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# INTEGRATING ROBUST RISK MANAGEMENT INTO PRICING: NEW THINKING FOR VA WRITERS

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The variable annuity (VA) industry is rebuilding and even making a concerted effort to reinvent itself after many insurers incurred large losses, experienced increases in guaranteed minimum benefit reserves and required capital and accelerated DAC write-offs. As VA writers work to take advantage of growing demand for a new generation of guaranteed income products, they should look carefully at the lessons learned from the recent financial crisis. Most writers have modified their products by raising fees, reducing guarantees, and requiring more restrictive asset allocations. Some insurers have even stopped writing VA guarantees in certain markets. Throughout the industry, hedging programs are being modified and strengthened. Most reinsurance companies have exited the VA market or are acting very cautiously.

There are plenty of cautionary tales about the impact of volatility on hedging costs and product profitability, and the resulting higher statutory capital requirements. However, thus far, less has been written about the more robust pricing of the newest generation of VA products that satisfies consumer needs, reflects recent lessons learned about volatility and risk and ensures the acceptable profitability of those products. As insurers continue to design new products to reflect new market realities and uncertainties, it is time for capital market and actuarial minds to work together on integrating risk management and pricing.

## RECOGNIZING FACTORS AFFECTING VA GUARANTEE PRICING

One legacy of the financial crisis is a deeper and more granular recognition of key factors that impact the pricing of VA guarantees. Of particular importance are the potential impact of policyholder behavior on the hedging of embedded guarantees, lower risk-free rates on risk-neutral pricing of embedded guarantees, lower long-term expected equity growth rates, higher volatility (implied and realized), higher basis risk and increased accounting complexity.

***Policyholder behavior:*** Higher persistency means higher potential revenue and profitability for most non-lapse-supported products and usually for VA base contracts. On the other hand, all embedded guarantees (death or living benefits) are exotic derivatives and higher persistency has the opposite effect on their profitability; they are lapse-supported and the notional value of liability options increases as more contracts stay in force. Because either over- or under-hedging can result in losses, it is critical for insurers to monitor changes in policyholder behavior and dynamically adjust their hedging positions to reflect those changes. Experience analysis and robust attribution analysis of hedge program performance are critical in understanding the impact of policyholder behavior on the hedging of VA guarantees.

***Interest rate risk in a period of lower risk-free rates:*** Many economists foresee an extended period of low interest rates; therefore insurers will need to manage product design very carefully, given the current mismatches between low risk-free rates and higher roll-up rates. Roll-up or bonus rates that are significantly higher than the risk-free rates are creating embedded losses every year and are obviously not sustainable. One risk mitigation tactic has been to design products that have floating roll-up rates that are linked to risk-free rates.

***Lower long-term expected equity growth rate:*** Given the capital market crisis, it is unrealistic to assume a return to the strong long-term equity returns of the 1990s. Faced with uncertainty about expected returns, insurers could encounter higher earnings volatility, lower profits, and higher claims, reserves and required capital. Insurers will have no alternative but to price more conservatively to deal with the likelihood of reduced profitability (specifically, ROE) of their products.

***Higher implied and realized volatility:*** Along with uncertainty about equity return rates, potential higher volatility will significantly impact the pricing of embedded guarantees in VA products and thus challenge normal VA pricing methods. Fair value and marked-to-market accounting will increase the demand for

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derivatives to reduce the earnings volatility. The unbalanced supply of, demand for, and lack of liquidity of long-dated options render implied volatility higher. Higher implied volatility has made it more costly to hedge using options, and sometimes unaffordable relative to the guarantees priced in VAs.

Recently, realized volatilities have been catching up with implied volatilities, resulting in higher realized hedge costs. This increase in realized volatility has increased delta-hedging costs as compared to the cost of short-term options. Real-world pricing based on higher long-term volatility assumptions will place more pressure on profitability and capital positions, particularly as both VACARVM and C3 Phase II are directly impacted by the expected long-term volatilities of asset classes.

***Higher basis risk:*** In late 2008 and early 2009, many hedgers—insurance companies and banks—incurred losses from basis risk (i.e., tracking errors between changes in the VA liability and corresponding hedge assets), with some hedgers losing 300 or more basis points of assets under management. While most hedgers experienced positive tracking errors in 2009, insurers have become more active in their management of basis risk through a more careful selection of underlying mutual funds. It will be critical to continue managing the basis risks directly, beginning with the selection of the underlying funds. Despite the recent occurrence of more positive tracking errors, pricing and/or volatility assumptions will need to be adjusted to account for basis risks.

***Accounting complexity:*** Continuing uncertainty and increased complexity in accounting requirements will impact insurers' financial performance and product profitability and, ultimately, market competitiveness. Under more benign economic conditions, insurers and rating agencies focused primarily on minimizing GAAP earnings volatility. Many insurers did not implement economic hedges for GMDB and GMIB benefits, and only a few priced these benefits as derivatives marked-to-market under SFAS 133 or 157. Since the financial crisis, however, insurers have become much more concerned about their statutory capital. With the liquidity crisis and high credit/counter party risks, capital has become expensive and funding costs higher. Regulatory requirements, such as VACARVM and C3 Phase II, may continue to complicate efforts to integrate risk management positions (such as hedging) that make sense economically, but could increase statutory requirements.

## RISK MANAGEMENT AND PRICING

With so many unknowns and variables, particularly related to future volatility in the capital markets, VA writers must once again address the systemic and structural risks to the profitability of new products. VA guarantees, particularly, should be treated as derivatives in the pricing calculation. Unlike traditional insurance liabilities, which are not leveraged to the market and that can be managed by pooling risk, derivatives must be managed differently. In fact, the systematic risk associated with derivatives cannot be diversified away. Insurers will need to determine and manage the trade-offs between earnings volatility and capital optimization, as well as those between marked-to-market profitability (based on forward-looking implied or expected volatility) and trading profitability (based on realized volatility).

There is an urgent need to develop pricing strategies that can withstand long-term uncertainty. Insurers need to develop integrated approaches that incorporate robust and real-world risk management into the pricing process. This will require careful alignment and collaboration between the pricing and risk management functions and a careful mix of actuarial science and financial engineering disciplines. The approaches must be diversified and designed for both the short and long term, and can include:

- Diversification that addresses both actuarial and capital issues over the short and long term.
- Capital market solutions, typically managed by hedging/derivatives teams, which might include dynamic hedging, semi-static hedges, and such.
- Insurance options, typically managed by actuaries, including reinsurance whenever possible and affordable.
- Structured hedges, which are often hybrids between a dynamic hedge and full reinsurance.

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An integrated approach to risk management must include better integration of financial engineering and actuarial science and utilize robust modeling of hedges and derivatives in pricing systems. One example is the use of nested stochastic simulations to price the products and incorporate hedging strategies in pricing runs.

The challenge is to ensure that risk management and hedging strategy development optimize the trade-offs among capital management, financial risk management, derivatives management and product management. To effectively optimize the trade-offs, it will be prudent to plan for the possibility that "black swan" events may occur much more frequently than normally distributed events and that many long-term actuarial pricing assumptions will no longer be as relevant or reliable. Integration of pricing and hedging processes will enable pricing models that reflect more realistic hedge outcomes and reveal hedge ineffectiveness.

Designing and executing an integrated risk management and pricing framework before another crisis will provide protection that is neither too late nor costly, and should help ensure better profitability in the long run.

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