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**Explanatory Text
On the Proposal for
Guidelines
On
Pre-application for Internal Models**

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1. Introduction

- 1.1. The EIOPA Guidelines on Pre-application for Internal Models aim to provide guidance on what national competent authorities and an insurance or reinsurance undertaking engaged in a pre-application process should consider in order that national competent authorities are able to form a view on how prepared this insurance or reinsurance undertaking is to submit an application for the use under Solvency II of an internal model for the calculation of the Solvency Capital Requirement. Under Solvency II an insurance or reinsurance undertaking applying for the use of an internal model to calculate the Solvency Capital Requirement will have to comply with the Directive requirements as further specified in the Delegated Acts when issued.
- 1.2. The Guidelines aim to increase convergence of supervisory practices during the pre-application process. They should also in turn help an insurance or reinsurance undertaking to develop its internal model framework and thereby prepare to submit an application to use an internal model under Solvency II. They also extend the pre-application process for an undertaking aiming at submitting an application for decision on the use of an internal model from the first day on which Solvency II is applicable.
- 1.3. In the case of pre-application process for groups, there should be appropriate level of communication between national competent authorities within the colleges, in particular between the national competent authorities involved.
- 1.4. Communication between national competent authorities and the insurance or reinsurance undertaking should continue throughout the pre-application and the future assessment of the application the undertaking may submit under Solvency II and after the internal model is approved through the supervisory review process.
- 1.5. More provisions on the pre-application process are contained in CEIOPS' Level 3 Guidance on Pre-Application process for internal models (former CEIOPS Consultation Paper 80)¹.
- 1.6. All the document apply, unless otherwise explicitly stated, to the pre-application process for:
 - An internal model, full or partial, that would be submitted for decision to use for the calculation of the Solvency Capital Requirement of an insurance or reinsurance undertaking under Solvency II.

¹ https://eiopa.europa.eu/fileadmin/tx_dam/files/consultations/consultationpapers/CP80/CEIOPS-DOC-76-10-Guidance-pre-application-internal-models.pdf

- An internal model for a group, full of partial, as defined below, which would be submitted for this decision.

1.7. For the purpose of Section II the following definitions apply:

- “*Internal model(s) for a group (or for groups)*” should be understood as both an internal model that would be used under Solvency II for the calculation only of the consolidated group Solvency Capital Requirement (under Article 230 of Solvency II) and an internal model that would be used under Solvency II for the calculation of the consolidated group Solvency Capital Requirement as well as the Solvency Capital Requirement of at least one related undertaking included in the scope of this internal model for the calculation of the consolidated group Solvency Capital Requirement (group internal model under Article 231 of Solvency II).
- “*The national competent authorities concerned*” should be understood as the national competent authorities of all the Member States in which the head offices of each related insurance and reinsurance undertakings included in the scope of a group internal model as referred to above (Article 231 of Solvency II) and for which the Solvency Capital Requirement would be calculated by the group internal model, are situated.
- “*The national competent authorities involved*” should be understood as the national competent authorities of all the Member States in which the head offices of related undertakings included in the scope of an internal model for a group (both under Article 230 and Article 231 of Solvency II) are situated. The national competent authorities concerned in the case of a group internal model under Article 231 of Solvency II are part of these national competent authorities involved.
- “*Expert judgment*” should be understood as the expertise of individual persons or committees with relevant knowledge, experience and understanding of the risks inherent in the insurance or reinsurance business.
- The concept of “*richness of the probability distribution forecast*” is determined mainly in two dimensions: the undertaking’s extent of knowledge about the risk profile as reflected in the set of events underlying the probability distribution forecast and the capability of the calculation method chosen to transform this information into a distribution of monetary values that relate to changes in basic own funds. The concept of richness should not be reduced to the

granularity of the representation of the probability distribution forecast because even a forecast in form of a continuous function might be of low richness.

- “*The reference risk measure*” should be understood as the Value-at-Risk of the basic own funds subject to a confidence level of 99,5% over a one-year period as set out in Article 101(3) of Solvency II.
 - “*Analytical closed formulae*” should be understood as a direct mathematical formula that links the risk measure chosen by the undertaking to the reference one as defined above.
 - “*t=0*” should be understood as the date of which the Solvency Capital Requirement computation will be made by the undertaking according to its internal model.
 - “*t=1*” should be understood as one year after the date of which the Solvency Capital Requirement computation will be made by the undertaking according to its internal model.
 - A quantitative or qualitative aspect of an internal model should be considered as “*material*” when a change or an error of this aspect could generate an impact on the outputs of this internal model, which could influence the decision-making or the judgement of the users of that information, including national competent authorities.
- 1.8. The boxes included in this document reproduce the Guidelines that have been published by EIOPA in the Consultation Paper 13/011. They only aim to facilitate the reading of the document and are not subject to public consultation.

2. Section I: General provisions

Guideline 1: General provisions

National competent authorities should take the appropriate steps in order to put in place from 1st of January 2014 the present Guidelines on Pre-application for Internal Models.

During the pre-application process, national competent authorities should take the appropriate steps in order to form a view on how prepared an insurance or reinsurance undertaking engaged in a pre-application process is to submit an application for the use of an internal model for the calculation of the Solvency Capital Requirement under Solvency II and to meet the internal models requirements set out in Directive 2009/138/EC, in particular in Articles 112, 113, 115, 116 and 120 to 126.

During the pre-application process, national competent authorities should form a view on how the insurance or reinsurance undertaking engaged in the pre-application process takes the appropriate steps to:

- (a) build its internal model framework in a way that enables it to be prepared to use the internal model both, for risk management and decision-making purposes, and for the calculation of the Solvency Capital Requirement; and**
- (b) prepare for the eventuality that its internal model may not be approved and set up processes to calculate the standard formula Solvency Capital Requirement as well as to consider the capital planning implications.**

Guideline 2 - Progress report to EIOPA

National competent authorities should send to EIOPA, a progress report on the application of these Guidelines by the end of February following each relevant year, the first being by 28 February 2015 based on the period 1 January 2014 to 31 December 2014.

3. Section II: Pre-application for internal models

Chapter 1: General

Guideline 3 – National competent authorities’ review

During the pre-application process, when defining and considering the extent of the reviews they carry out for the purposes of this process, national competent authorities should take into account at least:

- (a) the specificities of the undertaking engaged in the pre-application process, and of its internal model;**
- (b) the relation between the aspect of the internal model being reviewed and other parts of the internal model; and**
- (c) the proportionality principle as set out in Article 29(3) of Solvency II bearing in mind that proportionality principle should not, however, be understood as waving or lowering any of the internal models requirements set out in Solvency II. In particular, national competent authorities should take into account the proportionality principle by considering:**
 - (i) the nature, scale and complexity of the risks to which an insurance or reinsurance undertaking is exposed; and**
 - (ii) the design, scope and qualitative aspects of the internal model of this undertaking.**

National competent authorities should provide feedback to the undertaking on the reviews they carry out on the internal model for the purposes of pre-application.

- 3.1. The requirements for the use of internal models for Solvency Capital Requirement calculations are set out in Articles 112, 113, 115, 120 to 126, 230 and 231 of Solvency II, and would be further developed in the Delegated Acts issued by the European Commission and EIOPA standards and Guidelines. Such requirements need to be fulfilled by all undertakings (irrespective of their size) if they want to use an internal model to calculate their Solvency Capital Requirement under Solvency II. It is expected that through the pre-application process national competent authorities form a view on how prepared the undertaking is to comply with such requirements. In doing so, national competent authorities consider the proportionality principle as described in Article 29(3) of Solvency II. Proportionality does not exempt any undertaking from complying with requirements set out in

- Solvency II or anyhow lower them, but the way to establish compliance vary depending on the specific nature, scale and complexity of each internal model and of the specific risks and business of each undertaking; proportionality has never to be put forward to justify a failure of the use test, not meeting the statistical quality standards or not properly validating the internal model and its use or any other requirement.
- 3.2. On the use test for instance, it is expected that national competent authorities form a view on how prepared the undertaking is to comply with the requirements set out in Article 120 of Solvency II. The review by national competent authorities is carried out on the basis of proportionality, as some uses may not be materially important to the undertaking given the nature of its business.
 - 3.3. In relation to the statistical quality standards and the validation standards, national competent authorities need to consider that, as no particular method for the calculation of the probability distribution forecast for internal models is prescribed in accordance with Article 121(4) of Solvency II and as internal models have to be adapted to the specific business of the insurance and reinsurance undertaking, internal models may vary significantly in their methodology, the information, assumptions and data used for the internal model and in their validation processes. The statistical quality standards and the validation standards set out in Solvency II therefore provide some principle-based requirements.
 - 3.4. In the case of documentation, smaller amounts of documentation would be a consequence of the level of complexity of the model, and not of the thoroughness of its documentation.

Guideline 4 - Changes to the internal model during pre-application

National competent authorities should monitor and, where appropriate, review changes that the insurance or reinsurance undertaking will make to its internal model after some reviews have been completed during the pre-application process.

To this end, national competent authorities should ensure that the insurance or reinsurance undertaking notifies to them any changes to the internal model or plan of changes the undertaking considers relevant.

National competent authorities should, in relation to the changes the insurance or reinsurance undertaking makes to its internal model during the pre-application process, form a view on, at least:

- (a) the governance the undertaking puts in place in relation to these changes, including the internal approval of changes, the internal communication, the documentation and the validation of the changes; and**
- (b) the classification of changes the undertaking establishes.**

Chapter 2: Model changes

- 3.5. As part of the initial approval of the internal model national competent authorities have to approve the policy for changing the internal model.
- 3.6. The Guidelines on model changes aim to provide guidance about what national competent authorities and an undertaking need to consider, through the pre-application process, in order that national competent authorities are able to form a view about the relevance and the adequacy of the policy for changing the internal model the undertaking establishes.

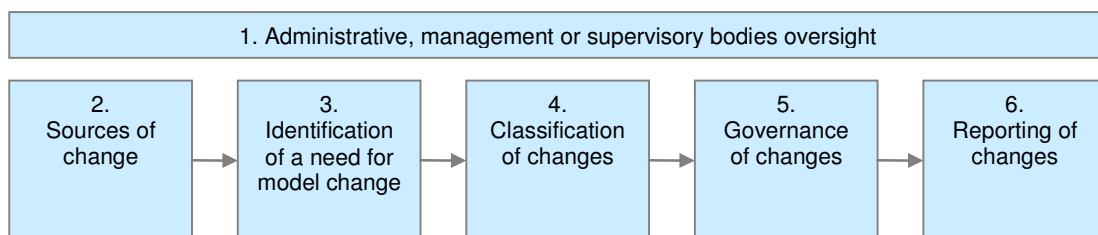
Guideline 5 - Scope of the policy for model changes

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking, when establishing the policy for changing the model, covers all relevant sources of change that would impact its Solvency Capital Requirement, and at least the changes:

- (a) in the system of governance of the undertaking;**
- (b) in its compliance with the requirements to use the internal model;**
- (c) in the appropriateness of the technical specifications of its internal model; and**
- (d) to the risk profile of the undertaking.**

- 3.7. It is good practice for an undertaking to update its internal model in order to keep the model and its parameters accurate and up-to-date. For example, to update methodologies as appropriate in order to reflect improved techniques. The purpose of the policy for model change is to describe the procedures the undertaking puts in place to ensure that the internal model is appropriate and would meet the requirements on an on-going basis.

- 3.8. The model change process is a framework for the undertaking and a useful tool for national competent authorities. In particular for national competent authorities as they would be able to use this information to satisfy themselves that the internal model, once the model is approved, would continue to comply on an on-going basis with the tests and standards for model approval. The model change policy is useful to help on the informational needs of national competent authorities as well as on the needs of the undertaking. National competent authorities would need to have at all times, as part of the on-going supervisory process, a clear picture of the current internal model and in particular enough information to be confident that the internal model complies with the tests and standards for model approval.
- 3.9. The policy for model change provides a framework to promote:
- Good modelling practices: undertaking's ability to change its internal model to adapt to changing circumstances;
 - Enhanced risk management: the internal model provides a valuable tool for the undertaking to develop and constantly adapt its analysis and knowledge of its risks;
 - Efficient supervision: the policy provides insight to national competent authorities into the undertaking's philosophy and appetite for making changes to the internal model.
- 3.10. National competent authorities expect that the policy for model change covers the following aspects:



- 3.11. The policy established by the undertaking is not intended to cover extension of the model scope, such as inclusion of additional risks or business units. Any such change to the model scope would automatically be subject to supervisory approval, following the same approval process as a major model change.
- 3.12. A change to the policy itself would be treated similarly, and so does not need to be covered by the policy.

- 3.13. The regular update of parameters would fall into the scope of a model change. National competent authorities need to be kept informed by the undertaking about the currently used parameters. National competent authorities would want to know, for example, if an undertaking providing significant interest rate guarantees uses an unusually low value for interest rate volatility. It is important that national competent authorities form a view on how the undertaking chooses its criteria for determining whether a change is appropriately major so as to ensure that only changes in material parameters are flagged as major. National competent authorities form a view about the use by the undertaking of qualitative criteria to help to that effect.
- 3.14. Some internal models include a great number of parameters which interact together in impacting the outputs of the internal model. Hence it may be more appropriate for the undertaking to consider and describe the impact of changes to some parameters in batch instead of individually. If the undertaking considers that this would be more appropriate the policy would describe the parameters that would be batched together to define a single change and explain why this is appropriate, and what would be the circumstances under which this would cease to be appropriate.
- 3.15. Such batch of parameters would be less appropriate if the process to update those parameters is not adequately formalised and described and subject to appropriate level of governance.
- 3.16. In order to form a view on the appropriateness of the level of information that is reported by the undertaking when minor changes are performed, national competent authorities may look at how the undertaking sets in the policy for model change a summarised report.
- 3.17. A way for national competent authorities to form a view on how the undertaking "back-tests" that the model change policy, in general, and the definition of major changes, in particular, perform effectively, could be to review how the undertaking evaluates the model change policy in the light of past changes made to the model.
- 3.18. As potential sources for change, the model change policy may for instance, cover changes to or arising from but not limited to, the following areas:
- Structure of the model (including use of IT systems and platforms).
 - Methods used to calculate the probability distribution forecast (including external models and data).

- Assumption and parameter, or process to derive such assumption and parameter if such process is clearly defined, documented and part of the model governance.
- Data governance, processing and application of data as well as the data policy.
- System for measuring diversification effects or to take into account the dependencies across risks categories.
- Use of the internal model including changes in reporting and outputs from the model.
- Nature, scale and complexity of the risk profile (including material changes in business model, business strategy, products and lines of business, emerging risks, asset management policy and any other relevant changes to the risk profile).
- Outsourcing (or in-sourcing activities previously outsourced) activities related to the internal model or the identification, measurement, monitoring and reporting of risks.
- Legal environment may impact the internal model either through changes in jurisdiction or changes in law relevant to the undertakings within the same regulation.
- Where applicable, any change that might impact the internal model, for example changes that might impact inputs to the internal models.

Guideline 6 - Definition of a major change

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking develops and uses a number of key qualitative or quantitative indicators to define a major change, and whether the insurance or reinsurance undertaking sets out an objective approach for classifying changes as major.

Whilst the quantitative impact of a model change on the Solvency Capital Requirement or on individual components of the Solvency Capital Requirement may be one of the indicators an insurance or reinsurance undertaking plans to use to identify major changes, national competent authorities should form a view on how the undertaking ensures that other qualitative and quantitative indicators are also used.

National competent authorities should form a view on how the insurance or reinsurance undertaking ensures that the indicators it develops take into account the specificities of the undertaking itself and of its internal model.

- 3.19. According to Article 115 of Solvency II, the policy for changing the internal model shall include a specification for identifying whether changes to the internal model are major or minor. The goal is for the undertaking to develop a reliable system to classify anticipated types of model changes.
- 3.20. National competent authorities form a view on how the undertaking ensures that this system is simple, but it has to be flexible enough to serve both the undertaking's need for creative innovations on risk models and national competent authorities' need to control the implementation of these innovations in order to maintain the overall integrity and adequacy of the internal risk model in an effective and efficient way.
- 3.21. If the undertaking put in place its own internal classification of model changes to meet internal needs, it can leverage this internal classification to determine minor and major changes, for instance through a clear mapping between the internal classification and minor and major changes.
- 3.22. The appropriate classification of model changes depends to a high degree on the individual situation of each undertaking. Therefore national competent authorities consider that indicators developed by the undertaking are specific to this undertaking and may satisfy a number of qualitative or quantitative criteria.
- 3.23. It is regarded as good practice that some of the indicators used are related to the tests or standards. National competent authorities take into account that the undertaking may also consider how they can use their validation report and their P&L attribution to design appropriate indicators. The impact on the Solvency Capital Requirement is also an indicator.
- 3.24. The criterion mentioned above regarding the impact on the Solvency Capital Requirement is obviously not applicable to changes to the model that would have no effect on the calculated Solvency Capital Requirement like changes in the system of governance or the use of the internal model. Furthermore, a change, even major, could have no consequences at a certain point in time on the Solvency Capital Requirement because of a specific risk profile of an undertaking (e.g.

- unpredictable netting effect). Even if a change has an effect, the magnitude depends strongly on the current parameterisation of the internal model. An example would be a change in the modelling of options and guarantees. If these are currently “deep out of the money” the immediate effect on the Solvency Capital Requirement may be negligible.
- 3.25. The impact of a change to the Solvency Capital Requirement may vary according to prevailing market conditions. This may be taken into consideration when drawing conclusions from the impact to the Solvency Capital Requirement.
- 3.26. The classification of changes into minor and major may take into account a series of qualitative as well as quantitative criteria such as to make the classification an objective and transparent process. The qualitative criteria may include for instance the areas of the model affected (such as governance, calculation methods, assumptions and parameters), the risks category (such as market risks, underwriting lines of business or product), or other relevant segmentation. The quantitative criteria include the impact to the Solvency Capital Requirement.

Guideline 7 - Combination of several changes

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking plans to evaluate the effect of each change in isolation and the effect of all changes combined on the Solvency Capital Requirement or its individual components.

National competent authorities should form a view on how the insurance or reinsurance undertaking plans to evaluate such effects in order to prevent individual impacts that offset one another and the combined impact of multiple changes from being overlooked.

- 3.27. National competent authorities take into account that the undertaking may consider using different qualitative indicators for different type of changes, or different contributing parts of the probability distribution forecast.
- 3.28. National competent authorities take into account that in some instances the effects of several changes on the Solvency Capital Requirement may offset each other. With another parameterisation this effect may later disappear.

- 3.29. In other instances a combination of related minor changes each of which generating a limited impact on the Solvency Capital Requirement could in combination generate a high enough impact on the Solvency Capital Requirement.
- 3.30. The undertaking may decide a priori how to combine changes from pre-defined events for a consistent approach to change management.

Guideline 8 - Group internal model change policy (under Article 231 of the Directive 2009/138/EC)

Through the pre-application process, in the case of a group internal model, the national competent authorities involved should form a view on how the insurance or reinsurance undertaking develops one model change policy.

The national competent authorities involved should form a view on how the insurance or reinsurance undertaking ensures that the model change policy includes a specification of major and minor changes with regard to the group, as well as each of the related undertakings which would use the group internal model to calculate their individual Solvency Capital Requirement.

National competent authorities should form a view on whether the insurance or reinsurance undertaking classifies a change that is major at an individual undertaking to be a major change within the policy.

- 3.31. This Guideline aims to provide guidance on how national competent authorities form a view on how the undertaking maintains the integrity of the internal model as one model. There is always the risk that the model is changed independently at solo and group level resulting in models that are different. So the Guideline aims at ensuring that there is one model change policy and also that the relevant national competent authorities are informed of the changes that might happen at solo level.

Chapter 3: Use test

- 3.32. One of the requirements that an insurance or reinsurance undertaking needs to fulfil in order to use an internal model for the Solvency Capital Requirement calculation is the use test.
- 3.33. The Guidelines on the use test aim to provide guidance about what national competent authorities and an undertaking need to consider, through the pre-application process, in order that national competent

- authorities are able to form a view on how prepared the undertaking is to comply with the use test.
- 3.34. Internal models in Solvency II are more than a calculation kernel, sometimes referred to as the “actuarial model”. An undertaking would not be able to meet the use test if it follows a modelling framework for internal decision-making and a different one for regulatory capital assessment. It is expected for example that the model used for the calculation of the regulatory solvency capital requirements is also used for the internal capital allocation.
- 3.35. These Guidelines reinforce the concept that national competent authorities need to take into account that the use test is specific to the undertaking and that a checklist approach of uses is not to be used by national competent authorities during pre-application to form a view on how the undertaking is ready to comply with the use test, model fitting to the business model, supporting decision-making and being an integral part of risk management. The people element of the use test is emphasised through the need that national competent authorities form a view on how the undertaking ensures proper understanding of the internal model by the administrative, management and supervisory body and by managers at different levels within the undertaking. There is guidance on how national competent authorities form a view about the application of the use test at group level.
- 3.36. To assist national competent authorities and undertakings during pre-application on understanding this complex area, some examples are provided on good and bad practices and also of how this can be assessed. Even though they are intended to be representative examples, they are not exhaustive and they are not intended to be used by the undertaking to build a checklist that they blindly abide to. The solutions proposed in these examples are not to be seen either as definitive or as prescriptive. The examples are high-level and simple to show how the use test assessment could work.

Guideline 9 – Assessment of compliance

Through the pre-application process national competent authorities should form a view on how prepared each insurance or reinsurance undertaking is to comply with the use test as set out in Article 120 of Solvency II, and in particular in relation to, at least:

- (a) the different uses of the model;**
- (b) how the model fits to the business;**

- (c) how the model is understood;**
- (d) how the model supports the decision-making; and**
- (e) how the model is integrated with the risk management system.**

National competent authorities should form this view taking into account that no complete and detailed list of specific uses should be prescribed to the insurance or reinsurance undertaking.

- 3.37. Through the pre-application process, national competent authorities form a view on how prepared the undertaking is to comply with the use test based on proportionality. Some uses may not be materially important to the undertaking given the nature of their business.
- 3.38. A number of inconsequential uses of the model alone would not be sufficient to comply with the use test requirement. National competent authorities could query, for example, why the internal model output is not being used in the risk management system.
- 3.39. Although there are minimum requirements in Solvency II for the use test, there is no detailed and complete list of uses that the undertaking has to abide with. National competent authorities take into account that the uses of the internal model vary from undertaking to undertaking.
- 3.40. The future uses of the internal model may be considered at the early stage of the development of the internal model and may form part of the drivers for the development and specifications of the internal model.
- 3.41. National competent authorities take into account that information from the undertaking such as communication and notes of feedback on the internal model and areas for improvement may be useful to identify the uses of the internal model.
- 3.42. Once an overall picture of the use of the internal model is developed, national competent authorities can then look at the components for each use. Note that different uses would have the components applied to a greater or lesser extent. For example, if the use considered is in respect of risk management, then the risk management component would apply more than others. If the use relates to pricing, then the decision-making component would apply more.

Guideline 10 – Incentive to improve the quality of the internal model

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking will ensure that the internal model is used in its risk-management system and decision-making processes in a way that creates incentives to improve the quality of the internal model itself.

- 3.43. National competent authorities take into account that this Guideline is not requiring the undertaking to extend the scope of a partial internal model, but to improve the internal model within its current scope. Furthermore national competent authorities take into account that it is neither a requirement to force the undertaking to implement changes which are not useful for it. It is expected that the undertaking only implements changes that would improve the internal model.
- 3.44. From an undertaking's or a national competent authority's perspective, changes as shown in the examples below may indicate a need to implement changes within the internal model:
- Methods used to assess risk within the undertaking's risk management system on a very granular basis have improved. Consequently national competent authorities may consider asking the administrative, management and supervisory body of the undertaking to plan to improve the calculation engine of their internal model, too, if this better reflects the risk profile and is proportionate to the nature, scale and complexity of the risks modelled.
 - From a supervisory perspective the internal model may also be improved to reflect the increase in use, for example, if the undertaking is using the internal model output for more granular decisions.

Examples of how the Guideline can be applied

- 3.45. Examples relating to the internal model outputs and inputs from different parts of the calculation engine are calculated for regulatory purposes with little or no internal incentive for ensuring the quality of those outputs:
- The decision taker within an undertaking is using different tools to assess the outcome of their decisions. The administrative, management or supervisory body of the undertaking and national competent authorities might expect that the results of the different

tools would not be un-reconcilable and that the decision taker has plausible reasons as to why he does not rely on the result of the internal model, and has documented the process for taking into consideration the different tools. National competent authorities would express their concern if there is no suggestion to improve the internal model at this point.

- The internal model supports the decision-making in the undertaking. The way the output of the internal model are prepared or are reported would allow or limit the manner in which it can be used by different users in an undertaking. Therefore it might be necessary to improve the quality of the internal model in such a way that the granularity of the internal model increases.
- The internal model uses output from external models and/or data and this might, in some circumstances, need to be changed or adapted. The undertaking could carry out this change either directly or indirectly:
 - Directly – the undertaking makes the relevant changes within the internal model, even if the external model and/or data provider does not update the external model and /or data. The undertaking needs to be aware of the consequences of such changes on the effectiveness of the external model, and the possible issues that may arise during further updates of the external model.
 - Indirectly – the undertaking could require the provider to carry out the change taking into consideration the timeframe required for approval of a major change if relevant. In this case the undertaking also needs to ensure that, if the provider cease to operate or provide the services agreed, it would be able to carry out the necessary changes.

3.46. Examples relating to deterioration in the accuracy, robustness or timeliness of the internal model outputs is unlikely to be picked up by the undertaking's internal processes: the internal model governance and validation policy are joined up by the risk-management function. It can be the case where different parts of the internal model are maintained and operated by different parts of the undertaking (for example, an economic scenario generator is operated by the life actuarial team and a catastrophe model by the catastrophe modelling team). If the two teams do not discuss assumptions that are linked, such as inflation, but the two teams do, however, document fully what

they are doing, then the risk-management function could encourage the information flow between the two teams.

