The Importance of Financial Risk Management in Today’s Variable Annuity Market

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Introduction

Variable annuities (VAs) are playing an increasingly important role in helping individual investors achieve a secure retirement.¹ Today’s VAs typically enable individuals to invest their retirement savings in a diversified portfolio of equity and fixed-income securities, while locking in future streams of guaranteed lifetime income. As a result, today’s VAs help protect investors who are preparing for retirement from key risks including market risk, the risk that a market downturn will reduce an individual’s retirement income, and longevity risk, the risk that an individual will outlive his or her retirement savings. These protections are especially valuable because of the decline in access to defined benefit (DB) retirement plans, which protect individuals from both market and longevity risks. Among the roughly 50% of private-sector workers with access to any type of retirement plan, the percentage covered by a DB plan has fallen from 81% in 1981 to 32% in 2007.²

The VA market has grown from more than $900 billion in assets under management to nearly $1.4 trillion over the last decade.³ However, the financial crisis of 2008 challenged the VA industry. Many VA providers set aside additional capital to support their products’ guarantees and redesigned their products to varying degrees after the sharp decline in financial markets in 2008. In certain cases, providers retrenched from the market for a period of time by ceasing the sale of certain products.

The changes made by VA providers had an impact on financial advisors. Some advisors had to switch VA providers, resulting in a disruption to their practices at a time when clients needed more attention than ever. Advisors and their clients became concerned about whether VA providers would be able to fulfill their promises. A recent survey of financial advisors found that nearly 50% of advisors said that the top reason why investors are not buying VAs is because of concerns about the financial stability of the insurer.⁴

However, at the same time, the financial crisis increased the appeal of VA guarantees – 84% of financial advisors said that the subject of income guarantees was discussed more frequently in 2009 than it had been a year earlier.⁵ A consumer survey found that more than 80% of individuals wish they had been better protected during the financial crisis.⁶ So, the financial crisis clearly increased both the appeal of VA guarantees as well as the level of scrutiny being placed on how VA providers manage financial risk. Investors and advisors want to be assured that a VA provider possesses robust financial risk management capabilities that will enable the provider to fulfill its promises for decades to come, regardless of market conditions. The importance of advisors and investors evaluating the risk management capabilities of VA providers was highlighted by the financial crisis, which impacted some providers to a greater degree than others. The objective of this white paper is to help incorporate financial risk management considerations into the VA provider selection processes by providing a window into how the VA industry approaches financial risk management.

Specifically, this paper generally focuses on three aspects of financial risk management:

- **Overall strategy.** Risk management considerations are playing a greater role in shaping the development of VA providers’ overall strategies, including what types of products providers offer, as well as the market segments on which providers focus. As a result, the strategic choices made by a VA provider are indicative of the provider’s approach to financial risk management.

- **Product design.** VA providers manage financial risk by designing products that strike a balance between how risky a product is for the provider and how attractive a product’s benefits are to investors.

- **Core financial risk management processes and financial strength.** Strong risk governance and a sophisticated hedging program are essential elements of a robust financial risk management program, regardless of which strategy a VA provider is pursuing or how a provider designs its products. VA providers complement their risk management processes with their financial strength, which includes aspects such as a provider’s approach to capital management and the diversity of the business portfolio within which a VA provider resides.

The remainder of this paper describes the evolution of financial risk management in the VA industry, and explores each of these three aspects in greater detail.

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The Evolution of Financial Risk Management in the Variable Annuity Industry

Financial risk management in the VA industry has evolved considerably over the last two decades for a number of reasons, but perhaps most significantly, because of the rapid pace of VA product innovation.

In the early 1990s, VAs were primarily marketed as tax-advantaged accumulation vehicles with a guaranteed minimum death benefit (GMDB) that provided the return of at least an investor’s principal investment at the time of death. GMDBs exposed VA providers to mortality and market risks, because if a GMDB investor dies at a time when an investor’s account value has fallen below the value of his or her total investment, providers must pay the difference to the investor’s beneficiaries. Until the late 1990s, VA providers often accessed the reinsurance markets to manage these risks.

In the late 1990s, individual investors became more concerned about generating retirement income because of increasing longevity and the decline in access to DB plans. Providers responded by developing VAs with “living benefits” to help consumers accumulate retirement assets and generate retirement income. In 1996, the first living benefit was introduced, the guaranteed minimum income benefit (GMIB) rider. The original GMIBs allowed individuals to invest in a diversified portfolio of securities with the guarantee that, at a specified time in the future, they could annuitize their savings to generate a specified minimum lifetime stream of income. More importantly, GMIB providers guaranteed that the amount that could be annuitized would at a minimum be the original investment compounded at a certain rate for a specified number of years. GMIBs are still being offered today, but the current versions also allow investors to receive lifetime withdrawals without annuitization.

