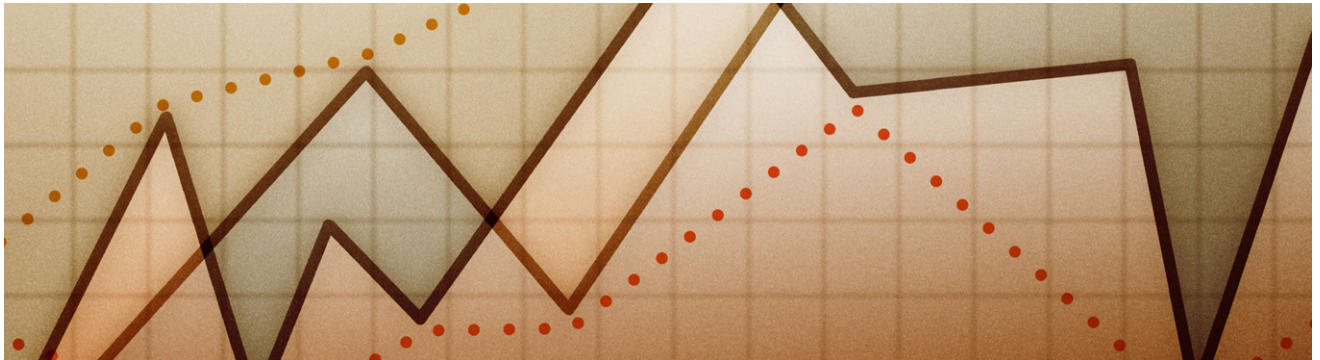


**McKinsey Working Papers on Risk**



# Responding to the Variable Annuity Crisis

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# Responding to the Variable Annuity Crisis

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## Introduction

As the crisis of 2008 and 2009 shakes the banking system to the core with housing and other credit-related losses, the life insurance sector is going through its own nightmare. Not only have life insurers experienced realized and unrealized losses in their general accounts from credit exposures, their variable annuity (VA) businesses have created exposures to equity markets that are now threatening the survival of some and putting pressure on the business model and balance sheet of others.

This led to one of the most challenging years in recent insurance industry history: in 2008 the total market capitalization of the largest 10 insurers decreased by 53 percent. Total losses amounted to \$36 billion. For the top VA carriers, available capital evaporated. By the time this article was written (late March 2009), a host of life insurers saw the ratings on their holding companies and life insurance entities downgraded by rating agencies.

A fundamental premise of the industry – that it is well positioned to manage the risks faced by baby-boomers through their retirement years – has also been shaken. It became apparent that the “arms race” on variable annuity living benefits (see appendix, “Taxonomy of guarantees,” p. 15-16) had exposed the industry to significant amounts of non-poolable, non-diversifiable risks. Furthermore, insurers’ variable annuity businesses leveraged them to the equity markets, wherein revenues go down with the S&P and costs of the guarantees grow exponentially.

Heightened volatility across equity markets and significant declines in Treasury rates caused large losses across VA policy cohorts and created untenable pricing arrangements for variable annuity writers. In response, most insurers have raised prices or cut benefits for new sales. This profound change in market conditions also requires a fundamental review of the business. Variable annuity writers need to reassess the medium-term growth prospects, profitability, and capital consumption over the cycle.

This working paper takes stock of what happened, considers possible outcomes for the industry over the coming few years, and lays out a game plan for insurers to manage their book in the near term and consider their strategic options in the medium term.

