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Manage Non-Life Catastrophe Risk with Custom Scenarios for Solvency II Compliance

The Solvency II standard model is nearing completion. Quantitative Impact Study 4 (QIS4) was released on 1 April 2008 and will run through July 2008. In QIS4, the non-life catastrophe risk capital component of the solvency capital requirement (SCR) calculation has been modified substantially from QIS3 and has become more complex. In particular, QIS4 includes a personalised catastrophe scenario capital calculation option, improving the risk sensitivity of the standard model relative to a specific carrier. This approach can provide a competitive advantage through the use of model results for internal management purposes and the compliance process.

Background

Solvency II's objective is to protect policyholders and support the stability of the broader European and global insurance systems. The SCR is fundamental to the regulation and requires carriers to maintain a 99,5 percent probability of remaining solvent for the coming 12 months in the face of the many risks that threaten solvency.

QIS4 introduces a modified SCR calculation for non-life catastrophe capital. The capital charge for catastrophe risks arises from extreme or irregular events that are not captured by the risk-based capital charges for premium and reserve risk in the QIS4 standard formula. The catastrophe risk capital charge calculation is intended to determine the non-life catastrophe risk capital needed to ensure that carriers reach the SCR's 99,5 percent solvency requirement.

The Catastrophe Risk Capital Calculation

Carriers can address the QIS4 standard catastrophe risk capital calculation through the use of scenarios with line of business or regional focus. Alternatively, Solvency II permits the use of proprietary models (approved by the supervisory authority) that are tailored to a carrier's lines of business and geographic concentration.

QIS4 offers three methods for calculating the non-life catastrophe risk capital component of the SCR: regional, line of business and customised. Regional scenarios include both natural and man-made catastrophes. If regional scenarios are not available, the carrier can use a QIS4 standard formula based on line of business premium income. Alternatively, carriers are allowed to use proprietary models in order to evaluate the loss scenarios (both geographically and by line of business) that are most pertinent to the carrier.

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Method 1: Line of Business

If the supervisor of a particular territory covered does not have regional scenarios available, QIS4 entails the application of a standard formula based on premium income by line of business.

Method 2: Regional Scenarios

If regional scenarios are available, carriers can use geographically-based estimated losses in the standard formula. The regional scenarios include both natural catastrophes and man-made catastrophes. Local supervisors will provide guidance on how to use regional scenarios to determine underwriting losses.

Method 3: Carrier-Specific

Under QIS4, carriers have considerable flexibility. A third alternative allows the use of proprietary catastrophe models instead of QIS4 standard calculations. In order to be used for Solvency II compliance, though, they will have to be approved by the firm's supervisory authority. This method allows carriers to use geographical and line of business scenarios that are tailored specifically to their portfolios.

Either Method 1 or Method 2 provides a baseline for Solvency II compliance, but the results may not represent a firm's catastrophe exposure sufficiently. Method 3 allows carriers to use proprietary models in order to generate more accurate risk scenarios. For reinsurance business located outside of the European Economic Area, Method 3 is required. The scenarios chosen for Method 3 can include partial or full internal model output (including commercial catastrophe models) or they can be based on other approaches, such as deterministic estimates derived from experience and judgement. Regardless of the reasoning, though, the firm will need to explain how it has selected its scenarios.

Calibrating Approved Internal Models

According to QIS4, carriers preferring to use Method 3 (i.e., approved internal models) may calibrate their models in one of two ways: on an occurrence basis or annual basis.

Calibration on an Occurrence Basis

If the occurrence basis option is used, the carrier must select single-event scenarios, such as a particular windstorm, flood, earthquake or fire. The non-life capital charge for scenario i , CAT_i , is the cost for a specific scenario ("i"), net of reinsurance and allowing for the cost of reinstatement premiums, the impact on profit commissions in reinsurance contracts and any exceptional costs incurred by the firm in post-event management.

Firms will be required to select scenarios that they expect to exceed the "materiality threshold." According to QIS4, materiality is based on the cost of the most severe scenario. If a particular scenario's cost is at least 25 percent of the cost of the most severe scenario, it is considered to be "material." As to which scenarios must be included in the carrier's analysis, QIS4 leaves the decisions to the companies.

With the appropriate scenarios selected, the carrier then determines the aggregated capital charge for the total non-life catastrophic risk charge as shown below.

$$\text{CAT}_{\text{non-life}} = \text{CAT Risk Capital} = \sqrt{\sum_i \text{CAT}_i^2}$$

$\text{CAT}_{\text{non-life}}$ = aggregated capital charge

CAT = catastrophe cost

i = scenario

For each scenario, the cost is squared, and the sum of the squared costs for all qualifying scenarios is taken. The aggregated capital charge is the square root of the sum.