After the stock market crash of 2000, new living benefits were introduced as individuals and advisors began seeing greater value in having insurance companies provide some form of risk protection for retirement assets and income. After 2000, the guaranteed minimum accumulation benefit (GMAB) and guaranteed minimum withdrawal benefit (GMWB) riders became part of the mainstream VA market.

GMABs promise investors a minimum account value (usually based on the amount of the initial deposit in the annuity) at some point in the future regardless of market fluctuations. GMWBs promise investors access to a minimum stream of future income for a specified number of years (usually 14-20 years), based on the amount originally invested, while preserving the ability for investors to access their savings at any time. GMWBs may also provide annual increases in the level of future guaranteed income based on a combination of an investor’s VA account performance and guaranteed increases. VA providers quickly enhanced GMWBs by extending the guaranteed income promise from a specified number of years to life without, for the first time, requiring annuitization; these products were called guaranteed lifetime withdrawal benefit (GLWB) VAs. Exhibit 1 compares the different types of living benefits.

### History of Variable Annuities

<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990s</td>
<td>Marketed as tax-advantaged accumulation vehicles with a death benefit and a minimum return of principal</td>
</tr>
<tr>
<td>1996</td>
<td>GMIBs (living benefit guarantees) introduced to provide an opportunity to accumulate assets for retirement and generate guaranteed retirement income through annuitization</td>
</tr>
<tr>
<td>2000</td>
<td>GMABs and GMWBs are introduced as “non-annuitized” benefits around the time of the significant decline in the stock market in early 2000</td>
</tr>
<tr>
<td>2005</td>
<td>GLWBs introduced to guarantee a minimum level of annual income for life, with enhanced features such as potential to “lock-in” market gains</td>
</tr>
</tbody>
</table>

1. Annuitization allows a VA investor to exchange the assets within a VA for a specified stream of guaranteed income. Upon annuitization, the investor generally gives up control over and access to their assets. You should note, however, that for non-qualified and standalone qualified annuity contracts, some firms require that annuitization occur no later that the oldest annuitant’s 95th birthday.
Exhibit 1: Living Benefits Comparison

Living benefit VAs typically provide tax-deferred accumulation, have fees and surrender charges, offer a variety of investment options, and enable investors to annuitize their savings if desired. For additional fees, the contracts may offer the following guarantees:

<table>
<thead>
<tr>
<th>Feature</th>
<th>GMAB(^1)</th>
<th>GMIB(^2)</th>
<th>GLWB(^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Addresses longevity risk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guarantees a minimum account value at some future date</td>
<td></td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Provides guaranteed lifetime income without annuitization</td>
<td></td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>Provides flexibility once lifetime income has begun (e.g., income can be stopped/started, and investors can access underlying assets)</td>
<td></td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>Helps protect lifetime income from market risk</td>
<td></td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Offers potential to “lock-in” market gains for retirement income purposes</td>
<td></td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Passes any remaining account value to beneficiaries after lifetime income has begun</td>
<td></td>
<td></td>
<td>●</td>
</tr>
</tbody>
</table>

1 Guaranteed Minimum Accumulation Benefit: guarantees that an individual’s account value will be worth a certain value by the end of a pre-specified period
2 Guaranteed Minimum Income Benefit: generally allows the individual to annuitize the contract for a guaranteed minimum income stream at some point in the future; features shown are based on original GMIBs introduced in the market
3 Guaranteed Lifetime Withdrawal Benefit: generally guarantees the individual will be able to withdraw a minimum level of annual income for life without annuitization
The introduction of GMIBs and GLWBs increased VA providers’ exposure to longevity risk because providers assumed responsibility for providing investors a lifetime stream of income. Living benefits also exposed providers to additional market risk because providers became responsible for providing investors a minimum stream of income, regardless of fluctuations in investors’ account values. Finally, the flexibility of living benefit features increased investor behavior risks for providers. For example, guarantee fees may encourage individuals to invest more aggressively than they might ordinarily because they are assured a guaranteed benefit.8 Or, in a prolonged market decline, investors may deplete their other sources of income, and as a result, may start drawing income from their VAs earlier than the provider had assumed when pricing its guarantees.9

The rapid pace of product innovation was accompanied by a loss in access to the reinsurance markets.10 The elevated risks of the new product features coupled with the increased volatility in financial markets in 2000 caused many re-insurers to retreat from the market and increase prices.11 Reinsurance became a cost prohibitive risk management tool for most VA providers.

Product innovation, changes in the reinsurance market, and the experience by VA providers during the 2000 market downturn all contributed to providers making some level of investment in financial risk management capabilities between 2000 and 2008, including:

- **Building sophisticated hedging programs to address market risk.** Some VA providers began hiring teams of capital market professionals to purchase financial instruments, such as options and other derivatives, to offset the risks posed by living benefit VAs. By 2004, seven providers had introduced such hedging programs.12 By the end of 2007, most providers had some type of a hedging program in place.13,14

- **Strengthening modeling and analytic capabilities to measure and manage financial risk.** For example, VA providers invested in modeling capabilities to allow them to model an extensive range of capital markets and investor behavior scenarios to measure risk and inform product design and pricing decisions.

