

# Modern Variable Annuity Risk Management

## Executive Summary

The modern variable annuity company has the same goals as ever to grow sales and asset-based fee income, but now with more complex guarantee features in a challenging economic environment. As such, the requirements for companies' risk management capabilities have risen considerably, and can be organized along three key segments of risk, each of which the Ruark Companies are well-positioned to help manage:

**Investment risk.** This is commonly handled by companies through hedging programs, possibly in a reinsurance wrapper. These programs have become quite sophisticated, but exclude coverage for mortality, longevity, and policyholder behavior risks. Although direct management of hedging programs is outside of our current scope, we facilitate these programs for variable annuity companies, investment banks, and reinsurers on both consultative and brokerage bases.

**Insurance risk.** This is policyholder mortality and longevity risk, which the variable annuity industry has done little to manage. Even if the investment risk can be hedged effectively otherwise, changes in policyholder mortality or longevity expose the company to catastrophic losses and result in a moving target for hedging programs. Appropriately structured reinsurance can mitigate this risk and improve the effectiveness of hedging programs. This is one of our core competencies, and we have facilitated and administered these types of reinsurance for more than a decade.

**Policyholder behavior and other risks.** Most notably, this includes surrender, partial withdrawal, annuitization, and fund selection behavior that may affect the cost of guarantees. Reinsurance is unavailable for these risks, so companies aim to design products prudently, monitor experience carefully, and react to that experience promptly as it emerges. This is another of our core competencies, and our industry-leading experience studies of policyholder behavior are integral to companies' effective management of these risks.

The business of the Ruark Companies is to help our clients develop and maintain integrated solutions spanning these three risk management requirements. We believe that this constitutes best practice for the modern variable annuity company aiming to manage the overall product risk.

*“Things done well and with a care, exempt themselves from fear.”  
-William Shakespeare*

## **Introduction**

The financial crisis. “What happened? Why? Who is to blame? Are we recovering? Will we ever? Will there be another? Soon? When will we see less uncertainty in the capital markets? When will interest rates increase? And inflation? What is risk-free? Where have the jobs gone? Will they return? What industries and companies will thrive or wither? What will be the political, fiscal, and monetary policy responses in the U.S. and abroad?” This list goes on.

The specter of these questions hangs over us all. Yet we must move forward into 2012 without clear answers. For the Ruark Companies, our business is helping our clients to manage risk in all seasons. Much of our focus is in the variable annuity industry, at the intersection of investment and insurance risks, where the financial crisis has forged tremendous changes.

As we move forward from the recent crisis, we should be mindful of the past. In the old days of the 1990s and early 2000s, a variable annuity company could offer guarantee features to policyholders that drove sales and asset-based fee income, while reinsuring the bulk of the guarantee risks to a reinsurer. This holistic reinsurance greatly simplified their required risk management capabilities. Alas, those days are long gone, probably never to return. What is the modern variable annuity company to do?

## Investment Risk

For variable annuity companies, investment risks have rightfully received most of the attention over the last few years, as volatile equity markets and historically low interest rates have combined to dramatically increase the cost to provide attractive guarantees to policyholders. For some companies, this has been particularly painful as changes in values of hedge assets failed to keep up with increases in reserves for guarantees to policyholders, resulting in losses of hundreds of millions of dollars. Several companies that were recently among the variable annuity industry's sales leaders have significantly curtailed or closed to new sales, effectively moving their annuity line of business into run-off mode.

In spite of this, industry sales continue to be strong, with \$111 billion through 2011Q3, compared to \$140 billion for 2010 and \$128 billion for 2009<sup>1</sup>. For companies still selling annuities, the increased cost to provide guarantees has been partially offset by higher charges to policyholders, reduction to the level or nature of the guarantees provided, and refinements to hedging programs. And whether selling new business or in run-off, effective investment risk management is the foundation of companies' risk management practices.

Variable annuity companies commonly manage the product's investment risk through hedging programs, possibly in a reinsurance wrapper, whereby a portfolio of financial derivatives is intended to fund the guarantees. These programs have become quite sophisticated and effective, assuming that non-investment risks like mortality, longevity, and policyholder behavior can be predicted with certainty. The Ruark Companies help variable annuity companies and reinsurers to establish and maintain these programs through our relationship development efforts and guidance on product and reinsurance wrapper design, data integrity, and reinsurance administration.

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<sup>1</sup> LIMRA Data Bank.