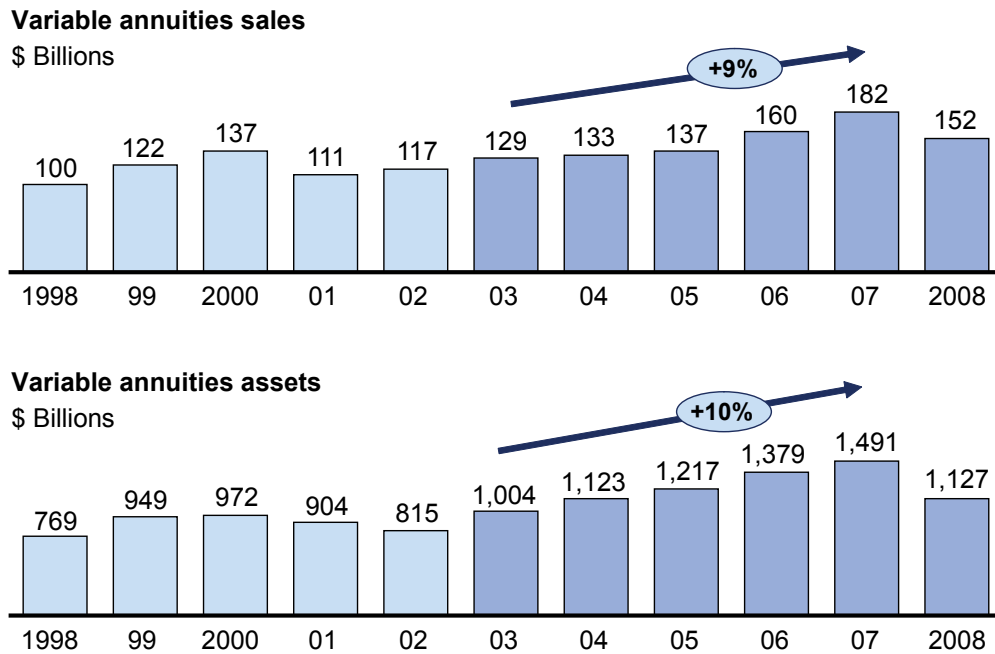
## Prelude to the crisis

The period of 2003-07, which may now seem like a distant era, was an exceptionally strong one for the life insurance industry:

- In total, revenues grew by 15 percent (\$108 billion), reaching \$830 billion in 2007.
- Cumulative profits over 5 years amounted to \$165 billion.

The main driver of this performance was variable annuities. Exhibit 1 on the following page shows variable annuity sales grew by around 9 percent annually over this time (approximately \$50 billion total), increasing assets to about \$1.5 trillion by 2007.

Exhibit 1

**Variable annuities 1998-2008**

Source: LIMRA survey (1998-2007); Morningstar (2008); analyst reports

It is worth recalling also that the variable annuity has undergone fundamental changes over the last 20 years. From a straightforward product at its inception, it has evolved into a complicated financial instrument with significant risk exposures for the manufacturer. Four trends drove this transformation.

### 1. “ARMS RACE” ON LIVING BENEFITS

Before 2003, and in particular before the 1990s, when dividend and capital gains tax rates were higher and largely in line with marginal tax rates, variable annuities offered policy holders a chance to accumulate higher levels of tax-deferred savings within a life insurance wrapper.

The 1990s saw the broadening of available investment choices and enhancements to death benefits, which resulted in asset growth of 21 percent per year, with assets reaching almost \$1 trillion by the end of 2000.

By 2003, affluent baby-boomers began approaching middle age with swelling 401(k) balances and limited ability to protect themselves against longevity and market risk. Changes in tax rates also weakened the traditional appeal of variable annuities as a tax deferral vehicle, and growth started to flatten. These forces pushed the industry aggressively to develop and market new guarantees promising continued tax deferral (similar to 401(k) and other IRA vehicles) while also offering market and longevity protection to policyholders.

In the early 2000s guaranteed living benefits were introduced. Living benefits provided a threshold of payments that policyholders could receive either during the accumulation or withdrawal phase (depending on the type of living benefit), regardless of their lifespan. The introduction of these guarantees set off a period of rapid development in which the market saw waves of new products with increasingly sophisticated guarantees. This innovation generated significant customer interest because it allowed customers to preserve assets in the face of equity market declines. The introduction of “WB for Life” in 2005 created a new standard for the industry, and competitors quickly followed. Its primary appeal relative to other living benefit riders was that it combined the longevity protection of an income benefit with the liquidity of the regular withdrawal benefit. Importantly, the introduction of these living benefits took place in the context of rising stock markets: a wave of benefits were launched beginning in 2002 and continuing to 2007, a period when the S&P 500 index grew at 9 percent per year.

In some sense, VAs emerged as the natural product for affluent investors in their 50s and 60s as they transitioned from the accumulation to the decumulation stage of their investment lifecycle. By 2007, the majority of VA assets were sourced from qualified as opposed to non-qualified sources.