3.47. Examples relating to the undertaking lacking a process for monitoring the appropriateness of the internal model and for improving it:

- The risk-management function is responsible for the tasks set out in Article 44(5) of Solvency II. If the internal model is complex, and covers several activities and business centres, monitoring appropriateness might be a lengthy and convoluted process;
- There are always changes in the environment of an undertaking, in its organisational structure, in the science and knowledge available with an impact on the modelling structure, etc. To address those challenges, the undertaking may implement a process which identifies and collects the changes that may improve the model (e.g. through the risk-management function). Such a process could include the following:
 - Feedback loop between the modelling team and the team which is responsible for validating the model (link to validation);
 - Feedback loop between the modelling team and the users of the internal model or users of its outputs;
 - Feedback loop between for example the internal audit and the modelling team;
 - Open communication with national competent authorities which guarantees that applications for the approval of major changes are submitted to national competent authorities without delay.

Guideline 11 – Fit to the business

Through the pre-application process national competent authorities should, in forming a view on how the insurance or reinsurance undertaking ensures that the level of detail to which the internal model fits its business is appropriate, consider the following factors:

- (a) whether the uses of the internal model by the insurance or reinsurance undertaking in its decision-making process covers strategic decisions, more detailed key business decisions and any other relevant decisions;**
- (b) the insurance or reinsurance undertaking's risk management**

- system and how granular this is;**
- (c) the granularity required for the decision-making process of the insurance or reinsurance undertaking;**
 - (d) the structure of decision-making fora in the insurance or reinsurance undertaking;**
 - (e) the internal record by the insurance or reinsurance undertaking related to the design of the output from the internal model; or**
 - (f) other relevant ones**

- 3.48. National competent authorities can form a view on how the design process the undertaking went through, could be used by this undertaking to evidence that the internal model and the business model are aligned.
- 3.49. Demonstration of evidence by the undertaking that the internal model is adjusted for changes in the scope or nature of the business of the undertaking is an example of good practice. Examples of such changes include reorganisations, expansion into new markets or development of new lines of business.
- 3.50. The undertaking may want to consider the results of the profit and loss attribution in the assessment of goodness of fit of the internal model to the business model. For example, the profit and loss attribution may indicate that the internal model has not an appropriate level of detail, or that the structure of the internal model does not allow output that reflects the way the business is run.
- 3.51. Another example of good practice is when the internal model is capable of producing outputs that are at least as granular as the decision-making process of the undertaking. Additional guidance on this is provided as part of the profit and loss attribution (please refer to the relevant Guidelines). This demonstrates the alignment between the internal model and risk-management system.
- 3.52. Understanding the outputs and the management information produced by the internal model and how they are used in decision-making is a key component of this Guideline.

Guideline 12 – Understanding of the internal model

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking ensures understanding of the internal model by the administrative, management or supervisory body and staff using the internal model for decision-making; including providing training, seminars or workshops on the internal model.

With the aim of forming a view on their understanding of the internal model national competent authorities should consider using interviews of persons from the administrative, management or supervisory body and persons who effectively run the insurance or reinsurance undertaking.

National competent authorities should also consider reviewing the documentation of the minutes of the board meetings or appropriate decision-making bodies to form a view on how ready is the insurance or reinsurance undertaking to comply with the use test requirements.

- 3.53. Both overall and detailed understanding may be gained from training provided by the undertaking. Thus evidence of training, seminars or workshops for the members of the administrative, management or supervisory body can be one way for national competent authorities of forming a view on the understanding of the internal model by the undertaking.
- 3.54. Training, seminars or workshops for the administrative, management or supervisory body could include the overall review of:
- The structure of the internal model;
 - The scope and purpose of the internal model and the risks covered by the internal model, as well as those not covered;
 - The way the model fits with the business and the risk-management system
 - The general methodology applied in the internal model calculations;
 - The limitations of the internal model;
 - The interpretation of the relevant inputs and outputs of the internal model;
 - The diversification effects taken into account in the internal model;

- Other relevant information for the manager.
- 3.55. The Guideline also applies to external models and data:
- Understanding the effect and significance of proprietary elements of external models including the differences that may arise between different models or outputs;
 - Understanding all material risks related to the use and reliance of external models and data. For example: the risks arising given that the model provider may cease to operate, the risks arising given that in-house expertise that understands the external models and data may leave the organisation, the risks arising given that information may be required from the model provider and they are not able to disclose this or it falls outside the boundary of the contract agreed.
- 3.56. National competent authorities form a view on how the undertaking considers how they access information from the vendor – especially if the administrative, management or supervisory body challenges key assumptions/limitations.
- 3.57. The CEIOPS Report on Lessons learned from the crisis also highlights the administrative, management or supervisory body understanding of the internal model as an important factor. The Report recommends that the administrative, management or supervisory body be required to understand the drivers behind market movements, together with its own portfolio positions, in particular in times when historical relationships in markets break down. It is expected that the risk management systems under Solvency II takes into consideration those lessons learned, and that this is reflected in the use of the internal model.
- 3.58. Thus demonstration of evidence of training, seminars, induction programmes or workshops for all members of the administrative, management or supervisory body or the persons effectively running the undertaking may be one way of forming a view on how ready is the undertaking to comply with the use test.
- 3.59. National competent authorities may want to consider what the objectives of these workshops are, how the objectives are achieved, how frequently they are run, participation rates and what assessment is done at the end. Supervisory review of a training handbook or other material does not prevent the responsible people within an undertaking being asked detailed questions to assess whether the contents of training has been understood.

3.60. In particular national competent authorities may use interviews of the administrative, management or supervisory body or other persons who effectively run the undertaking to assess the understanding of diversification effects, dependencies or understanding capital allocation, as well as other aspects of the internal model.

Applying the understanding

3.61. Furthermore it is expected that the outputs of the internal model are discussed with the risk-management function and that the results of this discussion are reported to the administrative, management or supervisory body and can therefore be seen in the minutes of the board meetings or of other committees and decision-making bodies. National competent authorities may review minutes from the relevant committees / decision-making bodies in the undertaking to assess how output from the internal model is used, i.e., how it is discussed, how the discussion is documented, how suggested improvements to the internal model output are fed back to the risk-management function, etc. Where minutes refer to actions to be carried out, national competent authorities may check that the actions have actually been implemented.

3.62. National competent authorities may also find it helpful to review what reports have been requested by members of the administrative, management or supervisory body. Then national competent authorities can ask the board members to explain the reports and how they change over time. The undertaking may wish to consider the format of the internal model reporting and how the format could be improved to enhance senior management understanding; for example, the inclusion of graphics or diagrammatic representation of data can enhance communication.

3.63. Consequently the minutes of the board meetings with discussions and results of those discussions on risk profile of the undertaking can be reviewed as a way of forming a view by national competent authorities. National competent authorities may also find it helpful to see how members agreed to act on the outcome of the discussions and how decisions were communicated and acted within the company.

Guideline 13 – Support of decision-making

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking ensures that the internal model will be used both in decision-making

and to calculate the Solvency Capital Requirement.

When the insurance or reinsurance undertaking uses additional tools to the internal model as part of the decision-making process, national competent authorities should form a view on how the insurance or reinsurance undertaking identifies inconsistencies and considers them as a potential basis to improve the quality of the internal model.

- 3.64. National competent authorities take into account that, in some cases, the internal model can produce results on more than one basis. However, these results need to be consistent with each other. National competent authorities form a view on how the undertaking would analyse and understand the different impact of various courses of action on various measures – e.g., economic capital, IFRS earnings, local GAAP, management accounting measures, rating agency capital, etc., so that the results produced by the internal model are appropriate for the use which the undertaking intends to make of the internal model. However, these results need to be consistent with each other. In addition, national competent authorities form a view on how the undertaking identifies the extent of consistency of output used for different decisions.
- 3.65. Where a divergence occurs between the outputs of the internal model, national competent authorities form a view on how the undertaking understands and is able to explain this divergence. For example, the undertaking understands and explains the model output on a Solvency II or Economic Capital basis and the output on an IFRS basis.
- 3.66. National competent authorities consider that the internal model is not the only tool used to make decisions in the business, and it is expected that an undertaking has a number of tools used to support decisions made within the business.

Guideline 14 – Support of decision-making

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking ensures that the internal model gives prospective support to decision-making and provides retrospective verification of decision-making.

- 3.67. The support and verification of decision-making does not mean that it is expected that undertakings develop detailed assessments for all

- decisions but it needs to at least cover all decisions likely to have a significant impact.
- 3.68. Support for decision-making can in this context be expressed as a reduction of the uncertainty of information used in the decision-making process.
- 3.69. It is expected that the results of the internal model would be used at least for business decisions that have a major impact on the risks of the undertaking. So the internal model is to be used in decision-making processes, including the setting of a business or risk strategy. The board needs to agree on a certain business or risk strategy and this agreement needs to be evidenced (e.g. in the minutes of the board meeting).
- 3.70. It is regarded as good practice for the undertaking to document why significant decisions are made, including how the output of the internal model was factored into the eventual decision and why decisions differ from those indicated by the internal model output, and the additional information that has been used to arrive at the decision, as well as documenting the rationale for decisions where the outputs from the internal model support the decision.
- 3.71. The retrospective verification of a decision is strongly linked to the profit and loss attribution as set out in Article 123 of Solvency II: the undertaking has to attribute the profit and losses at least to every major business unit in the scope of the internal model. That means the internal model can be used to compare actual profit or loss to the decision which was taken.
- 3.72. When forming their view, national competent authorities take into account that support for a decision can also contribute to create a higher acceptance of the internal model within the undertaking. For example the internal model may produce a single point in the distribution (e.g. 1 in 200), while the undertaking might have a risk appetite expressed at a different level (e.g. 1 in 250 rather than 1 in 200). In this case if the model is not trusted because it has not been fitted for other parts of the distribution it might not be useful for decision-making. Therefore national competent authorities would consider if the internal model is fit to the use.

Guideline 15 – Support of decision-making

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking

documents the use of the output of the internal model in decision-making and how the output is aligned with the decision.

National competent authorities should form a view on how the insurance or reinsurance undertaking captures as well in the documentation where the output of the internal model is not aligned with the decision.

National competent authorities should form a view on how the insurance or reinsurance undertaking ensures that the internal stakeholders of the undertaking, in particular its administrative, management and supervisory bodies, receive regular internal model results that relate to the relevant business decisions.

- 3.73. National competent authorities form a view on how the undertaking ensures that internal communication processes and reporting are set up in a way that ensures that in particular the administrative, management and supervisory bodies receive regular and comprehensive internal model results that relate to the relevant business decisions. In addition, national competent authorities form a view on how persons at other relevant levels of the undertaking receive also appropriate regular and comprehensive reports. This might mean that additional transformations of internal model results are needed in order to make them “fit for management decisions”.
- 3.74. When forming a view on the use of internal model output in decision-making, and the discussion and debate around the decision, national competent authorities could look for the debate that took place in the undertaking in relation to the design and the output from the internal model. For example, the decision to be considered is framed in a robust way, with the key drivers for the decision clearly set out. The possible outcomes from different decisions need to be clear, and uncertainty in these outcomes set out. This might assist the decision-making process, by making the question being debated clear and agreed by all decision-makers, as well as highlighting the key assumptions and risks from different alternatives decisions, including changing nothing.
- 3.75. Support for decision-making could be for example as follows:
- Use of an internal model to reduce the uncertainty of information in the case of a merger or acquisition. If an undertaking considers acquiring a new company, from the risk perspective, this undertaking would have to absorb potential losses which might occur after having acquired the company. The internal model can be used in the assessment of the capital which has to be held to

cover for potential future losses and hence supports the decision-making process. The internal model may at a minimum be able to produce the capital and risk management impact of a potential decision against which any assessed profit could be viewed. There might be a lack of data concerning the new company. In this case the undertaking might use assumptions or approximations. From a supervisory perspective it is important that such information is factored into the decision-making process accordingly;

- The internal model can be used for assessing the future cash flows of single products or lines of business;
- The internal model can also be used to support the quantification of the risks to which the future earnings are exposed and support decisions on capital allocation;
- The internal model can be used throughout the years to monitor how business is developing against an undertaking's business plan;
- The internal model can also be used as part of the pricing process. The undertaking may for example calculate the economic price for the product with the internal model. Therefore the undertaking may decide to add desired profit margin.

3.76. The use of the internal model can demonstrate on the one hand why decisions have been made. On the other hand if the decision maker would have made decisions on given actual events in a different way to what he did given the output of the internal model this may give an indication of possible weaknesses of the internal model. An intensive analysis on decisions chosen might indicate that the internal model has to be amended.

Guideline 16 – Support of decision-making

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking ensures that the internal model is at a minimum able to measure the economic capital and to identify the impact on the risk profile of potential decisions for which the model is used.

National competent authorities should form a view on how the insurance or reinsurance undertaking also understands the effect such decisions will have on the Solvency Capital Requirement.

Adequate Pricing

3.77. If a new product is introduced, national competent authorities might expect that the results of the internal model are taken into account during the decision process. That does not mean that the undertaking has to provide a detailed assessment of the expected profit and losses. But from a supervisory perspective the undertaking would at least have to assess the amount of risk capital which has to be held. This amount of capital can afterwards be compared with the realised profit and losses. If the result of the comparison is that the amount of risk capital as an output of the internal model is not comprehensive enough we would from a supervisory perspective expect the internal model to be adjusted.

Efficient use of capital

3.78. It is expected that the results of the internal model would be used at least for business decisions that have a major impact on the risks of the undertaking. So the internal model is to be used in decision-making processes, including the setting of a business or risk strategy. The board of the undertaking needs to agree on a certain business or risk strategy and this agreement needs to be evidenced (e.g. in the minutes of the board meeting). To form a view on how the business or risk strategy is really implemented in the internal model accordingly, national competent authorities might compare the results of the internal model with the documented business or risk strategy. For example if the board agreed on reducing a certain kind of risk but the risk capital as an output of the internal model increased in this risk category this might indicate an incomplete implementation of the business or risk strategy.

Guideline 17 – Frequency of calculation

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking develops a process to monitor its risk profile and how a significant change of the risk profile will trigger a recalculation of the Solvency Capital Requirement.

3.79. A continuous monitoring of risk profile is key to decision-making and planning. For governance purposes, national competent authorities form a view on how the undertaking develops processes to monitor its risks, including identifying new risks that they may be exposed to. It

would be important that the undertaking links this process for the recalculation of the Solvency Capital Requirement with the process to change the internal model. The undertaking's processes would identify the circumstances under which a change to the risk profile can be adequately addressed through a recalculation of the Solvency Capital Requirement and the circumstances under which a change to the internal model is needed. This would ensure that the model is up to date and that the undertaking maximises the use of this model in decision-making.

Guideline 18 – Group specificities

Through the pre-application process, in case of a group internal model, the national competent authorities involved should form a view on how the participating undertaking and the related undertakings which would use the group internal model to calculate their individual Solvency Capital Requirement cooperate to ensure that the design of the internal model is aligned with their business.

The national competent authorities involved should form a view on the evidence provided by the participating undertaking and related undertakings that, at least:

- (a) their individual Solvency Capital Requirement would be calculated with the frequency required by Article 102 of Solvency II and whenever it is needed in the decision making process;**
- (b) they can propose changes to the group internal model, especially for components that are material to them or following a change in their risk profile or changes in local conditions; and**
- (c) the related undertakings possess the adequate understanding of the internal model for the parts of the internal model which cover the risks of that undertaking.**

The national competent authorities involved should form a view on how insurance or reinsurance undertakings that would use a group internal model to calculate their Solvency Capital Requirement, ensure that the design of the internal model is aligned with their business and their risk-management system, including the production of outputs, at group level and at related undertaking

level, that are granular enough to allow the group internal model to play a sufficient role in their decision making processes.

- 3.80. In the context of a group internal model, the use test applies to the model used to calculate the Solvency Capital Requirement. In particular the use test applies to the undertakings using the internal model to calculate their Solvency Capital Requirement in relation to the outputs at group level but also in relation to the outputs at the level of that undertaking. A key component of the use test is how the internal model is embedded in decision making, which may vary by entity.
- 3.81. An appropriate governance of the internal model provides the framework for the group and the related undertakings to cooperate closely in the use of the internal model. Such governance may be formalised in the forms of contracts/ legal arrangements such as service level agreements or through policies and dedicated procedures. This cooperation may be a way to identify where the internal model would be used in their systems of governance.
- 3.82. They would be able to evidence that the group internal model would be adjusted to reflect changes in the group or in the related undertaking's risk profile. For instance it is expected that the policy for changing the internal model foresees changes to the internal model as possible consequences of changes in the risk profile for all undertakings in the scope of the internal model.
- 3.83. In order to be able to calculate their Solvency Capital Requirements properly and to meet the use test requirements, related undertakings would need to have adequate understanding about the internal model. A source of that understanding is, for example, having access to the relevant and up-to-date internal model documentation, created either at group or at solo level.
- 3.84. The above-mentioned requirements are equally important when the group uses external models or chooses not to operate the external model directly.
- 3.85. The undertakings fully or partially within the scope of an internal model for a group that would be used to calculate the group Solvency Capital Requirement, but which would not be used to calculate their solo Solvency Capital Requirement would need also to comply with the use test in relation to the output of the internal model at group level. This implies that:

- The model would be able, at the minimum, to produce outputs at the level of those related undertakings;
- Those related undertakings are able to demonstrate an overall understanding for the parts of the internal model which would cover their risks;
- The consolidated group Solvency Capital Requirement would need to be recalculated if the risk profile of the related undertaking alters significantly since the last reported group Solvency Capital Requirement such as materially impacting the group Solvency Capital Requirement.

Chapter 4: Assumption setting and expert judgement

- 3.86. One of the requirements that an insurance or reinsurance undertaking needs to fulfil in order to use an internal model for the Solvency Capital Requirement calculation is being able to justify the assumptions underlying the internal model to national competent authorities.
- 3.87. The models for risk (“internal models”) use assumptions which must be based on the expertise of individual persons or committees with relevant knowledge, experience and understanding of the risks inherent in the insurance or reinsurance business (expert judgement). Expert judgement is therefore an important ingredient in the assumption setting process. These Guidelines on assumption setting and expert judgement aim to provide guidance about what national competent authorities and an undertaking do through the pre-application process to ensure that national competent authorities are able to form a view on how prepared the undertaking is to comply with the requirements in relation to the setting of those assumptions and in particular to the use of expert judgement on which these assumptions are based.
- 3.88. Especially where data availability or quality is limited, as well as in other situations where modelling decisions contain a large degree of subjectivity, both risk and valuation models need to overcome limitations in data by the use of assumptions which are based on expert judgement. In extreme cases, appropriate data may not be available at all and expert judgement can allow risk assessment which otherwise would not be possible. In these cases, the use of assumptions based on expert judgement is actively encouraged. But even in cases where there is sufficient data the need for expert judgement arises in selecting the data to use.

- 3.89. Therefore, the focus of these Guidelines is the choice of modelling assumptions which are closely tied to limitations in data, although they apply to all assumptions for valuation and risk models in general. As an assumption overcoming the limitations in data is hard to be separated from other assumptions based on the expertise of persons with relevant knowledge, experience and understanding of the risks inherent in the insurance or reinsurance business thereof, the scope of the term “assumptions based on expert judgement” is kept rather broad and no explicit boundaries are given.
- 3.90. While the choice of assumptions based on expert judgement is associated with a large degree of subjectivity and, due to their nature, such assumptions do not lend themselves naturally to traditional methods for validation, the use of expert judgement as the basis for such assumptions happens in a controlled environment. Other controls take precedence such as a tight governance framework [Guideline 20], good communication that includes limits and uncertainties of the assumptions based on expert judgement [Guideline 21] and thorough documentation [Guideline 22]. Validation also still plays a role, for example in the maintenance of a track record [Guideline 23].
- 3.91. The Guidelines on assumption setting and expert judgement provide guidance in order that national competent authorities are able to form a view on how the undertaking sets up these controls and explains their background.
- 3.92. Where committees rather than individual persons provide assumptions based on expert judgement, national competent authorities also form a view on how these committees set such assumptions and use expert judgement on which these assumptions need to be based.

Guideline 19 – Assumptions setting

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking sets assumptions and uses expert judgment in particular, taking into account the materiality of the impact of the use of assumptions.

National competent authorities should form a view on how the undertaking assesses materiality taking into account both quantitative and qualitative indicators and taking into consideration extreme losses conditions.

National competent authorities should form a view on how the

insurance or reinsurance undertaking gives attention to the interrelation between the indicators considered as indicators that have limited impact in isolation may have a material impact in combination.

- 3.93. In any internal model, the various assumptions differ widely in their materiality.
- 3.94. This would also hold in the context of setting up a balance sheet for solvency purposes. This can either be the case where assumptions need to be taken for the valuation of assets where market values are not available and a model is required for this purpose or where the valuation of liabilities requires such assumptions to determine the value of the best estimate or the risk margin.
- 3.95. When the undertaking assesses materiality, it can take into account indicators and metrics such as the solvency capital requirement, technical provisions, own funds and other related metrics. Attention is to be given to the interrelation between the metrics considered by the undertaking.
- 3.96. Examples for quantitative indicators for materiality in relation to internal models are the estimated impact of the typical change or uncertainty in such assumptions on capital or other model outputs, or results of any tool used in model validation such as stress and scenario testing or sensitivity analysis. Qualitative indicators can also be used to determine whether assumptions can be material or not.
- 3.97. Where individual assumptions are immaterial, they may still be related or sufficiently similar and together they may become material as a whole. In this case, they are to be treated according to this aggregate materiality. An example for this may be the individual entries in a correlation matrix, which individually have very little impact on model output, but together can change model results dramatically.

Guideline 20 - Governance

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking ensures that all assumption setting, and the use of expert judgement in particular, follows a validated and documented process.

National competent authorities should form a view on how the insurance or reinsurance undertaking ensures 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.

National competent authorities should form a view on how the insurance or reinsurance undertaking signs off the assumptions at levels of sufficient seniority according to their materiality, up to and including the administrative, management or supervisory body.

3.98. This Guideline is connected with Guideline 22 on documentation. The documentation of the process enables to assess the validity of the resulting assumptions.

3.99. Instead of being the product of a black box, an assumption based on expert judgement is to be viewed as the end result of a process with distinct steps. This improves documentation and transparency, and serves to differentiate the hypotheses on which the assumption is based from the processing of these hypotheses and the resulting judgement itself. In addition, validation efforts can focus on the steps of the process as well as the outcome.

3.100.A stylized view of the process of choosing the assumption based on expert judgement may consist of the following steps:

- a. definition of the domain of the problem;
- b. selection and briefing of the expert, e.g. by reminding experts about the inherent biases and shortcomings of judgements;
- c. collection of available information which could be quantitative or qualitative in nature;
- d. processing the available data and synthesis of the resulting assumption. This may involve construction of a micro-model² in the internal model context;
- e. reporting and documentation;
- f. validation.

3.101. Likewise, where assumptions on the same issue are derived by several experts in the same undertaking, for example in geographically dispersed locations, the process ensures consistency between these assumptions. Benchmarking of assumptions across entities by a group function may be a tool for ensuring consistency across the group.

² In this context, micro-model refers to the mechanism that translates the information used by the expert into something that is useable for the internal model

Guideline 21 - Communication and uncertainty

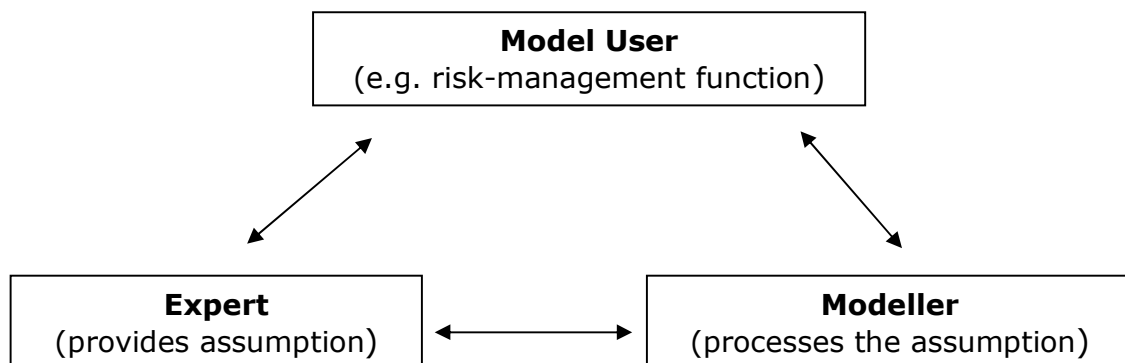
Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking ensures that the processes around assumptions, and in particular around the use of expert judgement in choosing those assumptions, specifically attempt to mitigate the risk of misunderstanding or miscommunication between all different roles related to such assumptions.

National competent authorities should form a view on how the insurance or reinsurance undertaking establishes a formal and documented feedback process between the providers and the users of material expert judgement and of the resulting assumptions.

National competent authorities should form a view on how the insurance or reinsurance undertaking makes transparent the uncertainty of the assumptions as well as the associated variation in final results.

3.102. Sometimes, there is the risk that the context and meaning of an assumption based on expert judgement is not fully understood by its users. For example, the expert responsible for providing an assumption and its users may be part of organisationally or geographically distant units with little regular communication. However, this Guideline does not imply that two roles cannot fall on the same person.

3.103. Generally, three different roles related to internal modelling and assumptions in the scope of this Guideline can be distinguished:



- 3.104. Miscommunication can appear on all three sides of this triangle. Even in cases where two roles fall on the same person (e.g. modeller and expert are the same person), there is still one more communication link which can fail.
- 3.105. A formalized feedback between all three different roles reduces the risk of misunderstanding or misusing assumptions based on expert judgement.
- 3.106. An example for evidencing this feedback is to include in the documentation addressed in Guideline 22:
- A summary of the context and application of assumptions based on expert judgement, jointly signed off by the provider and the user;
 - Minutes of meetings where decisions on assumptions have been made;
 - Reports of working groups on which the decisions were based.
- 3.107. While a sound process, feedback and sign-off, as well as documentation and validation may reduce or eliminate bias in an assumption based on expert judgement and increase its reliability, some uncertainty may always remain.
- 3.108. The remaining uncertainty can be made transparent in a variety of ways, both qualitative and quantitative ones: for example, the expert gives a qualitative indication of the degree of certainty; alternatively the expert provides plausible upper and lower bounds in case of a parameter setting.
- 3.109. Knowing the degree of uncertainty inherent in assumptions based on expert judgement enables the undertaking to judge its impact on the final model output as well as identifying areas of model risk and potential future model improvements, taking into account the materiality of the assumptions based on expert judgement.