By 2008, investor election of guaranteed living benefits had increased significantly, with living benefit riders attached to more than 80% of new VA sales.15 The rapid election of living benefits and the absolute growth of the VA industry meant that VA providers entered the financial crisis of 2008 bearing more risk than they had before the 2000 market downturn. However, some VA providers were better prepared than they had been before the 2000 downturn because of significant investments in risk management capabilities.

Hedging programs generally performed as expected during the financial crisis of 2008. Milliman, a leading actuarial consulting firm, estimated that hedge programs were about 90% effective and potentially saved the VA industry $40 billion in September and October of 2008.16

However, hedging programs cannot completely eliminate risk. For example, hedging programs cannot eliminate exposure to basis risk, i.e., the risk that a hedging instrument will respond differently to the markets than the underlying investment that a hedging instrument is designed to address.17 During September and October of 2008, such hedge “breakage” costs in the industry are estimated to have exceeded $4 billion.18

VA providers responded forcefully and quickly to the financial crisis. Experts estimate that a handful of the larger providers injected more than $2 billion in capital into their VA businesses in 2009 to increase capital reserves.19 Many providers “de-risked” their businesses by redesigning their products extensively, and in some cases, even retrenching from the VA market. In the four-month period from July to October 2008, there were four product changes among the top 15 GLWB products. In the next four-month period, from November 2008 to February 2009, providers made 16 such product changes.20 These product changes had a significant impact on advisors, who had to re-evaluate, and in some cases, replace existing VA providers, particularly providers who ceased the sale of certain products.

The financial crisis and its effects continue to highlight the need to better understand how VA providers approach financial risk management. In addition, the financial crisis marks the acceleration of a phase in VA financial risk management in which providers manage risk not just through hedging programs or core risk management processes, but also through a heightened focus on product design and other strategic decisions.

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8. A more detailed description of hedging programs is provided later in this paper.
11. A more detailed discussion on basis risk is included later in the paper.
Overall Strategy

Until recently, most VA providers shared a strategic approach that was largely similar. In short, most VA providers attempted to rapidly introduce new product features or benefits in order to win the attention of advisors and investors. This dynamic produced a steadily richer array of guarantees from which investors could choose. VA providers attempted to align their risk management capabilities with these guarantees through increased investment in hedging programs and analytics.

From this financial crisis, VA providers have begun pursuing increasingly divergent strategic paths. This divergence reflects different views on how the VA market is likely to evolve, as well as different perspectives on how to best manage financial risk. Three key strategies are emerging:

• **“Traditional strategy.”** The “traditional strategy” is the strategy that most VA providers were pursuing before the financial crisis. Traditional VA providers focus on the subset of advisors that have historically favored using VAs to address their clients’ income needs, and offer these advisors products with income guarantees, a high degree of investor flexibility, and industry average pricing. After the recent financial crisis, all the major traditional VA providers lowered guarantees or increased fees.21 Traditional VA providers manage risk primarily through hedging programs and the maintenance of sufficient capital to support guarantees.

• **“Simpler, lower cost strategy.”** VA providers pursuing this strategy are attempting to achieve two objectives. First, they are attempting to reduce financial risk by offering simpler products with reduced guarantees. Second, they are using simpler and lower cost products to appeal to advisors and investors who have generally not considered VAs because of concerns about fees or the perceived complexity of VAs. The adoption of this strategy across VA providers has accelerated after the financial crisis.

• **“Product based risk management strategy.”** VA providers pursuing this strategy offer products with strong guarantees, a high degree of investor flexibility, industry average pricing, and a product based risk management feature. A product based risk management feature is a “self-governing” mechanism that helps reduce risk in response to external market conditions. For example, one such feature is a guarantee whose benefit growth rate is tied to an index such as Treasury rates. Another example is the use of a predetermined mathematical formula to transfer investors’ assets between equity and fixed-income investments based on the impact of market fluctuations on investors’ account values.22 Finally, another example is the linkage of VA rider fees to an external index, such as the Chicago Board Options Exchange Volatility Index (VIX). Similar to traditional VA providers, product based risk management VA providers also made product changes, such as reducing guarantees or increasing fees, after the financial crisis.

Financial advisors can quickly identify the strategic path that a VA provider is pursuing by reviewing the provider’s product offerings. This will help advisors understand how a VA provider is approaching financial risk management. It will also help advisors evaluate the alignment between a VA provider’s chosen strategy and investors’ needs.

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21 Based on the top 20 providers of advisor-sold annuity sales in the First Quarter 2010. Source: VARDS, company filings and prospectuses.
22 Another example of this type of feature is the incorporation of an algorithm directly within an investment choice within a VA's investment menu.
Product Design

Product design plays a central role in financial risk management because it impacts both the types and levels of risk that a provider bears. At the same time, product design determines how attractive a product is to advisors and investors.

