainty i.e. the extent to which future cash flows can be estimated;
    c) the nature of the cash-flows.

SECTION 5: VALIDATION

GUIDELINE 83 – PROPORTIONALITY OF TECHNICAL PROVISIONS VALIDATION

193. Insurance and reinsurance undertakings should require the actuarial function to ensure that the validation process is proportionate, considering the significance of the impact, both in isolation and in combination, of assumptions, approximations and methodologies on the value of technical provisions.

GUIDELINE 84 – SELECTION OF VALIDATION APPROACHES AND PROCESSES

194. Insurance and reinsurance undertakings should require the actuarial function to consider which validation approaches and processes are most appropriate depending on the characteristics of the liability and intended use for the approach or process.

GUIDELINE 85 – QUALITATIVE AND QUANTITATIVE APPROACHES

195. Insurance and reinsurance undertakings should require the actuarial function to ensure that the validation process covers both quantitative and qualitative aspects and goes beyond a comparison of estimates with outcomes. It should also include qualitative aspects such as assessment of controls, documentation, interpretation and communication of results.

GUIDELINE 86 – REGULAR AND DYNAMIC VALIDATION PROCESS

196. Insurance and reinsurance undertakings should require the actuarial function to perform a regular and dynamic process in which it periodically refines validation approaches to incorporate experience gained from carrying out the previous validations and in response to changing market and operating conditions.

GUIDELINE 87 – COMPARISON AGAINST EXPERIENCE – DEVIATIONS

197. Insurance and reinsurance undertakings should ensure that the actuarial function:
   a) identifies the total deviation between expected and actual claims experience;
   b) splits the total deviation into its main sources and analyses the reasons behind the deviation;
   c) if the deviation does not appear to be a temporary aberration, makes recommendations on the changes to the model or assumptions used.

198. Undertakings should ensure that relevant market data and trends are considered as a part of the comparison against experience.

GUIDELINE 88 – COMPARISON AGAINST MARKET FOR CONTRACTS WITH OPTIONS AND GUARANTEES

199. Insurance and reinsurance undertakings should consider whether there is a range of market instruments that are available to approximately replicate the contracts with inherent options and guarantees. Where available, the price of such portfolios should then be compared against the value of the Technical Provisions, calculated as the sum of the best estimate (calculated using cashflow projections) and risk margin.

COMPLIANCE AND REPORTING RULES

200. This document contains Guidelines issued under Article 16 of the EIOPA Regulation. In accordance with Article 16(3) of the EIOPA Regulation, competent authorities and financial institutions are required to make every effort to comply with guidelines and recommendations.

201. Competent authorities that comply or intend to comply with these Guidelines should incorporate them into their regulatory or supervisory framework in an appropriate manner.

202. Competent authorities are to confirm to EIOPA whether they comply or intend to comply with these Guidelines, with reasons for non-compliance, within two months after the issuance of the translated versions.

203. In the absence of a response by this deadline, competent authorities will be considered as non-compliant to the reporting and reported as such.

FINAL PROVISION ON REVIEW

204. These Guidelines will be subject to a review by EIOPA.

TECHNICAL ANNEX I- SIMPLIFICATION FOR THE ATTRIBUTION OF THE OVERHEAD EXPENSES

The recurrent overhead expenses are defined in the following manner:

$$ROA_t = RO_{last} \cdot \left(\frac{RO_{next}}{RO_{last}}\right)^{\frac{1}{2}} \cdot \frac{s + 13 - t}{12(s + 12)}$$

Where:

s = expected duration in months to fully settle any obligation arising from the insurance contract, since the start of insurance cover
$t = 1, \ldots, 12$ month of the projection period
RO_{last} = recurrent overhead expenses observed during last 12 months
RO_{next} = recurrent overhead expenses anticipated for next 12 months
ROA_t = recurrent overhead expenses attributable to month t

TECHNICAL ANNEX II - SIMPLIFICATION FOR CLAIMS SETTLEMENT EXPENSES

Simplification for the provision for claims settlement expenses based on an estimate as a percentage of the claims provision:

This simplification is based on the following formula, applied to each line of business:

$$Provision\ for\ ULAE = R\ \times \left[IBNR + a\ \times PCO_{reported}\right]$$

where:

R = Simple or weighted average of R_i over a sufficient period of timeR_i = Paid Claims settlement expenses / (gross claims + subrogations).
$IBNR$ = provision for IBNR
$PCO_{reported}$ = gross of reinsurance provision for reported claims outstanding
a = Percentage of claim provisions

TECHNICAL ANNEX III - SIMPLIFICATION FOR PREMIUM PROVISIONS

Simplification to derive the best estimate for premium provision based on an estimate of the combined ratio in the line of business in question:

The following input information is required:

(a) estimate of the combined ratio (CR) for the line of business during the run-off period of the premium provision;
(b) present value of future premiums for the underlying obligations (as to the extent to which future premiums fall within the contract boundaries);
(c) volume measure for unearned premiums; it relates to business that has incepted at the valuation date and represents the premiums for this incepted business less the premiums that have already been earned against these contracts (determined on a pro rata temporis basis).

The best estimate is derived from the input data as follows:

$$BE = CR \cdot VM + (CR - 1) \cdot PVFP + AER \cdot PVFP$$

where:

BE = best estimate of premium provision.

CR = estimate of combined ratio for line of business on a gross of acquisition cost basis i.e. CR = (claims + claim related expenses) / (earned premiums gross of acquisition expenses).

VM = volume measure for unearned premium. It relates to business that has incepted at the valuation date and represents the premiums for this incepted business less the premium that has already been earned against these contracts. This measure should be calculated gross of acquisition expenses.

$PVFP$ = present value of future premiums (discounted using the prescribed term structure of risk-free interest rates) gross of commission.

AER = estimate of acquisition expenses ratio for line of business.

The combined ratio for an accident year (= occurrence year) is defined as the ratio of expenses and incurred claims in a given line of business or homogeneous group of risks over earned premiums. The earned premiums should exclude prior year adjustment. The expenses should be those attributable to the premiums earned other than claims expenses. Incurred claims should exclude the run-off result, that is they should be the total for losses occurring in year y of the claims paid (including claims expenses) during the year and the provisions established at the end of the year. Alternatively, if it is more practicable, the combined ratio for an accident year may be considered to be the sum of the expense ratio and the claims ratio. The expense ratio is the ratio of expenses (other than claims expenses) to written premiums, and the expenses are those attributable to the written premiums. The claims ratio for an accident year in a given line of business or homogeneous group of risks should be determined as the ratio of the ultimate loss of incurred claims over earned premiums.

With respect to level (1) of the hierarchy:

Life Underwriting Risk

The simplifications allowed for the SCR calculations in respect of mortality, longevity, disability risk, expense risk, revision risk and catastrophe risk carry over to the risk margin calculations.

Health Underwriting Risk

The simplifications allowed for the SCR calculations in respect of health mortality, health longevity, medical expense disability-morbidity, income protection disability morbidity, health expense and SLT health lapse risks carry over to the risk margin calculations.

Non-life Underwriting Risk

The calculation of the future SCRs related to premium and reserve risk could be somewhat simplified if renewals and future business are not taken into account:

- If the premium volume in year t is small compared to the reserve volume, then the premium volume for the year t can be set to 0. An example may be business comprising no multiple-year contracts, where the premium volume can be set to 0 for all future years t where $t \geq 1$.
- If the premium volume is zero, then the capital charge for non-life underwriting can be approximated by the formula:

$$3 \cdot \sigma_{(res,mod)} \cdot PCO_{Net}(t)$$

where

$\sigma_{(res,mod)}$ represents the aggregated standard deviation for reserve risk and $PCO_{Net}(t)$ the best estimate provision for claims outstanding net of reinsurance in year t.

The aggregated standard deviation for reserve risk $\sigma_{(res,mod)}$ could be calculated using the aggregation steps as described in Articles 117 of Commission Delegated Regulation 2015/35, assuming all the amounts relating to premium risk are equal to zero.