Guideline 22 - Documentation

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking documents the assumption setting process, and in particular the use of expert judgement, in such a manner that the process is transparent.

National competent authorities should form a view on how the insurance or reinsurance undertaking includes in the documentation

the resulting assumptions and their materiality, the experts involved, the intended use and the start and revision date.

National competent authorities should form a view on how the insurance or reinsurance undertaking includes 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.

National competent authorities should form a view on how the insurance or reinsurance undertaking makes sure that users of material assumptions receive clear and comprehensive written information about those assumptions.

3.110. Transparent documentation implies that instances in which an assumption based on expert judgement is used can be easily identified from the documentation. National competent authorities can consider that the undertaking might, for example, maintain an up-to-date index or reference list of instances where expert judgement is used, or make the use of electronic search tools feasible for the purpose.

3.111. National competent authorities can consider that another implication of transparent documentation is that the undertaking provides thorough, i.e. clear and comprehensive, documentation for all material judgement. It may not be necessary or reasonable to provide extensive and highly detailed documentation on all instances in which an assumption based on expert judgement is used. The proportionality in the setting of the assumption (cf. Guideline 19) needs to be taken into account and could be reflected in the level of detail of documentation provided that all relevant information with respect to the particular assumption is still included in the documentation.

3.112. National competent authorities form a view on how the documentation of the model describes the assumptions in such a manner that they are transparent and that their validity can be assessed by assumptions users and national competent authorities. In this regard, the documentation needs to clarify:

- How and what kind of expert judgement is involved in choosing the assumption;
- The materiality in the setting of the assumption (cf. Guideline 19);
- The context of the use of expert judgement, if not evident;

- The reasons to call for the assumption, if not evident;
- Evidence for the expertise of the assumption provider; and
- The rationale for the assumption, including the information basis used.

3.113. The context and the reasons to call for the judgement with respect to the undertaking's internal modelling or valuation process and application of the judgement need to become clear from the documentation. The initial context, in which the assumption based on expert judgement was intended to be applied, as presented to the expert(s), is to be consistent with the context in which the assumption is being finally applied. Any inconsistency in this respect needs to be documented. National competent authorities form a view on how the undertaking is aware of any limitations of the application of the judgement to ensure it is correctly and appropriately used.

3.114. Assumptions may be based on expert judgement formed by a group/committee or an individual. In the former case, the name and position of all experts with a specified role in the elicitation process and providing essential contribution to the process would be documented. Providing collective evidence for the expertise (the level and variety of knowledge) for the whole group/committee may in most instances be sufficient. Any relevant professional experience such as education, on-the-job-training and the access to information bases in the relevant field could be used as evidence for expertise.

3.115. National competent authorities form a view on how the undertaking documents the rationale for the opinion, including the information basis used, in order to make assumptions transparent. The documentation is expected to describe the problem-solving processes and methods, and report and justify all instances where an assumption based on expert judgement was changed, overruled or disregarded before its application. The description for the rationale behind the problem-solving processes and methods could include:

- Inputs, interpretations and hypotheses on which the assumption is based (information basis), as well as how expert judgement has been used;
- Output(s) and any relevant shortcomings and uncertainty surrounding them. Where relevant, references to alternative assumptions are made. The opinions of all experts with essential contribution and involvement in the elicitation process are to be reported, irrespective of the opinions being used or not;

- Processes and methods for deriving the assumption. The processes and methods used to derive the assumption, particularly when multiple and differing expert responses are aggregated, are explained to the extent possible and relevant for the assumption under consideration.

3.116. National competent authorities form a view on how the undertaking also documents the results of the validation (cf. Guideline 23).

Guideline 23 - Validation

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking ensures that the process for choosing assumptions and using expert judgement is being validated.

National competent authorities should form a view on how the insurance or reinsurance undertaking ensures that the process and the tools for validating the assumptions and in particular the use of expert judgement are being documented.

National competent authorities should form a view on how the insurance or reinsurance undertaking tracks the changes of material assumptions in response to new information and analyses and explains those changes as well as deviations of realizations from material assumptions.

National competent authorities should form a view on how the insurance or reinsurance undertaking, where feasible and appropriate, uses other validation tools such as stress testing or sensitivity testing.

National competent authorities should form a view on how the insurance or reinsurance undertaking reviews the assumptions chosen, relying on independent internal or external expertise.

National competent authorities should form a view on how the insurance or reinsurance undertaking monitors the circumstances under which the assumptions would be considered false.

3.117. National competent authorities take into account that, as quantitative validation can be difficult, the validation by undertaking of the process of creating an assumption based on expert judgement is very important.

- 3.118. The validation of the process can include in particular the validation of the following items: definition of the problem to be addressed by expert judgement, criteria for selection of the expert(s), data and information gathered and used, decision, rationale of the decision (it needs to be transparent enough to clearly identify the factors weighted in the decision), uncertainty or conditions under which the selected decision would not be valid, and sign-off.
- 3.119. One purpose of the validation is to ensure a sufficient level of confidence in the assumptions that have a material impact on the output of the model and/or on decisions taken.
- 3.120. The process of tracking the assumptions against actual experience and new information is a key tool to determine whether the expert judgement is applied appropriately, both initially and on an on-going basis. National competent authorities form a view on how the undertaking considers materiality in deciding which assumptions would require tracking against actual experience and new information, as it may be impractical to complete this tracking for all assumptions.
- 3.121. Peer review, whether internal or external, can contribute to providing senior management with sufficient confidence in the areas of expert judgement affecting their decisions. It may contribute to the independence of the validation process, and increase over time the consistency across the undertaking.
- 3.122. Where possible, assumptions need to be compared against reality and to other external information.
- 3.123. National competent authorities form a view on how the undertaking using an internal model, includes in the validation process the documentation of the process and the tools for validating assumptions and in particular the use of expert judgement.

Chapter 5: Methodological consistency

- 3.124. One of the requirements that an insurance or reinsurance undertaking needs to fulfil in order to use an internal model for the Solvency Capital Requirement calculation is the consistency between the methods used to calculate the probability distribution forecast and the methods used for the calculation of technical provisions. Therefore, through the pre-application process, national competent authorities form a view on how the undertaking ensures this methodological consistency.

- 3.125. For the purpose of calculating the Solvency Capital Requirement of an insurance or reinsurance undertaking, an internal model produces a probability distribution forecast of certain monetary amounts. The probability distribution forecast determines the impact of possible future events on the monetary amounts at the end of the time horizon, which determine the financial situation of the undertaking.
- 3.126. As the calculation of the probability distribution forecast aims at capturing changes in the undertaking's basic own funds, which are in turn caused by changes in the values of assets and liabilities, a set of assumptions used by the undertaking for the calculation of the probability distribution forecast would be common with those used in the valuation of assets and liabilities for solvency purposes. In practice the calculation methods, data and parameters used for the valuation and their underlying assumptions may not be identical to their counterparts in the calculation of the probability distribution forecast. The different objectives may introduce deviations to some extent.
- 3.127. However, Article 121(2) of Solvency II sets out that the methods used by the undertaking to calculate the probability distribution forecast shall be based on adequate actuarial and statistical techniques.
- 3.128. With respect to the ability of the internal model to capture changes in basic own funds, adequate methods used by the undertaking to calculate the probability distribution forecast would be consistent with the valuation of assets and liabilities. Accordingly, national competent authorities form a view on how the undertaking chooses methods for the calculation of the probability distribution forecast that are consistent with the methods used for valuation of assets and liabilities, and in particular consistent with the calculation of technical provisions.

Guideline 24 - Consistency check points

Through the pre-application process, national competent authorities should form a view on how the insurance or reinsurance undertaking will ensure consistency between the methods used to calculate the probability distribution forecast and the methods that will be used for the valuation of assets and liabilities for solvency purposes.

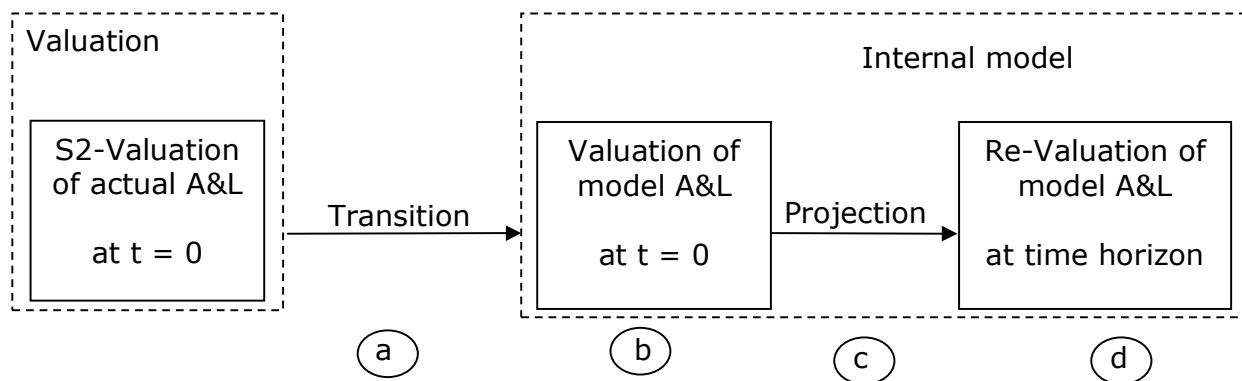
In particular national competent authorities should form a view on how the insurance or reinsurance undertaking will check consistency at the following steps of the calculation of the probability distribution forecast, in case that they are relevant to the model part under

consideration:

- (a) the consistency of the transition from the valuation of assets and liabilities for solvency purposes to the internal model for the purpose of Solvency Capital Requirements calculations;**
- (b) the consistency of the initial valuation of assets and liabilities in the internal model at the valuation date with the original valuation of assets and liabilities for solvency purposes;**
- (c) the consistency of the projection of risk factors and their impact on the forecasted monetary values with the best estimate assumptions of those risk factors used for the valuation of assets and liabilities; and**
- (d) the consistency of the re-valuation of assets and liabilities at the end of the time horizon with the initial valuation.**

3.129. In principle, the calculation of the probability distribution forecast can be decomposed into an initial valuation, a projection step and a revaluation. Depending on the risk type under consideration and the design of the internal model, some of these steps may coincide.

3.130. The consistency check points are indicated in the following illustration:



- a. at the first step, the assets and liabilities contained in the balance sheet for solvency purposes may not be used directly as input for the internal model, but may be transformed into model assets and liabilities that are better suited for the projection and revaluation steps within the internal model;
- b. the initial value of the model assets and liabilities is calculated to determine the starting point of the projection;

- c. the model assets and liabilities - more precisely, the underlying risk factors to which they are exposed - are projected into the future;
 - d. the model assets and liabilities are re-valued at the end of the time horizon.
- 3.131. The decomposition of the internal model calculation into an initial valuation, a projection and a re-valuation step can often be observed explicitly in practice or implicitly in the underlying theoretical framework of the internal model.
- 3.132. The assessment of consistency at step (a) (transition) and step (b) (initial valuation) ensures that the "starting point" of the projection is aligned with the values in the balance sheet for solvency purposes.
- 3.133. The assessment by the undertaking of consistency of the transition step needs to take into account that "consistency" is not a question of "similarity" between the valuation framework and the internal model. The calculation of the probability distribution forecast can be considerably different from the methods used for valuation in some cases, e.g. a Replicating Asset Portfolio approach may be used to project and re-value the liabilities of a Life Insurance undertaking, although a full projection is used to calculate the value of technical provisions.
- 3.134. At step (b), consistency can be assessed for instance by reviewing whether the techniques applied for the initial valuation of model assets and liabilities differ from the corresponding methods that were applied in the calculation of the balance sheet for solvency purposes.
- 3.135. Consistency at step (c) (projection) ensures that the development of the monetary values that are projected in the internal model are consistent with the calculation of corresponding monetary values within the valuation of assets and liabilities, and that the projected distribution of risk factors in the internal model is consistent with the best estimate assumptions that were applied in the valuation.
- 3.136. In most risk classes (mortality, for example), consistency typically requires a strong correspondence of parameters between risk and valuation model. For instance, national competent authorities form a view on how the undertaking reconciles the expected value of the projected distribution of future claims reserves with the best estimate of these reserves and explains the remaining differences.
- 3.137. With respect to economic assumptions and market risk factors such as interest rate curves, equity returns, credit spreads, volatilities and their interdependence, the consistency assessment at step (c) takes

into account that assumptions for valuation purposes typically are subject to a "risk neutral" framework and intended to reproduce observable prices, whereas the risk factors in the internal model are designed to emulate possible "real world" developments. This means that for market risk factors, parameters such as drift assumptions or volatilities can differ significantly between valuation model and internal model. Nevertheless, the valuation assumptions and the distribution of risk factors would be derived from a consistent basis, e.g. with respect to risk free interest rates or dependencies.

3.138. Consistency at step (d) (revaluation) ensures that the revaluation of the modelled assets and liabilities (or more generally, the calculation of projected basic own funds) at the end of the projection happens in a way that is consistent with the calculation method used for the balance sheet for solvency purposes.

3.139. For a given internal model, some of these steps may coincide and the decomposition may not be fully applicable. National competent authorities form a view on how the undertaking specifies the consistency check points outlined in the Guideline accordingly. For example, the valuation itself may already be based on model assets and liabilities rather than the original items, e.g. if a stochastic valuation model is applied. If the internal model uses the same model assets and liabilities, the transition step is trivial. National competent authorities form a view on how the undertaking, if using in its internal model another representation of assets and liabilities, assesses the consistency of the transition.

Guideline 25 – Aspects of consistency

Through the pre-application process, national competent authorities should form a view on how the insurance or reinsurance undertaking, when assessing consistency, will take at least the following aspects into account:

- (a) the consistency of the calculation methods applied in the valuation of assets and liabilities, and in the calculation of the probability distribution forecast;**
- (b) the consistency of data and parameters that are used as input for the respective calculations; and**
- (c) the consistency of the assumptions underlying the respective calculations, in particular assumptions on contractual options**

and financial guarantees, on future management actions and on expected future discretionary benefits.

Methods of Calculation

3.140.If the calculation of a certain monetary value – for instance, the future development of claims reserves in non-life – is performed differently in valuation and probability distribution forecast calculation, national competent authorities form a view on how the undertaking ensures consistency of the methods.

Data and Parameters

3.141.If the data used for valuation differs from the data used in the internal model, e.g. with respect to data aggregation, national competent authorities form a view on how the undertaking assesses consistency of the data.

3.142.This also applies to calculation parameters.

Assumptions

3.143.National competent authorities form a view on how the undertaking ensures that the underlying assumptions of valuation and Solvency Capital Requirement calculation by the internal model are consistent with each other, with special attention given to key assumptions.

3.144.In particular this holds for assumptions concerning:

- Contractual options and financial guarantees;
- Future management actions;
- Expected future discretionary benefits.

Guideline 26 - Consistency assessment

Through the pre-application process, national competent authorities should form a view on how the insurance or reinsurance undertaking will conduct regular consistency assessments as part of its internal model validation process as set out in Article 124 of Solvency II.

National competent authorities should form a view on how the insurance or reinsurance undertaking will conduct the consistency assessment on a quantitative basis whenever possible and

proportionate.

National competent authorities should form a view on how the insurance or reinsurance undertaking, in its consistency assessment, will identify and document any deviation between the calculation of the probability distribution forecast and the valuation of assets and liabilities.

National competent authorities should form a view on how the insurance or reinsurance undertaking will assess the impact of the deviations, both in isolation and in combination.

National competent authorities should also form a view on how the insurance or reinsurance undertaking will justify that the deviations will not result in an inconsistency between the calculation of the probability distribution forecast and the valuation of assets and liabilities.

3.145. Prescribing a defined set of consistency criteria limiting the extent of permissible methodological deviations would probably not lead to the desired goal, given the great variety in internal modelling. National competent authorities form a view on how the undertaking reflects in its consistency assessment the specific properties of its risk profile and of the design of its internal model.

3.146. Establishing a tailored process for assessing consistency together with appropriate criteria and checking consistency on an on-going basis requires the undertaking to regularly identify any differences in the actuarial and statistical techniques used in the calculation of the probability distribution forecast and the valuation of assets and liabilities, respectively. Therefore, national competent authorities form a view on how the undertaking ensures this.

3.147. National competent authorities form a view on how the undertaking, when developing consistency criteria, investigates all relevant methodological characteristics of the internal model. However, national competent authorities take into account that particular attention needs to be paid by the undertaking to the key model assumptions as referred to in Article 124 of Solvency II and to the parameterisation of the model.

3.148. National competent authorities form a view on how the undertaking particularly focuses the concept of consistency on adverse scenarios. If consistency would not be met with respect to tail events, the model

- would thus estimate a variation of a value that would not represent at all the variation of the balance sheet in these extreme scenarios, although this is typically the aim of the internal model.
- 3.149. A quantitative assessment may not always be possible for the undertaking. However, if a quantitative assessment is possible, national competent authorities form a view on how the undertaking conducts a quantitative assessment according to the principle of proportionality.
- 3.150. For example, the undertaking may contrast the value of the technical provisions with the average internal model outcome, i.e. the expected value of the probability distribution forecast.
- 3.151. It is essential that national competent authorities form a view on the undertaking's awareness of every deviation as it may happen that the significance of a deviation changes over time.
- 3.152. For instance, policyholder options that were of little value and caused only negligible risk in former market conditions might have been excluded by the undertaking from the scope of the internal model and considered as "immaterial deviations". In other market conditions the risk inherent in those policyholder options may become material.

Chapter 6: Probability distribution forecast

- 3.153. Some of the requirements that an insurance or reinsurance undertaking needs to fulfil in order to use an internal model for the Solvency Capital Requirement calculation are related to the probability distribution forecast, as defined in the Article 13(38) of Solvency II.
- 3.154. Internal modelling within a supervisory solvency regime generally focuses on distributions rather than risk numbers. For risk management purposes distributions represent a much more detailed and richer source of information than single numbers given that both representations are of comparable degree of reliability. Accordingly, Article 121(1) of Solvency II highlights the probability distribution forecast as the internal model output.
- 3.155. In accordance with Article 13(38) of Solvency II, this mathematical function is expected to display rich information about the undertaking's risk profile. This means illustratively that a rich probability distribution forecast well reflects the material features of the risk profile in the sense that, among other things, it informs about the range of possible outcomes, whether they are favourable or unfavourable, the expected

outcome or the most probable outcome; it contains information especially in the tail of extreme loss events and allows the computation of certain statistical quantities.

- 3.156. Through the pre-application process, national competent authorities form a view on how the undertaking allows for a methodological preference for richer probability distribution forecasts as they better enable in-depth analyses of the risk profile, permit a flexible use of risk management and risk mitigation techniques, support decision-making, facilitate the application of validation tools and may allow for a better risk aggregation and capital allocation.
- 3.157. Depending on limitations in the knowledge of the risk profile, in particular when relevant data and information is scarce, and/or on limitations in the capability of available calculation methods, the richness of the resulting probability distribution forecast varies and might be comparatively lower or higher. To the extent that internal models that generate a probability distribution forecast of low richness contribute to adequate risk assessment and effective risk management and decision-making processes, national competent authorities do not generally form a negative view on those models.
- 3.158. When applying these Guidelines on probability distribution forecast national competent authorities form a view by looking at the highest level of the undertaking and all lower levels of aggregation taking into account the scope of the internal model. This applies by analogy to partial internal models. In the case of an internal model developed by a group, national competent authorities form a view on how the group aims to arrive at a probability distribution forecast wherever the internal model is used at the level of individual insurance or reinsurance undertakings which are expected to be part of the group for Solvency Capital Requirement calculation or risk management purposes.

Guideline 27 - Knowledge of the risk profile

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking ensures that the set of events of the probability distribution forecast underlying the internal model is exhaustive.

National competent authorities should form a view on the processes that are put in place by the insurance or reinsurance undertaking in

order to maintain sufficient and current knowledge of its risk profile.

In particular, national competent authorities should form a view on how the insurance or reinsurance undertaking aims to maintain the knowledge of risk drivers and other factors which explain the behaviour of the variable underlying the probability distribution forecast, so that the probability distribution forecast can reflect all relevant characteristics of its risk profile.

- 3.159. For an undertaking using an internal model, the probability distribution forecast forms an important basis for both risk management and regulatory capital. Any characteristics about an undertaking's risk profile which are not reflected in the probability distribution forecast can potentially lead to wrong management decisions or inadequate regulatory capital.
- 3.160. A prerequisite for all relevant characteristics of the risk profile to be reflected in the probability distribution forecast is that they first have to be included in the set of events underlying the probability distribution forecast. Clearly, this is subject to proportionality and depends on the availability of relevant data and information. New relevant data and information may become available as e.g. scientific knowledge evolves. Any characteristic of the risk profile which is not included in the set of events is also not represented in the probability distribution forecast and thus may impair risk management and the calculation of the Solvency Capital Requirement.
- 3.161. These characteristics of the risk profile may be represented by risk factors, where risk factors may include financial market information such as interest rates, economic variables such as inflation or other underwriting risk factors, or in other ways, e.g. by the distributional characteristics of claims data sets.
- 3.162. In a risk-factor based internal model, the term "exhaustive" in the definition of the probability distribution forecast given in Article 13 of Solvency II refers to the presence of risk factors, and specifically to their dependency as well as the granularity of individual risk factors. National competent authorities form a view on how the undertaking strives to improve both aspects of the set of events: the more information about the undertaking's risk profile is contained in the set of events, the more reliable the probability distribution forecast can be as a basis for risk management. These aspects may also increase the reliability of the Solvency Capital Requirement.

3.163. Conversely, in such a model the exhaustiveness of the set of events can be jeopardized e.g. if the modelling of individual risk factors is not sufficiently granular.

Guideline 28 - Probability distribution forecast richness

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking assesses the appropriateness of the actuarial and statistical techniques used to calculate the probability distribution forecast, and on how it considers the capability of the techniques to process the knowledge of the risk profile as an important criterion.

National competent authorities should form a view on how the insurance or reinsurance undertaking chooses techniques that generate a probability distribution forecast that is rich enough to capture all relevant characteristics of its risk profile and to support decision-making.

National competent authorities should also form a view on how the insurance or reinsurance undertaking as part of this methodological assessment considers the reliability of adverse quantiles estimated based on the probability distribution forecast.

National competent authorities should form a view on how the insurance or reinsurance undertaking ensures that the effort to generate rich probability distribution forecast does not impair the reliability of the estimate of adverse quantiles.

3.164. Within internal modelling in accordance to Solvency II, the probability distribution forecast, defined by a mathematical function based on an exhaustive set of events, generally results from a comprehensive calculation methodology. This function provides rich information about the undertaking's risk profile. Illustratively, one can say that the probability distribution forecast informs about the range of possible outcomes, whether they are favourable or unfavourable, as well as the expected outcome or the most probable outcome, etc. It is undisputed that a rich probability distribution forecast contains information especially in the tail of the function, i.e. for adverse quantiles. Moreover, a rich probability distribution forecast may allow the computation of certain statistical quantities.

- 3.165. There are two stages of the concept of probability distribution forecast richness. The first stage refers to the underlying information basis, i.e. the knowledge of the risk profile, as the starting point from which the probability distribution forecast is constructed. The second stage refers to the methodology used in the calculation of the probability distribution forecast, i.e. the chosen actuarial and statistical techniques.
- 3.166. In the first stage, irrespective of the calculation methodology, the underlying information basis must be sound. As highlighted in Guideline 27, the probability distribution forecast can be reflective of all the relevant characteristics of the undertaking's risk profile only to the degree that the corresponding event set is exhaustive. In the second stage, the calculation method must be capable to transform the information into a rich distribution forecast³. In the current state of internal modelling, available and widely used methods differ substantially in respect of this capability. For illustration, one example for market risk is considered. In comparison to other risk categories the information basis available in market risk is quite substantial and usually not the limiting factor, ruling out some approaches to constructing the probability distribution forecast. Here, a stress scenario approach typically results in a less rich probability distribution forecast as compared to a stochastic capital market model: a forecast that consists of a few selected points of the distribution function compares to a forecast that ranks a high number of events according to their loss potential.
- 3.167. It is important to stress that the concept of probability distribution forecast richness is not to be reduced to the granularity of the probability distribution forecast representation. The output may even be a continuous distribution, as obtained, for example, by a scenario approach that is complemented with a distribution assumption: in absence of a method which is powerful enough to process an exhaustive event set, a small number of selected scenarios is calculated and used to parameterize the distribution function chosen. Nevertheless, in many cases one would not qualify a distribution forecast resulting from such a methodological approach as rich without further considerations. On the contrary, one would challenge the methodology and investigate if unfounded richness was introduced by making the distribution assumption (cf. Guideline 30). While it is not always easy for the undertaking and national competent authorities to

³ More precisely a distribution of monetary values that relates to the change in basic own funds. In a risk factor based model, for example, realisations of risk factors are transformed into profits or losses.

judge a probability distribution forecast according to its richness, in some cases methodologies to calculate a probability distribution forecast exist that are more superior in terms of richness than others.

Preference for rich probability distribution forecasts

- 3.168. Richer probability distribution forecasts generally provide a stronger basis for the undertaking's risk management and provide better support for its decision-making processes. National competent authorities form a view on how the undertaking, when assessing the adequacy of the methodology used in probability distribution forecast calculation, considers especially the richness of its output as an important criterion, being aware that there are other relevant criteria.
- 3.169. The preference for rich probability distribution forecasts can be most easily seen using an extreme example: single point probability distribution forecasts (maybe based on a stress scenario approach) as opposed to "full" probability distribution forecasts (maybe resulting from a purely stochastic simulation approach). Apart from this example, however, similar considerations do apply whenever the richness of a probability distribution forecast is affected due to some limitations.
- 3.170. First, some advantages of rich probability distribution forecasts are given, before possible negative implications of probability distribution forecasts of low richness are discussed.
- 3.171. A sound knowledge of the risk profile which is accurately represented by a rich probability distribution forecast
- a. allows easy computation of many different risk measures:
 - expected Shortfall / Tail VaR cannot be determined based on a single point in the distribution;
 - different risk measures may be needed for different stakeholders (regulators, shareholders, rating analysts, etc.);
 - if only one point of the distribution function is known, risk management informed by internal model results is reduced to capital management;
 - b. facilitates computation of stress tests and scenario analyses;
 - c. enables an in-depth analysis of the risk profile, showing which risks dominate at which quantiles and which risk factors impact which parts of the distribution;

- d. permits different risk management tools to be targeted at different quantiles in the probability distribution forecast.
- 3.172. There are various negative implications if the richness of the probability distribution forecast is low. They are presented based on the core requirement that the internal model plays an important role in the undertaking's risk management system and decision-making processes as well as its economic and solvency capital assessment and allocation processes. Accordingly, examples in the areas of risk management, aggregation, capital allocation and model validation are given.