VA providers try to balance these two considerations to realize a number of benefits. First, “less risky” products enable providers to absorb significant asset flows into their products while maintaining financial risk at manageable levels. Second, “less risky” products reduce a VA provider’s dependence on supplementary risk mitigation measures, such as hedging programs and capital. Finally, products that achieve a balance between managing risk and providing attractive benefits to investors will likely be able to attract clients and assets over the long-term.

The specific approaches to product design vary significantly across providers. This paper describes one approach in which product design levers are employed to ensure that the risks posed by a provider’s products can be accommodated within a given risk budget.

Risk Budgeting

A risk budget can help guide product development efforts as to how much risk a provider is able and willing to absorb. The level of the budget is impacted by a number of factors such as capital availability and a provider’s overall risk tolerance. This budget consists of three risk buckets:

1. **Market risk**, which includes equity, interest rate, and credit risks. For example, GLWB providers absorb equity and interest rate risk. If an investor’s account value declines due to equity market performance or shifts in the interest rate environment, then the VA provider is exposed to the risk that the account value may be insufficient to fund the promised level of guaranteed lifetime income. Further, with the long-term nature of these guarantees, lower interest rates also increase the cost of producing these long-term income guarantees.

2. **Actuarial risk**, which includes longevity and mortality risks. For example, GLWB providers absorb longevity risk because individuals may live longer than predicted in the actuarial assumptions that providers make. Similarly, GMDB providers are absorbing mortality risk because individuals may not live as long as predicted.

3. **Investor behavior risk**, which includes risks related to how investors utilize VA product features. For example, generally GLWB investors can elect to begin drawing guaranteed lifetime income. The uncertain timing of this decision poses a risk for VA providers, because the timing affects both the amount of guaranteed lifetime income that an investor will draw as well as the amount of fees that the provider will receive from the investor. Investors’ asset allocation decisions are another source of risk because investors that choose a more aggressive asset allocation within a VA will create more market risk for the provider than investors who adopt a more conservative asset allocation.

Product Design Levers

VA providers help to manage financial risk by making product design decisions to accommodate a given risk budget, and in certain cases, to increase the available risk budget. Below are some of the product design levers that help achieve these objectives:

1. **Nature of the guarantees offered to investors.** The types and levels of guarantees offered impact what risks a provider bears, and at what cost they bear them. For example, GLWB providers can increase or reduce risk based on the level of guaranteed lifetime income promised and how much this income automatically increases.

2. **Investment platform.** VA providers can help manage risk through the investment choices made available to investors. For example, offering investors access to a well-diversified set of investment choices can help reduce risk because such an investment menu enables the construction of more diversified, and hence less volatile, investment portfolios.

3. **Restrictions on investor behavior.** VA providers can help manage risk by placing a range of restrictions and requirements on investor behavior. For example, investors may be required to be of a minimum age to buy a VA optional benefit. Other examples of restrictions include waiting periods to commence guaranteed lifetime income and requirements that investors maintain an asset allocation within certain parameters, such as a ceiling on the equities allocation within a portfolio, to help reduce a VA provider’s exposure to market risk.

4. **Pricing.** The fees charged by a VA provider impact the risk budget. For example, higher fees would increase the available risk budget, which funds the three key risk buckets.

5. **Product based risk management.** VA providers can help manage risk by including self-governing mechanisms within their products that reduce risk based on external market conditions. As discussed earlier, some VA providers are tying the level of a guarantee or fees to indices, such as Treasury rates or the VIX, or utilizing a mathematical formula to transfer investors’ assets between equity and fixed-income investments based on the impact of market fluctuations.
Exhibit 2 contains examples of how each of these product design levers can be used to impact the risk budget. VA providers clearly have access to a wide range of product design options to help manage risk. However, VA providers are constrained by the realities of the marketplace in their ability to use the product design levers as a risk mitigation tool. For example, the competitiveness of the VA market limits how much providers can raise prices to enlarge the available risk budget. Less robust guarantees may help reduce risk, but may be unattractive to advisors and investors.

Marketplace realities mean that VA providers must carefully utilize each product design lever and make difficult trade-off decisions about where to take risk, and where to avoid it. One of the most powerful tools to guide these trade-off decisions is the articulation of a focused value proposition for a VA provider’s product line, such as increasing guaranteed lifetime income or offering competitive fees. A focused value proposition helps a VA provider manage risk because it facilitates decision-making about which risks a provider should take, and which risks the provider should avoid because they do not support the chosen value proposition.

