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New requirements for principle-based statutory reserving for US variable annuity business

AG43, the emerging new piece of US actuarial guidance, will for the first time require firms to undertake a principles-based stochastic reserving calculation in their assessment of statutory reserves for Variable Annuity business.

A quite similar stochastic assessment requirement has existed for a number of years for statutory capital for VA business (C-3 Phase II). However, the new reserving requirement will significantly raise the profile and implications of this type of work when it takes effect at the end of 2009.

At its most basic, the principle-based approach says 'Do the right thing and explain it'. Figuring out what's 'right' is difficult, but the process of thinking seriously about the answer will bring benefits. Prescription simply provides a formula, so there's no need to think and or understand.

The run-off capital approach and its economic scenario requirements

Globally, two competing risk capital definitions are emerging for the assessment of principle-based reserves and/or capital:

1. The short-term market-consistent solvency approach; and
2. The long-term cashflow funding (or run-off) approach.

Each of these approaches makes its own particular demands on the modelling and calibration of the stochastic economic scenarios that underpin the capital assessments.

The run-off approach is focused on downside risk tails over the very long-term (decades). The long-term modelling horizon naturally limits the number of relevant data samples that can be used in calibrating stochastic asset models and hence estimating tails (e.g. there are ten non-overlapping samples of a 10- year equity return in the 20th century). So the tail estimation approach inevitably involves making assumptions about short-term return behaviour (e.g. annual return volatility) and then using a model structure to extrapolate what that implies for longer-term volatility and, in particular, the downside risk tail.

This need for some form of extrapolation also arises in the market-consistent liability valuations that underlie the 1-year VaR approach. However, a key difference between the two approaches is that in the cashflow run-off approach, assumptions about the long-term behavior of risk premiums can be very important. All Black-Scholes scholars know that risk premium assumptions are irrelevant to market-consistent valuation. And the tails of the short-term real-world stochastic projections used in the market-consistent solvency approach are relatively insensitive to the size of the risk premium. But over the longer-term real-world modelling horizon required by the cash-flow funding approach, assumptions about the risk premium can be much more relevant.

The pre-packaged scenario set – a starting point for AG43

The American Academy of Actuaries makes available 'pre-packaged' scenario sets for equity indices, interest rates and a credit index that can be used in the implementation of AG43. Whilst these can provide a sound starting point, there are a few technical limitations that the actuary should consider when assessing the adequacy of these scenarios for this purpose, particularly in the context of assumptions about risk premiums.

For example, the yield curve model used in the pre-packaged scenario set does not have an arbitrage-free structure. When a yield curve model does not have an underlying arbitrage-free structure, by definition there are asset strategies that can be constructed that offer infinite risk premiums. When using such a model, it is virtually impossible to understand the risk premium assumptions that are embedded in the risk capital assessment.

Further, the equity model is a total return model – it does not build expected returns up from the level risk-free interest rates. Given the low level of the current US Treasury curve (relative to historical averages) the equity risk premium embedded in the expected equity total return assumption is very high – significantly higher than it has been historically. And the lack of a dynamic adjustment in the forward-looking expected equity return as interest rates move up or down could significantly under-state the risk of further falls in interest rates and the impact of a long-term low interest rate environment.

Another limitation of the pre-packaged scenario set is that its focus is limited to the modelling of equity returns and interest rates. The assessment of reserving requirements for (dynamically hedged) Variable Annuity business in 2009 is likely to demand more. For example, for those firms with dynamic hedging strategies in place that will require future re-balancing of option contracts, the stochastic projection of option-implied volatility surfaces will be an important element of the assessment of the possible future costs of that hedge re-balancing. What if the market cost of buying more options is significantly higher at the times when the dynamic hedging strategy requires more of them? This will probably be the case, but this risk is not easily captured when using the pre-packaged scenarios.

Credit risk is a further important example. There is some basic allowance for the credit risk in corporate bond indices in the pre-packaged scenarios, but it has many fundamental limitations. It is calibrated to end-2005 data, and so it does not reflect today's very different credit risk environment. It has a modelling assumption that the volatility of the credit component of corporate bonds is lower when risk-free rates are lower (something which does not resonate with today's environment). It is not possible to allow for the different levels of risk and return that are provided by investment in different credit ratings of bond index, as the scenario set only provides returns for a single generic A-rated corporate bond index. It also does not allow any disaggregation of the credit return into drivers such as credit spread changes and default experience.

Today, many Variable Annuity products will permit significant investment of underlying funds in corporate bond portfolios. These are usually investment-grade portfolios, but there are increasingly sub-investment grade funds that are also provided. From a risk assessment perspective, it is important to note that hedging programs have tended not to focus on the credit risk that is created by these investment options. Hedging programs have naturally focused on the bigger risk exposures – equities and interest rates.

This means that, net of an effective typical dynamic hedging program, credit risk may often be the single biggest source of market risk that a Variable Annuity book is exposed to.

In summary

AG43 introduces principle-based reserving to US Variable Annuity business at the end of 2009. It will require stochastic asset modelling to be used in Variable Annuity US statutory reserve calculations for the first time. Many firms will use the pre-packaged American Academy scenario set in their AG43 implementation. Whilst this will provide a reasonable starting point, there are a number of technical limitations to these scenarios that the actuary should be aware of when considering if they are an appropriate basis for their AG43 stochastic assessment.

We believe this applies to both equities and interest rate outputs produced in the pre-packaged scenarios. However, we believe it is especially true for credit risk. The credit risk modelling in the pre-packaged scenarios is quite basic. In the time since these scenarios were produced in 2005, credit risk has emerged as one of VA's biggest sources of financial market risk, particularly net of the effect of hedging strategies. And recent events have highlighted that past estimates of credit risk were perhaps unduly relaxed.

Barrie & Hibbert is meeting the AG43 challenge in a number of ways. First, our real-world multi-asset modelling capability provides a leading complete long-term real-world asset

modelling solution to meet the integrated multi-asset risk needs of AG43. Whilst a number of Barrie & Hibbert clients will be using the Economic Scenario Generator for the integrated modelling of equity, interest rate, credit risk and other financial market risks in AG43, we also recognise that for some firms, the incentives to use the pre-packaged scenarios for end-2009 will be significant. For those firms, we have produced the B+H AG43 Credit Risk Scenario Set: a scenario set that provides credit returns and credit spreads for a number of corporate bond indices of various credit qualities, and which is fully integrated with the pre-packaged Academy scenario set's equity and interest rate scenarios. This provides a significantly more robust and rigorous approach to assessing the impact of corporate bond portfolios' credit risk on VA reserving requirements than has been available until now.

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