Risk Management

- 3.173. Full ranges of possible outcomes may be overlooked.
- 3.174. Risk limits in terms of a single point in the distribution can easily be circumvented by pushing risks beyond the concerned quantile. Therefore, it would be useful for persons in charge of the risk-management function as well as business and senior management to know what the risks to the left and right of that quantile are, if and why there are risks that fall beyond that quantile.
- 3.175. Risk mitigation techniques which impact the tail beyond certain quantile(s) are invisible and therefore des-incentivised.

Aggregation

- 3.176. Often, it is already difficult to infer a statistically sound dependency structure for those risks which are well known. This is even more difficult when the marginal distributions provide little information.
- 3.177. When aggregating sub-portfolios into a total portfolio, even a single quantile of the total portfolio distribution depends on the full distribution of sub-portfolios. Distributions and aggregation method interact, and to achieve the desired quality of the result, as much as possible needs to be known about the distributions.
- 3.178. Additionally, if only one point of the distribution (one quantile) is known, it is possible to construct examples where the sub-additivity property does not hold just as in the case of the VaR risk measure.

Capital Allocation

- 3.179. An (almost) full distribution of sub-risks is desirable for fair allocation of capital based on a complete risk profile. Any allocation method

based on very few points of the distribution might lead to misallocation of capital because risks have not been accounted for in the allocation method. Conversely, a misspecification of the allocation method namely as a result of an incorrect application of enrichment techniques can result in significant bias in capital management and decision-making process.

Model validation

3.180.If only one quantile is available, the only back-testing exercise that can be carried out is whether observed changes, e.g. of basic own funds, are inside or beyond the quantile boundary. However, if the (almost) full distribution is available, such observations can be checked against the full distribution, which results in stronger basis for the application of validation tools.

Richness vs. Reliability

3.181.National competent authorities form a view on how the undertaking aims for rich probability distribution forecasts and judges the calculation methodology according to this criterion. This preference for rich probability distribution forecasts may be in conflict with the need for reliable probability distribution forecasts. For example, a methodological change could result in an increase of the probability distribution forecast richness, but possibly at the expense of its reliability. In those cases national competent authorities form a view on how the undertaking establishes a reasonable balance between the reliability and the richness of the probability distribution forecast, and ensures that the outputs of the internal model do not include an undue model error or estimation error.

3.182.Of outstanding importance is the reliability of the probability distribution forecast in its tail. In particular, estimates of adverse quantiles used in the calculation of economic or regulatory risk capital must be highly reliable. National competent authorities form a view on how the undertaking, while striving for a richer probability distribution forecast, does not impair the reliability of those estimates.

Guideline 29 –Assessment of richness of the probability distribution forecast

Through the pre-application process, to form a view according to Guideline 28 and with a view to ensure a harmonised approach for the pre-application and model changes, national competent

authorities should take into account at least:

- (a) whether the probability distribution forecast reflects the risk profile of the undertaking;**
- (b) as a necessary but not sufficient condition, the current progress in actuarial science and the generally accepted market practice;**
- (c) with respect to the level of probability distribution forecast richness, any measures that the insurance or reinsurance undertaking puts in place to ensure compliance with internal model tests and each of the standards set out in Articles 120 to 126 of Solvency II;**
- (d) for a particular risk under consideration, the way in which the techniques chosen and the probability distribution forecast obtained by the insurance or reinsurance undertaking interact with other risks in the scope of the internal model as regards the level of richness of the probability distribution forecast; and**
- (e) the nature, scale and complexity of the risk under consideration.**

3.183. The richness of the probability distribution forecast may be affected for mainly two reasons. In general, undertakings do not have full knowledge of every aspect of their risk profile. Often, relevant information or data as e.g. loss experience is scarcely available. Furthermore, there are limitations in the actuarial and statistical techniques available for calculation of the probability distribution forecast. The techniques may not be capable to process the undertaking's knowledge of the risk profile.

3.184. In the case of such limitations internal modelling may result into a comparatively low richness probability distribution forecast. If the internal model, for example, is not able to process a large number of different events, it is typically restricted to a selection of events and generates key points corresponding to some quantiles of a potential full distribution forecast. Then most often, these quantiles are exactly those required for internal and external use.

3.185. National competent authorities form a view on how the undertaking assesses the materiality of limitations in the knowledge of their risk profile and the capability of techniques chosen to calculate the

probability distribution forecast. In doing so, national competent authorities form a view on how the undertaking considers particularly the implications on the probability distribution forecast in terms of its richness (as pointed out in the explanatory text of Guideline 28).

- 3.186. It is an important but difficult task for national competent authorities to form a view on the adequacy of the internal model according to the richness of the resulting probability distribution forecast. Is the basic knowledge of the risk profile sufficient? Is the event set processed exhaustive enough? Does the probability distribution forecast provide information rich enough for its use in risk management and decision-making? These questions are not at all easy to answer.
- 3.187. Of course, the answer must be given on a case-by-case basis. However, there are limitations in modelling that are quite common to certain risk categories or insurance markets, and therefore encountered by national competent authorities again and again in the course of their review work. This together with strong communication among national competent authorities facilitates harmonised supervisory decision-taking.
- 3.188. In their assessment national competent authorities take into account:
- Current progress in actuarial science and the generally accepted market practice;
 - Measures taken to ensure compliance with internal model tests and standards;
 - The interaction with other risks within the overall model scope; and
 - The proportionality principle.

Scientific progress and market practice

- 3.189. A generally accepted modelling practice, provided that one has been established in the market for a particular risk category or type of business under consideration, may serve national competent authorities as a reference. The market practice could be more or less advanced regarding to the richness of the probability distribution forecast. By contrasting these methods to those chosen by the undertaking, national competent authorities may obtain an indication for the level of probability distribution forecast richness and the challenges faced by this undertaking. It is expected that this does not mislead the undertaking to simply adopt the market practice nor national competent authorities to urge the undertaking to use it. It is

rather expected that the market practice – the applicability given – needs some sort of adaptation to the undertaking’s specific risk profile.

3.190. Awareness of the progress currently made in actuarial science is also important. This allows evaluating the undertaking’s efforts to strive for a rich probability distribution forecast. Low richness probability distribution forecasts occur in areas where scientific developments have so far not resulted in methodologies which generate distributions in the very strict sense of Article 13 of Solvency II. However, many of those areas are evolving, so that in future improved methods can be expected. These methods would probably first be used in the scientific and research community and may not immediately be applicable in a business or industry context, for example because of stability or performance issues. However, over time those newly-developed methods would mature and find their way into the undertaking’s production environment. Where this is the case, the undertaking making use of internal models is expected, in the absence of good reasons to the contrary, to keep pace and continually improve its internal model. Accordingly, national competent authorities may ask the undertaking to show how the methodology chosen would be kept up-to-date or why they have chosen such methodology against existing alternatives. This is particularly advisable if alternative methodologies exist that would probably be appropriate and superior with respect to the richness of the probability distribution forecast.

Measures to comply with tests and standards

3.191. In case of limitations affecting the richness of the probability distribution forecast, the internal model may need to be subject to a more intensive model validation process by the undertaking and tighter integration into its system of governance. National competent authorities form a view on how the undertaking using such a model makes extensive use of validation tools (stress-testing, scenario analysis etc.) and puts more effort into improving the model.

3.192. In view of the possible implications, as outlined in the explanatory text to Guideline 28, the supervisory view on the adequacy of the internal model is largely determined by the effectiveness of any measures the undertaking puts in place to ensure compliance with internal model tests and standards.

Integration into the overall model scope

3.193. National competent authorities need to be aware that, within a modular approach, limitations in individual components of an internal model might be transferred to the internal model as a whole. Every single model component affects via aggregation the richness of the probability distribution forecast up to the topmost level of the undertaking (in line with the model scope). For this reason, national competent authorities need to consider the different levels of aggregation in their assessment.

Proportionality Principle

3.194. The considerations described above are clearly subject to the proportionality principle.

Guideline 30 – Probability distribution forecast enrichment

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking takes care not to introduce into the probability distribution forecast unfounded richness which does not reflect the original knowledge of its risk profile [cf. Guideline 27].

National competent authorities should form a view on how the methodology followed by the insurance or reinsurance undertaking to enrich the probability distribution forecast complies with the Statistical Quality Standards regarding methods, assumptions and data. Where these techniques involve the use of expert judgement the relevant Guidelines on assumptions setting and expert judgment should apply.

3.195. It is often necessary to enrich the probability distribution forecast. For a low richness probability distribution forecast consisting of only few points, for example, one might consider it beneficial to increase the number of data points, using techniques such as interpolation, extrapolation or fitting, thereby allowing for an advanced aggregation technique. Another example is to make additional assumptions in case that the tail risk is not appropriately reflected.

3.196. Enrichment heavily based on statistical or mathematical techniques with limited original information regarding to the specificity of the risk or possible outcomes needs to be appropriately challenged in order to

- ensure that the resulting probability distribution forecast adequately captures the risk profile.
- 3.197. National competent authorities form a view on how the undertaking avoids introducing unfounded richness into the probability distribution forecast, e.g. by adding unsubstantiated points to a single point probability distribution forecast. Moreover, enrichment must not be misused by the undertaking to establish desired properties of the probability distribution forecast. Otherwise the implication might be that the risk profile is represented incorrectly by the undertaking and the probability distribution forecast could be misleading for its use for risk management and decision-making processes.
- 3.198. Enrichment is part of the overall probability distribution forecast methodology, and consequently, the methodology used to enrich the output is subject to the Statistical Quality Standards too. The requirements regarding methods, assumptions and data do particularly apply. In practice, probability distribution forecast enrichment heavily relies on the use of expert judgement. Therefore, the corresponding Guidelines apply.
- 3.199. National competent authorities form a view on how the undertaking makes the enrichment transparent to the users of the probability distribution forecast. Especially in case that the impact is material, national competent authorities form a view on how the undertaking presents to such users the enriched probability distribution forecast together with the related assumptions, enabling users to assess objectively its reliability.

Chapter 7: Calibration - approximations

- 3.200. One of the requirements that an insurance or reinsurance undertaking needs to fulfil in order to use an internal model for the Solvency Capital Requirement calculation is the calibration standard.
- 3.201. National competent authorities form a view on how the insurance and reinsurance undertaking demonstrates that it is able to derive from its internal model the value of the Solvency Capital Requirement as defined in the Article 101(3) of Solvency II, namely the Value-at-Risk of the basic own funds subject to a confidence level of 99,5 % over a one-year period, which is referred as "the reference risk measure" for the sake of this Chapter. In doing so, an insurance or reinsurance undertakings is allowed by Article 122(3) of Solvency II to use approximations while ensuring that the Solvency Capital Requirement

obtained provides a level of protection for policyholders which is equivalent to that set out in Article 101(3) of Solvency II.

- 3.202. The Guidelines on calibration-approximations aim to provide guidance on what national competent authorities and the undertaking need to consider, through the pre-application process, in order that national competent authorities are able to form a view about the relevance and the adequacy of the approximations that will be used by the undertaking to derive the Solvency Capital Requirements from an internal model using another risk measure, time horizon, or underlying variable, than the reference one (see definition of the reference risk measure).
- 3.203. The Guidelines do not provide guidance about the adequacy of the risk measure used in the internal model.
- 3.204. In practice, approximations to derive the reference risk measure from the probability distribution forecast may be justified in the following contexts:
1. Another mathematical risk metric: e.g. Tail-Value-at-Risk instead of Value-at-Risk;
 2. Another confidence level: e.g. 99,95% instead of 99,5%;
 3. Another time horizon: e.g. 5 years instead of 1 year;
 4. Another underlying variable than basic own funds is used to determine the probability distribution forecast: e.g. IFRS equity.
- 3.205. This paper does not cover in a different way approximations arising at different levels of aggregation: there are no major differences in the process for assessing the adequacy of approximations at the topmost level of aggregation or at a lower one. Moreover, there is no need a priori to distinguish partial internal models from full internal models with respect to recalibration.

General explanation

- 3.206. If relevant, all the Guidelines apply directly to the four possible practical differences quoted above. However, some of them are worth an explanation in one of the four practical contexts.

Context 1: Another mathematical risk metric

- 3.207. The Value-at-risk metric chosen by Solvency II is not the only risk metric known in financial institutions and academia to quantify a risk. Thus, some undertakings could use another mathematical risk metric

- in practice. In particular, this could be the case for branches of groups whose headquarters are located in a jurisdiction where the insurance regulatory framework imposes another mathematical risk metric.
- 3.208. During pre-application, national competent authorities receive information from the undertaking about the use of a mathematical risk metric other than the reference one.
- 3.209. In particular, national competent authorities can form a view on how the undertaking describes the risk metric in respect of the following risk measurement properties:
- Monotonicity: if a portfolio produces almost certainly more losses than another portfolio, its risk measure is higher;
 - Translation invariance: if there is the addition of an amount K of cash to the portfolio, the risk measure goes down by K . Similarly if there is the reduction of an amount K of cash to the portfolio, the risk measure goes up by K ;
 - Homogeneity: multiplying the size of a portfolio by a scalar x the risk measure is multiplied by x ;
 - Sub-additivity: the risk metric for two portfolios after they have been merged is no greater than the sum of their risk metrics before they were merged.
- 3.210. Without requiring the risk metric to follow the properties above, a detailed description of circumstances where the risk metric would not follow one or more of them could be asked by national competent authorities to form a view on the appropriateness of the approach followed by the undertaking.

Context 2: Another confidence level

- 3.211. For risk management purposes, or external reasons (e.g. facilitate reporting to ratings agencies) some undertakings use different levels of confidence to derive their economic capital.

Context 3: Another time horizon

- 3.212. The undertaking may decide to use a different time horizon in their internal model than the prescribed one year.
- 3.213. For example the time horizon used by the undertaking could be longer than one year and could be aligned to their:

- Risk appetite: Undertaking may set up their risk appetite for capital on a longer time horizon than one year for strategic reasons;
- Life cycle of products: Some undertakings may look at the average term structure of their products and plan their capital requirements based on this average term especially to align with payments;
- Business plan: Some undertakings may wish to align their capital requirements with their planning period, especially if smoothed earning over a long period is one of their goals and this is aligned to their dividend payments;
- Management style: Some undertakings may choose a longer time horizon (for example ultimate) for capital management rather than a mark to market approach where the portfolio could be transferred to another party in the next year.

3.214. In some situations an undertaking may decide to use time horizons of less than one year:

- To align with the average terms of its products;
- It could also have a planning period shorter than a year for operational/financial reasons;
- To capture management actions which occur more frequently than annually – e.g., dynamic hedging.

Context 4: Another underlying variable

3.215. The undertaking may decide to use a different variable on which to base its probability distribution forecast than the basic own funds specified in Articles 88 of Solvency II, provided that these amounts can be used to determine the changes in basic own funds and that the undertaking is able to justify the underlying assumptions, as required in the Article 121 of Solvency II. An undertaking may typically want to do this if its own risk appetite is linked to a variable different than the basic own funds.

3.216. This difference can originate from (see detailed examples of differences in the explanatory text of Guideline 31):

- Different valuation methods for asset or liabilities;
- Different ways of assessing own funds.

Guideline 31 - Knowledge of approximations
Through the pre-application process national competent authorities

should form a view on how the insurance or reinsurance undertaking demonstrates a detailed understanding of the approximations that it will make.

In particular, national competent authorities should form a view on how the undertaking at least:

- (a) considers the error that will be introduced by the approximations in the Solvency Capital Requirement;**
- (b) demonstrates that the approximations it will make will not result in a Solvency Capital Requirement that will be materially underestimated compared to the result of the calculation with the reference risk measure, in order to ensure that policyholders are provided with a level of protection equivalent to that provided in Article 101(3) of Solvency II; and**
- (c) challenges and justifies the stability of the output of approximations over time, and under extreme loss conditions, according to its risk profile.**

National competent authorities should make clear to the insurance or reinsurance undertaking that they will not allow material uncertainty around approximations this undertaking will make to recalibrate the Solvency Capital Requirement if this uncertainty leads to an underestimation of the Solvency Capital Requirement.

Explanation to Guideline 31 in context 1

3.217. When using approximations in the context of another mathematical risk measure, national competent authorities form a view on how the undertaking is able to explain how the approximations change the analysis of the four properties introduced above, if at all.

Explanation to Guideline 31 in context 3:

3.218.(c) National competent authorities form a view on how the undertaking challenges the stability of approximations over time, and under stressed conditions. National competent authorities form a view on how the undertaking understands the approximations needed when using a different time horizon. In order to understand such approximations, the undertaking may need to consider some of the following:

- If the undertaking is using a longer time horizon and then interpolating to one year, it would want to consider solvency not only at the final period, but also at intermediate periods. For shorter time horizon, the projections may need to include the anticipated change in business volume or product mix;
- When interpolating from longer time horizons, assumptions and future management actions such as tax treatment, allocation of expenses, bonus payments, may need to be well understood by the undertaking and taken into consideration. In smoothing over a longer time period, a larger smoothing window would be used and as a result the resulting volatility would be lower than if a smaller window was used. So the undertaking may wish to check whether the resulting curve used in the interpolation is adequate for calculating short term capital requirement. The same considerations may need to be taken into account for extrapolating from a short term horizon;
- When interpolating from longer time horizons, the undertaking may want to consider any discontinuity in the curve and the implications that this would have on the approximations, especially if the discontinuities occur in the 1 year time horizon. These step changes could be due to optionality features, payment of guarantees or dividends and in run-off businesses this could simply be due to natural run-off of certain portfolios. Extrapolation also considers any step changes in the capital requirement curve;
- When extrapolating from shorter time horizons, the undertaking may need to consider the appropriateness of the shocks applied over the shorter time horizon and be able to justify the translation of these shocks to the reference time period. For example, if an undertaking is using a time period of 1 month, a link with the 1-year shock with a proportional coefficient of 12 or the use of the 12th power may not be appropriate. Attention needs to be given to the dependency between time periods when providing this justification;
- Any curve used for interpolating (or extrapolating) the required capital may need to take into account business or underwriting cycle, ensuring that they do not diverge. For example, suppose the business cycle is indicating a period of high volatility. Typically, the undertaking would expect the curve used to show an increase of required capital over the reference period. If this is not the case,

then the undertaking may wish to understand why their calculations are diverging from external macroeconomic forecasts;

- The curve used for interpolation and extrapolation of capital may need to be tested for adequacy and stability under a number of scenarios. This could be achieved by completing a number of stress scenarios.

Explanation of Guideline 31 in context 4

3.219. When forming a view on how the undertaking understands the approximations, national competent authorities take into account that there are various aspects that the undertaking may want to consider:

- Complexity: the complexity of the difference between the underlying variable chosen and the basic own funds may affect the work required by the undertaking to show that they have an appropriate understanding of the approximations required. A few examples of different complexity are given below:
 - The approximation could be an additive adjustment, for example an asset or liability could be adjusted by a fixed amount. In this case it may be easy for the undertaking to show that it understands the difference if it can demonstrate that the addition is constant over time and across different stress scenarios. The undertaking may want to perform stress tests to check whether the amount does not change under various stress conditions;
 - The approximation could be an interpolation between known points. In this case the undertaking may want to consider that the materiality, deviation and stability of the underlying curve can be well understood. The undertaking may also want to consider the approximations which are made by using a reduced number of points to represent a curve, as well as any approximations to represent the curvature of the resulting curve. The use of stress tests may be useful to understand the behaviour of the underlying curve under various stresses;
 - The approximation could be a transformation that re-values assets based on bespoke financial or actuarial models, for example a Black-Scholes derived formulation. In this case, the undertaking may want to consider materiality, deviation, and stability of the basic components of the models as well as the underlying assumptions. The undertaking may also want

to ensure any weaknesses are well understood and tested under different scenarios.

- Materiality: it is thus important to understand the level of materiality both under normal conditions and under stressed conditions. In cases when there are step changes, whenever there is an optionality or guarantee, there is a risk that the materiality would be low under normal conditions but increase significantly under certain stress conditions;
- Error term and Bias: any approximation would usually be subject to an error term and a bias, especially as the approximation becomes more complex or uses statistical approaches such as regression. When considering the possible deviations and stability of the approximations, the undertaking may want to consider the level of the bias under different scenarios. The undertaking may also want to consider the possible error term of the results through a variance or other measure of variation;
- Validation/Reconciliation: the undertaking shows that the approximations are adequate and that appropriate tests are used to demonstrate the appropriateness of the approximations; and on how this feeds into the validation process that the undertaking establishes;
- Documentation: national competent authorities form a view on how well the undertaking documents any approximation and follows the standards set in Article 125 of Directive 2009/138/EC: thus how the undertaking clearly documents the full technical aspects of the approximations as well as any underlying parameters and assumptions.

3.220. National competent authorities also form a view on how the undertaking documents the stresses and scenarios used to determine the stability of the approximations and the behaviour of the approximations under stressed conditions.

3.221. Reconciliation is not only the explanation of differences between two independent models, one being used regularly and for the assessment of the economic capital and the other only for regulatory purposes. It is rather a process explaining the differences in the ways the same model is used and their rationale.

Guideline 32 - Reference risk measure as an intermediate result

When the insurance or reinsurance undertaking can derive the reference risk measure directly from the result of the economic capital calculation process, through the pre-application process national competent authorities should form a view on how the undertaking will be able to demonstrate that this result will reflect appropriately its risk profile over the next year.

Explanation to Guideline 32 in context 3:

3.222.If the undertaking is using a longer time horizon, but the model also produces distributions at interim time horizons, the undertaking may be able to read off the Solvency Capital Requirements from the interim distributions produced by the internal model.

3.223.In this case, national competent authorities form a view on how the undertaking ensures that the interim distributions give an appropriate reflection of the risk profile to which the undertaking is exposed.

Guideline 33 - Use of another underlying variable

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking, if it will use for the calculation of the Solvency Capital Requirement the variation of an underlying variable different from the basic own funds, demonstrates:

- (a) either that the difference between the basic own funds and the underlying variable will not be material at $t=0$ and in any situation until $t=1$; or**
- (b) that there can be no significant variation of this material difference over the next year, even under extreme losses conditions, according to the undertaking risk profile.**

National competent authorities should form a view on how the insurance or reinsurance undertaking, if it will use the variation of an underlying variable different from the basic own funds to derive the value of basic own funds, demonstrates that:

- (a) it will be able to reconcile the difference between the basic own**

funds and the underlying variable at $t=0$; and

(b) it will understand the difference between the basic own funds and the underlying variable in any situation until $t=1$.

National competent authorities should form a view on how the balance sheet for solvency purposes that will be run by the insurance or reinsurance undertaking will enable such undertaking to determine the amount of eligible own funds available to cover the Solvency Capital Requirement, irrespectively of the calculation method used to calculate this Solvency Capital Requirement.

Explanation of Guideline 33 in context 4:

3.224. National competent authorities form a view on how the undertaking, in determining the values of assets and liabilities in the balance sheet for solvency purposes, would be compliant with valuation requirements set out in Solvency II.

3.225. National competent authorities take into account that, where the differences between the underlying variable chosen and the basic own funds is either immaterial over all scenarios or constant over all scenarios, the approximations used by the undertaking in determining the Solvency Capital Requirements may be more straight forward. In either of these cases, national competent authorities form a view on how the undertaking is able to demonstrate that the difference is either immaterial or constant over all scenarios.

3.226. National competent authorities take into account that the undertaking might want to use a number of techniques to demonstrate that the difference is either immaterial or constant. These techniques may include:

- Quantitative techniques, such as scenario testing;
- Qualitative techniques, such as analysing the theoretical properties and expected behaviours of the differences;
- A combination of the above.

3.227. In the case where the difference is neither immaterial nor constant, national competent authorities form a view on further measures that may be required to the undertaking to justify the approximations it makes.

3.228. National competent authorities form a view on how the undertaking, when using any approximation in case of another underlying variable, is able to demonstrate that it understands the differences between the basic own funds and the internal measurement. This means that the undertaking is able to reconcile the differences between the basic own funds (as defined by Article 88 of Solvency II) and the approach used by the undertaking at the start of the period and after 1 year under a number of scenarios. The undertaking could not cherry pick some scenarios to verify whether they understand the differences but develop some analysis that allow them to develop core understanding and principles about the differences that would be applicable for all scenarios.

3.229. Special care may need to be taken by national competent authorities when reviewing approximations when the nature of the difference between the underlying variable and the basic own funds gives a different ranking to the same scenario. As an example, scenario j may represent the 99,5% point in the distribution for the underlying variable chosen by the undertaking. But, due to different risk sensitivity, scenario j may only represent the 97,5% point for the variance of basic own funds. In this case it would not be appropriate to use the impact on the basic own funds of scenario j directly, and further approximations would need to be made to get to the equivalent level of protection set out in Article 101(3) of Solvency II.

Guideline 34 - Use of analytical closed formulae

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking, where it will use analytical closed formulae to recalibrate its capital requirement from the internal risk measure to the reference one, demonstrates that the assumptions underlying the formulae will be realistic and will also be valid under extreme losses conditions, according to the insurance or reinsurance undertaking's risk profile.

Explanation of Guideline 34 in context 3:

3.230. If an undertaking chooses to use a closed formulae approximation approach for the time horizon, it is important that national competent authorities form a view on how the undertaking understands all the underlying assumptions and that all the considerations mentioned in Guideline 31 are explicitly included in the closed formulaic derivation

by the undertaking. In particular national competent authorities take into account that, if the undertaking is using a longer time horizon and then interpolating to one year, it would want to consider solvency not only at the final period, but also at intermediate periods as well. For example, the validity of square root adjustments for time horizon as commonly used for value at risk approximation would need to be explained in terms of the considerations mentioned above.