### Product design features that help manage risk while providing benefit to investors

VA product designers strive to design products that help mitigate financial risk, while providing benefits to investors. Exhibit 3 describes selected examples of product features that attempt to achieve both of these objectives:

#### Exhibit 2: Variable Annuity Product Design Levers to Manage Financial Risk

<table>
<thead>
<tr>
<th>Product design examples</th>
<th>Market risk</th>
<th>Actuarial risk</th>
<th>Investor behavior risk</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level of Guarantees</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guaranteed roll-ups which provide guaranteed annual increases in future retirement income for every year investors delay drawing income</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Limiting the frequency with which guaranteed lifetime income step-ups occur</td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Investment Platform</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limited investment menu (e.g., only index funds)</td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asset allocation requirements for investors (e.g., minimum 20% investment in fixed-income)</td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Restrictions on Investor Behavior</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waiting periods to begin drawing guaranteed income from VAs</td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum age requirements for VA investors</td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age based guaranteed withdrawals</td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pricing</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Higher guarantee fees</td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Product Based Risk Management</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tying promised rate of increases in future guaranteed income to Treasury rates</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Use of a predetermined formula to transfer investors’ assets from a more risky to less risky asset allocation based on the impact of market declines on investors’ account values</td>
<td>●</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Exhibit 3: Examples of Product Features That Help Manage Risk for VA Providers While Providing Benefits to Investors

<table>
<thead>
<tr>
<th>Description</th>
<th>Impact for investors</th>
<th>Benefit for VA providers*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roll-ups</td>
<td>• Enables investors to realize a higher retirement income</td>
<td>• Helps reduce the risk of investors drawing income sooner than expected</td>
</tr>
<tr>
<td></td>
<td>• Requires investors to delay drawing income to realize this benefit</td>
<td>• May reduce the expected number of years for which a VA provider must provide guaranteed income</td>
</tr>
<tr>
<td></td>
<td>• May increase revenues because more assets are held within the VA for a longer period of time</td>
<td></td>
</tr>
<tr>
<td>Age Based Guaranteed Withdrawals</td>
<td>• Enables investors to realize a higher retirement income</td>
<td>• Helps reduce the risk of investors drawing income sooner than expected</td>
</tr>
<tr>
<td></td>
<td>• Requires investors to delay drawing income to realize this benefit</td>
<td>• May reduce the expected number of years for which a VA provider must provide guaranteed income</td>
</tr>
<tr>
<td></td>
<td>• May increase revenues because more assets are held within the VA for a longer period of time</td>
<td></td>
</tr>
<tr>
<td>Asset Transfer Algorithm</td>
<td>• Helps provide downside protection for investors’ account values, but a reduction in expected account value returns (discussed later in paper)</td>
<td>• Helps reduce equity market risk</td>
</tr>
<tr>
<td></td>
<td>• Will typically shift assets from equities to fixed-income when equity markets are underperforming</td>
<td></td>
</tr>
<tr>
<td>Index Based Guarantees</td>
<td>• Provides a guarantee that is responsive to market factors, but results in a lower guarantee in certain market environments</td>
<td>• Helps reduce capital market risk</td>
</tr>
<tr>
<td></td>
<td>• Investor guarantees, such as promised annual growth in future lifetime income, that fluctuate based on market factors such as Treasury rates</td>
<td></td>
</tr>
<tr>
<td>Index Based Fees</td>
<td>• Provides a fee structure that is responsive to provider costs, but results in higher fees in certain market environments</td>
<td>• Helps reduce risk of VA provider having to absorb higher costs in certain market environments</td>
</tr>
<tr>
<td></td>
<td>• VA living benefit fees that are tied to an external index, such as the VIX index</td>
<td></td>
</tr>
</tbody>
</table>

*The level of risk reduction provided by these features will depend on how these features are implemented and also on how investors behave (e.g., whether investors are actually drawing income).
Asset transfer algorithms and index based guarantees or fees are examples of product based risk management features. Product based risk management features are becoming an increasingly important risk management tool for VA providers, highlighting the need for advisors to better understand the advantages and disadvantages of such features. The following case study explores this issue by comparing the investment results of a GLWB VA with a product based risk management feature – an asset transfer algorithm – to a GLWB without an algorithm.

Both of these VAs provide the following benefits to investors:

- Investors are eligible to receive lifetime annual withdrawals of 5% of their “benefit base.”
- The benefit base is first set as the value of investors’ original investment in the VA. After this, the benefit base is equal to the highest anniversary value of an account, compounded daily at a 5% annual rate (the benefit base is stepped up once a year), until the time when an investor begins lifetime withdrawals or the end of ten years, whichever occurs first.

One of the VAs includes an asset transfer algorithm that determines when investors’ assets are transferred between equity and fixed-income investments due to the impact of market fluctuations on investors’ account values. For example, if an investor’s account declined in value, a portion of the investor’s equity investments may be transferred to fixed-income investments. The algorithm specifies when transfers should be made in either direction depending on fluctuations in the investor’s account value.