## **2. AGGRESSIVE ASSET ALLOCATION**

With the introduction of living benefits and market performance guarantees, policyholders used variable annuities as a vehicle to invest in mutual funds. Over the last 5 years, investment choices in the VA wrapper have become more focused on equity. Furthermore, restrictions on asset allocation were implemented gradually and sometimes not fully enforced, and a significant number of carriers saw massive flows into equity on 2006-08 vintages. The share of equities in the VA asset portfolio was 50 percent in 2002, for example, but in 2007 an average allocation to equity of more than 80 percent was not uncommon.

## **3. CONTINUED SHIFT TOWARD THIRD-PARTY DISTRIBUTION**

A secular shift toward third-party distribution took place during this period. Third-party distributors accounted for around 50 percent of VA sales in 1994 versus 68 percent in 2007. This shift had many notable consequences. It partially fueled the arms race on living benefits as advisors pushed customers to upgrade to the latest – and most attractive – living benefits across carriers. It also exposed carriers to pricing pressures on guarantees, creating the possibility a winner’s curse for manufacturers.

## **4. BROAD ADOPTION OF DYNAMIC HEDGING AND SELF-INSURANCE AS RE-INSURANCE CAPACITY DRIED UP**

During the last bear market, many insurers reinsured a portion of their mostly death-benefit liabilities. As equity prices fell, many of these carriers, notably Allmerica and American Skandia, stumbled and even saw their books of business assumed by other carriers.<sup>1</sup> Not surprisingly, reinsurers that backed many of these liabilities were also badly burned during this period. By 2003-04, reinsurers had responded by pulling much of their capacity from the industry and would not return in a meaningful way for a few years.

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<sup>1</sup> Prudential bought American Skandia’s VA business in 2003.

With limited reinsurance capacity available and strong demand for their living benefits, insurers had to develop or contract for hedging programs that would protect them from the tail risks and income fluctuations which would otherwise accrue to those offering the complex derivatives that living benefits had become. By the end of 2007, most of the major VA writers were operating large-scale hedging programs that rivaled small trading floors in investment banks and had open positions in futures, swaps, and options that reached into the billions of dollars.

As early as 2005, industry leaders and commentators were describing the quality of hedging programs as perhaps the most critical determinant of future success in the marketplace. Knowingly or unknowingly, however, insurers retained some of the risk, either because they only partially hedged or because of flaws in their hedging programs. The unprecedented events of 2008 were to expose insurers to the reality of these exposures.

## **The variable annuity industry faces the crisis**

2008 saw a series of widely publicized events in the economy and in the stock market, with notable implications for the VA market.

- The stock market had its worst year since the Great Depression.
- Stock market volatility skyrocketed. After hovering around 20 percent for the last few years, the VIX index (measure of short-term volatility) reached an all-time high of 80 percent in the fall of 2008.
- Risk-free interest rates reached all-time lows, with short rates on Treasury Bills occasionally drifting into negative territory.
- Financial liquidity evaporated for many products: the bid-ask spread on long-term options increased markedly and trading volumes were significantly reduced.

These conditions exposed the industry to several painful realities.

### **1. RISK HEDGING PROGRAMS WORK . . . BUT ONLY TO A CERTAIN EXTENT**

Broadly speaking, the hedging programs adopted by most insurers worked as intended. It is estimated that hedging programs saved the industry about \$40 billion in September and October of 2008, offsetting more than 90 percent of the industry's increase in hedged liability over that period.<sup>2</sup> This success can be explained by the fact that most insurance companies purchased derivatives to cover, at least in theory, the major risks underlying the variable annuity guarantees – notably changes in the price of the underlying investment, and changes in volatility and interest rates.

Nevertheless, most insurers faced record levels of breakage in their hedging strategies. Most carriers' reported breakage below 2 percent before 2008. In 2008, some carriers experienced double-digit

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<sup>2</sup> Based on a recent report from Milliman.



breakage (e.g., 30 percent). Hedge breakage cost the industry a total of more than \$4 billion in September and October of that year alone.

