

# The Standard Formula: A Guide to Solvency II

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## Chapter 9 Internal Models

### Introduction

There are two main methods of calculating the solvency capital requirement (SCR) under Solvency II, the “standard formula” and “internal model” methods:

- a. The standard formula method, as its name suggests, is the default approach and is a standard set of rules which apply unless a (re)insurer has an internal model. Nonetheless, calculation of the SCR under the standard formula method is complex, involving many assumptions and consideration of seven categories of risk and within that, twenty-two sub-categories — and a degree of standardisation that may not always be optimal or appropriate; and
- b. Under the alternative, internal model method, a (re)insurer must analyse data relating to its own risks and develop its own assumptions, calibrations and correlations. Stochastic models and other sophisticated statistical techniques will typically be used. The IM will be bespoke to the (re)insurer and may be voluntarily adopted with regulatory approval or, in theory at least, imposed upon the (re)insurer.

Although the IM is bespoke to the (re)insurer in question, the Prudential Regulation Authority (PRA) requires benchmarking to ensure there is a degree of consistency between IM firms. In practice this may, to a degree, limit the individuality of firms’ IMs. The PRA may require a (re)insurer to run its IM on relevant benchmark portfolios, using assumptions based on external data, to verify the calibration of the IM and to check that its specification is in line with generally accepted market practice. Other requirements for the IM include: (i) an annual review of causes and sources of profits and losses and attribution of risk categories to those; and (ii) a regular cycle of IM validation and documentation.

For larger, more complex businesses, an IM is more likely to reflect the risk profile of the (re)insurer more accurately than use of the standard formula. Generally, firms will choose whether to apply for approval to use an IM, although a supervisor may require a (re)insurer to use a full or partial IM (or, in some cases, a capital add-on to the standard formula) to calculate its SCR if the risk profile of the (re)insurer deviates significantly from the assumptions underlying the standard formula.<sup>286</sup>

A (re)insurer may also choose a partial IM where a particular aspect of its business does not fit well within the standard formula. In that case, it must explain and justify the reason for the limited scope of the model in its approval application. The partial IM must result in an SCR which reflects the risk profile of the (re)insurer more appropriately and must integrate into the SCR standard formula.<sup>287</sup>

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<sup>286</sup> Article 119 of the Solvency II Directive.

<sup>287</sup> Article 239 of the Level 2 Delegated Regulation; SCR — Internal Models 4.2(2) and (3).

Following the UK's departure from the European Union on 31 December 2020, the UK's divergence from EU-derived rules includes liberalisation of the EU Solvency II regime towards a new Solvency UK, moving the UK back toward a less prescriptive and more principles-based regulatory rule set. To date, these changes have touched lightly on the area of IMs (see further below), and we expect the PRA to continue to tweak its approach to IMs in the coming years.

## 1. Advantages of an Internal Model

Advantages to an IM typically include:

- a. **Sophistication.** An IM generally allows a (re)insurer to reflect better the complexities of a multinational or specialist insurance business when compared to the standard formula.
- b. **Risk sensitivity.** An IM tracks risks more accurately and, therefore, overall capital will be more accurately determined when compared to the standard formula. Less capital leads to lower costs of capital, leading to cost advantages and the potential to utilise capital more efficiently within the business.
- c. **Risk awareness.** Developing an IM requires a (re)insurer to invest time and resources in understanding the risks of the business at a fundamental level.
- d. **Flexibility.** More flexibility in how the (re)insurer takes credit for certain risk mitigation techniques it has implemented. IMs develop over time and can respond more quickly than the standard formula to changes in a (re)insurer's risk landscape.
- e. **Duration.** An IM permits a (re)insurer to calibrate its SCR using a longer timescale than the standard formula.<sup>288</sup> This may allow insurers to accommodate longer-term considerations into their IMs, such as sustainability risks.
- f. **Data.** An IM provides the (re)insurer with more data which can be used to make positive business decisions. For example, the model can provide information on different return periods which can be extremely useful.