Ernst & Young compared these two VAs by conducting 2,000 hypothetical Monte Carlo, or random, simulations, using the market performance of different asset classes as variables, to obtain the investment results of a 55-year-old investing in each of these two VAs over a hypothetical ten-year period. It is assumed that the investor does not commence lifetime withdrawals during this hypothetical ten-year period. The following exhibit presents the results of these simulations:

Exhibit 4: Comparison of a VA with an Algorithm to a VA without an Algorithm

<table>
<thead>
<tr>
<th>Probability of Significant Loss in Account Value During Hypothetical 10 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>This study showed:</td>
</tr>
<tr>
<td>• The algorithm helped reduce the probability of a significant loss in account value</td>
</tr>
<tr>
<td>• The trade-offs are that annual account value returns were forty basis points (0.4%) lower for the VA with the algorithm than the VA without the algorithm, and the investor gives up some degree of control over asset allocation</td>
</tr>
</tbody>
</table>

Key assumptions used in analysis

- Fees (same for both VAs): Mortality and Expense charge of 1.35%, Asset Management fees of 0.95%, and lifetime withdrawal benefit fee of 1%
- Asset allocation: 55-year-old investor’s original asset allocation assumed to be 70% equities and 30% fixed-income
- Asset transfer algorithm: The algorithm used in this analysis is the same algorithm employed in Prudential’s Premier variable annuities with a Highest Daily lifetime income benefit issued by Prudential Financial companies, and it was chosen as this algorithm is the most common in this space. This analysis is by no means intended to be reflective of Prudential’s or any other provider’s variable annuity.
- Important: The projections generated by the Ernst & Young Monte Carlo simulation regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. The analysis presents a range of possible outcomes; the calculated results will vary with each use and over time.

23 While the algorithm is intended to reduce account value volatility, it is not a tool to optimize investment results.
As shown in Exhibit 4, the use of the asset transfer algorithm helps lower the probability of an investor experiencing a significant loss in the investor’s account value over a hypothetical ten-year period. However, this benefit is accompanied by a reduction in expected annual account value returns. In addition, the algorithm requires investors to relinquish some degree of control over asset allocation within their VAs.

The algorithm helps VA providers manage risk because it helps reduce the probability of a significant loss in an investor’s account value, and hence the probability that an investor’s account will be depleted. Since VA providers must give investors their promised stream of lifetime income regardless of the value of an investor’s account, the algorithm helps protect VA providers from a scenario in which they have to fund an investor’s stream of lifetime income from their capital reserves. VA providers can take advantage of this risk reduction by offering rich guarantees without increasing fees. At the same time, the algorithm benefits investors, because investors are also concerned about protecting their VA account values, especially if they are relying on their account values as a source of funds for emergencies or other needs. Of course, as the above analysis demonstrates, this benefit comes at the expense of a reduction in expected annual returns.

**Core Financial Risk Management Processes and Financial Strength**

A VA provider’s core financial risk management processes, such as its hedging program and risk governance practices, are important elements of robust financial risk management, regardless of which strategy or product design approach a provider has adopted. VA providers then rely on financial strength to serve as an added buffer against risk beyond the protection provided through product design or risk management processes.

**Hedging Programs**

VA providers can mitigate risk through careful product design. The goal of a hedging program is to help address the market risk to which a VA provider is exposed after accounting for the risk mitigation provided through product design. VA providers’ hedging programs operate by measuring the different types of market risk to which a provider is exposed, and then purchasing financial instruments, such as options or other derivatives, to offset these risks. VA fees provide the funds to purchase these instruments.

A comprehensive hedging program, sometimes called a “Three Greek” hedging program, will utilize financial instruments to hedge all of the key market risks that a VA provider faces. Such hedging programs address the risk of equity prices changing or “delta,” the risk of a change in volatility or “vega,” and the risk of interest rates changing or “rho.” Exhibit 5 describes the types of financial instruments that VA providers can use to hedge these risks:
Exhibit 5: Financial Instruments Used in Hedging Programs to Help Manage Financial Risk

<table>
<thead>
<tr>
<th>Description</th>
<th>Instrument Examples</th>
<th>Can be applied to manage:</th>
<th>VA Risk Reduction Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Options</strong></td>
<td>Holder has right to buy or sell underlying security on a specified date at a specified price</td>
<td>• Call option—right to buy</td>
<td>• Purchase long-dated S&amp;P 500 puts to reduce downside equity risk</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Put option—right to sell</td>
<td></td>
</tr>
<tr>
<td><strong>Futures</strong></td>
<td>Holder has obligation to buy or sell underlying security on a specified date at a specified price</td>
<td>• Long futures—obligation to buy</td>
<td>• Sell long-dated S&amp;P 500 futures to reduce downside equity market risk</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Short futures—obligation to sell</td>
<td></td>
</tr>
<tr>
<td><strong>Swaps</strong></td>
<td>Transfers specific types of risks associated with a financial instrument between parties without transferring the instrument itself</td>
<td>• Interest rate swaps</td>
<td>• Purchase interest rate swaps to protect against risk of interest rates declining</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Currency swaps</td>
<td></td>
</tr>
</tbody>
</table>

Un fortunately, hedging programs cannot completely eliminate market risk. Any hedging program is exposed to basis risk, or the risk that a financial instrument and the underlying investment that the instrument is designed to hedge will not respond in tandem to market conditions. For example, a VA provider that purchases a financial instrument based on the S&P 500 index to hedge its equity risk may be exposed to basis risk because the VA provider’s investors’ aggregated accounts may consist of equity portfolios that are different in composition than the S&P 500 index.