There are several reasons for the magnitude of the hedge breakage:

- **Basis risk:** in extreme market conditions, mutual fund performance differed significantly from their benchmarks. Many players reported differences in performance of over 5 percent.
- **Liquidity:** the liquidity of hedging instruments – especially long-dated ones – dried up as volatility was increasing. The bid-ask spread on 1-year put options on the S&P 500 significantly increased over the last months of 2008 (Exhibit 2).
- **Policyholder behaviour:** consumers are facing historically high levels of uncertainty and fear. Traditional dynamic behavioural modeling has been pushed to its limit by current events. For example, assumptions that carriers made on annuitization rates of annuity contracts may not hold up in these volatile times.
- **Counterparty risk:** actual defaults and fears about the sustainability of major financial institutions introduced a new dimension of uncertainty to hedging programs. Some carriers were caught with exposure to institutions such as Lehman Brothers.
- **Execution risk:** given the wide swings of the market, execution delays and frequency of rebalancing became critical – and proved difficult to manage for some carriers.

## 2. UNMITIGATED RISKS ARE EXPOSED

In addition to losses from hedge breakage, many carriers did not fully hedge the economic liability associated with living benefits. The reasons for this include the following factors.

### Accounting treatment of income and death benefits (“GMIBs”)

Because of specific accounting practices, most carriers typically hedged this exposure only partially. GMIBs are not typically marked to market under GAAP accounting (see appendix, “Accounting treatment of guarantees, pp. 16-17) and carriers that have hedged to a GAAP as opposed to an economic objective have typically underhedged this exposure.<sup>3</sup>

Neither did many players choose fully to hedge death benefits (“GMDBs”). The cash and accounting impact of this decision is likely to be minimal in the short term. However, some estimates suggest that the true economic exposure of the industry to unhedged GMDB could be as much as \$15 billion. Should market conditions stay as they are today, these DB-related losses could be a drag on industry earnings for years to come.

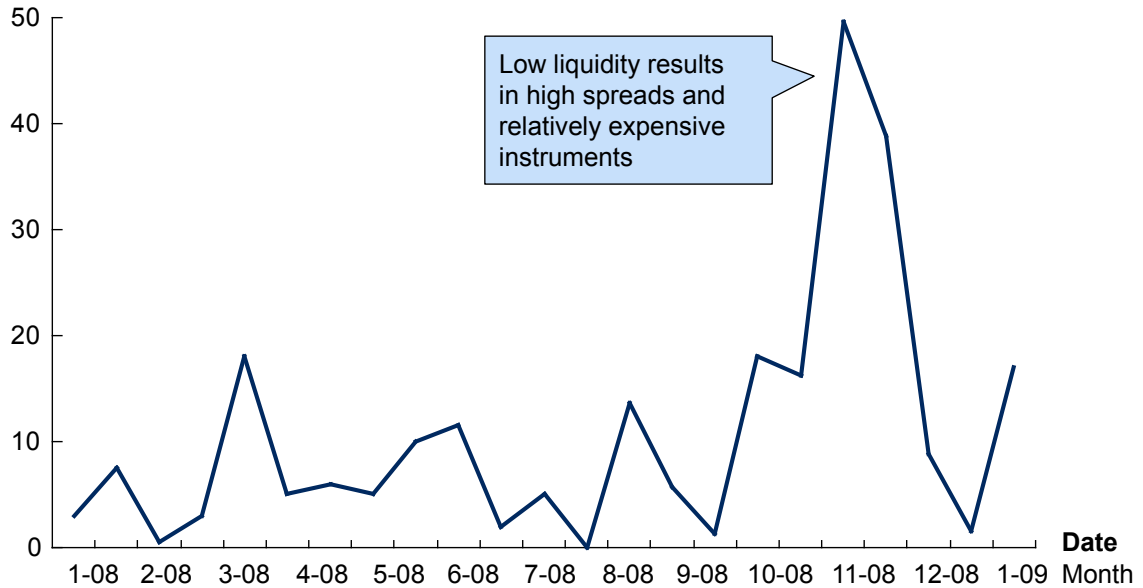
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<sup>3</sup> A widely publicized report from Goldman Sachs estimates total economic cost for the industry of unhedged GMIB exposure at \$23 billion.

