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Variable Annuity Risk and Seeking "The Perfect Hedge"

by Douglas L. Robbins

Of the many concerns on the mind of variable annuity (VA) pricing actuaries, one of the highest today is investment risk. First, how do we price for it? Better yet, is there a way we can dispense with it outright?

After all, we would like nothing better than a consistent predictable profit stream, risk-free. For VAs, our profit stream comes largely from fees charged as a percent of separate account values, so fluctuations in those values are counter to our main purpose. The addition of guarantees makes the situation worse. And the proposed RBC requirements for variable products has additional pricing implications regarding those guarantees.

As risk managers we seek to acquire something that is negatively correlated to the profit stream we now possess. The closer that "something" is to 100 percent negatively correlated with VA profits, the closer we are mathematically to being able to create a fixed profit stream. The negatively correlated instrument is well known to risk managers as a "hedge." We might seek to hedge our position regarding either guarantee risk (in order to minimize required capital) or total profitability.

Obtaining the perfect hedge is easier said than done. The first complicating issue is cost. The fact that we are seeking to "acquire" something generally implies that we have to pay something for it. If the price exceeds the value we are trying to protect, there is obviously no future in the transaction.

If we attempt to build a strategy on the asset side, via options and/or futures contracts, we may be able to hedge very well indeed. But the more perfect we attempt to make the hedge, the more trading we will have to do to keep the assets and liabilities in balance as conditions change, increasing trading costs. (Uncertainty about future decrement rates makes this especially tough for some benefits.) More importantly, market volatility could turn out to be higher than anticipated when a hedging strategy is devised. If so, our hedging cost will turn out to be higher than budgeted as well, all other things being equal.

Hedging our risks via reinsurance might seem attractive, and a few reinsurance solutions for guarantee risk still can be found at times. One factor making reinsurance potentially appealing is that the cost is often charged as a percent of asset fees. This leaves us to simply enjoy the remainder, if any. Another nice feature is that, if the reinsurance completely covers the risk, we do in fact have 100 percent negative correlation. The guarantee-based reinsurance cash flows (net of premiums) exactly mirror our direct flows.

The problem with reinsurance recently is that many programs do not completely cover tail risk. Such "partial tail coverage" programs often assign losses over a certain level back to the direct writer. This means that the 100 percent negative correlation only extends to the cap. Scenario testing of such a program might determine that required capital levels are barely reduced by the intended hedge. Thus the hedge fails to achieve the intended pricing impact (reducing RBC). Lastly, one more risk to consider is reinsurer insolvency.

One relatively new rider to variable annuities was initially billed as a good hedge for

total VA profitability, at essentially no net cost to the writer. That was the enhanced earnings death benefit (EEDB). For an additional asset fee, this rider would add 40 percent or so of contract gains to the annuity death benefit, ostensibly to cover income taxes on gains. The gains considered in the additional benefit were capped at some multiple of premiums paid, but because this death benefit paid off in an up market (rather than a down market, like most other guarantees), it was considered to be negatively correlated with other VA features and riders.

In fact, stochastic pricing of a VA with an EEDB added in produces quite similar tail results to those of the VA alone. At the upper tail, the cap on the EEDB limits its potential cost to the insurer, although its asset fees grow just like those of the base VA (and other riders), in very good scenarios.

More importantly, at the lower tail, where the EEDB costs nothing, the additional EEDB fees generated (since they are asset-based) are also at their lowest levels. And at that point, the worse things get for the VA and GMDB, the worse they get for the EEDB too.

In fact, like the situation discussed above with "partial tail coverage" reinsurance, the negative correlation between the EEDB and VA/GMDB is only over a band of fund value ranges. In this case, it is a narrow band, between premiums paid and the benefit cap. More importantly, the correlation outside that band is not merely zero. It is positive, due to EEDB charges being based on the same fund value as other asset charges.

It is apparent that many things might appear to be hedges, but fail to do the job in some cases. We have been in a market over the past three or so years that would have been perceived as unlikely at its outset. This scenario would have defeated some of the strategies we have discussed here, but not all potential ones.

Product development actuaries are continuing to seek the "golden bullet" for managing VA risk. They will continue to look on both the asset and liability side, and may also consider hedges between different products (e.g., VA vs. EIA, a topic for another day). The most diligent actuaries will carefully test any potential new strategy over a wide range of potential future scenarios. □

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Risk-Relevant Resources

by The SOA Risk Management Task Force

Looking for timely, thought provoking information on risks affecting your line of business? Why not visit the SOA Risk Management Task Force Web site at http://www.soa.org/sections/rmtf/rmtf.html

Created back in 2002, task force subgroups have been researching and writing about all facets of risk that affect the industry. Not only will you benefit from the research and documentation available on the site, you'll find useful links to other risk-oriented resources, network opportunities and events. Subgroups include:

- Economic Capital Calculation and Allocation
- Enterprise Risk Management
- Equity Modeling
- Extreme Value Models
- Health Risk Management
- Policyholder Behavior in the Tail
- Pricing for Risk
- Risk Based Capital Covariance
- Risk Management Metrics

Please take this opportunity to visit the site, add it to your list of favorites for frequent review and send your comments, questions and considerations to RMTF contacts.

The RMTF welcomes and needs your participation too! If you would like to learn more about the Risk Management Task Force in general or any of its subgroups, contact Dave Ingram or Valentina Isakina at *david.ingram@milliman.com* or *visakina@soa.org*. □