As a further simplification it can be assumed that the undertaking-specific estimate of the standard deviation for premium risk and reserve risk remains unchanged throughout the years.

Also the underwriting risk charges for catastrophe risk and non-life lapse risk are taken into account only with respect to the insurance contracts that exist at t = 0.

Counterparty Default Risk

The counterparty default risk charge with respect to reinsurance ceded can be calculated directly from the definition for each segment and each year. If the exposure to the default of the reinsurers does not vary considerably throughout the development years, the risk charge can be approximated by applying reinsurers' share of best estimates to the level of risk charge that is observed in year 0.

According to the standard formula counterparty default risk for reinsurance ceded is assessed for the whole portfolio instead of separate segments. If the risk of default in a segment is deemed to be similar to the total default risk or if the default risk in a segment is of negligible importance, then the risk charge can be arrived at by applying reinsurers' share of best estimates to the level of the total capital charge for reinsurers' default risk in year 0.

With respect to level (2) of the hierarchy:
By using a representative example of a proportional method the reference undertaking's SCR for the year t could be fixed in the following manner:

$$SCR_{RU}(t) = SCR_{RU}(0) \cdot \frac{BE_{Net}(t)}{BE_{Net}(0)} \qquad t = 1,2,3, \ldots$$

where

$SCR_{RU}(t)$ = SCR as calculated at time t≥0 for the reference undertaking's portfolio of (re)insurance obligations;

$BE_{Net}(t)$ = best estimate technical provisions net of reinsurance as assessed at time t≥0 for the undertaking's portfolio of (re)insurance obligations.

The simplification described above can be applied also at a more granular level, i.e. for individual modules and/or submodules. However, it is noted that the number of calculations to be carried out will in general be proportional with the number of modules and/or submodules for which this simplification is applied. Moreover, it needs to be considered whether a more granular calculation as indicated above will lead to a more accurate estimate of the future SCRs to be used in the calculation of the risk margin.

With respect to level (3) of the hierarchy:
With respect to life insurance the duration approach implies that the risk margin $CoCM$ could be calculated according to the following formula:

$$CoCM = CoC \cdot SCR_{RU}(0) \cdot AdjDur_{mod}(0)$$

where:

CoC = the Cost-of-Capital rate;

$SCR_{RU}(0)$ = the SCR as calculated at time t=0 for the reference undertaking's portfolio of (re)insurance obligations; and

$AdjDur_{mod}(0)$ = the modified duration of reference undertaking's (re)insurance obligations net of reinsurance at t=0 adjusted to take into account the inclusion of the lambda factor.

$AdjDur_{mod}(0)$ is calculated according to the following formula:

$$AdjDur_{mod}(0) = \frac{\sum_{k\geq 1} \alpha_k \cdot PV(CF_k, r)}{BE(0, r) \cdot (1 + r)}$$

where:

$\alpha_k = \sum_{t=0}^{k-1} \max(0.96^t, 0.5)$;

CF_k = cash flows at time *k* for the obligation, assumed to be deterministic, i.e. no financial options and guarantees and no dependency on the interest rate level;

$PV(CF_k, r)$ = the present value of deterministic cash flow CF_k under rate r, i.e. $CF_k \cdot (1 + r)^{-k}$;

r = the internal rate of return of the cash flows CF_k under the risk-free rate term structure at the valuation date;

$BE(0,r)$ = the best estimate technical provisions net of reinsurance as assessed at time t=0 assuming deterministic cash flows CF_k, i.e. $\sum_{k\geq 1} PV(CF_k, r)$.

Where $SCR_{RU}(0)$ includes material sub-risks that will not exist over the whole lifetime of the portfolio (for example non-life premium risk for unexpired contracts or material market risk), the calculation can often be improved by

- excluding these subrisks from $SCR_{RU}(0)$ for the above calculation;
- calculating the contribution of these subrisks to the risk margin separately;
- aggregating the results (where practicable allowing for diversification).