Explanation of Guideline 34 in context 4:

3.231. When an undertaking plans to use closed formulae, for example a financial model, national competent authorities form a view on how the undertaking demonstrates that the assumptions inherent in the formulae are credible and valid under stressed conditions. For example, in the case that assumptions of volatility and dependency tend to break down in periods of stress, national competent authorities form a view on how the undertaking ensures that the models used for approximations remain reliable. An undertaking may intend to use, for internal purposes, a different approach to risk margin to the one referred to in Solvency II, or develop an approximate approach to determine the required risk margin. Sometimes the undertaking may use derived functional forms to do either of these. In which case, it is important that national competent authorities form a view on how the undertaking makes clear the underlying assumptions under normal conditions and tests the assumptions for continued credibility under stressed conditions.

Guideline 35 - Management actions

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking, where it chooses in its internal model a time horizon longer than one year, will take into account management actions in the context of the Solvency Capital Requirement calculation, and will ensure that such management actions will occur and will have effects on the balance sheet for solvency purposes between $t=0$ and $t=1$, and will reasonably be expected to be implemented.

National competent authorities should form a view on how the insurance or reinsurance undertaking ensures that the general principles about the valuation of assets and liabilities will hold at $t=1$.

Explanation of Guideline 35 in context 3:

- 3.232. National competent authorities take into account that, even if the chosen time horizon is longer than one year, management actions could be taken into account in the context of the Solvency Capital Requirements calculation as long as they occur and have effects between $t=0$ and $t=1$, and can reasonably be expected to be implemented. At $t=1$, the general principles about the valuation of assets and liabilities hold. For example if hedges are used over a long time period and it is assumed that they would be renewed at expiration date, it may still not be possible to take them into account on the one year horizon, especially if an expiry date falls within that period. This is because renewing hedges may not be cost effective or bears a large carry-over cost under stressed conditions.
- 3.233. Likewise, when extrapolating from shorter time periods, attention would be given to the cost and availability of risk mitigating measures over the longer time period.

Guideline 36 - Multiple approximations

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking, where it will have to make several approximations, will assess whether there will be any interactions between these approximations that will need to be allowed for explicitly.

Explanation of Guideline 36 in context 2:

- 3.234. National competent authorities take into account that the issue of reconciling the level of confidence could in practice be closely linked with the reconciliation of risk measures. Further, if mathematical risk measures are also different, it could be better to first use approximations to reconcile the mathematical risk measure, and then align the level of confidence.

Explanation of Guideline 36 in context 3:

- 3.235. When several approximations are used, national competent authorities form a view on how the undertaking considers whether there are any interactions between those approximations that need to be allowed for explicitly. National competent authorities also form a view on whether the undertaking understands how the order of application of the

approximations impacts the final result. For example, approximations for future premium may interact with that for time horizon as the long term assumption for future premium may not hold true for shorter term horizon.

Explanation of Guideline 36 in context 4:

3.236. When several approximations are used, national competent authorities take into account that the undertaking would want to consider whether there are any interactions between those approximations that need to be allowed for explicitly. National competent authorities also form a view on whether the undertaking understands how the order of application of the approximations impacts the final result. National competent authorities also form a view on how the undertaking understands the stability of the approximation and how the error term increases with a particular order of application of the different approximations. For example, an undertaking may need an approximation for adjusting for risk free rate and another approximation for allowance of future premium. Since the undertaking would need to discount the future premium, there would be an interaction between the approximation for interest rate and that for future premium. In this case both the interaction and the order application of the approximations are important and their impact needs to be understood.

Chapter 8: Profit and loss attribution

3.237. One of the requirements that an insurance or reinsurance undertaking needs to fulfil in order to use an internal model for the Solvency Capital Requirement calculation is the profit and loss attribution.

3.238. The Guidelines on profit and loss attribution aim to provide guidance about what national competent authorities and the undertaking need to consider, through the pre-application process, in order that national competent authorities are able to form a view on how the undertaking ensures the relevance and the adequacy of the profit and loss attribution process.

3.239. These Guidelines provide a definition for profit and loss as the change in the economical capital resources. They also provide guidance on the categorisation of risks and develop a framework for the application of the profit and loss attribution.

Guideline 37 – Definition of profit and loss

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking considers profit and loss as changes over the relevant period, not attributable to capital movements, in:

- (a) basic own funds; or**
- (b) other monetary amounts used in the internal model to determine changes in basic own funds, such as the actual change in economic capital resources.**

National competent authorities should form a view on how the insurance or reinsurance undertaking considers economic capital resources in this context as the surplus of assets over the technical provisions and other liabilities not treated as capital, on an economic basis.

When an undertaking uses a variable other than the basic own funds in its internal model, national competent authorities should form a view on how the insurance or reinsurance undertaking uses this variable for the purposes of profit and loss.

National competent authorities should form a view on how, through the profit and loss attribution, the undertaking identifies how changes in the risk drivers relate with the movement in the variable underlying the probability distribution forecast.

3.240. National competent authorities form a view on how the undertaking ensures that the definition of profits and losses for the purpose of the attribution is consistent with the variable underlying the probability distribution forecast.

3.241. National competent authorities also form a view on how the undertaking ensures that the attribution includes all material risks, not only those that are modelled internally.

3.242. Examples of capital movements are dividend payments or public offerings.

3.243. For the purpose of profit and loss attribution national competent authorities form a view on how the undertaking ensures that the consistency over time of the method applied allows a useful

comparison of the profit and loss attribution from one period to another.

Guideline 38 – Application of profit and loss attribution

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking ensures that the profit and loss attribution is consistent with the intended applications of the profit and loss attribution in the use test and in the validation process.

3.244. National competent authorities form a view on how the undertaking defines an appropriate risk categorisation that reflects its risk profile. The planned uses of the output of the internal model might influence the granularity of the internal model. Therefore the granularity of the profit and loss attribution might also differ depending on the planned application of the results of the profit and loss attribution.

Guideline 39 – Application of profit and loss attribution and the use test

As the results of the profit and loss attribution provide valuable information for risk management and decision-making and therefore for forming a view on how prepared the insurance or reinsurance is to comply with the use test, through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking will evaluate and documents on a regular basis, and at least on an annual basis, how these results might be appropriately used within its risk management and decision-making.

3.245. National competent authorities form a view on how the undertaking ensures that the attribution of profits and losses to risk categories is consistent with the granularity of risks modelled within the internal model, which itself is needed for decision-making and risk management in the undertaking.

3.246. National competent authorities form a view on how the undertaking implements an appropriate process on an on-going basis with appropriate internal controls to implement relevant changes to the internal model as a result of the previous profit and loss attribution. More specifically, national competent authorities form a view on how the undertaking properly documents the process and evaluates the

design and operating effectiveness of the internal controls on an on-going basis (at least annually). It is expected that the results of the process would lead to adequate action within the undertaking.

3.247. The results of the profit and loss attribution exercise provide information that is important and relevant for the system of governance (including the scope of the internal model, risk management, limit setting, allocation processes). Therefore the application of the results of the profit and loss attribution is important to assess the compliance by the undertaking with the use test. Some areas where the profit and loss attribution might support the system of governance of the undertaking and potential applications of the profit and loss attribution to the use test are outlined.

The aim of the profit and loss attribution in the use test

3.248. The application of the results of the profit and loss attribution in the decision support and in the risk management of the undertaking is important. Therefore national competent authorities form a view on how the undertaking evaluates and documents on a regular basis how the results of the profit and loss attribution might be appropriate in terms of supporting decision-making ("decision support") and the risk management system. National competent authorities form a view on how the undertaking assesses whether the application of the profit and loss attribution for validation purposes might also help decision-making and risk management. National competent authorities form a view on how the undertaking evaluates on a regular basis, and at least annually the design and the operating effectiveness of the profit and loss attribution.

Potential applications of the profit and loss attribution within the decision support

3.249. National competent authorities form a view on how the administrative, management or supervisory body of an undertaking takes the output of the internal model into account in the decision-making process. The model is forward looking, and therefore the output of the internal model attempts to describe future events. National competent authorities take into account that the undertaking's information concerning a future event is never complete. As a consequence the internal model can also be seen as an instrument that can help to reduce the uncertainty of information used to describe future events.

- 3.250. Compared with this, the result of the profit and loss attribution is based on actual values related to decisions which have taken place and can therefore be used by the undertaking to evaluate the former decision. The evaluation of a former decision gives indications to the undertaking which it can use to improve the process leading to future decisions.
- 3.251. The following examples might be potential applications by the undertaking of the profit and loss attribution within the decision support: the profit and loss attribution can be used to identify and analyse the sources of profits and losses. Therefore attribution of the realized profits and losses to the corresponding risk drivers can be performed. The decision taker is thus able to localize the risk drivers or risk categories which need further analysis. This gives the decision taker the ability to identify the parts of the realized profits or losses which might influence the future decision-making process. A next step could be a decision to analyse which part of the profit can be attributed, for example to the movement in the market and which part can be attributed to the performance of the responsible person for this risk category.

Potential application of the profit and loss attribution within the risk management

- 3.252. The intention of a risk management system of an undertaking is to manage losses before they can cause material damage to such undertaking. Therefore, national competent authorities form a view on how the undertaking implements internal controls which assist it in doing so. National competent authorities would expect the undertaking to design internal controls and implement them effectively. Therefore national competent authorities would expect the undertaking to review internal controls on an on-going basis for the risk management system to work effectively. The results of the profit and loss attribution may help the undertaking to improve the quality of its risk management system.
- 3.253. The following examples might be potential applications by the undertaking of the profit and loss attribution within its risk management system.
- 3.254. The profit and loss attribution might be used to identify and analyse the sources of profits and losses. High losses might be an indication of inappropriate internal controls. The responsible person can thus investigate the reasons for this. Another example is if the profit and

loss attribution exercise underlies an emerging risk which was not identified by the risk management system. This may require action to revise the part of the risk management system dedicated to the identification of risks.

- 3.255. The profit and loss attribution can be used by the undertaking to review the risk identification process. All material quantifiable risks shall be taken into account by the undertaking and modelled within the internal model as set out in Article 121 of Solvency II. National competent authorities take into account that, if there are some material profits or losses which cannot be attributed by the undertaking to a specific type of risk or category of risks, then this might be an indication that the process of the risk identification followed by the undertaking might not be appropriate. Another reason could be that the application of materiality by the undertaking is inappropriate. For example, consider a risk category identified as non-material by the undertaking and not modelled within the internal model: if material loss arises that cannot be attributed to the categories of risks chosen in the internal model but can be attributed to this specific risk category which was not modelled as it was considered to be non-material then this might indicate that the application of materiality by the undertaking was not appropriate.
- 3.256. Consider as another example that the undertaking envisages the expansion of the business in developing markets: if the result of the profit and loss attribution is that there are material losses in this market this is not conclusive that the risk strategy is inappropriate but at least provides a reason to complete further analysis by the undertaking. Another application for the undertaking might be to check the implementation of the risk strategy: if the risk strategy demands that the engagement of a special risk category needs to be reduced then the profit and loss attribution gives an indication whether the responsible person in the operating unit acted accordingly. A high profit or loss in this special risk category might be an indication that the implementation of the risk strategy has not been effective.
- 3.257. The profit and loss attribution can be used by the undertaking to assess how it goes about setting its risk appetite. The comparison between the profits and losses attributed to the risk category and the limit for that risk category can give the undertaking an indication whether the risk appetite it has set is appropriate. National competent authorities are aware that the profit and loss attribution by the undertaking is completed after events have taken place and that it therefore cannot be used by the undertaking to recognize a breach of

the limit in advance. However, the undertaking can use it to review the risk appetite setting process and to monitor on an on-going basis how close the limit is to being breached.

Guideline 40 – Application of profit and loss attribution and validation

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking ensures that information relating to how the model has performed in the past provided by the profit and loss attribution feeds into the undertaking’s regular validation cycle.

- 3.258. National competent authorities take into account that there are several possible applications of profit and loss attribution that the undertaking can use for validating the model. The following paragraphs outline these applications. The way in which the profit and loss attribution is applied by the undertaking in the validation standards has an impact on the level of granularity at which the profit and loss attribution needs to be completed by the undertaking.
- 3.259. One potential application by the undertaking is to test whether all relevant risk factors have been identified correctly and whether the functional dependencies between risk factors and the amount at which assets and liabilities could be settled have been properly specified. To this end, the undertaking could compare the observed market values of assets or liabilities with the output of the internal model when the actual realisations of the risk factors are used as an input. This application is similar to the application described above.
- 3.260. If actual market values deviate significantly from the internal model output, the undertaking could identify the causes. To do this, the undertaking may need to carry out a profit and loss attribution at a more granular level (“drill down”). One possible outcome could be that risk factors not yet included in the internal model by the undertaking have had a significant impact on profits and losses.
- 3.261. However, even though there may be no observable market prices for liabilities, the change in “observable prices” for market liabilities can be estimated by the undertaking by using actual experience in order to derive the assumptions required to estimate a proxy market value.
- 3.262. The comparison mentioned above can be done by the undertaking at different levels (e.g. for single assets as well as for portfolios). A more

- granular approach could be more effective in identifying potential weaknesses on a case by case basis.
- 3.263. A second potential application of a profit and loss attribution the undertaking can use for validating the model is to compare the actual profit or loss with those from the probability distribution generated in the past by the internal model. This kind of back-testing plays a crucial role in the validation by the undertaking of market risk models for the trading activities of banks under the Basel II rules.
- 3.264. Unfortunately, this approach would normally not be readily transferable to the internal model of an insurance undertaking as the number of observations is usually limited, although it could be increased by using a shorter time horizon. But even if only one data point per year is available some conclusions might be drawn by the undertaking (e.g. if the probability function assigns the range in which the observed outcome lies a probability of zero) in particular regarding the underlying assumptions of the model.
- 3.265. In principle the undertaking can perform the comparison between actual profit or loss and the distribution forecast at every level where the internal model generates a probability distribution. The internal model might – for instance – generate a distribution forecast for profits and losses on the stock and bond portfolio and combine them to an overall probability distribution for the investment portfolio.
- 3.266. The comparison at different levels can yield different insights. While comparing forecast and actual result on the stock and bond level might be used to validate the modelling of these separate risks; a comparison for the investment portfolio might indicate shortcomings of the aggregation mechanism.
- 3.267. A third possible application by the undertaking is to test the effectiveness of management rules that might be incorporated in the internal model. These rules may refer to particular investment portfolios as well as to assets and liabilities simultaneously (e.g. if an undertaking limits its overall interest rate risk).
- 3.268. In the previous paragraphs possible applications for a profit and loss attribution that the undertaking can use for validating an internal model were described. But profit and loss attribution is only one instrument of the undertaking for validation. National competent authorities form a view on how the undertaking, in considering the use of profit and loss attribution for validation, takes into account the

overall objectives of the validation policy it establishes, as well as other potential instruments for validation.

Chapter 9: Validation

3.269. One of the requirements that an insurance or reinsurance undertaking needs to fulfil in order to use an internal model for the Solvency Capital Requirement calculation is the validation standard.

3.270. The Guidelines on internal model validation aim to provide guidance on what national competent authorities and the undertaking need to consider, through the pre-application process, in order that national competent authorities are able to form a view on the relevance and the adequacy of the validation process of the internal model.

3.271. These Guidelines cover both the validation process and the validation tools.

3.272. Regarding the validation process, by providing further details on:

- The process the undertaking establishes for the purposes of validation and the validation policy;
- The governance of the validation process;
- The independence of the validation process;
- Some specificities for groups.

3.273. Regarding the validation tools, by providing further details on:

- The universe of tools;
- The types of tools which are considered by the validators;
- The uses of the tools;
- The data sets for validation.

3.274. National competent authorities form a view on how the level of granularity of the validation of the internal model carried out by the undertaking is sufficient to provide the undertaking with enough comfort that the model is appropriate for the purpose for which the model is being used.

3.275. The validation of the internal model is not only the process of providing or reaching comfort that the quantitative aspects of the model, such as the data, methodology, assumptions and results are appropriate. Qualitative aspects of the model are to be considered as well.

3.276. The validation of the internal model is part of the wider internal model governance requirements for the undertaking. As a result, national competent authorities form a view on how the undertaking ensures that the findings of the validation process are escalated to the appropriate level of management.

Guideline 41 – Validation policy and validation report

Through the pre-application process, national competent authorities should form a view on how the insurance or reinsurance undertaking ensures that the validation policy it establishes sets out at least:

- (a) the processes, methods and tools used to validate the internal model and their purposes;**
- (b) the frequency of regular validation for each part of the internal model and the circumstances that trigger additional validation;**
- (c) the persons who are responsible for each validation task; and**
- (d) the procedure to be followed in the event that the model validation process identifies problems with the reliability of the internal model and the decision-making process to address those concerns.**

National competent authorities should form a view on how the insurance or reinsurance undertaking documents in a validation report the results of the validation as well as the resulting conclusions and consequences from the analysis of the validation.

National competent authorities should form a view on how the insurance or reinsurance undertaking includes in this report a reference to the validation data sets as mentioned in Guideline 52 as well as the sign-off from the main participants in the process.

3.277. There are many different types of internal models that may be used by an undertaking to calculate the Solvency Capital Requirement. These models or the outputs of the model are used in the undertaking's business for different purposes and by different teams and individuals. This variety of internal models is supported by different processes, IT systems and software. In addition to all the possible differences in methodologies, processes and programmes, the risk profiles also vary from undertaking to undertaking.

- 3.278. Thus, setting out a detailed list of which validation procedures are deemed to be appropriate may cause difficulties, as different procedures may be more appropriate for different undertakings, depending on the type of model, the risk profile and the corporate structure of the undertaking. In addition, setting out validation procedures that are appropriate and sufficient now may not be appropriate and sufficient in the future.
- 3.279. Therefore it is more appropriate for each undertaking to design their own validation policy, which sets out the way in which they will validate their own internal model and why that way is appropriate.
- 3.280. As set out in Article 116 of Solvency II, the administrative, management or supervisory body of the undertaking shall have responsibility for putting in place systems which ensure that the internal model operates properly on a continuous basis. One of these systems would be an effective validation process.
- 3.281. The written policy and the written validation report may be one of the ways for the administrative, management or supervisory body to show its interest in the validation.
- 3.282. National competent authorities form a view on how the undertaking includes in the validation policy not only the various validation tools and methods to be used in the validation process, but also more information on the process, such as who is contributing to the validation tasks, what to do with the results of the validation tools, and explanation of how the validation is independent such as to provide and effective challenge to the model. The outcomes of the validation (to be documented in a validation report) may mention the strengths and weaknesses of the model and the conditions of its applicability regarding the environment where the model operates (for instance data and external environment) as well as the usage for which the model is appropriate.
- 3.283. Guideline 46 of this paper considers which parties could contribute to the different tasks in the validation process. Regardless of the parties contributing to the validation tasks, the validation report could include details of the validation which has taken place. This applies wherever parts of the validation have been performed with some input from internal or external parties.

Guideline 42 – Scope and purpose of the validation process

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking, when specifying the purpose and scope of the validation, clearly sets out the specific purpose of the validation for each part of the internal model.

National competent authorities should form a view on how the insurance or reinsurance undertaking covers both qualitative as well as quantitative aspects of the internal model within the scope of the validation.

National competent authorities should form a view on how the insurance or reinsurance undertaking, when considering the scope of the validation, in addition to considering the validation of the various parts of the internal model, considers the validation in its entirety and in particular the appropriateness of the calculated probability distribution forecast to ensure that the level of regulatory capital will not be materially misstated.

3.284. National competent authorities form a view on how the validation process developed by the undertaking would provide comfort that the qualitative and quantitative requirements of the model would be met and that the internal model would be fit for an appropriate calculation of the Solvency Capital Requirement.

3.285. In particular national competent authorities form a view on how the validation programme or test plans set out by the undertaking, to the extent that is not already stated in a validation policy, states which validation test would be conducted on which part or aspect of the model.

3.286. When considering how there is comfort that the various tests and standards would be met, unambiguous sets of criteria may be established by the undertaking.

3.287. The undertaking may want to consider what validation processes are in place along the different steps of the modelling process. For example, the undertaking may want to consider what validation processes are in place for:

- The inputs that are fed into the modelling process, such as data and expert judgements;

- The processes and calculation methods that are applied to the inputs themselves, such as setting parameters, making assumptions and assessing the correct application of the methodologies;
 - The outputs of the model.
- 3.288. The undertaking may also want to consider what validation procedures would be required at the different stages of the modelling process. For example, the undertaking may want to consider what validation processes are in place during:
- The strategic planning of the model (origination);
 - The design of the model;
 - The implementation of the model and roll out of further enhancement;
 - The on-going and regular use of the model.
- 3.289. National competent authorities form a view on how the undertaking ensures that the validation is not limited to the origination and design of the model but that all stages of the modelling process are covered by the validation.
- 3.290. The undertaking may want to consider at what level of granularity the validation takes place. The level of granularity used needs to be sufficient to provide the undertaking with enough comfort that the model is appropriate for the purpose for which the model is being used.
- 3.291. If the validation tools are providing results that are not explainable by the undertaking, it may be an indication that more detailed validation is required.
- 3.292. Validation policies may differentiate between several type of validations; e.g. initial validation, implementation validation and on-going validation (other distinctions are also possible). For each type of validation the validation policy may state:
- The topics that are covered by the specific type of validation (e.g. methodology and assumptions, data quality, expert judgement);
 - The type of activities (e.g. desk research, interviews, tests) and volume of validation activities that is performed;
 - The expected outcome of the validation: some criteria or threshold to specify when the result of the validation is a "passed" and when it is a "failed".

- 3.293. If an undertaking decides to deviate from the policy on this point, it is expected that the validation report clearly states what the background and nature of the deviation is. The undertaking would need to also secure that items that were not covered by a validation, would be covered elsewhere or at another appropriate time.
- 3.294. Validation is not only the process of gaining comfort that the quantitative aspects of the model, such as the data, methodology, assumptions and results are appropriate. Qualitative aspects of the model need to be considered as well. The whole quantitative and qualitative aspects of the model that need to be validated would include at least the following areas: data, methods, assumptions, expert judgement, documentation, systems/IT (to the extent that it can materially impact the output of the internal model), model governance and use test. This is not an exhaustive list. For example, a challenge by means of quantitative evidence is warranted in the case of expert judgement. Particularly, the relevant (quantitative) information could form the basis to weigh alternative judgements, and contribute to the validation of the modelling choice.
- 3.295. The validation of qualitative aspects of the model, such as the model governance and the use test, may not only be performed by the quantitative tools. Instead, this part of the validation process may also relate to the steps taken by the undertaking to gain confidence that the qualitative aspects of the model are appropriate. For example, how has the undertaking gained confidence that they are meeting the use test, and how has the undertaking gained confidence that they have the appropriate governance systems in place? In addition to validating that the decisions on the internal model and relevant processes have been implemented, the validation may also include how the uses of the model and the governance in place satisfy the requirements.
- 3.296. In considering the validation in its entirety, the undertaking may understand limits of the validation process which may not be directly observable if all the validation components are considered in isolation. As an example, a number of components which are considered by the undertaking to be immaterial could have a material impact in combination. In this case if all of these immaterial components are not validated appropriately, then it may not be possible for the undertaking to get enough comfort from the model.
- 3.297. Consideration is to be given that the validation process aims particularly at building comfort in the appropriateness of the probability distribution forecast.

Guideline 43 - Materiality

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking considers the materiality of the part of the internal model being validated, not only in isolation but also in combination, when using materiality to decide on the intensity of the validation activities.

When the insurance or reinsurance undertaking does not validate specific individual parts of the internal model with a high level of accuracy because of their lack of materiality, national competent authorities should form a view on how the insurance or reinsurance undertaking nevertheless takes into consideration that those parts in combination may be material when it decides how they should be validated appropriately.

National competent authorities should form a view on how the undertaking considers sensitivity testing when determining materiality in the context of validation.

3.298. National competent authorities form a view on how the insurance or reinsurance undertaking takes a proportionate approach to the validation process, as it may not be feasible to apply all validation tools to all parts of the model at the most granular level.

3.299. For qualitative parts of the model, sensitivity tests may not always be possible. In this case, an indication of the materiality of the model component may be gained by considering the impact on the overall robustness and credibility of the model if that component were not in place.

3.300. When setting the validation process attention is given to the various components that form part of the internal model. The components cover the different structural elements of the internal model – such as modules - as well as the risks impacting or underlying the risk profile – down to the appropriate level of granularity – and also the qualitative aspects of the internal model – such as governance and compliance with the test and standards.

Guideline 44 – Quality of the validation process

Through the pre-application process, national competent authorities should form a view on how the insurance or reinsurance undertaking

sets out all the known limitations of the current validation process.

Where there are limitations to the validation of parts which are covered by the validation process, national competent authorities should form a view on how the insurance or reinsurance undertaking is aware of them and documents these limitations.

National competent authorities should form a view on how the insurance or reinsurance undertaking ensures that the assessment of the quality of the validation process explicitly states the circumstances under which the validation is ineffective.

National competent authorities should form a view on how the insurance or reinsurance undertaking also identifies the source of uncertainty related to the validation process, and if feasible, a quantification of the degree of those uncertainties.

3.301. National competent authorities form a view on how the undertaking sets out all the known limitations of the current validation process.

3.302. More specifically, if there are components of the internal model framework which are not covered by the validation with a high level of accuracy due to their lack of materiality, national competent authorities form a view on how the undertaking also explicitly states and justifies this.

3.303. In addition, where there are limitations to the validation of components which are covered by the validation process, national competent authorities form a view on how the undertaking is aware of and documents these limitations.

3.304. National competent authorities can form a view on how the undertaking sets out its planned developments of its validation process if applicable.

Guideline 45 – Governance of validation process

Through the pre-application process national competent authorities should form a view on the governance the insurance or reinsurance undertaking puts in place around the communication of the results of the validation it carries out.

National competent authorities should form a view on how the insurance or reinsurance undertaking forms and communicates

internally an overall opinion based on the findings of the validation process.

National competent authorities should form a view on how the insurance or reinsurance undertaking puts in place pre-defined criteria in order to determine whether the results, or part of the results, of the validation, are required to be escalated within this undertaking.

