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Risk Management of Guarantees on Equity—Oriented Products

by Hubert B. Mueller

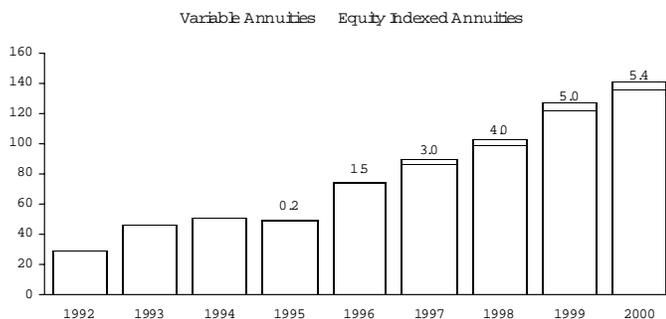
Hubert Mueller's presentation at the SOA's Risk Management Seminar on the risk management of guarantees on equity-oriented products was grouped into three parts:

- Market Background
- The Risk Management Process,
- A detailed explanation and case study on Dynamic Hedging

Market Background

Equity-oriented products exist in North America, Europe, Australia and South Africa, primarily in the form of variable and equity-indexed life and annuity products. During the 1990's, sales for equity-oriented products in the United States have quintupled from \$29 billion in 1992 to over \$140 billion in 2000, as illustrated in Exhibit 1.

Exhibit 1: Sales of Equity-Oriented Products in the U.S.



Source: Tillinghast - Towers Perrin

Guarantees offered include both death benefits and living benefits, which are offered in various forms:

DEATH BENEFITS

- Guaranteed minimum death benefit (GMDB)
- Enhanced earnings benefit (EEB)
- Spousal step-up death benefit (SSDB)

LIVING BENEFITS

- Guaranteed minimum accumulation benefit (GMAB)
- Guaranteed minimum income benefit (GMIB)
- Guaranteed payout annuity floor (GPAF)
- Guaranteed minimum withdrawal benefit (GMWB)
- Return of premiums (on EIAs)

Key risks resulting from the sale of equity-oriented products include economic risks (payouts under guarantees, revenue loss, capital volatility), accounting risks (earnings and reserve volatility), pricing and operational risks. In particular, the recent volatility in the capital markets has caused increasing pressure on earnings, and forces some companies to lower their growth forecasts for future mortality and expense (M&E) fees.

Many reinsurers have pulled out of the market, forcing direct writers to address risk management issues on their own, or with the help of outside consultants. At the same time, there is increased attention from state regulators and rating agencies on companies' risk management practices and capital markets exposure. Currently, a task force of the Academy of Actuaries is working on new RBC requirements for C-3 risk, which will cover both equity-oriented and interest sensitive life and annuity products. This regulation will be modeled along the lines of the capital requirements recently introduced by the Canadian regulatory authority (OSFI) in the Canadian market, and is expected to be effective in 2003.

Risk Management Process

To manage the risks from these guarantees, companies can employ one of the following strategies:

- Self-insurance (most common)
 - Without additional capital ("naked")
 - Holding additional capital
- Reinsurance
- Capital market solutions
- Static Hedging

- Dynamic Hedging
- Securitization
- Product design
- Consolidation of risks
- Buying/selling blocks of business

Most variable annuity (VA) writers are self-insuring the risks and/or reinsuring at least a portion of the risks. In addition, an increasing number of companies in the US and Canada are using static or dynamic hedging techniques. The goal is not necessarily to reduce or even eliminate risk. The goal is to maximize companies' financial objectives, subject to given risk tolerances and constraints

The risk management process can be broken down into five steps:

- Step 1: Understanding the risk—Quantification of risk exposure
- Step 2: Deciding whether the risk exposure is appropriate
- Step 3: Analyzing risk management options
- Step 4: Formulating and implementing risk management strategy
- Step 5: Monitoring risk exposure and results of risk management strategy

A case study focused on steps 1 and 3. In particular, the use of risk profile curves allows a comparison of the exposure for the company under the various risk management options available. This allows companies' management to focus on the action steps needed to minimize the downside risk within the tolerance level, while maximizing overall profits achieved.

Dynamic Hedging

The last part of the presentation was focused on providing an overview and a case study on dynamic hedging.

Dynamic hedging is a risk management strategy used to mitigate the exposure resulting from having written or sold an option contract. Dynamic hedging involves periodic rebalancing of a hedge portfolio in order that the change in market value of the hedging instruments offsets the change in the value of the option. This is achieved by examining the sensitivity of the option and hedge instruments against changes in the underlying,

volatility, and interest rates. The metrics used to measure these sensitivities are commonly referred to as the "Greeks."

- For example, a put option embedded in a liability portfolio can be hedged using a short position on stock index futures. The futures position would be rebalanced periodically in order to maintain a delta neutral position.
- Dynamic hedging relies on liquid and reasonably continuous markets.
- Dynamic hedging can provide a similar level of hedge effectiveness as a static hedge, but without the implied volatility premium included in buying OTC options.

Definitions of "the Greeks" (Delta (δ), Gamma (χ), Vega (v), Theta (θ), Rho (ρ)) were provided. The level of dynamic hedging can be varied, e.g. Delta hedging, Delta & Gamma hedging, or Delta, Gamma & Vega hedging, etc. For practical and cost reasons, most companies concentrate on Delta and Gamma hedging. Closer to the expiry of the options, more focus is placed on hedging Gamma and Vega exposure.

Next, Hubert explained the dynamic hedging process and provided a case study on calculating Delta, Gamma and Vega. The presentation concluded with an analysis of the pitfalls in dynamic hedging and suggestions on how to avoid them.

Hubert B. Mueller, FSA, MAAA, is principal at Tillinghast-Towers Perrin in Weatogue, CT, and a member of the SOA International Section Council. He can be reached at muelleh@tillinghast.com.