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Solvency II: Preparing your ESG for Internal Model Approval

For those insurers intending to use a full or partial Internal Model to calculate the Solvency Capital Requirement (SCR) within their Solvency II balance sheet, the regulators have set out seven tests that need to be passed to gain regulatory approval. In this Insight Note, we consider what requirements the tests will create on the ESG and what an insurer might need to do to prepare for these.

The tests are described in detail in CEIOPS' Consultation Paper 56¹ released in July 2009 and incorporate:

- Use Test
- Statistical Quality
- Calibration Test
- Profit & Loss Attribution
- Validation Test
- Documentation
- External Models

There are a number of approaches to calculating the SCR that an insurance company might take within its Internal Model, including full nested stochastic projections, balance sheet sensitivities ('Greeks') along with a curve-fitting approach, and the use of replicating portfolios that approximate liability values. Regardless of the approach chosen, there will be a need to project a realistic joint distribution of the key risk drivers, such as market, credit and demographic risk variables.

Most insurers will have significant market risk exposures and therefore a relatively sophisticated approach will be required for modelling the key market risk variables, such as equity returns, interest rates and credit spreads, using a "real-world" Economic Scenario Generator (ESG).

In addition, the calibration of any Internal Model is likely to require the calculation of the balance sheet in the base case, and possibly in a number of sensitivity scenarios. For this, a "market-consistent" (or risk-neutral) ESG will be needed in cases where the liabilities exhibit asymmetric payoffs (e.g. participating business with guarantees).

Use Test

The Use Test requires that the Internal Model be used within a firm's risk management, economic capital assessment and allocation, and governance processes. Some of the areas that could potentially come into scope of the Use Test include risk and capital measurement and management, hedging, product pricing, and financial reporting. The insurance company is also required to demonstrate that the SCR is recalculated each time the Internal Model is used for such a purpose, and the need to use the Internal Model frequently in a wide range of applications creates some specific challenges for the ESG.

¹ <http://www.ceiops.eu/media/files/consultations/consultationpapers/CP56/CEIOPS-CP-56-09-L2-Advice-Tests-and-Standards-for-internal-model-approval.pdf>

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Firstly, the firms' views on a realistic future distribution of financial risk variables are likely to change as market conditions evolve. Also, any market-consistent calibration of the ESG will take as its key input the market prices of a range of financial assets and these will be constantly changing through time.

For major decisions at least, one or potentially several recalibrations of the ESG will therefore be required before the Internal Model can be recalculated. This could create significant issues if such recalibrations cannot be performed quickly and easily. For example, adjusting one input into the calibration (e.g. risk-free term structure) can often impact on the quality of fit elsewhere (e.g. fit to interest rate derivative prices), potentially making even relatively small changes time-consuming.

Secondly, whilst it will be desirable to use a consistent set of scenarios across all of the above applications, each will potentially require different features of the economy to be modelled accurately. For example, some insurers currently calibrate their equity models to the average moneyness of the policyholder guarantees, but such a calibration may not be appropriate for analysing the effectiveness of an equity hedging programme designed to protect against significant equity market falls.

Although it may in theory be possible to use different calibrations for different purposes, this alternative is unlikely to be attractive due to the potential difficulty of reconciling results that have been calculated using a different set of economic assumptions. As a result, more sophisticated ESG models that can accurately capture all of the relevant features without the need for separate calibrations will be required.

Statistical Quality

Whilst the Statistical Quality test encompasses a wide range of aspects of Internal Models, the main impact on ESGs will be in demonstrating that any economic data used to calibrate the ESG is accurate enough and appropriate for the purpose of the calibration.

Real-world ESG calibrations are designed to generate a plausible distribution of future economic conditions, and are therefore inherently subjective. In general, a real-world calibration would be developed through historical data analysis, supplemented by expert opinion on questions such as the appropriateness of different data series or the weight that should be placed on recent, relative to more historical data.

Even in the case of market-consistent calibrations which are designed to reproduce market prices, judgement is still required when developing calibrations for assets on which no derivatives are traded in sufficiently liquid amounts, such as property. It is almost certain that in order to obtain Internal Model approval, any such judgements or limitations will need to be clearly documented and explained.