However, even with these limitations, hedging programs enable VA providers to offer investors valuable guarantees. In addition to focusing on the “Three Greeks,” robust hedging programs typically leverage:

- Tight integration between the hedging and product design teams so that the needs of the hedging team are considered during product development. For example, changes to a VA provider’s investment platform should be made based, in part, on how such changes would impact a hedging program.

- Frequent (e.g., daily or more frequent) monitoring of the risk within a VA provider’s book of business to identify the capital markets trades required to reduce risk. Less frequent monitoring can result in a significant gap between the risk that a provider is exposed to and the portfolio of financial instruments that the provider owns to hedge this risk.

- The presence of a capital markets focused hedging team that is distinct from, but collaborates with, the actuarial teams that have traditionally been the cornerstone of risk management within VA providers. These teams would typically comprise experienced capital markets professionals, risk experts, and individuals with quantitative modeling skills. The team should be organized around a well-staffed trading desk that interfaces with the capital markets.

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Risk Governance
Rapidly changing capital markets conditions, evolving VA product designs, and shifts in investor behavior all demand strong risk governance to help a VA provider manage risk over both the short-term and the long-term. Risk governance should help a VA provider measure financial risk and facilitate “risk aware” decision-making across all the functions within a provider. Some of the key elements of strong risk governance generally include:

- The use of a cross-functional committee comprising representatives from finance, product design, hedging, actuarial analysis, and other related functions to manage financial risk. The committee would typically meet regularly to review the evolving risk position of a VA provider based on capital market conditions, trends in investor behavior, and insights from new actuarial or financial analysis. The committee may also ensure that any new trends, such as unexpected shifts in investor behavior, are quickly incorporated into current decision-making within the impacted functional areas. The committee may also identify new analyses or modeling that might be conducted to better inform the organization about its risk position.
- Investment in sophisticated modeling and analytic capabilities. Measuring the risk posed by VAs is an analytically intensive exercise. Risk can be measured by modeling a range of capital market and investor behavior scenarios. The financial crisis has further served to broaden the range of capital market scenarios that VA providers should incorporate into their analytic processes. VA providers can help strengthen their analytic and modeling capabilities through frequent investment in powerful computing platforms, recruitment of talented risk experts from the academic community, and the implementation of sophisticated modeling approaches.

Financial Strength
Financial strength provides additional protection against risk beyond that provided through product design, hedging, and strong risk governance. Advisors recognize this as demonstrated by a recent survey in which advisors said that the financial strength of a VA provider is one of the most important provider selection criteria – second only to product features. There are three primary aspects of financial strength:

- The claims-paying credit ratings assigned to a VA provider by rating agencies.
- The VA provider’s approach to capital management, which determines how much capital a provider holds. For example, the level of capital that a VA provider holds may be based, in part, on a “worst case” capital market planning scenario used by the provider.
- The diversity of the business portfolio within which a VA provider resides. Being part of a diverse business portfolio may bolster a VA provider’s financial strength in several ways. First, a diverse business portfolio with businesses that have varying degrees of sensitivity to equity markets helps cushion the impact that negative equity markets have on a VA provider. Second, a diverse business portfolio can provide a valuable hedge against the risks posed by a VA business. For example, a company that owns both a significant life insurance business and a VA business may benefit because the company’s exposure to longevity risk within its VA business may be partially offset by the advantages that increased longevity would provide to the life insurance business. Finally, a diverse business portfolio may provide a VA provider greater access to capital, particularly during times of market stress.

Conclusion
VAs play an increasingly important role in helping investors achieve a secure retirement, particularly as access to DB plans declines and longevity increases. The unique guarantees offered by today’s VAs are also attracting more attention as investors seek ways to protect against a replay of the market conditions experienced in 2008.

However, this attention is being accompanied by a greater level of concern about the ability of the VA industry to deliver on its promises. As a result, advisors must now incorporate risk management considerations into the already complex VA selection process that they undertake on behalf of their clients. This paper helps advisors address this challenge by providing some perspectives on the major building blocks of financial risk management within the VA industry.

