SOCIETY OF ACTUARIES

Article from:

The Financial Reporter

March 2008 – Issue 72

Market-Consistent Valuations Of Life Insurance Business: The U.K. Experience A Report for the Society of Actuaries

by Chris O'Brien

The following Executive Summary is an excerpt from a report by Chris O'Brien entitled, "Market-Consistent Valuations of Life Insurance Business: The U.K. Experience." For the full report, visit the SOA Web site at http://www.soa.org/research/life/research-market-consistent-uk.aspx.

U.K. life insurers writing participating business have, since the end of 2004, been required by their regulator, the Financial Services Authority (FSA), to value their assets and liabilities on a market-consistent basis. This was intended to provide a more relevant and reliable basis for measuring and regulating the solvency of life insurers than the traditional approach using a net premium valuation.

The purpose of this paper is to:

- Explain the new valuation approach based on market-consistent values, and its rationale;
- Set out the issues faced by life insurers in implementing the new regime; and
- Explain how insurers addressed these issues—in particular, the importance of the modelling techniques they used—and how insurers' practices varied.

Implementing the new regime was a major challenge but has had positive achievements. It has been particularly useful in highlighting the importance of the guarantees and options of insurers. However, we find that the value placed on guarantees and options depends partly, but significantly, on what economic model the insurer has used. We suggest further research to understand why models that look to provide market-consistent values do, in practice, provide markedly different values.

The New Rules: Which Products Do They Apply To?

The new rules apply to major life insurers writing participating business. Participating policies, written by both stock and mutual insurers, have traditionally been an important part of the U.K. market, and are essentially a form of savings contract, with some life insurance cover, together with guarantees, options and "smoothing." The guaranteed payout increases over time as annual bonuses (dividends in U.S. terminology) are declared and added to the policy. The assets backing policies are usually a mixture of bonds, equities, property and cash. A policyholder's premiums accumulate over the course of the policy, with the investment return earned; when we make a deduction for claims, expenses, tax and profits transferred to shareholders, the outcome of this calculation is the "asset share," i.e., the share of the insurer's assets that can be attributed to the policy.

At maturity, the policyholder typically receives a payment about equal to the asset share, but it may differ; for example:

- The guaranteed benefit must be paid if it exceeds the asset share;

continued on page 16 >>

- Some policies contain options (particularly important are guaranteed annuity options): when exercised, they can add to the liabilities of insurers;
- While the asset share changes daily as asset values vary, insurers aim to provide policyholders with a more stable payout using "smoothing" and therefore change bonus rates only infrequently (say twice a year): this may mean payouts are either above or below asset shares.

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The traditional valuation of liabilities used a net premium valuation, with the benefits valued excluding any future bonuses (at least explicitly). This was not "realistic" and lacked transparency. When the FSA took over responsibility for insurance regulation in the United Kingdom in 2001, it wished to understand the solvency of life insurers on a more realistic basis, and it set about designing a new regulatory regime to achieve this.

A New Approach: "Market-Consistent" Valuations

FSA decided that the "realistic" valuations should use market-consistent values of assets and liabilities. In other words, insurers should value their assets and liabilities in the same way that the market uses to price other financial instruments. This could have been called fair value; however, given that the meaning of fair value was being debated in the discussions on insurance accounting, it was a term best avoided.

For assets, market consistency is typically market value, since most assets of life insurers are traded. Traditionally, the United Kingdom has largely used assets at market value already, but insurers now had to include (the market value of) assets that were previously inadmissible.

The valuation of liabilities was more problematic. At maturity, the insurer expects to pay the asset share to the policyholder, so the asset share as accrued to the balance sheet date, with the assets at market value, is an appropriate market-consistent starting point. However, the insurer has to account for the additional amounts payable from guarantees, options and smoothing. Can this be assessed on a market-consistent basis?

The approach to valuing guarantees was to regard participating policies as comprising the asset share and a put option, i.e., an option to sell the accumulated assets for the guaranteed amount, which option would be exercised if the asset share was lower than the guarantee. So, can we look up the prices of put options and then place a value on the guarantees? Unfortunately, no, because put options in the market do not extend as far as the 35 years or more that life policies last, and because it may not be easy to find put options on all the assets that make up the asset share, in particular property.

Therefore, insurers typically use an economic scenario generator (ESG), being a stochastic model that projects scenarios of future interest rates, shares and other asset prices, which is calibrated to the prices of put options as quoted on the market at the balance sheet date, and then used to work out the prices of other put options on a basis that is intended to be market-consistent.

The ESG will be run to produce some thousands of scenarios, but it is too complex to run it in conjunction with all individual policy data, so a model of the insurer's business is used. The outcome enables the insurer to assess the probability of the guarantee exceeding the asset share and hence the value of the extra payments it expects to make. The model can also be used to place a value on the options under policies, and on payments being above or below asset share as a result of smoothing.

The FSA rules also refer to "management actions," such as an insurer changing its investment strategy to reduce the likelihood that the guaranteed benefit exceeds the asset share. If the valuation is to realistically represent the future, the model needs to incorporate "management actions." However, this is complex to model, and FSA allows firms discretion regarding whether or not they incorporate the effect of management actions.

Issues In Implementing the New Requirements

The new rules were implemented on Dec. 31, 2004, following a hectic three-year period for the regulator, the life insurance industry and the actuarial profession. Insurers faced several issues in implementing the rules. We focus here on how they valued their liabilities, which is where the main challenges have been.