Exhibit 2

**Bid-ask spread of S&P 500 call option**

Dollars



Note: S&P 500 Option, March 2009 (SPH9C 680 Comp Index)  
 Source: Bloomberg

**Pricing and volatility**

Most insurers are not fully hedging volatility exposure (Vega) and hence face the risk that under current conditions of extreme volatility pricing of their product does not adequately cover the cost of servicing the annuitant. The volatility and exposure are shown in Exhibit 3 on the following page. As can be seen, market volatility has significantly increased, which will raise hedging costs in the medium term. The exposure to market volatility risk is also shown in the exhibit, which compares the market price of the top publicly traded U.S. annuity writers<sup>4</sup> to the VIX index.

**Deferred acquisition cost**

Additionally, amortization schedule of policyholder acquisition cost varies with market performance. These changes to the amortization schedule lead to earnings volatility, which most companies are not hedging today. In some carriers, DAC exposure has reached ~30 percent of shareholder equity and could lead to losses ~\$1 billion annually.<sup>5</sup>

<sup>4</sup> Includes results for Prudential, Ameriprise, Lincoln Financial Group and Hartford Financial Group.

<sup>5</sup> Based on Morgan Stanley Research, 2008.

### 3. NOT ALL CARRIERS ARE CREATED EQUAL

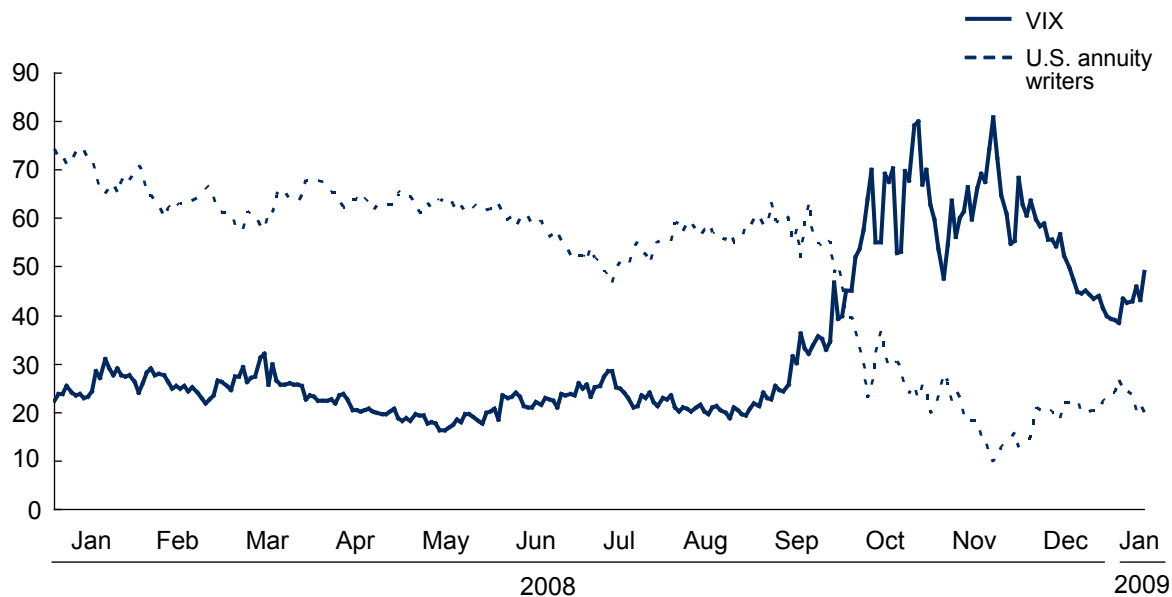
The inherent imperfections in the risk management program of various VA writers mentioned above and extreme bearish market conditions have created a perfect storm, which is significantly challenging many of the leading VA providers.

Although the entire industry is facing challenging times, there are meaningful differences between carriers based on their level of exposure and the effectiveness of their risk mitigation.

Exhibit 3

#### Market price of the top publicly traded U.S. annuity writers vs. VIX

Prices



- **Exposure to living benefits:** carriers which led the arms race on living benefits paid a steep price for it. For some carriers, the election rates for living benefits was over 70 percent during the 2006-08 period. The vast majority of living benefits issued during that period are now deeply “in the money.”<sup>6</sup> As with many insurance products, a winner’s curse seems to have emerged over the last year or two.
- **Effectiveness of risk mitigation program:** carriers that chose to hedge only partially for directional changes in the equity market or volatility are under significant pressure.

