

## **Life Conference and Exhibition 2010**

### **C8: Compliance with Solvency II Internal Model Tests**

#### **Extreme Events Working Party**

V1.0 13/10/2010

Our original aim for this presentation was to give guidance about how actuaries might go about demonstrating that the extreme stresses in an internal model have been derived in a way that meets the statistical quality standards in Solvency II (in particular the guidance/rules in Former CP56 chapter 5)<sup>1</sup>.

However the more we discussed the requirements the more we came to realise that there are no clear answers to this question. At one end of the spectrum a severe interpretation of the requirements leads to standards that no firm could meet in practice (there just isn't enough data). At the other extreme a liberal interpretation could mean that any approach might suffice with sufficient documentation.

In the end we decided to illustrate the issues by looking at the modelling of credit risk. We thought credit risk would provide a good case study since:

- There are significant volumes of market data, but the data needs careful handling.
- There are several very different ways of trying to model credit risk.
- It is a risk that is extremely important to many firms, and at least significant for most.
- There is wider divergence in firm's actual portfolios compared with, say, equities.
- The modelling problem is more complex and has more dimensions than some other asset classes (e.g. equities).

Our presentation is split into two parts.

#### **1. Presentation of Survey Results**

In recent years Towers Watson has conducted a survey of how firms model credit risk for UK ICA purposes. They have kindly made the results of the survey available to the working party and we will be presenting a summary of the conclusions. As part of this we will be looking at the range of outcomes for the 0.5%ile return for some sample portfolios.

The aim is to examine the range of practices used for ICA models.

#### **2. Modelling approaches under Solvency II**

We then look at four possible approaches to credit modelling for Solvency II. These are not meant to be exhaustive; they are just four possible approaches chosen to bring out the range of options and illustrate some of the key issues.

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<sup>1</sup> At the time of writing the Working Party was working off CEIOPS Final Advice (Former CP56) as draft Level 2 Implementing Measures had not been published.

The four approaches are:

- *Commercial credit model:* There are some commercial credit models on the market that allow you to model credit portfolios at a very detailed level. These models can be used for a variety of portfolio management and risk applications. While not primarily designed for ICA/Solvency II this is an obvious area of application.
- *Commercial ESG model:* There are commercial Economic Scenario Generator (ESG) models on the market which contain a wide range of credit modelling capabilities. These are typically implemented using Monte Carlo simulation methods to generate outcomes for credit and asset variables over many time periods. Modelling many asset classes simultaneously in a coherent way makes an ESG an obvious choice for ICA/Solvency II modelling.
- *Merton model:* Merton models characterise a corporate bond as a risk free asset plus a short position in a put option on the value of the firm. This then allows changes in credit risk to be modelled using option pricing tools.
- *In-house ESG:* It is also possible for a firm to design, build and calibrate its own ESG. Like a commercial ESG, it would also be implemented using a Monte Carlo engine to generate future economic scenarios. The credit model within the ESG would normally be tailored to the in-house portfolio in terms of breadth and granularity. Longer term assumptions would likely be based on in-house economic views. As with a commercial ESG, the joint modelling of different asset classes (and risk factors) lends itself very well to Solvency II modelling.

Below we show how a comparison of models could look taking a number of questions drawn from FCP56. In our presentation we will summarise what we think are the key issues and lessons. Note that we are not trying to assess other aspects of these models such as cost, or ease of implementation; we are restricting ourselves to the FCP56 criteria.

In addition, within these four categories there are a range of models available with, for each, a range of implementation and calibration approaches possible. The answers below do not cover every possible option but are intended to represent a typical set-up.

These are hypothetical examples only and are not intended to describe specific models or specific implementations.

In the rankings shown green and red do not represent pass and fail; the RAG status represents how well we think the model measures up to one particular aspect of FCP56.

Model Question	Interpretation	Commercial Credit Model	Commercial ESG	Internal ESG	Merton Model
Does the model produce a full distribution of possible outcomes?	Is it stochastic?	GREEN	GREEN	GREEN	GREEN
	OK with tails?	RED	AMBER	AMBER	AMBER
To what extent is the model:					
Transparent	How well is knowledge of the model likely to be held in the organisation?	AMBER	AMBER	GREEN	AMBER
Detailed		GREEN	AMBER	AMBER	RED
Parsimonious		RED	AMBER	AMBER	GREEN
Robust	Capital Requirements stable even when markets are volatile	RED	AMBER	GREEN	RED
Sensitive		GREEN	AMBER	AMBER	GREEN
How easy is it to flex assumptions to produce sensitivities?		RED	AMBER	GREEN	GREEN

Is the risk model sensitive to the following changes in the portfolio: <ul style="list-style-type: none"> <li>No. of issuers</li> <li>Rating mix</li> <li>Actual spreads</li> <li>Sector weightings</li> <li>Term mix</li> <li>Currency mix</li> <li>Individual stocks</li> <li>Other</li> </ul>	Granularity	GREEN	RED	RED	RED
How does the model cover value risk and default risk?	Are all material elements of credit risk covered.	AMBER	GREEN	GREEN	GREEN