National competent authorities should form a view on whether the insurance or reinsurance undertaking specifies under which conditions the results of the validation process should be escalated; and on how the insurance or reinsurance undertaking clearly defines and sets the escalation path in such a way as to maintain an independent validation process.

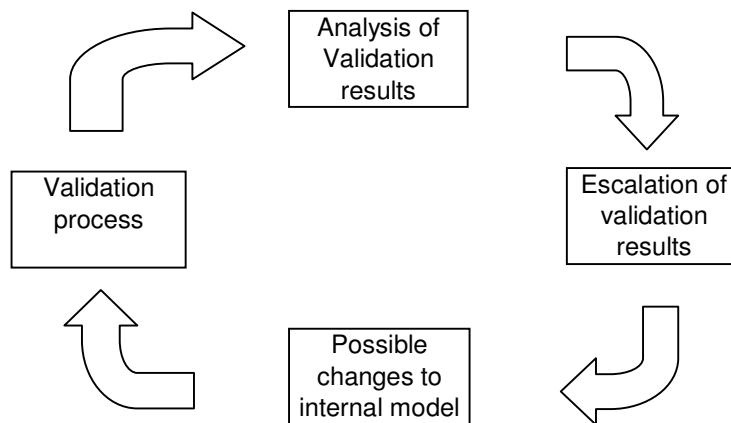
National competent authorities should form a view on how the validation policy the insurance or reinsurance undertaking establishes sets out how the results of the different validation tools are reported, for both regular validation as well as specific validation carried out, and how they will be used if the tests show that the internal model did not perform as intended.

3.305. The governance of the internal model is not to be confused with the overall governance requirements of Solvency II, set out in Articles 40 to 49 of Solvency II. The governance requirements set out in Articles 40 – 49 apply to all undertakings under Solvency II regardless of whether or not they would use an internal model to calculate the Solvency Capital Requirement. The governance referred to in this guidance paper only refers to the governance of the validation of the internal model.

3.306. National competent authorities take into account that the validation process of the undertaking includes the use of various validation tools. Once these validation tools are run, the results of the validation tools are analysed by the undertaking. This includes a qualitative analysis of the outputs of the quantitative validation tools.

3.307. An overall opinion presents the final result of a validation and is based on the underlying findings. The methodology to arrive at an overall opinion is not a mere mathematical exercise. The meaning of an overall opinion is clearly defined in terms of Solvency II compliance and of usability of the internal model.

3.308. The validation process is also linked to the wider internal model governance requirements, as the results of the analysis need to be escalated to the appropriate level of management within the undertaking. The undertaking then uses this information to determine any changes that may be required to the internal model. A simplified diagram of this validation process is included below:



3.309. This process is also linked to the principle of the use test requesting the undertaking to use the internal model in its risk-management system and decision-making processes in a way that creates incentives to improve the quality of the internal model itself. The validation process described above provides the opportunity for the undertaking to constantly monitor and improve the model, which may be required as a result from the pressure to improve the quality of the internal model.

Guideline 46 – Roles in validation process

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking, if parties other than the risk-management function contribute to specific tasks in the validation process, ensures that the risk-management function fulfils its overall responsibility as set out in Article 44 of Solvency II, including the responsibility to ensure the completion of the various tasks within the validation process.

National competent authorities should form a view on how the insurance or reinsurance undertaking formally explains the role of each party in the validation process defined.

National competent authorities should form a view on whether the

allocation of tasks for the entire validation process is covered by the undertaking in the validation policy it establishes.

3.310. National competent authorities take into account that, due to the wide scope of the nature of the validation process, different areas within an undertaking could contribute to complete the validation tasks within the validation process. Thus, it is possible that many different parties are involved in the overall validation process.

3.311. National competent authorities form a view on how the role of each party in the validation process is formally defined by the undertaking. The text below describes how different parties within the undertaking could contribute to the validation process.

Risk-management function

3.312. Article 44(5) of Solvency II sets out that the risk-management function shall cover testing and validating of the internal model. Thus it is the task of the risk-management function to ensure that all the necessary processes are in place to ensure that the tasks set out for the validation policy are met.

3.313. Due to the wide ranging scope of the internal model, it may be more effective and efficient in some cases for other parties to contribute to some of the tasks required in the validation process. This can be allowed, as long as the risk-management function remains responsible for the completion of the various tasks.

3.314. Other parties may contribute to certain parts of the validation process, as long as there are clear lines of reporting and the risk-management function is responsible for putting the validation process in place and ensuring its completion.

Administrative, management or supervisory body (through the feedback loop)

3.315. Although there is no direct requirement in the Solvency II Framework, the administrative, management or supervisory body (AMSB) to be involved in the overall validation, the AMSB plays a role in providing for a risk-management function as required per Article 44(4) of Solvency II. The risk-management function needs to be granted with necessary power and resources to perform, as part of its duties set out in Article 44(5) of Solvency II, the validation of the internal model and to report on the analysis of the performance of the internal model. It is

expected that the results of the validation process would be covered in the report on the performance of the internal model, and that this report would be communicated to senior management and the AMSB.

3.316. The conditions under which results of the validation process are escalated to the senior management and AMSB are covered in the clear escalation path discussed in the previous Guideline.

Other parties

3.317. The following parties are examples of other parties that may contribute to the validation process:

Actuarial Function

3.318. Parts of the validation tasks include collecting and analysing information, for example providing an analysis of the actual against expected experience. It may be that there are systems in place within the actuarial function which have already been set up to collect this information. In this case it may be sensible for the actuarial function to be involved in contributing to some of the tasks in the validation process in order for the undertaking to streamline processes and to facilitate an efficient allocation of tasks.

Internal Audit

3.319. Internal audit may contribute to the assessment of the quality of the validation process and those activities may be used to support the validation by the risk-management function. As an example, internal audit may be involved in validating whether some of the processes required to meet the use test have been complied with or in validating the independence of the validation.

Internal control

3.320. Some of the tasks performed by the internal compliance function may be well co-ordinated with the tasks required to be performed for some of the validation tasks. Thus it may be efficient to leverage off some of the work done by the internal compliance function to complete some of the tasks required in the validation in particular regarding the suitability of processes and procedures.

External

3.321. The validation process may also include tasks performed by external providers, although having any of the tasks performed by external parties does not relax any of the other requirements set out for validation.

3.322. In accordance with the provisions from Article 44(5) of Solvency II, the risk-management function fulfils responsibility for the validation and to ensure the independence and expertise of external resources. For instance it is good practice for the risk-management function in charge of the model validation:

- To stay in close touch with the external party and to consider and perform any appropriate follow-up;
- To assess that the activities performed by the external party is free from restrictions and limitations that might influence the outcome;
- To assess that a realistic budget and timeframe are available for the services to be performed;
- To assess that the external party and the person who performs the validation activities do not have undue conflict of interest.

3.323. It is not required that all the above parties are involved in completing validation tasks. Also the above list is not exhaustive, and other parties may contribute to the validation process.

Guideline 47 – Independence in validation process

Through the pre-application process national competent authorities should form a view on how the risk-management function of the insurance or reinsurance undertaking, in order to provide an objective challenge to the internal model, ensures that the validation process is done independently from the development and operation of the model and that the tasks set out in the validation policy it establishes create and maintain the independence of the validation process.

National competent authorities should form a view on how the insurance or reinsurance undertaking, when deciding the parties which contribute to the tasks related to the validation process, takes into account the nature, scale and complexity of the risks that this undertaking faces, the function and the skills of people to be involved, the internal organisation of the undertaking and its

governance system.

3.324. National competent authorities take into account that the lack of objective challenge by the undertaking in the validation process would result in a low amount of credibility that can be placed on the validation results.

3.325. It is a requirement of Solvency II that the risk-management function of the undertaking is tasked with both the design and implementation of the internal model as well as the testing and validation of the model. The fact that the risk-management function is responsible for both tasks does not mean that it is impossible to create and maintain independence, as:

- The validation process is owned by the risk-management function, but other parties could contribute to them;
- A degree of independence can also be maintained by separating out tasks by different employees within the risk-management function.

3.326. The validation process of the undertaking can leverage on some activities performed or supported by people involved in the development (by running some tests and calculations for instance), but cannot rely entirely on this work. National competent authorities form a view on how the undertaking demonstrates that the tasks are set independently and that at least the most material tests, calculations and analysis are performed by people not involved in the development of the model.

3.327. When leveraging on activities performed or supported by development, the people or team in charge of the internal model validation within the undertaking may consider:

- Before the start of the validation, drafting a concise test plan including the minimum validation tests required to acquire sufficient comfort, in accordance with the validation policy;
- Verifying that:
 - The people or team in charge of the model development performed the necessary tests (according to the test plan) in an adequate manner;
 - The tests can be reproduced;
 - The people or team in charge of the model development has substantiated possible deviations of the test plan in an adequate manner.

- 3.328. In any case, the people or team in charge of the model validation would be expected to form its own independent opinion.
- 3.329. National competent authorities form a view on how the undertaking also considers how independence is maintained over time. As an example, if model changes are implemented in response to an independent review, the review of the change by the same reviewer in future validation cycles may result in a decrease in independence over time. A proportionate approach to maintaining independence over time would need to be taken by the undertaking to ensure that it is manageable.
- 3.330. In order to build an objective challenge, the undertaking may create opportunity for an internal challenge by knowledgeable staff and senior management. This challenge can for instance take place between group staff and business units or between risk management and business people. To create the opportunity for this internal challenge, transfer of knowledge prior to the acceptance of the model is to be considered.
- 3.331. The principle of proportionality needs to be taken into account by national competent authorities, especially in the case of undertakings with limited resources; taking into consideration the objective of the independence of the validation to create an effective challenge. In this spirit, ensuring the independence through separated reporting line can be a means to that end. The right balance is struck between any potential conflict of interest that might arise in the course of the validation of the internal model on the one hand, and a disproportionate level of segregation of duties on the other hand.

Guideline 48 - Specificities for group internal models

Through the pre-application process for a group internal model the national competent authorities involved should form a view on how the insurance or reinsurance undertaking considers the validation of the internal model in the context of the calculation of both the consolidated group Solvency Capital Requirement and the Solvency Capital Requirement of related undertakings which would be calculated with the group internal model; and on how the insurance or reinsurance undertaking explicitly sets out this consideration in the validation policy it establishes for the group internal model.

National competent authorities should form a view on how the participating undertaking and the related undertakings for which the Solvency Capital Requirement would be calculated with the internal

model, establishes a single validation policy to cover the validation process both at group and individual level.

- 3.332. National competent authorities take into account that it may be possible for the undertaking to streamline the validation process, as some of the tasks performed to validate the components of the model used to calculate the group Solvency Capital Requirement are similar to the tasks performed to validate the components used to calculate the solo Solvency Capital Requirement.
- 3.333. The model may be using the same component in the calculation of both the group and some individual related undertakings. Some tasks performed to validate a component of the internal model in the context of the group Solvency Capital Requirement may provide comfort that the solo Solvency Capital Requirement is appropriate as well, while some tasks may only provide validation at the group level. In the latter case, some validation tasks need to be considered in the context of the solo Solvency Capital Requirement.
- 3.334. Particularly, it may be that validation tasks performed at the group level may be insufficient in the context of the solo Solvency Capital Requirement to provide the same quality of validation. Examples of this could include the following:
- There are different levels of materiality at group and at solo level. A component that is immaterial in the context of the group Solvency Capital Requirement may be very material in the context of the solo Solvency Capital Requirement;
 - Validation which is done at group level for a component may include analysis of the performance of the model against actual experience, where the actual experience was taken from aggregated data across the group. It may be in this case that the same test completed only for the scope of the solo business may result in different validation results.
- 3.335. Note that the examples above are only two examples of how validation performed at group level may not be appropriate in the context of the solo Solvency Capital Requirement, and is not an exhaustive list.
- 3.336. National competent authorities form a view on how the undertaking explicitly considers, in the validation policy for the group internal model, how the validation is appropriate in the context of both the group and the solo Solvency Capital Requirement.

3.337. The risk-management function of the solo undertaking, given its understanding of the solo risk profile and how the model reflects this risk profile, may want to be involved in setting up the validation policy of the group internal model, to ensure that the validation provides appropriate comfort that the model is appropriate in the context of the solo Solvency Capital Requirement.

Guideline 49 – Universe of tools

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking ensures that the qualitative or quantitative validation tools it uses are appropriate and reliable to validate the internal model for internal use and will be also appropriate and reliable for the Solvency Capital Requirement calculation.

National competent authorities should form a view on how the insurance or reinsurance undertaking understands the validation tools it uses and acknowledges that different tools have different characteristics and limitations. National competent authorities should form a view on whether the insurance or reinsurance undertaking considers which validation tools or combination thereof are the most appropriate to meet the purpose and scope of the validation, as set out in the validation policy it establishes.

National competent authorities should form a view on how the insurance or reinsurance undertaking puts a process in place to choose the appropriate set of validation tools in order to ensure a robust validation process. National competent authorities should form a view on how the insurance or reinsurance undertaking documents this process and whether it considers at least the following characteristics when selecting the validation tools:

- (a) level of complexity: validation tools ranging from simplified techniques to sophisticated methods ;**
- (b) nature: validation tools being qualitative, quantitative or a combination of both;**
- (c) knowledge required: the extent of knowledge required by the persons performing the validation;**
- (d) independence: the level of independence required by the person**

performing the validation;

(e) information required: potential restrictions to the amount or the type of information available for external versus internal validation ; and

(f) cycle of validation: validation tools varying to cover every key assumption made at different stages of the internal model from development, to implementation and to operation.

Guideline 50 – Stress tests and scenario analysis

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking uses stress tests and scenario analysis as part of the validation of the internal model.

In particular national competent authorities should form a view on how the insurance or reinsurance undertaking ensures that the stress tests and scenario analysis it uses cover the relevant risks and are monitored over time.

3.338. National competent authorities take into account that other validation tools may be developed by the undertaking, which may be more effective or more appropriate than tools currently available. Sometimes an undertaking may decide to check the output of a particular validation tool against a validation that has been done before and in which the undertaking has better understanding.

3.339. A universe of tools that would contribute to the validation process includes:

- Statistical tests;
- Alternative models or modelling techniques;
- Simplified models;
- Qualitative tools.

3.340. It is up to the undertakings themselves to set how they use those validation tools within their validation process. Even though some tools are prescribed in the Solvency II framework, national competent authorities form a view on how the undertaking is able to understand their scope, limitations and purpose.

Testing the results of the model against experience

- 3.341. The testing of results of the internal model against experience is used to assess the discrepancies between forecasts made by the model and actual realisations. Where actual realisations may not be directly available, the model forecasts may be compared to realisations made on the base of a comparable data set.
- 3.342. Undertakings need to justify why the chosen comparable data set is appropriate. The reliability of the test depends on the selection of data used and specific attention to the data selection would increase the benefit undertakings and national competent authorities may expect from the test.
- 3.343. This test against experience is referred to as "back-testing" and can be used by undertakings to find various kinds of errors. One objective of the analysis can be to determine whether differences come from omission of material risk factors from the model, whether they arise from errors from other aspects of the model specification such as the dependency structure including the assumptions of linearity, or whether the errors are purely random and thus consistent with acceptable performance of the model.
- 3.344. One way to use back testing is to statistically test the hypothesis that the observed frequency of exceptions equals the expected frequency. Of course this is subject to the amount of data reasonably available.
- 3.345. In addition to back-testing of the outputs, undertakings may perform additional tests such as fixing the outputs of the model and comparing actual experience conditions against the inputs to determine the quality of the parameter estimation, or overall goodness of fit tests to investigate the shape and stability of the distribution (please refer to the relevant Guideline in the Chapter on expert judgement).

Sensitivity testing

- 3.346. Another prescribed test in Article 124 of the Directive 2009/138/EC is sensitivity testing which aims at challenging the internal modelling by testing the sensitivity of the results to changes in key underlying assumptions. For instance out of sample testing, where relevant, may provide comfort that the results of the model are not dependent on particular sample used to set the assumptions.
- 3.347. The analysis may be performed by introducing small changes to the assumptions such as to the parameters, but also to some more

structural aspects of the model like mathematical methods or statistical distributions. For instance, to test the sensitivity of the results to the choice of a particular statistical distribution selected, the undertaking may use a range of alternative distributions at risks or lines of business level and measure and analyse the impact on the results.

- 3.348. Sensitivity testing can also be used in validating parts of the internal model which place reliance on expert judgement, for example, where expert judgement is used to assist in determining the dependencies between risks.
- 3.349. Sensitivity tests may also examine the effect of making changes in a number of parameters or assumptions at the same time in order to validate the model for unexpected interactions, particularly if interactions between different variables are complex and material.
- 3.350. Testing the sensitivity of the internal model may also be useful to identify cases where a small difference in the input leads to significant changes in the output. In those cases, and where such behaviour can be justified, particular attention is given to the modelling of the cause-effect-relation.

Stability testing

- 3.351. Stability testing may be used to get comfort that the results produced by the internal model are reproducible, and that the same inputs lead to results which are similar. This is particularly relevant when using stochastic simulations, and can be used, for example, to validate that the number of iterations or simulations is sufficient to provide stable results, particularly in light of the calculation of the Solvency Capital Requirement, and regardless of the seed of the random number generator.

Stress tests and Scenario Analysis

- 3.352. Stress tests and scenario analysis are particularly useful to give insight into the tail of the loss distribution and in providing information relating to the dependencies between risks and capturing non-linearity. Stress or scenario testing as reverse testing may prove very useful in the process to internally challenge the model, and may provide useful opportunities for the senior management to develop their understanding on the model as well as to get comfort on its performance.

- 3.353. Stress test typically aims to assess the impact of a single event while scenario analysis aims to assess the impact of a combination of events. For a full stochastic model, the stress conditions/scenario may be represented by some of the simulated paths.
- 3.354. As a validation tool stress test and scenario analysis provides information about what the results may look like under various conditions including but not limited to exceptional but plausible large-loss events. It may also identify possible limitations of the model.
- 3.355. Scenario analysis may be particularly useful to validate the relations and dependencies between risks and variables under stress conditions. When reviewing this aspect, the undertaking pays particular attention in validating that tail and non-linear dependencies are appropriately captured.
- 3.356. By analysing the impact of stress events or scenarios, the undertaking may get insight into the features of the internal model such as tail of the loss distribution, and dependencies between risks including non-linearity. This type of validation may increase user's confidence that the internal model reflects appropriately the undertaking's risk profile.
- 3.357. Stress test and scenario analysis would be individually set out by the undertaking or group based on their own experience and their risk profile. The stress event or scenario may be derived using historical scenarios, deterministic or stochastically generated scenarios.
- 3.358. In addition to its function as validation tool, stress test and scenario analysis may provide the undertaking with some insight regarding its risk profile, and may prove useful in risk management and decision-making.

Reverse stress tests

- 3.359. In reverse stress tests the undertaking identifies the modelled stress and scenarios that could threaten its viability. This test induces the undertaking to consider scenario beyond normal business settings and leads to single out interaction between risks. In a group context, specific events including contagion and systemic factors may prove useful in validating the internal model at group level.
- 3.360. In addition to its function as validation tool reverse stress tests may be used to set risk management actions to mitigate the impact on the undertaking's viability of the unidentified events and scenarios.

Profit and loss attribution

3.361. More guidance is provided in the dedicated Guidelines on profit and loss attribution.

Additional validation tools

3.362. Some other tools may be used in the validation such as but not limited to:

Benchmarking

3.363. For instance benchmarking against alternative approach(es) or technique(s) of specific components of the internal model. When observing and analysing the differences produced by the alternatives approaches or techniques consideration is given to the appropriateness of the approaches and techniques to the risk profile. A particular weakness of this approach, that needs to be considered when using this tool, is the risk that it may incentivise herding behaviour that may result in creating systemic risk.

Analysis of change

3.364. Analysis of change from one period or run of the model to the next may provide comfort that changes in results are clearly understood and their causes identified.

Hypothetical portfolio

3.365. Hypothetical portfolio of assets and/or liabilities can be used to validate the model by estimating the risk profile underlying the portfolio. This technique can be used to validate changes in the internal model.

Simplified models

3.366. Simplified models may prove to be valuable tools, for instance in comparing the results from the internal model with results obtained from a more simple and easy to understand approach. Simplified methods or approaches may contribute to providing comfort regarding the output produced by the internal model. This tool may also be valuable for analysing the impact of assumptions.

Manual tracking of some internal model calculation

- 3.367. To reproduce the calculation steps of the internal model may be useful to validate a proper implementation of the internal model or the proper integration of different parts or components of the internal model.

Peer review

- 3.368. Peer review can be used as a validation tool assuming the process brings an effective challenge. This tool may be particularly relevant in validating expert judgement when the independence between the original expert judgement and the peer review is achieved.

Tool Selection

- 3.369. Having a well-defined process for choosing the appropriate tools allows the knowledge about the tools to feedback through the validation cycle and ensures that tools are chosen consistently and appropriately.
- 3.370. National competent authorities form a view on how the undertaking ensures, when choosing validation tools, that the complexity of the tools fits the purpose of the validation. Objective statistical methods may provide a more effective process of validation, particularly for the outputs for the model, but may have limitations in validating expert judgements. Nevertheless, when validating expert judgement, the challenge needs also to consider relevant data and numerical evidence. Some risk models can be more complicated than others with complex features and may require more advanced set of tools.
- 3.371. A suite of validation tools may complement each other, and help to convey an understanding of the model limitations. For instance, some tools are better at testing the model ability to rank risks, i.e. to segment on a relative basis, whereas other tools are better at testing the absolute forecast accuracy. Similarly a simplified technique such as an easy-to-process proxy model may contribute to the validation of the model for a specific range of circumstances, but a more sophisticated method may be necessary to validate the performance of the model under other circumstances.
- 3.372. The validation process may also be applied to simplified configurations of the internal model. For instance validation may be applied to the model while turning off some of the features of the internal model like future management actions and/or risk mitigations techniques. Those features or layers of complexity can then be turned on successively (or

through the capture of intermediate results), in order to validate the impact of those features on the internal model results.

- 3.373. Tools can be classified as qualitative, e.g. interviews and expert judgement and quantitative, e.g. back-testing. It is important to bear in mind that such qualitative tools are not solely for qualitative aspects of the models. Sometimes when applying quantitative methods, a qualitative tool such as expert judgement may be needed to provide a complementing critical view and evaluation of the results.
- 3.374. The undertaking may consider some tools particularly relevant for specific aspects of the model, for instance sensitivity testing may be particularly useful at the level of a single output or at the level of a particular risk, while scenario analysis may be particularly useful at the aggregated level for example to analyse and contribute to validate the dependencies between risks, business entities or solo undertakings at the group level.
- 3.375. Validation is not a purely mechanical exercise and when designing a validation process or deciding on a tool, one has to take into consideration the purpose of the model and potential use and its overall control environment. Whether designing questionnaires for qualitative assessment or developing back-testing tools, one needs to take into account such information. Furthermore, validation performed by third party may lack this insight and the tools need to be designed to account for this.
- 3.376. The internal model follows a cycle from the design stage to the implementation and embedding stage. The validation process follows this cycle and takes into consideration that some validation tools may be more appropriate for some stages in the model life cycle (design, development, implementation and operation).

Guideline 51 – Application of the tools

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking is able to explain which parts of the internal model are being validated by each of the validation tools used and why these validation tools are appropriate for the particular purpose by describing at least:

- (a) the materiality of the part of the model being validated;**
- (b) the level at which the tool will be applied from individual risks,**

modelling blocks, portfolio, business unit to aggregated results;

(c) the purpose of this validation task; and

(d) the expected outcome from the validation.

3.377. National competent authorities take into account that undertakings, when using the validation tools, may want to:

- Identify clearly what are the validation performed and communicate it to the administrative, management or supervisory body and the national competent authorities;
- Have performed a self-certification of the validation taking into consideration the limitations of the tools;
- Have robust processes in place to ensure that the validation was actually performed;
- Ensure that the tools and methods applied provide the comfort that the internal model is appropriate as set out in the validation policy.

3.378. A schematic of the model and role of validation tools may be a useful way to provide a clear and synthetic illustration of which components or aspects of the model are validated by the different tools used. This may help to ensure a robust process and be useful as a communication tool with the national competent authority to review and assess the validation of the internal model.

3.379. The tools and methods used when approaching different aspects of the internal model are selected taking into account the aspect of the internal model to be validated. It is important to understand and be able to explain the main purpose of using any particular tool. Some tools and methods, for example mathematical analysis, would be more appropriate to validate the model structure (conceptual model validation). Some tools and methods, for example walk-through processes and calculation using fixed values for some variables in order to check the model results against easily calculated values, would be more appropriate to validate the computer programming and implementation aspect of the internal model (model verification). Some tools and methods, for example validation against experience, would be more appropriate to validate the accuracy of the model related to its intention (operational validity).

3.380. Where either a bottom-up (testing the sub-models first then the overall model) or top-down (testing the overall model first then the

sub-model) approach is adopted, particular attention is given to the validation of aggregation inside the internal model where it is appropriate for both the causal relationships as well as statistical dependencies.

- 3.381. Specific tools involve specific limitations. For instance some quantitative techniques may be sensitive to sampling error; therefore it would be appropriate to run the tool using several different samples of data or to apply appropriate criteria in the selection of data used during the validation. The reliability of other tests or tools may be limited by the scarcity of data.
- 3.382. National competent authorities form a view on how the undertaking takes into consideration the specific limitations of the validation tools used when applying and drawing conclusions from the validation process.
- 3.383. The purpose of a validation task drives the selection of the tool in light of the expected outcome. Different validation tasks would aim at different purposes such as for example: validating the accuracy of parameters. For example statistical test, validating the limited sensitivity of the results to the choice of a particular method etc. Before performing the validation tasks, the undertaking may set criteria to classify the outcomes of the tasks, for instance a confidence interval can be pre-set that would establish if the outcome of a statistical test would be pass or fail.

Guideline 52 – Validation data sets

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking ensures that the selected data and expert judgement used in the validation process effectively allows it to validate the internal model under a wide range of circumstances that have occurred in the past or could potentially occur in the future.