Originally it was assumed that smaller companies would use the standard formula at first, and graduate to IMs at a later stage. In practice, however, the hoped-for benefits of industry-wide use of IMs have not been borne out. The cost of developing an IM typically runs to tens of millions even for mid-sized companies, and hundreds of millions for larger companies.

Further, the capital benefit of using an IM has sometimes proved illusory, as supervisors tend to use the approval process to enforce the inclusion of conservatism into assumptions that concern them.

Moreover, practice has evolved and moved away from the original concept of the SCR. The original concept for Solvency II was that all insurers would have to hold capital of at least 100% of SCR. Many regulators now expect companies to document their "risk appetite" in a policy, with firms now generally expected to set their risk appetite targets at perhaps 130% of SCR for a company with a strong parent and parental guarantees, to 150% and perhaps even more for a self-standing company. Publicly quoted companies typically run at levels in excess of 180% of SCR. Frequently, you can see coverage levels even higher. Effectively, SCR has become a kind of minimum capital requirement (or MCR) and risk appetite has become the new SCR. Relatedly, supervisors have typically required the larger companies in their market, and those with particularly complex businesses, to adopt an IM — which can be viewed as a means of supporting this conservatism.

## 2. Requirements for Use of an IM

### Model Approval

A (re)insurer may only calculate its SCR using a full or partial IM if it has been granted IM approval, and only to the extent of that approval.<sup>289</sup> Once approval has been granted, the (re)insurer is required to use the model to calculate its SCR.

### Use Test

At the core of the use test is the requirement that firms can demonstrate that the IM is "widely used in and plays an important role in their system of governance".<sup>290</sup> Insurers are expected to develop systems and controls to identify, measure and manage each risk. The use test specifies that they should use the same models for this purpose as are used to calculate their best estimate of liabilities (or BEL) and SCR. The idea is that proper risk management should not be a compliance issue, but sit at the heart of running the business, including as follows:

- a. The model supports relevant decision-making processes, including the setting of the business strategy.
- b. The model and its results are regularly discussed and reviewed by the (re)insurer's administrative, management or supervisory body (AMSB).
- c. All material quantifiable risks identified by the risk management system and which are within scope of the IM are covered by the model.
- d. The (re)insurer uses the IM to assess the impact on its risk profile of material decisions.
- e. The outputs from the IM are taken into account in formulating risk strategies, including risk tolerance limits.
- f. The IM outputs are included in internal risk management reporting procedures.

<sup>288</sup> Article 122 of the Solvency II Directive and SCR Internal Models 12.1.

<sup>289</sup> SCR — Internal Models 2.1.

<sup>290</sup> Article 120 of the Solvency II Directive.

- g. Quantification and ranking of risks produced by the IM trigger risk management actions where relevant.
- h. Relevant change procedures are followed.<sup>291</sup>

### The Role of the Board

The PRA also stresses the responsibilities of a (re)insurer's board.<sup>292</sup> Although it is not necessary for all board members to be technical experts as such, the PRA does, however, expect board members to be able to understand and explain areas such as the key strengths, limitations and judgements within the model; assumptions and judgements that have the most material impact on the model output; and key sources of information and advice which the board has relied on. This includes knowledge as follows:

- a. The structure of the IM.
- b. The way the model fits to the business and is integrated into the risk management system.
- c. The scope and purpose of the IM.
- d. The risks that are or are not covered by the model.
- e. The general methodology applied in the IM calculations.
- f. The limitations of the IM.
- g. The diversification effects taken into account in the IM.

The PRA also expects that the executive should be able to explain the (re)insurer's IM in simple and transparent terms to the non-executive directors (NEDs) — and for NEDs to challenge how the viability and sustainability of the business model, risk appetite and management framework are reflected in the IM.