## Insurance Risk

While hedging programs have become a common and effective investment risk management practice, their primary shortcoming is that they require accurate and consistent prediction of non-investment risks such as mortality, longevity, and policyholder behavior. Of course, this is impossible. Therefore, the company is exposed to the mismatch risk between the portfolio of derivatives used to hedge the expected behavior, and the portfolio of derivatives needed to hedge the actual behavior over several decades. Is there a solution?

Yes! We think that the solution is prudently structured reinsurance that complements the hedging program, rather than replaces it. Let's consider two examples.

### Mortality

With variable annuity guaranteed minimum death benefits (GMDB), if the product's funds are hedgeable and deaths could be predicted with certainty, then a company should be able to hedge away the GMDB risk. But of course, deaths are not predictable, so even companies with otherwise effective hedging programs are exposed to mortality risk in the GMDB.

"Who cares?" some may ask. "Living benefit guarantees dominate the industry now, and we haven't heard much lately about variable annuity companies losing money due to GMDB risks."

Annuity sales have indeed been dominated by living benefit guarantees for the last several years, but through our industry experience studies we are familiar with many companies for whom mortality spiked as much as 50% monthly during recent market troughs when the net amount at risk was at its highest levels. This created large unhedgeable insurance losses at a most inopportune time.

The financial impact of the mortality spike varied depending on the size, age, and composition of the block for each company. But a representative seasoned \$10 billion GMDB block had as much as \$3 billion of net amount at risk in 2008-2009. With a baseline annual mortality rate of 4%, a monthly mortality spike of 50% resulted in an unhedgeable insurance loss of \$5 million in a single month ( $\$3 \text{ billion} \times 4\% \times 50\% / 12$ ), equivalent to 0.07% of assets. If we assume that the cost to hedge the guarantee at baseline mortality levels is approximately equal to the charge to policyholders (typically only 0.25-0.50% annually for a seasoned block), then we can clearly see that the additional mortality cost is very significant.

These mortality losses were not well publicized in the industry simply because they were dwarfed by all of the other turmoil in the financial markets, including hedging losses on living benefit guarantees. Yet there is no reason to think that this cannot happen again in volatile markets, particularly in a run-off operation where mortality risk increases naturally with age.

The practical solution is not reinsurance of the entire GMDB. Rather, it is reinsurance only of its pure mortality risk component. How? By structuring the reinsurance as a mortality swap, similar to classic reinsurance structures for life insurance products. With this structure, the reinsurer reimburses the variable annuity company for GMDB claims as they occur, in exchange for a series of reinsurance premiums that are equal to the net amount at risk times a specified tabular mortality rate. Together, with the hedging program covering changes in the net amount at risk and the reinsurance covering changes in mortality that apply to the net amount at risk to create GMDB claims, the company's mortality costs are locked in and the hedging program can operate more effectively.

This type of pure mortality reinsurance is readily available with reasonable pricing. So the question for any company is "Why *not* do this?" The Ruark Companies have developed, placed, and administered this type of reinsurance for more than a decade, and although the risk management sensitivities and objectives of variable annuity companies continue to evolve, our reinsurance expertise is of timeless value in managing mortality risk effectively.

## Longevity

Let's also consider living benefit guarantees. If and when these claims are triggered, they take the simple form of a life annuity, with inherent longevity risk. In fact, with increases in human longevity so well-publicized, the living benefit guarantee's ability to help retirees mitigate the risk of outliving their assets is central to its marketing appeal.

However, this benefit for retirees is a very significant risk for variable annuity companies. We think that this risk has been dramatically under-appreciated in the industry, and may be its last completely unmanaged risk. As a result, variable annuity companies continue to risk that long-term increases in human longevity will outpace the level of longevity priced into the product.

Three facts exacerbate this risk: the industry has no experience with living benefit guarantees in the payout phase; industry mortality experience does not follow standard tables; and demographers have a long history of severely underestimating mortality improvements. To illustrate, let's consider life expectancies on some recent and relevant bases.

The Ruark Mortality Table, which we developed in 2007 from an industry experience study of variable annuity mortality in the accumulation phase, with continued improvement using Scale G, produces a male life expectancy of 91.8 years. The 2012 Immediate Annuity Table with continued improvement using Scale G2 produces a male life expectancy of 91.4 years. In short, these two bases produce fairly similar male life expectancies of about 91 years.

But over the last forty years, demographers in North America<sup>2</sup> and the United Kingdom<sup>3</sup> have repeatedly underestimated mortality improvements by as much as 5 years life expectancy at birth. Relative to the bases above, this would result in a life expectancy of 96 years, equivalent to doubling projection Scale G2. How relevant is this to variable annuity living benefit guarantees in the payout phase?