Financial advisors and investors already consider a broad range of issues when evaluating VA providers. In addition, the following questions might be helpful for advisors and investors to consider specifically when assessing the financial risk management capabilities of VA providers:

- What is the provider’s overall strategy? Why has the provider adopted that strategy?
- What product design levers did the provider utilize to manage financial risk?
- What are the features within the provider’s product line that reduce risk, while benefiting investors?
- Does the provider have a hedging program? How has the provider structured its hedging program? Which risks is the program designed to address? How has the hedging program performed over time?
- What is the provider’s approach to risk governance? How does the provider ensure a coordinated approach to financial risk management across its entire organization? What types of investments has the provider made in analytic and modeling capabilities?

**Six Key Takeaways on Financial Risk Management**

- The financial crisis and its effects continue to highlight the need for financial advisors and investors to better understand how variable annuity providers manage financial risk.
- Variable annuity providers manage financial risk through their strategic choices, product design decisions, core risk management processes, and financial strength. Financial advisors and investors should evaluate these factors when evaluating how a VA provider manages risk.
- Variable annuity providers are pursuing increasingly divergent strategic paths after the financial crisis, reflecting not just different views on how the variable annuity market is likely to evolve, but also different approaches to managing financial risk. As a result, there is significant variation in the types of products and levels of guarantees offered to investors in today's variable annuity market.
- Variable annuity providers employ a range of product design levers to build products that help reduce risk for the provider, while offering attractive benefits to investors. Product-based risk management features, such as an asset transfer algorithm, help reduce risk for the provider while providing value to investors.
- The goal of a variable annuity provider's hedging program is to help address the market risk to which a variable annuity provider is exposed after accounting for the risk mitigation provided through product design.
- Financial strength provides additional protection against risk beyond that provided through product design, hedging, and strong risk governance.
Investors should consider the contract and the underlying portfolios’ investment objectives, risks, charges and expenses carefully before investing. This and other important information is contained in the prospectus, which can be obtained from your financial professional. Please read the prospectus carefully before investing.

A variable annuity is a long-term investment designed to create guaranteed income in retirement. Investment returns and the principal value of an investment will fluctuate so that an investor’s units, when redeemed, may be worth more or less than the original investment. Withdrawals or surrenders may be subject to contingent deferred sales charges. Withdrawals and distributions of taxable amounts are subject to ordinary income tax and, if made prior to age 59½, may be subject to an additional 10% federal income tax penalty. Withdrawals, other than from IRAs or employer retirement plans, are deemed to be gains out first for tax purposes. Withdrawals can reduce the account value and the living and death benefits.

Annuity contracts and optional living benefits contain exclusions, limitations, reductions of benefits and terms for keeping them in force. Your licensed financial professional can provide you with complete details. Your needs and suitability of annuity products and benefits should be carefully considered before investing.

Optional benefits may not be available in every state and may not be elected in conjunction with certain optional benefits. Optional benefits have certain investment, holding period, liquidity, and withdrawal limitations and restrictions. The benefit fees are in addition to fees and charges associated with the basic annuity. Please see the prospectus for more information.

The benefit payment obligations arising under the annuity contract guarantees, rider guarantees, or optional benefits and any fixed account crediting rates or annuity payout rates are backed by the claims-paying ability of the issuing insurance company. These payments and the responsibility to make them are not the obligations of the third party broker/dealer from which this annuity is purchased or any of its affiliates. They are also not obligations of any affiliates of the issuing insurance company. None of them guarantees the claims-paying ability of the issuing insurance company. All guarantees, including optional benefits, do not apply to the underlying investment options.

Highest Daily Lifetime Income uses a predetermined mathematical formula to help us manage your guarantee through all market cycles. Each business day, the formula determines if any portion of your account value needs to be transferred into or out of the AST Investment Grade Bond Portfolio (the “Bond Portfolio”). Amounts transferred by the formula depend on a number of factors unique to your individual annuity and include:

(i) The difference between the account value and the Protected Withdrawal Value;
(ii) How long you have owned Highest Daily Lifetime Income;
(iii) The amount invested in, and the performance of, the permitted subaccounts;
(iv) The amount invested in, and the performance of, the Bond Portfolio; and
(v) The impact of additional purchase payments made to and withdrawals taken from the annuity.

Therefore, at any given time, some, most, or none of the account value may be allocated to the Bond Portfolio. Transfers to and from the Bond Portfolio do not impact any income guarantees that have already been locked in. The Protected Withdrawal Value is separate from the account value, and not available as a lump sum.

Any amounts invested in the Bond Portfolio will affect your ability to participate in a subsequent market recovery within the permitted subaccounts. Conversely, the account value may be higher at the beginning of the market recovery; e.g., more of the account value may have been protected from decline and volatility than it otherwise would have been had the benefit not been elected. Please note: We are not providing investment advice through the formula. You may not allocate purchase payments or transfer account value into or out of the Bond Portfolio. See the prospectus for complete details.

Fixed income investments are subject to risk, including credit and interest rate risk. Because of these risks, a subaccount’s share value may fluctuate. If interest rates rise, bond prices usually decline. If interest rates decline, bond prices usually increase.

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