Calibration Test

The Calibration test deals with the risk measure used to calculate the SCR; under Solvency II, insurers are permitted to use a time horizon and confidence level of their choice, provided that they can demonstrate this alternative offers policyholders an equivalent level of protection as an SCR calculated using a 1-year VaR approach at the 99.5th confidence level.

There are currently no widely used and accepted methods for proving this equivalence, meaning that an insurer using an alternative risk measure may still need to perform the baseline calculation, potentially removing any incentive to use an alternative risk measure in the first place. However, anyone considering extending their ESG projection beyond the first year to create a set of economically coherent scenarios should consider carefully the impact that features such as volatility clustering and mean reversion may have on the appropriate multi-year asset return distribution.

Profit & Loss Attribution

The P&L attribution is likely to require several interim calibrations to enable an analysis of change in the balance sheet to be performed. Given the large number of inputs that feed into any ESG calibration, insurers will need to develop pragmatic solutions that strike the appropriate balance

between sufficient granularity to make the analysis informative and credible, and the effort required to produce each intermediate calibration.

Validation

Validation will require a demonstration that the outputs of the ESG are consistent with the calibration targets that have been set, and will cover areas such as the mean return, volatility of return and correlations. For applications such as 1-year VaR, the higher moments of the return distribution will also be important as these will impact on the key percentiles of the return distributions.

For those familiar with the Basel II framework implemented for banks, it may seem appealing to attempt to back-test the ESG model. This could involve performing ESG calibrations at specific historical dates and analysing how frequently actual returns exceeded those predicted by the ESG.

However, a major problem with such an approach is that much of the data required for an ESG calibration (e.g. equity volatilities) is only available for relatively short historical periods, perhaps up to 20 years. Given this limitation, the statistical significance of this validation would likely be questionable, and such work would also be a major undertaking for most insurers.

Documenting the limitations of the chosen ESG model will be as important as describing its key features.

Documentation

The details of the ESG model chosen, the theory underlying the models, as well as the calibration processes will all need to be documented in order to obtain Internal Model approval. When preparing ESG documentation, it will be important to recognise that even the most sophisticated models will not be capable of capturing all of the features of the economy being modelled.

It is therefore likely that documenting the limitations of the chosen ESG model will be as important as describing its key features. This should include a consideration of the alternative models that could have been chosen, their strengths and weaknesses, and an explanation of why the models chosen are the most appropriate.

External Models

Many insurers have chosen to use external providers for their ESG and so will need to consider the requirements of the Solvency II Directive regarding external models. Although regulators recognise that the use of external models can result in significant benefits to insurers, their use within an Internal Model also creates some specific challenges.

The tests set out above are intended to apply equally where an external model is used as part of the Internal Model, and Section 10.20 of Consultation Paper 56 sets out some specific requirements that need to be satisfied. This includes:

- an in-depth understanding of the methodology underpinning the external model (as well as the impact of any proprietary elements within it),
- documentation of the rationale for any adjustments to external model outputs; and
- retention of expertise on the external model whilst it is being used to calculate the SCR.

Insurers planning to use an external model as part of their Internal Model should start assessing the extent to which it satisfies these requirements, and engage with their model providers to fill in any gaps identified. Whilst some of these requirements may seem onerous, they will also demonstrate the value being provided by the external model and help insurers to identify areas where further development by their model provider is required.

Finally, it is worth bearing in mind that regulators will be approving the use of an external model within an insurer's Internal Model, rather than the external model itself. Although external model providers will undoubtedly need to provide a significant amount of information, insurers will need to incorporate this into their own documentation, focusing in particular on explaining why the model is appropriate to their specific risk profile.

Summary

Given the significance of most insurers' market risk exposures, the ESG is likely to be at the heart of any Solvency II Internal Model. The tests required to be satisfied for the Internal Model to gain regulatory approval pose some specific requirements on the ESG, and these should be considered carefully as part of any assessment of an insurer's readiness for Internal Model approval.

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