- 3.384. National competent authorities take into account that data used by the undertaking in the validation of the internal model is a key factor for the success and the appropriateness of the validation process. The data sets used for testing individual components of the model may be different from the data sets used for testing the overall model. Furthermore, validating the model on a particular dataset may miss important limitations of the model, the attention given to the selection

- of the dataset or expert judgements to be used during the validation could mitigate this risk.
- 3.385. Deciding and generating the relevant datasets for validation need to be consistent across purposes. For example, where a validation cycle identified the need for changing the model, the data to check changes in the model need to be consistent to the datasets used in the original validation. Nevertheless different datasets might be used if this is appropriate and adequately explained.
- 3.386. Testing the model based on data, which are independent from the data used to calibrate the model can also remove any bias in the validation and gives a fairer view of the validity of the model.
- 3.387. Expert judgement is used in many aspects of the models. For instance there may be cases where the data-based validation alone does not allow covering sufficiently wide range of circumstances considering the calibration target of the Solvency Capital Requirement. In these cases appropriate validation tools (e.g. benchmarking to other models and statistical distributions or stress testing) can be used to supplement the information available in the data. There are also instances in validation where expert judgement is used, for example in the choice of the validation tool or in interpreting the results of the validation. In this regard, national competent authorities take into account that undertakings may refer to the relevant requirements for the use of expert judgement set out in the corresponding Guidelines.

Chapter 10: Documentation

- 3.388. One of the requirements that an insurance or reinsurance undertaking needs to fulfil in order to use an internal model for the Solvency Capital Requirement calculation is the documentation standard.
- 3.389. The documentation of an internal model is primarily a tool for the insurance and reinsurance undertaking but is also a tool for national competent authorities in their assessment of an internal model. The purpose of the documentation is not solely to support the internal model during the pre-application process and future approval process but also to support the undertaking in its use of the model.
- 3.390. The Guidelines on internal model documentation aim to provide guidance on what national competent authorities and the undertaking need to consider, through the pre-application process, in order that national competent authorities are able to form a view on how

prepared the undertaking is to fulfil the internal model documentation requirements.

3.391. Through the pre-application process, national competent authorities form a view on how prepared an insurance or reinsurance undertaking is to submit an application for the use of an internal model for the Solvency Capital Requirement calculation. To this end national competent authorities review the information provided by the undertaking as well as the internal model documentation. Additionally, national competent authorities may need to refer to additional pieces of evidence to form their view. For example, in order to form a view on how prepared an undertaking is to demonstrate understanding of the internal model, national competent authorities may want to ask the undertaking to evidence a training presentation describing the main features of the model which the members of the administrative, management or supervisory body have received.

3.392. The previous example illustrates some important considerations that need to be taken into account already in pre-application, both by national competent authorities and the undertaking:

- Some of the materials provided by the undertaking during pre-application are not part of the internal model documentation;
- During the pre-application process, national competent authorities are likely to ask for additional evidence to form a view on how prepared the undertaking is to meet the requirements. This evidence can be both in written form (e.g. the training materials in the example) or otherwise (e.g. interviews, processes, systems etc.);
- By the same principle, not all of the internal model documentation pursuant to Article 125 of Solvency II needs to be included in the materials provided by the undertaking during pre-application.

3.393. A number of ancillary documents may be necessary for national competent authorities to form a view on the internal model of the undertaking – for example, results of simulation runs, board minutes evidencing the use test, training material, validation results and output. It is not practicable to include all this documentation in a single documentation package, a practical approach could be to submit a documentation directory or similar. A specific reference could then be provided by the undertaking in the documentation submitted for pre-application purposes.

3.394. There may not always be a clear delineation between internal model documentation and supporting documentation necessary for the purposes of pre-application.

Guideline 53 - Control procedures

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking ensures that the documentation of the internal model is kept up to date and regularly reviewed.

In particular, national competent authorities should form a view on how the insurance or reinsurance undertaking puts in place at least:

- (a) an effective control procedure for internal model documentation;**
- (b) a version control procedures for internal model documentation; and**
- (c) a clear referencing system for internal model documentation which should be used in a documentation inventory.**

3.395. National competent authorities form a view on how the documentation of the internal model by the undertaking provides an audit trail, to recording the implementation of model changes (both minor and major).

3.396. In particular, an effective control procedure ensures that the internal model documentation is kept up to date and is regularly reviewed.

3.397. A clear reference system ensures that the undertaking's document references are precise.

3.398. The documentation does not have to be one single document or a set of documents nor does it need to be in paper form.

Guideline 54 - Documentation of methodologies

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking produces a documentation which is detailed enough to evidence detailed understanding of the methodologies and techniques used in the internal model, including at least:

- (a) the underlying assumptions;**

(b) the applicability of such assumptions given the undertaking's risk profile; and

(c) any shortcomings of the methodology or of the technique.

National competent authorities should form this view also in case a methodology or any other technique used by the insurance or reinsurance undertaking in the internal model is documented by an external party.

National competent authorities should form a view on how the insurance or reinsurance undertaking, when documenting the theory, assumptions and mathematical and empirical basis underlying any methodology used in the internal model, in accordance with Article 125(3) of Solvency II, includes, if available, the history of the development of the methodology, as well as any other methodologies which were considered but not subsequently used by the insurance or reinsurance undertaking.

3.399. The validity of externally produced documentation which may have been written for a purpose other than documenting the internal model under consideration is recognised. In such cases, it is particularly important that the methodology or technique is appropriate for the situation to which it is being applied. Therefore, national competent authorities form a view on whether the undertaking is able to demonstrate sufficient understanding of the contents of the document in order to assess and justify the suitability of the technique or methodology for use in its model and the fit for its business.

3.400. In particular, national competent authorities form a view on how prepared the undertaking is to meet the requirements related to the assumptions underlying a methodology or technique (e.g. a probability distribution or an estimation method). National competent authorities also form a view on how the undertaking demonstrates through the documentation of methodologies understanding of any shortcomings of a methodology or technique of its internal model, and why any of such shortcomings are not material or do not render use of the methodology or technique inappropriate.

3.401. National competent authorities take into account that academic papers, by their nature, can be complex and they may assume a high level of prior knowledge. Reference to such papers on their own may not be sufficient to demonstrate an undertaking's understanding of a method or technique and its appropriateness to the undertaking's

business. However, exact formulation of model equations and variables is regarded as good practice.

3.402. Methodology development often involves trial and error. A record of that development could be useful for both national competent authorities in assessing the appropriateness of the methodology, and for the undertaking (including the validation function) in further improving the model. Whilst the initial stages of such development may not be documented formally as they happen, documentation of the development of a methodology can enable the undertaking to prepare itself for the fulfilment of the requirements of paragraph 3 of Article 125 of Solvency II.

Guideline 55 - Circumstances under which the internal model does not work effectively

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking includes in its documentation an overall summary of the shortcomings of the internal model, consolidated in a single document, containing at least the following aspects:

- (a) the risks which are not covered by the internal model;**
- (b) the limitations in risk modelling used in the internal model;**
- (c) the nature, degree and sources of uncertainty connected with the results of the internal model including the sensitivity of the results for the key assumptions underlying the internal model;**
- (d) the deficiencies in data used in the internal model and the lack of data for the calculation of the internal model;**
- (e) the risks arising out of the use of external models and external data in the internal model;**
- (f) the limitations of information technology used in the internal model; and**
- (g) the limitations of internal model governance.**

National competent authorities should also form a view on how the insurance or reinsurance undertaking includes in this summary the work done to identify the shortcomings of the model and any plans

for model improvements.

- 3.403. National competent authorities take into account that where internal models take a modular form, it is quite likely that separating the documentation of each module would allow the undertaking to address any shortcomings of that particular module. However national competent authorities form a view on how the undertaking carries out an overall assessment of shortcomings in a single summary document.
- 3.404. National competent authorities expect that any plans for model improvements are considered by the undertaking at a high level and therefore that a detailed model development plan is not included by the undertaking in this document.
- 3.405. This summary overview would also allow the undertaking and national competent authorities to assess the materiality of any circumstances under which the internal model does not work effectively, the appropriateness of the model for the undertaking and any plans to address the shortcomings.

Guideline 56 - Appropriateness to addressees

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking considers having documentation of the internal model that consists of more than one level of documentation for the internal model, commensurate with the different uses and target audiences.

- 3.406. Tailored documentation for key bodies and key personnel facilitates more effective implementation and control of the internal model.
- 3.407. National competent authorities do not expect that users of the model, such as the administrative, management or supervisory body and the other persons who effectively run the undertaking, use the same documentation as the model design team. However national competent authorities expect that the documentation for the administrative, management or supervisory body and the other persons who effectively run the undertaking is sufficiently detailed to allow them to meet the requirements of the use test, including understanding.

Guideline 57 - User manual

Through the pre-application process national competent authorities should form a view on how, as part of its documentation of the

internal model, the insurance or reinsurance undertaking puts in place a user manual for operation of the internal model which should be sufficiently detailed to allow an independent knowledgeable third party to operate and run the internal model.

3.408. A user manual for operation of the internal model is an important mitigant to key person risk, which exists both at model design level and model operation level.

Guideline 58 - Documentation of model output

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking documents and retains, not necessarily in a single document, the outputs of the model that are relevant to satisfy the requirements of Article 120 of Solvency II.

3.409. National competent authorities take into account that the undertaking may run a model several times at each valuation date, with each run possibly comprising many thousand simulations. It is recognised that retaining the output of every simulation for every run may be of limited value.

3.410. National competent authorities form a view about how the undertaking retains the full simulation input and output, with appropriate level of detail, for the run used to calculate the Solvency Capital Requirement for the undertaking at that valuation date.

3.411. For other stress and scenario tests the undertaking may develop its own policy on retention of model output. In doing this national competent authorities form a view on how the undertaking recognises that there is value in analysing simulation output, as part of its risk management and model validation processes. National competent authorities form a view on how the undertaking ensures that the use of the model outputs in risk management or decision-making processes forms part of its use of the model.

3.412. National competent authorities form a view on how the undertaking ensures that the output of the internal model includes management information, such as risk dashboards, risk registers and other reports used for risk management or decision-making.

Guideline 59 - Software and modelling platforms

National competent authorities should form a view on how the undertaking, in its documentation, provides information about the software, modelling platforms and hardware systems used in the internal model.

National competent authorities should form a view on how the undertaking, where using software, modelling platforms and hardware systems, provides in the documentation sufficient information to be able to assess and justify their use, and enable national competent authorities to assess their appropriateness.

3.413. A platform differs from an external model if the implementation of the model is independent of the platform on which it is run. For example, a model would theoretically give the same output if run on two different simulation platforms (with the same calibration), whereas two different natural catastrophe models would give different output.

3.414. In some cases, there may not be a clear distinction between what constitutes a modelling platform and what constitutes an external model. In such cases the undertaking and national competent authorities are expected to consider the appropriate level of documentation, and the need to monitor potential restrictions arising from the use of external models.

Chapter 11: External models and data

3.415. The Guidelines on external models and data aim to provide guidance on what national competent authorities and the undertaking need to consider, through the pre-application process, in order that national competent authorities are able to form a view on how prepared the undertaking is to comply with the standards related to external models and data in the context of an internal model intended to be used for the calculation of the Solvency Capital Requirement. These Guidelines do not cover technical provisions but only external models and data intended to be used for the calculation of the Solvency Capital Requirement.

3.416. The requirements relating to the internal models and data set out in Solvency II also apply to external models intended to be used for the calculation of the Solvency Capital Requirements, and external data intended to be used in an internal model. National competent

authorities form a view on the insurance or reinsurance undertaking pays particular attention to the specificities of such models and data.

Guideline 60 – External data

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking, given the nature of external data, demonstrates an appropriate level of understanding of the specificities of external data used in the internal model including any material transformation, rescaling, seasonality and any other processing inherent in the external data.

In particular, national competent authorities should form a view on how the insurance or reinsurance undertaking at least:

- (a) understands the attributes and limitations or other peculiarities of the external data;**
- (b) develops processes for identifying any missing external data and other limitations;**
- (c) understands the approximations and processing made for missing or unreliable external data; and**
- (d) develops processes to run timely consistency checks including comparisons with other relevant sources.**

3.417. National competent authorities take into account that some external data can be used directly by the undertaking such as market data, but external data is also quite important in external models.

3.418. The undertaking may decide to have a process for classification of data as external. The classification could for example, encompass external data that are used directly in the internal model and data that is used indirectly for the development or calibration of external models and for transformations of inputs (e.g. inflation).

3.419. Article 126 of Solvency II requires that the same data quality standards apply to external data. The data quality standards are set out in Article 121.

3.420. By their very nature, external data may pose further challenges that the undertaking may need to consider when assessing the quality standards of the external data used in its internal model.

- 3.421. In cases where a reference source is readily available, periodical reasonability checks may be used to assess the quality of the data. For example, when indices are used, the undertaking may need to understand how they were created to account for seasonal adjustments and changes in basis. The adjustments for these changes may be included in a data directory to ensure continuity of the checks and the changes that need to be made on the data.
- 3.422. Where other processed data, such as volatility is used, the undertaking may need to understand and document the historical data used and the transformations applied to it.
- 3.423. When the source of external data or information is not available, for e.g. in proprietary data or where raw data is too onerous to gather, then the provider may need to provide the sufficient information with specific references wherever possible. The undertaking may find it useful to set up processes for developing an understanding of the attributes and weaknesses of the data (e.g. resolution, limited record length, missing data, etc.).
- 3.424. In some cases especially for calibrating catastrophe models, due to lack of exposure and claims data, a catastrophe model for a country may have been calibrated using data from another country or with the use of expert knowledge. In other cases, expert judgement and analytical methods, for example extrapolation is used to complement scarce data. National competent authorities form a view on how the undertaking clearly communicates and documents these limitations, and assesses the implications.

Guideline 61 – Understanding of the external model

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking demonstrates that all parties involved in the use of the external model have a sufficiently detailed understanding of parts of the external model relevant to them including assumptions, technical and operational aspects.

National competent authorities should form a view on how the insurance or reinsurance undertaking gives particular attention to the aspects of the external model that are more relevant to its risk profile.

- 3.425. National competent authorities take into account that some models such as CAT models, Economic Scenario Generators and credit models can be classified as external models. In addition, external models may also include calculation components, libraries and risk models obtained from third-parties, which have an impact on the results of the internal model and are usually specifically designed for modelling of risks to which an insurance or reinsurance undertaking is exposed.
- 3.426. The undertaking may differentiate between external models and external platforms. However, some IT systems and software usually classified as platform may be regarded as external models. In some cases functions such as random number generator can have a significant impact on the calculation of the Solvency Capital Requirement. Similarly, the undertaking may decide to classify custom built functions (such as C++ library functions) as external models depending on their use in the internal model.
- 3.427. Article 126 of Solvency II sets out that the use of an external model shall not be considered to be a justification for exemption from any of the tests and standards set out in Article 120 to 125 of Solvency II. Therefore, national competent authorities form a view on how the undertaking meets for the external model and data the same standard of understanding as required for other parts of the internal model.
- 3.428. An effective channel for regular communication between the undertaking and the vendor or service provider may give a positive indication of appropriate understanding of the model. This may be evidenced by the undertaking through meetings, emails and other correspondence and participation to educational seminars.
- 3.429. Many of the external models are complex and a full understanding of the whole model may not be possible, or relevant for the undertaking. The external model may cover risks to which a particular undertaking is not exposed and as such are not relevant to the undertaking. National competent authorities form a view on how the undertaking, as it is applicable for the understanding of the theory and assumptions underlying the internal model, ensures a detailed understanding of the components of the external model that are used in the internal model.
- 3.430. National competent authorities form a view on how the undertaking, for parts of the external model relevant to its risk profile, develops an understanding of the methodologies applied and relevant assumptions including expert judgement on which the methodology used is based.

3.431. In order to form a view on the detailed understanding by the undertaking of the external model used within the internal model, national competent authorities can review how the undertaking:

- Demonstrates that all the significant limitations and uncertainties have been communicated to and are understood by the relevant stakeholders at all the levels within the undertaking;
- Ensures that persons who effectively run the undertaking have a sufficiently detailed understanding of the parts of the internal model used in the area which they are responsible of. This may include understanding the basic properties of the inputs, assumptions and the outputs and how they may impact the Solvency Capital Requirement and any decision based on them;
- Demonstrates that the users understand in detail the main components of the external model (for instance in case of a catastrophe model the usual components are: the event set module, the hazard module, the vulnerability module and the financial module), main operational aspects and outputs of the model. This includes understanding the calibration of the model and the data used for the calibration;
- Documents and justifies the processes for selection of any external model and ensures by regular reviews that the process is up-to-date and an appropriate external model is used;
- Documents major changes in the external model either done externally or any adaptation made internally. This may include, for example, documentation of major updates to the models or how the outputs of the external model have been modified prior to use in the internal model.

Guideline 62 – Reviewing the choice of external model and data

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking periodically reviews its justification for selecting a particular external model or set of external data.

National competent authorities should form a view on whether the insurance or reinsurance undertaking is not overly reliant on one provider and on how the undertaking puts in place plans to mitigate against any failures of the provider.

National competent authorities should form a view on how the

insurance or reinsurance undertaking pays attention to any updates of the external model or of the data that allows the undertaking to better assess its risks.

- 3.432. National competent authorities take into account that there may be some constraints for the undertaking to change the external model or data used in the internal model regularly. For instance the model or data may be embedded in the undertaking business processes, and in some cases changing the model and data may create additional risks related for instance to the appropriateness of IT systems. However, the undertaking may decide to have processes in place to assess whether the external model or data is still adequate given any change in its risk profile. The undertaking may decide on a frequency for reviewing the justification of selecting a particular model or data.
- 3.433. National competent authorities form a view on how the undertaking, when selecting an external model or set of data, particularly assesses the adequacy of the model or data to its risk profile, including the ability for the undertaking to collect appropriate data needed to run or parameterise the model.
- 3.434. National competent authorities take into account that if there are risks inherent in being overly reliant on one provider (such as in case of bespoke systems), the undertaking may decide to have risk mitigation plans in place, for example, source code escrow, identified alternative systems and expertise.
- 3.435. Similar attention could be paid to components of modelling platforms, software and hardware systems that can affect the use or results of the internal model. There are a number of ways that the undertaking and national competent authorities can assess the appropriateness and robustness of components of modelling platforms, software and hardware systems. Available methods for such an assessment include: stress and scenario tests, mini-models to replicate results, replicating results on other platforms, benchmarking run-times on other systems.
- 3.436. National competent authorities take into account that, when any deviation of the risk profile occur, the undertaking may consider if any available update of the external model or data is appropriate to address this deviation in the risk profile.
- 3.437. In some cases, the undertaking may decide on the use of multiple models:
- As a way to mitigate the risk of over reliance on a particular model;

- As a tool in the validation process; or
- To avoid over-reliance on a particular service provider or vendor as long as it fits its risk profile.

3.438. A multi-model approach can also be used for assessing the uncertainty around a particular risk. A multi-model approach can involve multiple vendors, one vendor and also models developed internally. National competent authorities form a view on how the method applied by the undertaking, where it chooses to blend output from multiple models, for instance as a way of mitigating the over-reliance on one model vendor, complies with the requirements applicable to the internal model and particularly the statistical quality standards as well as the validation standards. National competent authorities form a view on how the undertaking gives particular attention to establishing and maintaining a written explanation of the calculation of the blended output. In doing so the undertaking may set out a priori criteria or blending parameters, or explain any deviation from pre-set criteria and parameters.

3.439. National competent authorities form a view on how the intended use by the undertaking, of multiple models as a basis for calculation of the Solvency Capital Requirement does not prevent it from taking views and decisions on any material model assumptions. National competent authorities form a view on how the undertaking in this context acknowledges that the choice of a particular external model often involves taking a particular view on the risk in the tail.

3.440. The undertaking may identify some shortcomings of the external model and may want to resolve those shortcomings by adapting the external model or its output. As identification of shortcomings could be viewed by national competent authorities as an indicator of a detailed understanding by the undertaking; national competent authorities form a view on how the undertaking, when adapting the external model or its output, ensures that the adaptations comply with all the relevant tests and standards including statistical quality standards and that governance processes are in place for adapting the model.

Guideline 63 – Integration within the internal model framework

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking demonstrates that the approach for incorporating the external model into the internal model framework is appropriate, including the

techniques, data, parameters, assumptions selected by the undertaking, and the external model output or outputs.

3.441. National competent authorities take into account that there are many aspects that an undertaking may need to consider when incorporating the external model in its internal model framework. There are different approaches for doing this but all of them involve aligning systems, data and assumptions.

3.442. For example, the dependency structure inherent in the outputs of an external model may compromise the dependency structure used in the internal model or the systems may introduce operational risks in transferring data from one system to another. Also, the assumptions may not be properly aligned.

3.443. In order to ensure the appropriateness of the approach for incorporating the external model into the internal model framework, the undertaking can, for example:

- Check and document the consistency of the assumptions and the input data of the components incorporated;
- Make clear the ownership of the different phases of the process;
- Demonstrate that the external model is fit for its use as internal model;
- Notify and document the reasons for the approach used for processing inputs and outputs of the external model;
- Develop a change process with defined timelines, such as setting a process for the continuous improvement of the granularity and quality of the exposure data used in the external model and ensuring the regular and timely update of the process with strategic feedback loops;
- Evidence and justify the choice of the output and the way it is used.

Guideline 64 – Validation

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking performs its own validation of the material assumptions of the external model that are relevant to its risk profile and of the process for incorporating the external model and data within its own processes and internal model.

National competent authorities should form a view on how the insurance or reinsurance undertaking assesses the appropriateness of the selection or the non-selection of features or options which are available for the external model.

National competent authorities should form a view on how, as part of its own validation, the insurance or reinsurance undertaking considers appropriate information and in particular the analysis performed by the vendor or other third party, and, when doing so, on how the insurance or reinsurance undertaking ensures at least that:

- (a) the independence of the validation process from the development and operation of the internal model is not compromised;**
- (b) it is consistent with the validation process the insurance or reinsurance undertaking sets out and is clearly laid out in the validation policy; and**
- (c) any implicit or explicit bias in the analysis performed by the vendor or other third party is taken into account.**

3.444. As defined in Guideline 47 of the validation Chapter, the proportionality principle applies to the validation process.

3.445. National competent authorities can form a view on how the validation process by the undertaking particularly:

- Covers the key assumptions of the external model;
- Covers any material adjustments made to the inputs of the model, the model itself or its outputs by, at least, demonstrating their appropriateness and explaining their underlying reason(s);
- Is specific to the undertaking and focuses on parts of the model that are relevant to the risks and lines of business underwritten by the undertaking;
- Includes tests of outputs or performances against experience (sense checks);
- Makes use of the service providers or other expert knowledge and competencies to create / calibrate tests;
- If validation activities is delegated to service providers, ensures that the delegated activities are performed consistently with the undertaking validation process including for instance:

- Specific validation report but deeper analysis to specific risks;
- Frequency of validation;
- Checks when changes happen.

3.446. National competent authorities take into account that the undertaking may use the model through reinsurance intermediaries (brokers) rather than holding the licence for the model. The undertaking may decide to use aspects of the validation performed by vendors or brokers provided that it can gain comfort on the validation performed by the brokers that it meets the requirements. The undertaking may decide to do their own validation for a better understanding of the modelling of material assumptions and as the final onus for the validation checks performed is on the undertaking.

3.447. For example, an external validation report provided to the undertaking by the vendor, the service provider or an independent party may be used by the undertaking to base their approval assuming that the report provided is consistent with the validation process the undertaking establishes and complies with the Solvency II requirements on validation.

3.448. National competent authorities form a view on how a validation performed by the undertaking covers the approach for incorporating the external model or data into its internal model.

3.449. National competent authorities take into account that, although common practice for validating specific aspects of the model and data used by vendors in the development of their external models, the peer review by a third party (e.g. university or other independent institution) of the models could be used by the undertaking as a piece of evidence of a qualified and objective generic validation of the external model. The independence of such a process could be assessed taking into consideration the remuneration structure of the persons involved. Using this third party review does not prevent the undertaking from explaining how this review is relevant to its own use of the external model.

3.450. The undertaking may decide that this review could be used for:

- The selection process of the service provider and the setting up of adequate contingency plan;
- Setting the frequency of validation;

- Setting the frequency of update;
- Assessing other soft aspects (e.g. user friendliness, flexibility, stability);
- The validation of the outputs.

3.451. When complementing the vendors' validation, the undertaking may like to further develop their understanding of the validation performed through sensitivity analysis and benchmarking. National competent authorities form a view on how the undertaking, as part of its validation process, justifies and documents the use of options selected and the use of switches.

3.452. The undertaking may decide to validate the outputs of the model by demonstrating their understanding of (but not exhaustively):

- The material risk drivers;
- The limitations of the outputs.

3.453. The undertaking may decide to validate the inputs of the model by checking their appropriate treatment and demonstrating its understanding of:

- Whether the data provided by the undertaking used by the service provider reflects the undertaking risk profile;
- The integration of the external model within the internal model framework;
- The audit trail within the external model.

Guideline 65 – Documentation

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking, when documenting external models and data, demonstrates that it meets the documentation standards.

National competent authorities should form a view on how the insurance or reinsurance undertaking produces documentation on at least the following:

- (a) the aspects of the external model and external data that are relevant for its risk profile;**
- (b) the integration of the external model or external data within its**

own processes and internal model;

- (c) the integration of data, in particular inputs, for the external model, or outputs from the external model, within its own processes and internal model; and**
- (d) the external data used in the internal model and its source and use.**

If, as part of its own documentation, the insurance or reinsurance undertaking leverages on the documentation produced by the vendors and service providers, national competent authorities should form a view on how the insurance or reinsurance undertaking ensures that its ability to meet the documentation standards would not be compromised.

3.454. National competent authorities form a view on how the undertaking documents any material adjustments made to the inputs, modelling components or outputs of the external model together with the reasons and appropriateness. The same holds for the potential blending of any modelling results in the case that a multi-modelling approach is adopted.

3.455. National competent authorities form a view on how the undertaking documents its understanding of the model. The undertaking may decide to build its internal documentation around information and documentation provided by the vendors or service providers assuming this does not compromise its ability to meet the documentation standards. If the information and documentation provided are sufficiently detailed then this allows the undertaking to develop an appropriate level of understanding of the model.

3.456. Additionally, an undertaking may decide to document that the incorporation of its data (in vendor models or service providers' frameworks) was done correctly.