The main issues were as follows, and we then set out how firms have addressed these; we give particular emphasis to where insurers have adopted different approaches:

- How do insurers use an economic scenario generator model?
- How do insurers build a model of their business?
- Do insurers incorporate the effect of management actions?
- How many projections do insurers make?
- Do insurers have controls to ensure the results are accurate?

The research is based on the valuations carried out by the 37 insurers reporting on the new regime at the end of 2005.

How Do Insurers Use An Economic Scenario Generator Model?

Sixteen of the 37 insurers used a model provided by Barrie Hibbert (BH); nine used The Smith Model (TSM); and the remainder used either an internal model or a model from another provider. ESG providers allow insurers to vary the approach and/or assumptions in their models, to some extent.

Insurers can use risk-free rates and asset volatilities, deduced from market prices, to help calibrate the model they are using. However, we can see that there are differences between firms in their modelling, because each insurer has to report what its model produces for specimen put option prices. If an insurer reports a relatively high put option price, this implies it would put a relatively high figure on its liability for guarantees. The large differences throw doubt on whether the models, as operated, are really market-consistent. We have data for five-, 15-, 20-, 25- and 35-year options, on risk-free bonds, corporate bonds, equities and property (and some combinations of these), at, in and out of the money. We find:

- There are significant differences between insurers in the put option prices they are using: e.g., if we look at 15-year at-the-money put option prices on equities, one firm (the highest) has a price that is 72 percent more than the lowest;
- There is a greater variability for long-dated than short-dated put options (the highest is 83 percent greater than the lowest for a 35-year put option on equities);
- Out-of-the-money put options have greater variation in prices between insurers, compared with at-the-money and in-the-money put options;
- The variation in prices of put options on risk-free bonds is especially high, as one group of three insurers' modelling produces put option prices for 15-year at-the-money put options that are 65 percent higher than the next highest price;
- Put option prices on property have relatively low variability, which reflects insurers making similar assumptions about property price volatility (property options are not, in practice, available).

We also find significant differences between firms using different models. In many cases, firms using the BH model had the highest put option prices, then insurers using TSM, with those using the "other" models having the lowest. For 15-year at-the-money put options on equities, insurers using the BH model had a put option price 8 percent higher than the average; insurers using TSM 4 percent lower than average; "others" being 10 percent less than average. There is also significant variability among insurers using the same model (this tends to be greater for insurers using the BH model than TSM: e.g., for 15-year at-the-money put options on equities, the coefficient of variation of insurers using the BH model was 8.2 percent, while it was 3.1 percent for those using TSM).

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The option prices used by financially weak life insurers were often lower than those used by stronger firms. However, these differences are generally not statistically significant: the main driver for differences is the model (and the assumptions in the model) that the firm is using.

How Do Insurers Build a Model Of Their Business?

Insurers have to develop a model of the business so that running the projections is feasible. Between 2004 and 2005 they increased the number of "model points" they used: the average "compression

continued on page 18 >>

factor" increased from 1.95 percent to 3.21 percent (i.e., the number of model points was 3.21 percent of the individual policies).

It is important to choose model points that accurately represent the business, especially as regards to whether guarantees are in-the-money or not, and some insurers reported checks they carried out to confirm this.

Do Insurers Incorporate the Effect of Management Actions?

Some insurers built management actions into their models, others did not. This introduces an unfortunate inconsistency when comparing insurers' financial strength.

The author's view is that it is a priority to incorporate management actions; and that, in the meantime, insurers should disclose any actions they have not modelled.

How Many Projections Do Insurers Make?

Life insurers run projections of their stochastic model, the number varying from 500–10,000. Larger insurers tend to use more projections, but not proportionately more. Some insurers reported how the results converged when using a larger number of simulations.

Do Insurers Have Controls To Ensure the Results Are Accurate?

One concern is that, when the new rules were introduced, insurers' systems may not have been robust. Insurers did build in a number of checks on their models. However, several made adjustments to their 2005 valuations, suggesting that the initial results at 2004 were not correct. One insurer that had £1805m capital in 2004 gained £214m in 2005 as a result of a model change and a further £35m from changing the grouping of policies into model points. "Improvements to the stochastic model code" in another firm led to a £156m reduction in its £697m capital. Clearly, it is to be hoped that regime settles down and there are fewer such changes in the future.

Conclusions

The U.K. participating life insurance sector has experienced a radical change in its financial reporting. It has taken a tremendous effort by the regulator, the industry and the actuarial profession to achieve this. The realism of the methodology is regarded as very helpful: in the past, the assets and liabilities were intended to be on a prudent basis, but no one knew how prudent they were, if there wasn't a realistic benchmark. The market-consistent approach is now put forward as a realistic approach. Its transparency has led to a better understanding of life insurers' finances, especially regarding guarantees and options.

The modelling that life insurers are now doing involves:

- Using stochastic models to generate economic scenarios; calibrated to the market prices of options where possible, and then used to estimate a market-consistent value of the guarantees and options that they have granted;
- Applying this to a model of the business based on model points, which have to be chosen to represent the business appropriately; and
- Where possible, including management actions in the modelling.

However, there are further challenges ahead:

- What economic scenario generator an insurer uses can make a big difference to the reported value of its guarantees and options: more work is needed to understand (and, perhaps, reduce) these differences;
- Incorporating "management actions" more fully is important; and
- Further controls are needed so that we do not see a continuation of the errors that arose when the new regime was introduced. $

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