Let's consider an average annuity buyer, age 60 male, and make the illustrative assumption that claims are very unlikely to be triggered in the first ten years. Using the bases above, the life expectancy at age 70 is 18.4 years. Doubling projection Scale G2 gives a life expectancy of 20.5 years, which is an increase of 2.1 years in the payout phase. Is this a big deal?

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<sup>2</sup> Brian C. O'Neill, Deborah Balk, Melanie Brickman, and Markos Ezra, "A Guide to Global Population Projections", Demographic Research, 4, p. 203-288, 2001.

<sup>3</sup> Chris Shaw, "Fifty Years of United Kingdom National Population Projections: How Accurate Have They Been?", Population Trends, 128, Office for National Statistics, 2007.

Yes, it is a very big deal! For a \$10 billion premium block of 5% living benefit guarantees, we would expect perhaps 67% still in force after 10 years. So the cost to the company of the additional 2.1 years would be \$700 million ( $\$10 \text{ billion} \times 5\% \times 67\% \times 2.1 \text{ years}$ ). This is equivalent to 1.40% annually on the declining asset balance over the 10-year period. If we generously assume that the cost to hedge the guarantee with perfect prediction of policyholder behavior is approximately equal to the charge to policyholders (about 1.00% annually), then we can clearly see the catastrophic nature of the additional 1.40% cost of longevity.

We do not think that many variable annuity companies can absorb this level of longevity risk, or are managing it now. But pure longevity reinsurance is available and can be designed to mitigate this risk. Such structures would bear some resemblance to longevity swap products that have been in the early stages of development in the United Kingdom pension market since 2009, whereby the variable annuity company and reinsurer would swap the contingent living benefit guarantee cash flows modified for longevity deviations relative to a negotiated benchmark. Reinsurers' pricing would be based on experience data, with controlled volume units to manage the uncertain policyholder behavior decrements, and possibly with a modest additional premium stream in the accumulation phase and a term limit.

This type of longevity reinsurance is a creative extension of the Ruark Companies' expertise in the development, placement, and administration of mortality reinsurance. We believe that as variable annuity companies recognize the catastrophic nature of the longevity risk embedded in living benefit guarantees, longevity reinsurance will join hedging programs and mortality reinsurance as indispensable tools for the management of their investment and insurance risks.

## **Policyholder Behavior Risk**

Hedging programs complemented by mortality and longevity reinsurance are still not enough for effective variable annuity risk management. Why? Because policyholder behavior, most notably surrender, partial withdrawal, annuitization, and fund selection behavior, also has a dramatic impact on the cost of guarantees, and reinsurance is unavailable for these risks.

At the Ruark Companies, we have monitored variable annuity policyholder behavior and mortality for more than a decade. Our first industry experience study showed that variable annuity mortality differs significantly from standard tables, so we used it to develop a new standard – the Ruark Mortality Table. We have found that this table provides an excellent baseline for the shape of variable annuity mortality, particularly with appropriate modifiers for product type and policy size, and hence is also useful for mortality and longevity reinsurance.

Our subsequent industry experience studies examined surrender and partial withdrawal behavior to determine key drivers and cohorts for guarantee features. Our studies demonstrated that the mere election of a living benefit guarantee tended to reduce surrender rates significantly, and the magnitude was commensurate with the richness of the guarantee. Surrender rates also drop dramatically as guarantees become further in-the-money, and this sensitivity was heightened during the recent financial crisis. For partial withdrawals, cohorts exhibit a wide range of behavior, with varying impact on the cost of guarantees.

With these types of profound and detailed insights, regular installments of our industry-leading studies help variable annuity companies to design products prudently, monitor experience carefully, and react to that experience promptly as it emerges. This is why the Ruark Companies are integral to the industry's effective management of policyholder behavior risk.

## Conclusion

The modern variable annuity company faces heightened risk management requirements for products with complex guarantee features in a challenging economic environment. Against this backdrop, the Ruark Companies are well-positioned to help our clients develop and maintain integrated risk management solutions encompassing investment risk, insurance risk, and policyholder behavior risk. We believe that this constitutes best practice for management of the overall variable annuity product risk.



## About the Ruark Companies

The Ruark Companies consist of Ruark Insurance Advisors, Inc. and Ruark Consulting LLC. Founded in 1998, Ruark Insurance Advisors, Inc. has placed more than 40 reinsurance programs accounting for more than \$200 million of reinsurance premium annually. Ruark Consulting LLC provides actuarial and data analysis capabilities required for effective risk management.

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