Guideline 66 – National competent authorities' relationship with vendors of external models

Through the pre-application process national competent authorities should form a view on how the insurance or reinsurance undertaking keeps its responsibility for discharging its obligations related to its internal model and for the role of external model or data in the

internal model and any other requirements.

National competent authorities should make clear to the insurance or reinsurance undertaking that any contact between national competent authorities and the vendors of an external model to inform national competent authorities' reviews of such model should not exempt the insurance or reinsurance undertaking from demonstrating that the external model fulfils the internal model requirements.

National competent authorities should form a view on the use of an external model entirely for each individual pre-application process.

National competent authorities should make clear to the insurance or reinsurance undertaking that they will reject any application for using an external model if the insurance or reinsurance undertaking fails to provide the specific information required in order for an assessment of the application to be carried out by national competent authorities.

3.457. The pre-application process is between national competent authorities and the undertaking which would use of the internal model under pre-application to calculate the Solvency Capital Requirement. Thus national competent authorities deal directly with the undertaking during the pre-application process in order to form a view on how prepared the undertaking is to comply with the tests and standards as set out in Articles 120 to 125 of Solvency II.

3.458. More detailed provisions on this subject can be found in EIOPA Opinion on External Models and Data⁴.

3.459. Nevertheless, national competent authorities may want to contact the external model vendor directly in order to gain information on the external model which would be used in an undertaking's internal model. This information may vary and could include, for example:

- Context of the external model;
- Historical development of the external model;
- Theoretical basis of the model and assumptions;
- Data on which the external model has been calibrated;
- Optionality available within the external model.

⁴ https://eiopa.europa.eu/fileadmin/tx_dam/files/publications/opinions/1622_001.pdf

3.460. The information gained by national competent authorities may inform their review of internal model which includes the external model provided by the vendor, but the pre-application process is entirely based on each individual internal model.

3.461. National competent authorities expect that vendors, as part of their commercial relationship with undertakings, assist their clients in preparing themselves for the use of the model during pre-application and for the compliance with the requirements particularly, but not exclusively, regarding the documentation and validation of the external model, and where appropriate, the adaptation of the model to the client's needs.

Guideline 67 – Role of service providers when using external models and data

Through the pre-application process national competent authorities should form a view on whether the insurance or reinsurance undertaking uses an outsourcing agreement when it chooses not to operate the external model directly.

Similarly, national competent authorities should form a view on whether the insurance or reinsurance undertaking, through an outsourcing agreement, mandates a service provider to perform some tasks related to the external data.

National competent authorities should make clear to the insurance or reinsurance undertaking that it should not consider such outsourcing agreements to be a justification for exemption from demonstrating that the internal model fulfils the requirements.

National competent authorities should form a view on how the insurance or reinsurance undertaking ensures that any outsourcing agreement regarding the operation of an internal model or the performance of tasks related to the external data, in application of the requirements set out in Article 49 of Solvency II, defines the duties of the parties.

National competent authorities should form a view on how the insurance or reinsurance undertaking, irrespective of which party actually performs the tasks associated with the service provided, retains overall responsibility.

3.462. National competent authorities consider that, through the outsourcing policy, as per Article 49 of Solvency II, the provider may be required to provide further evidence that appropriate checks and validation have been carried out.

3.463. In case of catastrophe models, the undertaking may mandate a reinsurance broker to run one or more catastrophe models using undertaking's specific exposures. National competent authorities form a view on how the undertaking remains responsible for demonstrating that the external models used and the tasks performed comply with the requirements.

Chapter 12: Functioning of colleges during the pre-application process for internal models for groups

3.464. In the case of a pre-application process for an internal model for a group composed of several insurance or reinsurance undertakings which are supervised by national competent authorities of different Member States, during the pre-application process, those national competent authorities work together in order to form a view about the internal model.

3.465. All the Guidelines in this Chapter apply to both:

- The pre-application process for an internal model submitted to pre-application that would be used for the calculation only of the consolidated group Solvency Capital Requirement (Article 230 of Solvency II); and
- The pre-application process for an internal model submitted to pre-application that would be used for the calculation of the consolidated group Solvency Capital Requirement as well as the Solvency Capital Requirement of at least one related undertaking included in the scope of this internal model for the calculation of the consolidated Solvency Capital Requirement (group internal models under Article 231 of Solvency II) unless otherwise stated.

3.466. In addition to the role described above, the following provisions are useful background information:

- From Article 248(3) of Solvency II, the membership of the college of supervisors shall include the group supervisor and national competent authorities of all the Member States in which the head office of all subsidiary undertakings is situated. The national competent authorities of significant branches and related

undertakings shall also be allowed to participate in the college of supervisors. However, their participation shall be limited to achieving the objective of an efficient exchange of information;

- During the pre-application process, the group supervisor consults the national competent authorities involved. The other national competent authorities within the college of supervisors, that are not involved, are also to be allowed to participate in the pre-application process. However, their participation would be limited to identifying and preventing circumstances where the exclusion of parts of the business from the scope of the internal model under pre-application could lead to a material underestimation of the risks of the group, or where the internal model could conflict with another internal model under pre-application that would be used for the calculation of the Solvency Capital Requirement of any of the insurance or reinsurance undertakings in the group;
- During the pre-application process for a group internal model under Article 231 of Solvency II, the group supervisor is expected to provide all relevant information to the other national competent authorities concerned.

Guideline 68 - Forming a view about the scope of the internal model during the pre-application process for internal models for groups

During the pre-application process for an internal model for a group, when forming a view about the appropriateness of the scope of the internal model, the group supervisor, the other national competent authorities involved and other national competent authorities identified by the college should consider at least in particular:

- (a) the significance of related undertakings within the group with respect to the risk profile of the group;**
- (b) the risk profile of related undertakings within the group compared to the overall group risk profile;**
- (c) if applicable, a transitional plan by the group to extend the scope of the model at a later stage and the timeframe to do so;**
- (d) the appropriateness of the standard formula or another internal model under pre-application that would be used for the calculation of the Solvency Capital Requirement of any related undertaking included in the scope of the internal model but**

which Solvency Capital Requirement would not be calculated with the internal model for the group; and

- (e) the appropriateness of the standard formula or another internal model under pre-application that would be used for the calculation of the Solvency Capital Requirement of any related undertaking within the group but not included in the scope of the internal model for the group.**

When forming a view about the appropriateness of the exclusion of related undertakings within the group from the scope of the internal model, the group supervisor and the other national competent authorities involved, should assess whether this exclusion by the undertaking could lead to:

- (a) an improper allocation of own funds based on individual undertaking Solvency Capital Requirements rather than contribution to risk profile of the group;**
- (b) inconsistencies that would derive from the use of the internal model to calculate the group solvency capital requirement and the use of the standard formula or a different internal model under pre-application by any related undertaking within the group to calculate its Solvency Capital Requirement;**
- (c) weaknesses in risk management of the group and related undertakings within the group resulting from the limited scope of the internal model; or**
- (d) an inadequate group Solvency Capital Requirement in relation to the risk profile of the group.**

3.467. The national competent authorities involved in the pre-application process, with the participation of the other members of the college, cooperate in assessing the justification provided by the undertaking for the scope of the internal model it would use, either full or partial, and its appropriateness.

3.468. When assessing the appropriateness of an internal model under pre-application with a limited scope, any transitional plan to extend the internal model may provide useful indication of whether the internal model would play an important role in the system of governance of the undertaking on an on-going basis.

- 3.469. In forming their view about the scope on the internal model for a group under pre-application, the national competent authorities involved take into consideration the following points:
- The undertakings included in the scope of the internal model under pre-application that would be used for the calculation of the group Solvency Capital Requirement; and
 - In case of group internal models under Article 231 of Solvency II under pre-application, the related undertakings which would use the internal model to calculate the Solvency Capital Requirement.
- 3.470. Forming a view about the scope and the intended use of an internal model under pre-application is different depending on the process (i.e. either under Article 230 or Article 231 of Solvency II) and on the situation of each related undertaking.
- 3.471. Where the exclusion of a related undertaking from the scope of the internal model could create the situation listed in the Guideline above, it is desirable that the group supervisor and national competent authorities involved consider the situations outlined below.
- 3.472. If the exclusion of the related undertaking could result in an improper allocation of own funds, assuming the Solvency Capital Requirements would be appropriate, it is desirable that particular attention is given to the technique applied to integrate the partial internal model with the standard formula as the allocation of the diversification benefit between related undertakings would be the reason for the improper allocation of own funds.
- 3.473. If the exclusion of the related undertaking could create inconsistencies from the use of more than one model, it is desirable that the national competent authorities participating in forming a view on the scope of the internal model under pre-application consider how those inconsistencies could impact the risk management system and the decision-making processes. In particular they may consider how the inconsistencies could impact the on-going compliance with the use test for the relevant internal models.
- 3.474. While evaluating the consequences of excluding related undertakings from the scope of the internal model under pre-application it is desirable that the group supervisor considers in particular whether national competent authorities of related undertakings not yet included in the scope of the internal model but which are likely to be included in a future extension of the scope of the internal model, could be provided with relevant documents to enable them to participate in the

current pre-application process and to prepare for the likely extension of the scope of the internal model.

3.475.If the exclusion of the related undertaking of the scope of the internal model under pre-application could weaken the risk management system, it is desirable that the group supervisor and national competent authorities involved seek additional explanations from the undertaking on how this risk is being addressed.

3.476.If the exclusion of a related undertaking could result in an inadequate group Solvency Capital Requirement, then some remediating action would be needed:

- If the standard formula would not be appropriate for the excluded undertaking, the national competent authority responsible for this undertaking may mention this inadequacy to the undertaking and the group supervisor may mention the possibility of an extension of the scope of the internal model;
- In case the exclusion of the undertaking could result in an inappropriate integration of the partial internal model with the standard formula because, for example, the integration technique applied fails to accurately capture some dependency between the risks or major business units within the scope of the partial internal model, and the risks or major business units outside the scope of the partial internal model, the group supervisor may mention this inadequacy.

3.477.An example of the different purposes of the pre-application process review for a related undertaking depending on different situations is outlined in the following table:

	The group internal model (Article 231) under pre-application would calculate A SCR	The internal model for a group under pre-application would not calculate A SCR
Undertaking A (related undertaking) included in the scope of the internal model for a group under pre-application for the	Review the appropriateness of the group internal model for both the calculation of A SCR and for the A contribution to the group SCR	<ul style="list-style-type: none"> • Review the appropriateness of the internal model for the A contribution to the consolidated group SCR; • Review the

<p>purpose of the group SCR calculation</p>		<p>appropriateness of the exclusion of A for the calculation of its solo SCR with the internal model</p>
<p>Undertaking A (related undertaking) not included in the scope of the internal model for a group under pre-application for the purpose of the group SCR calculation</p>	<p>Non-applicable</p>	<ul style="list-style-type: none"> • Review the appropriateness of the exclusion of A for the calculation of its SCR with the internal model; • Review the appropriateness of the exclusion of A for the calculation of the consolidated group SCR with the internal model; • Identifying and preventing the circumstances where the exclusion of parts of the business from the scope of the internal model could lead to a material underestimation of the risks of the group, or where the internal model could conflict with another internal model under pre-application that

		would be used for the calculation of the Solvency Capital Requirement of any of the insurance or reinsurance undertakings in the group
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Guideline 69 - Tasks of the group supervisor and the other national competent authorities involved and participating in the pre-application process for internal models for groups

During the pre-application process for an internal model for a group, the group supervisor and the other national competent authorities involved should agree on the most efficient and effective allocation of tasks among the different national competent authorities involved.

The group supervisor, in consultation with the other national competent authorities involved, should record the agreed allocation of tasks and set up a work plan and the communication rules to follow among the national competent authorities involved during the pre-application process.

When appropriate, the group supervisor, in consultation with the other national competent authorities involved, should update the work plan.

The group supervisor should ensure that the work plan covers the timeline, main steps and deliverables for the pre-application process.

The group supervisor should ensure that the work plan, at least:

(a) establishes when and how to consult and involve in the pre-application process the other national competent authorities involved;

(b) establishes when and how to allow the other national competent authorities within the college of supervisors to participate in the pre-application process, bearing in mind that their participation

would be limited to identifying and preventing circumstances where the exclusion of parts of the business from the scope of the internal model could lead to a material underestimation of the risks of the group, or where the internal model could conflict with another internal model under pre-application that would be used for the calculation of the Solvency Capital Requirement of any of the insurance or reinsurance undertakings in the group; and

- (c) identifies the priorities for the assessment, taking into account the scope of the internal model, the specificities of each related undertaking within the group; the risk profile of the group and related undertakings within the group and the available and relevant information about the internal model.**

Whenever a national competent authority involved identifies a substantial point of concern regarding the pre-application process, it should share its concern with the group supervisor and the other involved authorities as soon as feasible.

3.478. The work plan referred to in the Guideline may be included in the work plan of the college, as defined in the coordination arrangement. The work plan can be adapted as appropriate as the review work is proceeding.

3.479. To ensure an effective pre-application process, all national competent authorities involved make their best effort to perform the allocated tasks.

3.480. The work plan for the pre-application process would be reviewed and updated as appropriate in order for the national competent authorities involved to keep an up-to-date view of the preparedness of the undertaking for instance because of changes made to the model or change in the scope: additional reviews would be scheduled and the work plan amended accordingly. Also, a change or delay in the delivery of documentation, evidence or information by an undertaking within the group may lead the national competent authorities involved to revise the work plan. Similarly, findings and preliminary views during the review work may also lead the group supervisor to amend the work plan in some circumstances either to perform more review in a specific area of the model or of the requirements or to reallocate review work to other areas.

- 3.481. The following examples illustrate how the application process may look like in the case of group internal models under Article 231 of Solvency II.
- 3.482. Example 1: assume a group made up of a DE, FR, PL and BE entities, where FR is the group supervisor. The group submits to the FR national competent authority, an application under Art. 231 of Solvency II to use an internal model to calculate the group Solvency Capital Requirement covering FR, DE, BE but excluding PL and to calculate the Solvency Capital Requirement of the DE and FR entities and not the BE and PL ones. The joint decision with respect to the approval of the group internal model would have to be made by the national competent authorities of FR and DE (concerned national competent authorities), as the internal model would be used by the related undertakings they supervise for the calculation of their individual Solvency Capital Requirement. The national competent authority in BE would have to be involved in the assessment, and the national competent authority in PL is to be allowed to participate for the limited purpose of identifying and preventing circumstances where the exclusion of parts of the business from the scope of the internal model could lead to a material underestimation of the risks of the group, or where the internal model could conflict with another internal model that would be used for the calculation of the Solvency Capital Requirement of any of the insurance or reinsurance undertakings in the group.
- 3.483. Example 2: Assume starting from Example 1, that the group internal model would now be used to calculate the Solvency Capital Requirement for the individual undertaking of BE. In this case the new joint decision would be taken by the previous national competent authorities concerned (FR and DE) and BE (which thus becomes concerned). PL would still be allowed to participate for the limited purpose described in the previous paragraph.
- 3.484. Example 3: Assume starting from Example 1 that the scope of the internal model used for the calculation of the group Solvency Capital Requirement would be extended to PL, but the PL entity would not be using the group internal model for the calculation of its individual Solvency Capital Requirement. In this case the new joint decision would be taken by the same national competent authorities concerned as Example 1 (FR and DE). The national competent authorities in BE and PL would have to be involved in the assessment.

- 3.485. It is important to note that in the case of examples 2 and 3, the group internal model would already have been approved. However, this would not automatically lead to the approval of the extensions of the use of the internal model.
- 3.486. It is expected that, in the case of a pre-application process for group internal model under Article 231 of Solvency II, the national competent authorities concerned contribute more heavily and more actively to the pre-application process than the national competent authorities only involved but not concerned.
- 3.487. In the case of a group internal models under Article 231 of Solvency II, where the internal model would be only used for the calculation of the Solvency Capital Requirement of related undertakings whose head offices are based in the same Member State as the group supervisor, the decision would be taken by the group supervisor only, although all national competent authorities involved would be consulted.
- 3.488. In all other circumstances than the in previous paragraph, for group internal model under Article 231 of Solvency II, more than one national competent authority would be concerned in the joint decision.
- 3.489. This Guideline aims to ensure efficiency and avoid diverging and inconsistent views on the same topic between different national competent authorities. In essence, the pre-application process for an internal model for the calculation of the group Solvency Capital Requirement is a combination of off-site activities and on-site examinations carried out at both group and related undertaking levels for the different components of the internal model.
- 3.490. The contribution of each national competent authority in the pre-application process is agreed upon by the group supervisor and the other national competent authorities involved in the pre-application process. The process needs to be adapted to suit the pre-application. Nevertheless a process that maximises the efficient use of the resources is desirable. For this aim, the participation in colleges provides the opportunity for a horizontal view that may help spreading observed good practices among colleges.
- 3.491. It is desirable not to duplicate work related to the pre-application process of an internal model methodology which would be used consistently across the different entities of the groups. Although national competent authorities involved in the process may have different views about the adequacy of this methodology for the

different related undertakings, it would be more efficient to coordinate the review activities.

- 3.492. In the case of pre-applications for a group internal model under Article 231 of Solvency II, each national competent authority review the implementation of the common methodology referred to in the paragraph above for their respective related undertaking, although aiming at leveraging this work through common on-site examinations. This approach is not contradictory to the aim of an efficient allocation of tasks as long as this implementation can be assessed at the level of the related undertaking.
- 3.493. In order to achieve the most efficient process in allocating tasks, the group supervisor and the other national competent authorities involved may in particular take into consideration for each component of the group internal model under pre-application:
- The persons who are responsible for designing the component;
 - The persons who are responsible for validating the component;
 - The persons who are responsible for providing the data;
 - The persons who are responsible for the parameterisation; and
 - How the component is integrated in the internal model at group level and/or at related undertaking level.
- 3.494. The group supervisor and the other national competent authorities involved in the process set up a work plan to allow each authority involved to give its views on its area of competence while optimising the use of the resources of all national competent authorities.
- 3.495. For example, if component "A" of the internal model under pre-application applies the same methodologies through-out the group and the tools provided by the group are used by local entities, on local data, it is likely that the process would be more efficient as it leads to:
- Common off-site activities at group level to study the methodology;
 - Common on-site examination at group level to assess the tools; and
 - Separate on-site local examination by the national competent authorities involved to check that data is adequate and by the authorities concerned to check that the component is implemented properly.
- 3.496. If, on the other hand, component "B" is strictly limited to undertaking A, it may be more efficient to:

- Arrange on-site examinations at local level involving the national competent authority of the individual undertakings and if it chooses to do so the group supervisor; and
- Apply a process at group level to assess how this component is integrated in the group internal model under pre-application.

Guideline 70 - Joint on-site examinations carried out during the pre-application process for internal models for groups

During the pre-application process for an internal model for a group, the group supervisor and the other national competent authorities involved should propose and discuss when and how to organize joint on-site examinations to verify any information concerning the pre-application process, with the aim of ensuring the effectiveness of this process.

The national competent authorities proposing a joint on-site examination should inform the group supervisor by indicating the scope and purpose of this examination, taking into account the objectives of joint on-site examinations in relation to the pre-application process as defined by the national competent authorities involved.

The group supervisor should then notify the other national competent authorities involved in the pre-application process, EIOPA, and, where relevant, other national competent authorities within the college, national competent authorities of significant branches as referred to in Article 248(3) of Solvency II, and the national competent authorities responsible for the supervision of other branches.

Once the national competent authorities participating in the joint on-site examination have been identified, they should discuss and agree the final scope, purpose, structure and allocation of tasks of the examination, including who is leading the review.

The national competent authority organising the on-site examination, if other than the group supervisor, should provide the relevant documentation to the group supervisor. The group supervisor should make the relevant documentation available to the national competent authorities involved in the pre-application process, to the other national competent authorities

participating in the joint on-site examination and to EIOPA. The group supervisor should provide the rest of college members and participants with a list of the relevant documentation received and provide them with the relevant documentation upon specific request.

On the basis of a report stating the main findings of the joint on-site examination, the national competent authority organising the on-site examination should discuss with the national competent authorities involved the outcome of the joint on-site examination and the actions to be taken.

The group supervisor should notify the rest of college members about the outcome and actions as part of the agreed communication within the college.

When they consider appropriate, the group supervisor or the national competent authority organising the on-site examination should also inform the undertaking of the outcome of the joint on-site examination.

3.497. This Guideline applies to joint on-site examinations carried out during the pre-application process of an internal model for groups organized either by the group supervisor, by another national competent authority involved, or by one of the other national competent authorities within the college.

3.498. For the purpose of pre-application process, national competent authorities involved or other authorities within the college may also in addition of joint on-site examinations, conduct local on-site examinations. This Guideline is applicable to joint on-site examinations, not to local ones.

3.499. Verifying information is not limited to checking information for accuracy based on what has already been submitted by the undertaking, or from off-site analysis carried out by the national competent authorities within the college as part of the pre-application process: it includes in the broadest sense investigating, probing and evaluating any information needed for the pre-application process.

3.500. Some joint on-site examinations would be already foreseen in the work plan agreed for the pre-application process, but further examinations can take place when deemed necessary for an effective pre-application process.

- 3.501. The participation in joint on-site examinations organised by the group supervisor of other national competent authorities involved is very useful for the efficiency of the process.
- 3.502. In particular such participation brings expertise about local specific products and helps the group supervisor and other national competent authorities involved in pre-application. The national competent authorities who participated in the joint on-site examinations provide input to the national competent authority responsible for reporting the main findings.
- 3.503. In the case of group internal models under Article 231 of Solvency II under pre-application, participating to joint on-site examinations is particularly useful for national competent authorities concerned, because some specificities designed at group level would be relevant for their individual Solvency Capital Requirement calculation by the group internal model under pre-application.
- 3.504. Joint on-site examinations organised by national competent authorities involved other than the group supervisor may be useful in the context of both internal models under pre-application for the calculation only of the group Solvency Capital Requirement and group internal models for the calculation of both, the group Solvency Capital Requirement and one or several individual Solvency Capital Requirements. In the first case, the national competent authorities involved need to form a view on how the undertaking's risk profile would be reflected in the calculation of the consolidated group Solvency Capital Requirement, while in the second case, the national competent authority concerned also aims at assessing whether the group internal model would be appropriate to derive the Solvency Capital Requirement of the related undertaking. The national competent authorities who participated in the joint on-site examinations provide input to the national competent authority responsible for reporting the main findings.
- 3.505. If the joint on-site examination is organised by a national competent authority of a related undertaking included in the scope of the internal model for a group under pre-application, but which Solvency Capital Requirement would not be calculated by the internal model, this on-site examination may cover some of the following objectives:
- Assess the appropriateness of the individual contribution the related undertaking would have to the calculation of the group Solvency Capital Requirement using the internal model;

- Assess the appropriateness of the exclusion of the relevant related undertaking from the calculation of its Solvency Capital Requirement using the internal model;
- Assess the appropriateness of the internal model under pre-application itself, including in particular the reasons for the exclusion of undertakings from the internal model for the calculation of the group solvency, and the reasons why the internal model would cover a related undertaking for the calculation of the consolidated group Solvency Capital Requirement but it would not be used to calculate the Solvency Capital Requirement of that related undertaking.

3.506. In the case of a group internal model under Article 231 of Solvency II under pre-application, if the joint on-site examination is organised by a national competent authority concerned, in addition to the previous paragraph, the examination may cover the assessment whether the group internal model under pre-application would be appropriate to calculate the individual Solvency Capital Requirement of the related undertaking, in particular, for the fulfilment of the tests and standards for this related undertaking.

3.507. A joint on-site examination may be also organized by one of the national competent authorities of a related undertaking not included in the scope of the internal model under pre-application. This on site-examination can only have the aim of identifying and preventing circumstances where the exclusion of parts of the business from the scope of the internal model under pre-application could lead to a material underestimation of the risks of the group, or where the internal model could conflict with an internal model that would be used for the calculation of the Solvency Capital Requirement of any of the insurance or reinsurance undertakings in the group.

3.508. The communication to the undertaking could take the form of a communication from the college, when national competent authorities taking part in the on-site examination or involved in the pre-application process for the internal model for a group consider it appropriate.

Guideline 71 - Off-site activities on internal models during the pre-application process for internal models for groups

During the pre-application process for an internal model for a group, national competent authorities involved should share and discuss the

main findings of their off-site activities with the group supervisor and the other national competent authorities involved.

The national competent authorities involved should share the approach they are following in the review of the elements of the internal model with the group supervisor and the other national competent authorities involved.

If, as a result of this sharing, the national competent authorities involved identify substantial differences in the approaches followed, they should discuss and they should agree on a process to develop consistent approaches when they consider appropriate to have this alignment.

When they deem appropriate, the national competent authorities involved should consider sharing the tools and techniques they are using for the review of the elements of the internal model with the other national competent authorities involved.

- 3.509. The aim of this Guideline is to ensure that all the national competent authorities involved are aware of the relevant information necessary for an effective pre-application process.
- 3.510. This can be done at college meetings or other specialized teams meetings, by written procedure or any other appropriate channel, bearing in mind the responsibility of the group supervisor in the sharing of information within the college.
- 3.511. Major off-site activities would be foreseen in the work plan for the pre-application process, but further off-site activities can take place when deemed necessary for an effective pre-application process.
- 3.512. Off-site activities can be conducted by national competent authorities individually or in coordination between several national competent authorities involved or by other national competent authorities within the college for the relevant purposes.
- 3.513. The alignment of approaches for the review of the internal model under pre-application is important to ensure a convergent and efficient pre-application process.
- 3.514. This cannot justify a failure of the use test, not meeting the statistical quality standards or not properly validating the internal model and its use or any other requirement, for undertakings using the internal model for the calculation of the Solvency Capital Requirement.

Guideline 72 - Involvement of third country national competent authorities during the pre-application process for internal models for groups

During the pre-application process for an internal model for a group, the group supervisor and the other national competent authorities involved should form a view on whether third country national competent authorities should be consulted, in the case that the contribution of the third country undertaking to the group's risk exposure is material.

Before consulting the third country national competent authority, the group supervisor, with the support of the national competent authorities involved, should take appropriate steps to ensure that the legislative provisions on the confidentiality of information of the jurisdiction where the third country national competent authority is situated are equivalent to the professional secrecy requirements resulting from Solvency II, other EU Directives and national legislation applicable to the involved national competent authorities.