With respect to level (4) of the hierarchy:
According to this simplification the risk margin $CoCM$ is calculated as a percentage of the best estimate technical provisions net of reinsurance at t = 0, that is

$$CoCM = \alpha_{lob} \cdot BE_{Net}(0)$$

where

$BE_{Net}(0)$ = the best estimate technical provisions net of reinsurance as assessed at time t=0 for the undertaking's portfolio of (re)insurance obligations within the given line of business;

α_{lob} = a fixed percentage for the given line of business.

TECHNICAL ANNEX V - SIMPLIFIED CALCULATION OF RECOVERABLES FROM REINSURANCE CONTRACTS AND SPECIAL PURPOSE VEHICLES

With respect to premium provisions:

The Gross-to-Net simplifications referred to below in respect of provisions for claims outstanding, 2), could also be used for the calculation of recoverables in respect of premium provisions, i.e. the provisions for (covered but not incurred) claims related to the current accident year (where i=n+1), by using the (anticipated) proportional part of the reinsurance cover for this year. This will be a conservative approach for the ceding (re)insurance undertaking, since the impact of the non-proportional reinsurance for the current accident (business) year is not taken into account.

With respect to provisions for claims outstanding:

1) Gross-to-Net simplification based on provisions for RBNS-claims ("case reserves")
   This simplification uses a ratio of net over gross provisions of an available portfolio A in order to estimate the net provisions of another portfolio B (NPB) based on the observable gross provisions of portfolio B (GPB). In other words, the Gross-to-Net simplification (GN) is stipulated as:

$$GN = \frac{NPA}{GPA}$$

   where NPA and GPA represents the net and gross provisions of portfolio A, respectively. Then this simplification is applied to calculate the net provisions for portfolio B as follows:

$$NPB = GN \; x \; GPB$$

   The following criteria need to be fulfilled in order to apply this simplification:

   - The benchmark portfolio (A) is similar to the portfolio (B) for which the simplification is used, cf. the principle of substance over form.
   -
   - The ratio (GN) is established by means of credible and sustainable data. This requires a data set exceeding at least two years.

   Ceded reinsurance varies with the size, the financial soundness and the risk aversion of a company, so that particular care is required when applying a ratio of net over gross from another benchmark portfolio. Such an approach can therefore only be used in cases where the benchmark portfolio is known to have a very similar nature as the own portfolio. Even if this is the case, however, the cession percentage for non-proportional reinsurance will heavily depend on the actual occurrence of large losses, and therefore be very volatile.

2) Gross-to-Net simplification based on cumulated paid claims (cumulated cash-flows)
   This simplification derives an estimate of net provisions for claims outstanding by using the gross provisions for claims outstanding in combination with an estimate of the impact of the reinsurance covers for the individual accident years.

   With respect to the rationale for using this simplification, it is noticed that for past accident years the reinsurance structure for an individual year is known and will (likely) not change retroactively. Accordingly, a comparison of net over gross cumulated cash flows per line of business in the past

– differentiated by accident year – may be used to derive an estimate of the impact of proportional and nonproportional reinsurance for the individual accident year (i.e. a Gross-to-Net simplification for the individual accident year).

For each line of business the Gross-to-Net simplifications for the accident years not finally developed (GNi) are stipulated as follows:

$$GNi = \frac{ANet, i, n-i}{AGross, i, n-i}$$

where $AGross, i, n-i$ and $ANet, i, n-i$ represent the cumulated paid claims gross and net of reinsurance, respectively, and n is the latest accident year with observed values of these cash-flows. These simplifications are then used to calculate the net provisions for claims outstanding for the individual accident years, that is

$$PCONet, i = GNi \times PCOGross, i$$

where $PCOGross, i$ and $PCONet, i$ represent the gross and net provisions for claims outstanding for accident year i, respectively. In order to apply this simplification both gross and net cumulated paid claims (gross and net cash flows) per accident year need to be available for each line of business. For newer accident years and especially the last accident year (where i=n) the stipulated simplification might be a bit too high due to the fact that the IBNR claims are likely to constitute a large part of the provisions for claims outstanding. Accordingly, the stipulated simplification is likely to lead to an overestimation of the net provisions in these cases.