

Guidance Note FSI GN 5

Calculation of the SCR Using a Full or Partial Internal Model

Objectives of this Guidance Note

The FSI Guidance Notes aim to assist insurers in complying with the requirements outlined in the Financial Soundness Standards for Insurers. While the Standards have the force of law and are used to establish minimum requirements with which insurers must comply, the Guidance Notes provide guidance only and do not have the same level of enforceability as the Standards. Insurers are not obliged to adopt the guidance, and are free to demonstrate that the requirements of the Standards are otherwise met.

Guidance Note FSI GN 5 sets out practices and guidelines aimed to assist insurers with their compliance with the requirements of FSI 5 (Calculation of the SCR Using a Full or Partial Internal Model). Not all practices or guidelines in this Guidance Note may be relevant to all insurers, and some aspects may need to be varied based on an insurer's individual circumstances and characteristics. Subject to the requirements of FSI 5 (Calculation of the SCR Using a Full or Partial Internal Model), insurers have the flexibility to design, operate, maintain and document their internal model in the way most suited to the nature, size, complexity and risk profile of their business.

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Chapter 1: Statistical Quality

This Chapter provides additional guidance for insurers on ways to demonstrate adherence to the statistical quality requirements set out in section 8.4 of FSI 5 (Calculation of the SCR Using a Full or Partial Internal Model).

A. Adequate, applicable and relevant actuarial and statistical techniques

1. Insurers should be able to provide evidence that the actuarial and statistical techniques used in the internal model meet the following criteria:
 - a) Applicable: The insurer has the resources (human and IT) necessary to implement, test and maintain the techniques chosen;
 - b) Relevant: The techniques chosen are such that the internal model and its results can act as aids to risk management and decision making;
 - c) Appropriate: The techniques chosen are suited to the modelling goals and are adapted to the available input and data;
 - d) Transparent: The methodology should reveal the logical connection between inputs (data and assumptions) and outputs (e.g. probability distribution forecast);
 - e) Up-to-date: The methodology is based on the best evidence available at the time the model is built, is scrutinised repeatedly and, when necessary, is modified or replaced;
 - f) Detailed and parsimonious: The model balances between complexity and parsimony, such that the model structure is as simple as possible while still capturing all essential characteristics at the necessary level of detail; and
 - g) Robust and sensitive: The techniques used are suited to the internal model, enabling it to provide results that are stable while at the same time, taking into account changes in the external and internal environment.

B. Consistency of calculation methods

1. Insurers should be able to demonstrate that the methods used to calculate the probability distribution forecast are consistent with the methods used to value technical provisions as set out in FSI 2.2 (Valuation of Technical Provisions). Where there are differences in methods employed, insurers should be able to identify, document and justify these differences.
2. Any valuations or models used for the internal model should also be consistent with methods used for other purposes (e.g. models for the valuation of options). Insurers should be able to explain, justify and document all deviations concerning methodology and assumptions used across different purposes, including the materiality of any deviations identified.

C. Current and credible information

1. Insurers should be able to demonstrate that the methods used to calculate the probability distribution forecast are based on current and credible information. Insurers should perform regular methodological reviews, taking into account relevant data that are available, information on assumptions, and possible alternative methods.

2. Insurers should be able to demonstrate that they keep track of developments in modelling methodologies and that they take these into account in their ongoing review of the model.
3. Insurers should be able to provide evidence regarding the credibility of information used to form the basis of methods applied.

D. Justification of underlying assumptions

1. Insurers should identify and document all internal model assumptions, their justification and the methodology used to set those assumptions, taking into account their significance, limitations, model risk, and possible alternatives.
2. Insurers should assess the materiality of the assumptions they employ, and test the impact of possible alternative assumptions using quantitative and/or qualitative assessments, where practicable and reasonable. The types of tests and assessments that should be performed in relation to the choice of assumptions should have regard to the principle of proportionality.

Chapter 2: Validation Tools

Section 10.7 of FSI 5 (Calculation of the SCR Using a Full or Partial Internal Model) sets out a range of validation tools that insurers should consider as part of their model validation process. This Chapter provides additional guidance on what each of these validation tools entail, and how they may be used for the purposes of validating an internal model.

