Understanding the ESG requirements for Solvency II

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Solvency II will require re-engineering of insurers valuation, reporting and risk-management processes. As part of this process it will be necessary for insurers to review the suitability of their current economic scenario generator (ESG) model and calibration set up.

For companies already preparing MCEV/EEV or using an economic capital model (or indeed an Individual Capital Assessment in the UK) the requirement to demonstrate suitability of their ESG model and calibration is not new, but the requirements of Solvency II introduce a new level of rigour.

There are two primary uses of an ESG in relation to Solvency II:

- The calculation of the technical provisions for liabilities with financial options and guarantees.
- The generation of valid joint real-world distributions for all the main risk factors, to support the calculation of the Solvency Capital Requirement (SCR).

Both uses are distinctly different from each other in terms of the risk factor model choices and the associated calibration considerations.

How appropriate is the ESG for valuing your liabilities?

The Committee of European Insurance and Occupational Pensions Supervisors (CEIOPS) is clearly interested in the suitability of the ESG used by companies to prepare their Solvency II Technical Provisions and has defined the minimum properties of an ESG. It has also specified that the asset model should be calibrated to the nature and term of the liabilities (particularly those liabilities giving rise to significant option and guarantee costs).

CEIOPS has issued detailed implementation measures for technical provisions in CP 39 -45.

It is evident that even the simplest of ESG model setup, such as, for example, a constant volatility equity model, can be calibrated to produce accurate market consistent option values for a particular term and strike. And, while a calibration of such an ESG may produce realistic values for one type of liability for one insurer, the same setup is unlikely to be appropriate for a different liability profile or for another insurer.

Some of the requirements for ESGs are covered in CP39 (3.30, 3.258-259, 3.335) and in CP43 (3.8-9).

As an example, a model that has a time varying deterministic volatility (TVDV) structure calibrated to the at-the-money volatility term structure would be appropriate for valuing liabilities which have guarantees that are at-the-money across various durations. If the insurer's book also included significant liabilities that were out-of-the-money then the same model and calibration would not be appropriate as it would understate the cost of guarantees. To solve this, a second calibration based on out-of-the-money options is needed.

Because most companies will have embedded options with a mix of strike prices, capturing this richness will require either multiple runs of simple models (each with a different calibration) or a more sophisticated model such as a stochastic volatility model with jumps (SVJD) which allows the different moneyness features to be captured simultaneously. Similar issues exist for other risk factor model choices, for example, deciding which model for interest rates gives the most appropriate representation of the swaption implied volatility surface will again require a trade off between simple models with multiple calibrations or a more sophisticated model.

Ease of calibration should also be considered when making model choices. Solvency II is likely to require models that allow for fast and reliable calibration, not only to satisfy auditors and regulators of the robustness of internal processes, but also to make practical the production of multiple sensitivity calibrations and perhaps ultimately full nested stochastic runs.

The complexity of issues in choosing the correct risk factor model and calibration for calculating Technical Provisions will present a significant challenge for insurers preparing for Solvency II. The potential for modelling choices to materially affect the level of Technical Provisions means that insurers will need to think carefully about their choices and be able to justify them to regulators.

What is an appropriate ESG for producing real-world scenarios for calculating the SCR?

The Solvency Capital Requirement (SCR) can be calculated by a standard formula or an internal model. The methodology used within an internal model for calculating the SCR is not specified by the regulator and it is likely that insurers will use a variety of approaches including: instantaneous shocks, curve fitting, replicating portfolios (RP) and nested stochastic runs. Although not specified, the regulator does suggest (in the main directive - article 120(2)) that, where practical, insurers should derive the SCR directly from the probability distribution forecast generated by the internal model.

Generating these distributions will require insurers to model the joint real- world behaviour of the underlying risk factors that drive the assets and liabilities. The type and granularity of the risk factors will depend upon the specific assets and liabilities of the insurer. However, there are some general issues to consider in relation to the risk factors:

- **Distribution of equity returns**. Over a one -year horizon, the fat-tails in equity returns become much more significant than over the longer horizons used for run-off type calculations. Given that this is a key risk for insurers there is a need for models that allow for skew and fat-tails in equity (and other asset) returns.

- **Stochastic volatility in interest rates**. If an insurer has guarantees that depend upon future interest rates, such as guaranteed annuities, then a model with deterministic volatility can only provide a limited understanding of the risk profile.

- Tail correlations. As the turmoil of 2008 showed, in extreme circumstances the correlations between asset returns, particularly equities, is much higher than in normal circumstances. Given the focus on the 99.5th percentile, tail correlation is likely to be a significant risk driver.

- **Projecting implied volatilities**. Many of the methods proposed for calculating the SCR require insurers to value option-like contracts at a one-year horizon. The ability to project derivative prices (or the building blocks for valuing derivatives) will be an important requirement. For example, projecting equity and swaption implied volatility will be an important step in RP projection, the seeding of 'inner' scenarios for nested stochastic projections and in determining the implied volatility stress in a curve fitting approach.

- **Credit risk.** Solvency II will require insurers to consider the granularity of their modelling of credit spread and default risk to ensure it is appropriate. For example, insurers may have to explicitly model bonds by individual rating rather than assuming some average rating or treating them as risk-free. Insurers may also have to explicitly model any material optionality in more exotic securities such as callable bonds or MBS.

- **Other Assets.** Asset classes such as hedge funds, private equity and emerging market equity may have to be modelled explicitly with an appropriate calibration. A lack of reliable data for calibration means this could be challenging.

- **Currency exchange rate risk**. Companies holding overseas assets (not just with overseas liabilities) will have to explicitly model exchange rate risk.

Calibration of real-world models presents many challenges. Data on tail-events is notoriously scarce so judgements around calibration choices become very significant. Insurers must also consider to what extent the calibrations of models should be representative of market conditions at a point-in-time or reflect a through-the-cycle view.

The potential for these and other modelling choices to materially affect the level of capital means that insurers will need to make considered choices and be able to justify them to regulators.

Conclusion

Solvency II will require insurers to review the use of their ESG model and calibration choices. The likely result is that insurers will need to increase the level of sophistication of models and calibrations for both the calculation of technical provisions and the SCR. As well as the technical implementation challenges, insurers will also need to ensure that staff have the appropriate knowledge and understanding of the models used in order to ensure that the correct judgements are being made. Given the potential complexity of the challenge, this is a process best started sooner rather than later.

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