### 3. Data Quality Standards

The IM regime specifies statistical quality standards.<sup>293</sup> Accordingly:

- a. The methods used to calculate the IM must:
  - i. Be based on adequate, applicable and relevant actuarial and statistical techniques.
  - ii. Be based upon current and credible information and realistic assumptions.
  - iii. Be consistent with the methods used to calculate technical provisions.
  - iv. Allow the IM to rank risk in a way which is sufficient to ensure that it is widely used and plays an important part in the (re)insurer's system of governance and capital allocation.

<sup>291</sup> Articles 223 to 226 of the Level 2 Delegated Regulation.

<sup>292</sup> SCR — Internal Models 7.1 (which implements Article 116 of the Solvency II Directive).

<sup>293</sup> SCR — Internal Models 6.3, SS12/16 (Changes to IMs used by UK insurance firms) and SS17/16.

- b. Data used must be accurate, complete and appropriate and data sets used in the calculation of the probability distribution forecasts must be updated at least annually.
- c. The model must cover all of the material risks to which the (re)insurer is exposed, including at a minimum the risks set out in SCR.
- d. The model must accurately assess particular risks associated with financial guarantees and contractual options, where material, and the risks associated with both policyholder options and the (re)insurer's contractual options, taking into account the impact that future changes in financial and non-financial conditions may have on the exercise of those options.
- e. The model must take account of all payments to policyholders which it expects to make, whether or not guaranteed contractually.
- f. Dependencies within and across risk categories can only be taken into account in the IM with respect to diversification effects if the PRA is satisfied that the (re)insurer's system for measuring diversification effects is adequate.
- g. The effect of risk mitigation techniques can only be taken into account in the IM if and to the extent that credit risk and other risks arising from the use of the technique(s) are properly reflected in the model.
- h. Future management actions can only be taken into account in the IM if and to the extent that the (re)insurer would reasonably expect to carry them out in specific circumstances and the model makes allowance for the time necessary to implement the actions.

### 4. IM Approval

A (re)insurer may only use an IM with — and to the extent of — supervisory approval.<sup>294</sup> Once approval has been granted, the (re)insurer is required to use the model to calculate its SCR.

An application for approval of an IM must be decided by the supervisory authority within six months from receipt of the “complete” application. The application should be accompanied by the (re)insurer's IM change policy, which also requires approval.<sup>295</sup> In practice, the overall process is likely to take up to a year, with submissions typically running to thousands of pages — the regulator (in the usual way) will wish to see drafts before final submission, which is a de facto extension of the formal timeline.

<sup>294</sup> Regulation 48 of The Solvency 2 Regulations and SCR — Internal Models 3.1. See also the Internal Model Guidelines.

<sup>295</sup> SCR — Internal Models 3.3.

## 5. Other Requirements

Other requirements for the IM include:<sup>296</sup>

- a. An annual review of causes and sources of profits and losses and attribution of risk categories to causes and sources of profits and losses.
- b. A regular cycle of IM validation.
- c. Documentation of the IM.
- d. Reporting of the outputs of that model so that the PRA can supervise the IM on an ongoing basis and monitor its performance over time.

## 6. Changes to IMs

Once an IM has been approved, the ability of a (re)insurer to make changes to the model is restricted:<sup>297</sup>

- a. A (re)insurer may not make any changes to its model which are not in accordance with its IM change policy (which will have been approved as part of the IM approval).
- b. Minor changes to the model which are in accordance with the policy can be made without PRA approval.
- c. Major changes to the model — as well as changes to the IM change policy — must be approved in advance by the PRA.
- d. The PRA expects firms to engage as early as possible with their supervision team about planned changes to their IMs.
- e. The PRA expects firms to submit no more than one model change application per year, although the application could include several individual major changes.
- f. In unusual circumstances, there may be more than one application in a year.