A. Back-testing

1. Back-testing involves the comparison of modelling results and assumptions against actual experience. Insurers should carry out back-testing of their internal model on at least an annual basis.
2. Where actual realisations may not be directly available, back-testing may be performed by comparing the model forecasts to realisations from a comparable data set. Insurers should be able to justify why any comparable data set they choose is appropriate.
3. Trigger events, such as the realisation of a loss above a predetermined limit, may be defined to initiate further investigations such as the:
 - a) Identification of the portfolio where the event was triggered;
 - b) Analysis of the root causes that led to this event, such as movements of market prices or changes in other parameters;
 - c) Examination of how the root causes are reflected in the internal model with the aim of identifying potential model weaknesses; and
 - d) Comparing large movements in profits and losses to the existing stress tests to provide useful indications of the continued validity of the stress test assumptions.

While trigger events may be helpful in analysing reasons for material divergences between expected and actual results, insurers should, on a regular basis, also analyse the results of back-testing that are not above the trigger event.

4. Back-testing results should be analysed to identify the reason for the divergence between the modelled results and reality. Insurers may utilise other validation tools and qualitative analysis to determine whether a deviation reflects a possible weakness in the model or otherwise.
5. The results of back-testing and any additional analysis should be discussed at the appropriate level of the insurer's management. These discussions should include whether the deviations should result in changes to the model, including the model structure or some parameter values.

B. Sensitivity analysis and other tests on the stability of the model

1. Insurers should perform tests on the robustness of their internal model using sensitivity analysis and other tests to assess the stability of the model.
2. Sensitivity analysis typically involves introducing small changes to assumptions and assessing its impact on model outputs. Insurers should be able to explain the reasons for any material sensitivity and how the sensitivity is taken into account in the decision-making process. The sensitivity testing should also illustrate how the cause-effect relationship is modelled adequately.

3. Sensitivity testing is especially important in validating parts of the internal model which place particular reliance on expert judgement, or where the expert judgement has a material impact on the results.
4. Apart from sensitivity testing, further tests may be required to assess whether the results produced by the internal model are stable and robust. These tests may include an analysis of the stability of the outputs for different calculations of the internal model using the same input data. A further run of the model should be able to produce results that are not significantly different where there have been no changes to the input parameters.
5. Other tests may include reviewing model results derived from changes in the model architecture, structure, formula, parameters and/or numerical procedures to test for stability.
6. Insurers should perform a critical analysis of the results from the sensitivity and stability analysis to determine whether changes are required to the model.
7. Insurer should identify and document the most significant assumptions and demonstrate the effect on the results to changes in the assumptions.
8. The results from sensitivity analysis and other stability testing should be reviewed regularly at the appropriate levels of the insurer's management, and should be considered when establishing policies and limits.

C. Stress testing and scenario analysis

1. Stress testing and scenario analysis aim to provide a more complete picture of what results may look like under various conditions. As a validation tool, stress testing and scenario analysis may identify possible limitations of the model, and assist users of the outputs of the model to understand how these limitations should be taken into account in decision-making processes.
2. Insurers should develop their own stress tests and scenario analyses that reflect the characteristics of their own portfolios, and be able to provide the Prudential Authority with a description of the methodology used to select stresses and scenarios.
3. Insurers should ensure that its stress testing and scenario analysis are consistently and comprehensively applied throughout its business.
4. The internal model should embody assumptions about relationships between variables and about their behaviour under periods of stress. Stress testing and scenario analysis may assist to validate that these relationships are appropriately reflected in the internal model.
5. The results of stress testing and scenario analysis should be monitored, assessed and updated on a regular basis. Insurers should analyse the results, review the interaction of risks and mitigating actions, and revise scenarios and calibrations in light of the results. The results should be compared to risk tolerance or limits as defined by the insurer. Senior management should be involved in overseeing a comprehensive and coordinated stress testing and scenario analysis program.

6. Insurers must also conduct reverse stress tests to understand what stresses would seriously threaten their viability. This reverse stress testing should involve the input of the board of directors and be adequately documented.

D. Profit and loss attribution

1. Insurers should review the causes and sources of profits and losses for each major business unit at least annually. This attribution should focus on categorising the causes of profits and losses by risk, including risks covered by the internal model and risks not covered by the internal model.
2. Any indication from the results of the profit and loss attribution which imply that the risk categorisation of the internal model does not reflect the risk profile of the insurer should be escalated to senior management. If further qualitative and quantitative analyses of the results show that the internal model does not reflect the insurer's risk profile appropriately, appropriate adjustments to the model should be made.
3. The attribution of profit and loss should be made in an objective and transparent manner, and be consistent over time.