Calibration on an Annual Basis

Annual calibration reflects the likelihood that, for most firms, the SCR requirement of a 99,5 percent (i.e. 1-in-200 years) confidence level is likely to involve a series of events subject to separate retentions, reinstatements and other costs. For annual calibration, $\text{CAT}_{\text{non-life}}$ equals the firm's estimated annual aggregate cost, net of reinsurance and allowing for the cost of reinstatement premiums and other reinsurance contract terms incurred by the firm, at the 99,5 percentile.

Competitive Advantage through Compliance

Method 3 is likely to lead to more accurate non-life CAT risk capital charge calculations. In addition to tailoring scenarios to the specific exposures they face, carriers will be able to ascertain the risk mitigation effect afforded by different reinsurance programs. The ability to execute will be determined by the capabilities of the models employed and the rigor of the analysis process.

Guy Carpenter & Company, LLC ("Guy Carpenter") has considerable experience advising clients on portfolio catastrophe risk management. Using a detailed analysis of the results generated by RMS, AIR and EQECAT-the three largest technical catastrophe models available-Guy Carpenter formulates targeted, actionable recommendations for clients.

Beyond the expertise accumulated by Guy Carpenter regarding catastrophe models and their applications, the firm has developed MetaRisk®, an economic capital model. MetaRisk can quantify the impact of using the Method 3 alternative in Solvency II. With customised non-life catastrophe risk scenarios, it may be possible to use the compliance process to secure a competitive advantage.

For Method 3 to deliver more accurate results than Method 1 or Method 2, two factors must be addressed. The modelling software implemented must be able to handle several types of events in an integrated environment, tracking interrelated factors at a granular level. Further, carriers must ensure that the scenarios supplied and data selected represent the spectrum of likely risks.

Guy Carpenter's MetaRisk platform has been designed to account for changes to the SCR with QIS4 and will continue to be adjusted as necessary until the standard is finalised. Along with other Guy Carpenter proprietary models, it will be possible to model the effects of a variety of non-life catastrophe scenarios and ascertain the mitigating effects of reinsurance. This combination provides analysis that is more targeted than the outcomes of Method 1 and Method 2 while facilitating Solvency II compliance.

Of course, the effectiveness of MetaRisk and other models is dependent upon the scenarios selected and the data supplied. Reinsurers must define the analysis scope carefully to ensure that likely perils are not overlooked. To ensure that proprietary model output reflects non-life catastrophe exposures, a carrier should:

- Select appropriate natural catastrophe and (particularly) man-made scenarios. While QIS4 offers examples, the list is not exhaustive.
- Quantify capital charges net of reinsurance for natural and man-made scenarios. Particular care is needed for the man-made scenarios, given that the process tends to be subjective. Stochastic models may be involved.
- Evaluate dependencies among losses in the various lines of business that one catastrophic scenario may affect.
- Ensure that there is no "double counting" of CAT risk within the premium risk capital charge. When selecting personalised catastrophic scenarios, it is important to ensure that the scenarios recognise that parts of catastrophe losses already covered by premium risk.

Further the quantification of the capital charge net of reinsurance for the "annual basis" of calibration where the 1-in-200 year loss is estimated from an aggregation of events may be challenging. Robust and detailed stochastic models are needed to aggregate net risks across different reinsurance programs.

Compliance with Solvency II may be necessary, but it does not have to be the only outcome of non-life catastrophe capital charge calculations. Using Method 3 to determine and manage exposure can lead to a competitive advantage in the reinsurance marketplace. Improved capital management and exposure analysis can lead to deeper knowledge of the risks faced and support more effective decision-making. In addition to addressing Solvency II requirements, the carrier can make the specific decisions that will result in the more effective use of capital and coverage techniques, leading to a wider set of strategic alternatives.

Conclusion

Approved internal models can provide more realistic results while still addressing Solvency II compliance. The use of internal capital models may require a few iterations, but the investment of time is likely to yield salient financial and operational results. Even though Solvency II implementation is four years away, embracing the Method 3 approach now will lead to more effective compliance in 2012 and may provide an inherent competitive advantage. Method 1 and Method 2 focus on satisfying the regulation's standard. Method 3 turns the effort into a strategic edge.

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