Transactions such as an acquisition or investment in a new asset class could lead to a change in the (re)insurer's risk profile requiring a model change application. It may not always be possible to obtain approval prior to the transaction, in which case the (re)insurer should discuss with the PRA a way forward.

Firms should provide a summary of their changes, the reasons for changes, the potential impact and the intended timescales. They should also articulate how they prioritised their changes as opposed to other model improvements.

It is important to include qualitative and quantitative indicators in the model change policy. The PRA encourages firms to consider the appropriateness of having different indicators or threshold levels for different risks or components of the model. It can be helpful if firms provide examples of model changes that meet their major change indicators in order to demonstrate the appropriateness of thresholds chosen.

<sup>296</sup> Articles 240 to 244 of the Level 2 Delegated Regulation and SCR — Internal Models 13 to 15; SS25/15.

<sup>297</sup> SCR — Internal Models 6.3, SS12/16 (Changes to IMs used by UK insurance firms) and SS17/16.

Once a formal IM application has been submitted to the PRA, there is limited opportunity for firms to make substantive changes. Where changes are material, a new application is likely to be required. Alternatively, firms themselves have an option to “stop the clock” on the current application.

If a series of minor model changes would amount to a major change, then they will be regarded as such. That said, an annual reset of minor model change accumulation will apply so that firms may reset, at the end of an annual cycle, minor model changes which, when accumulated, do not trigger the major change threshold. This is subject to an assessment<sup>298</sup> (i) by the (re)insurer pursuant to an established governance procedure as to whether a combination of minor changes would constitute a major model change; and (ii) by the PRA via review of the quarterly minor model change reports, with formal approval not being required.

## 7. Solvency UK

Following the UK's departure from the European Union on 31 December 2020, the UK is moving away from the EU's Solvency II regime, adapting Solvency II to the needs of the UK insurance market.

As part of this process, on 29 June 2023, the PRA released [Consultation Paper CP 12/23](#) (the CP) setting out its proposals across a wide range of areas, including IMs. See our 19 July 2023 client alert “[From Solvency II to Solvency UK: The PRA Provides Further Details of Its Post-Brexit Solvency II Reforms.](#)”

For IMs, the PRA will move away from a number of prescriptive requirements towards a smaller number of more principles-based requirements, for example, around modelling standards.

In summary, the PRA reforms will:

- a. Streamline the tests and standards required for new IMs and changes to IMs, while ensuring that appropriate IM standards are maintained.
- b. Introduce more flexibility when the PRA grants new permissions and variations to enable firms to use IMs to calculate their SCR.
- c. Implement a range of IM approval safeguards that could be used to bring an IM that is not wholly compliant into compliance with the calibration standards and mitigate the risks arising from such non-compliance in all other circumstances.
- d. Introduce an ongoing IM review framework, building on the PRA's existing supervisory review processes.
- e. Introduce an alternative to outright rejection of an IM application, namely imposition of one or two new safeguards: a residual capital add-on tool, and model use requirements.

<sup>298</sup> SS17/16.

The PRA has confirmed its intent in Policy Statement 2/24 to determine the outcome of a complete application within six months from the date of receipt of the application, to provide the (re)insurer with a written notice of that determination and will make reasonable efforts to do so. The changes to systems and controls will need to be implemented by insurers by 31 December 2024.

## 8. Funded Reinsurance

In Policy Statement 5/24 (which considers the use of funded reinsurance in the context of Solvency UK), the PRA re-emphasised that for firms using internal models or partial

internal models to calculate their SCR, the “use test” requires the output of such models to play an important role in risk management, decision-making and capital allocation.

The PRA expects firms to undertake robust modelling which takes into account the risks associated with funded reinsurance arrangements and to recognise the importance of the internal model or partial internal model outputs to the decision making process when it comes to deciding whether to enter into a funded reinsurance arrangement as a risk mitigation technique. Failure to do so may incentivise short-term behaviours not compatible with the long-term sustainability of the business.