Chapter 3: Internal Model Documentation

Section 11 of FSI 5 (Calculation of the SCR Using a Full or Partial Internal Model) sets out the minimum documentation requirements in relation to use of an internal model. This Chapter provides additional guidance on items that the Prudential Authority expects to be included in an insurer's internal model documentation, based on the requirements set out in section 11 of FSI 5.

A. Structure of the document

1. Insurers are not required to set out all internal model documentation within a single document. Insurers may include a list or mapping of all documents that they consider to be relevant to the internal model, and where and how these documents can be accessed. This list should be considered to be a key part of the documentation itself. The documentation should identify those responsible for compiling the list and/or updating documents.

B. Known drawbacks and weaknesses of the model

1. The documentation should describe the drawbacks and weaknesses of the internal model, including those that have a material impact on the appropriateness of the model and the circumstances under which it does not work effectively.
2. The documentation of circumstances under which an insurer believes that the internal model does not work effectively should address both design and operational details of the internal model, as well as the possible implications.
3. When assessing and documenting circumstances where the internal model does not work effectively, insurers should make note of the following:
 - a) Limitations in risk modelling and the scope of risks captured;
 - b) The nature, degree and sources of uncertainty surrounding the results of the internal model, and sensitivity of key assumptions;
 - c) Shortcoming and/or deficiencies in the input data;
 - d) Any specific features or limitations of the internal model, or any circumstances that present potential concerns or would significantly increase the uncertainty of the results of the internal model;
 - e) Risks arising out of the use of external models or data in the internal model; and
 - f) Insufficiencies in IT systems, governance and related controls surrounding the internal model.

C. Overview of historical development

1. The documentation should include details regarding the classification and justification of the major businesses units included as part of the internal model.
2. The overview of the historical development of the internal model should include the evolution of methodologies, assumptions and data over time, to allow an independent knowledgeable third-party to understand key development steps and their reasoning.
3. A record of version control of the internal model should be documented.

4. The documentation should include reasons for decisions on assumptions, data and parameters and their development over time. Where adjustments are made to the underlying data, the nature, amount, and reasons for the adjustments should be clearly stated.

D. Major changes

1. Changes made to the design or the operational details of the internal model, whether minor or major, should be documented, including the reasons for the changes and adherence to the insurer's model change policy.
2. When a major change has had a significant impact on the outcome of the internal model, outcomes from both the revised internal model and the previous version should be identified, quantified and documented.

E. Operational details

1. Insurers should have documented policies, controls and procedures in place for the management of the operational details of the internal model, including written responsibilities and accountabilities. These should be clearly understood by all parties involved and be reviewed at least annually.
2. The documentation should include a description of technology and software tools used to implement the internal model, and whether they are internal or external solutions. It should be thorough, sufficiently detailed and complete to support a review by an independent knowledgeable third-party. The description should demonstrate how the relevant technology and software are included in the insurer's contingency plans, security policies and business recovery plans.
3. The documentation should contain a directory of the data used in the internal model (specifying its source, characteristics and usage), and explicit information about data management as per the insurer's data policy.

F. Theory, assumptions, and mathematical and empirical basis

1. The documentation should set out the mathematical methods used in the internal model, and a description of the theories and empirical basis underlying the mathematical methods. The documentation should include the reasons for selecting a specific method, and an elaboration on the techniques used to meet the nature and complexity of the item under consideration.
2. The documentation should include an explanation of the methodology used to set assumptions, including:
 - a) The inputs on which the choice of assumptions is based;
 - b) The objectives of the choice of assumptions and the criteria used for determining the appropriateness of the choice; and
 - c) Any limitations in the choice of assumptions made.
3. All algorithms related to the mathematical methods should be documented, including the reasons for the selection of the algorithms and any known drawbacks or weaknesses.

4. The documentation should include reasons for decisions on assumptions, data and parameters. Where complex approaches have been used, a more detailed description of the approach should be given.
5. The documentation should include all use of expert judgment on assumptions, data and parameters. Insurers should have thorough documentation on expert judgement, including details on why expert judgment has been applied, the extent that expert judgment is likely to affect the internal model result, and how expert judgment has been evaluated. Where an expert judgment has been made, the name, experience and qualifications of the person or people making the judgment should be documented.

G. Specification on compliance with prudential requirements

1. The documentation should detail how compliance with this Standard is achieved, including the processes, policies, systems and controls in place to satisfy the requirements of each section of this Standard.