<sup>6</sup> “In the money” is a term used in call and put options to describe the difference between the price of the underlying asset and the strike price of the option. Consumers are said to be in the money on their put option when their account value is of significantly less value than the promised benefit.

Variable annuity exposures have contributed significantly to the relatively poor performance of carriers with leading VA positions. In the last 18 months, for example, 6 of the top 10 publicly traded VA writers have experienced average stock price declines of around 90 percent and their CDS spreads have ballooned ten times, to about 600 basis points.

## The future of the variable annuity market

The VA marketplace is in a state of flux. The evolution of the sector rests on the evolution of customer and distributor demand for the product and insurers' willingness to supply it.

**On the demand side**, the fundamental drivers of growth for the VA market are still in place, and the case for VAs being a valuable solution to manage retirement assets for baby-boomers is still compelling. Most baby-boomers are entering the pre-retiree population (age 55-65), and a majority of these are unprepared for retirement. Their cumulative income shortfall over the coming years is expected to reach \$1 trillion by 2030. More than one-third of these retirees are not hedged against outliving their income, while their life expectancy keeps increasing.<sup>7</sup> By significantly reducing assets available for retirement, the current crisis is further raising the level of anxiety of pre-retirees and early retirees, and increasing their receptivity to living benefits – even less generous ones. Distributors, and in particular independent broker dealers, which rely on variable annuities for a substantial portion of their income, will be keen to jump-start product sales, in particular as they have served their customers well during this crisis. Nonetheless, consumer assets have been depleted significantly by the crisis. The recession and deflated equity markets will limit consumer flows into equity products, including those with a guarantee, in the near to medium term. Finally, the fact that 80 percent of historical VA sales have been so-called “1035” exchanges portends difficult times ahead for VA flows as consumers and their advisors will not be in a position to exchange VAs with deep in the money living benefit options.<sup>8</sup>

**On the supply side**, carriers are responding to the new environment by raising prices<sup>9</sup> on living benefits, cheapening the overall benefit by reducing roll-up rates and ratchets, or doing both. Many are also considering exiting the business or significantly reducing the amount of capital deployed against it.

With both demand and supply sides undergoing significant evolution, the new equilibrium state for the variable annuity market is unclear. It will depend on how quickly economic conditions strengthen and how much confidence consumers have in the equity markets and credit-worthiness of VA providers. We see four possible scenarios.

**Scenario 1: Recovery of the VA market “as we know it.”** Economic conditions strengthen rapidly and VA sales resume at pre-crises growth rates:

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<sup>7</sup> Considering only high net worth and affluent segments of the population.

<sup>8</sup> 1035 exchanges are exchanges of one VA policy for another.

<sup>9</sup> Prices for variable annuity contracts have increased by 25 percent over the last 18 months.

- Consumer psychology rebounds as customers are attracted to stable and assured returns of VA guarantees
- VA products continue to be offered with similar levels of guarantees to consumers
- Carriers are able to manage the risk of guarantees cost-effectively using reinsurance, hedging and improved product design

**Scenario 2: Oversupply of VA guarantees.** VA sales collapse as consumers shy away from products even though carriers are eager to offer them.

- Consumers lack confidence in both insurance companies and VA product offerings
- While carriers are willing to maintain current VA products and guarantees, carriers will likely accept lower margins
- Products may be made simpler, to increase demand

**Scenario 3: Re-pricing of VA guarantees.** Economic conditions do not strengthen rapidly, leading to constrained supply and increased VA prices.

- While consumers are receptive to VA products, carriers are hesitant to offer guarantees at pre-crisis levels
- Guarantees are reduced and product prices are raised

**Scenario 4: Massive downscaling of the industry.** Economic conditions do not strengthen rapidly, consumers lose confidence in carriers and shy away from VA products. The industry goes into a long freeze.

- Consumers are uninterested in VA guarantees, as confidence in insurance carriers and attractiveness of VA product is low
- Carriers consider VA a lower priority as demand softens and risk management is costly; some carriers leave the VA market
- Product is simplified and guarantees reduced as carriers take on less risk

We believe that Scenario 3 is the most likely. Economic conditions will not recover for the next 12-18 months, but consumers will continue to see value in VA guarantees. VA carriers will significantly restructure products to simplify features (e.g., limit roll-up), limit basis risks (e.g., increase index investing) and pass higher hedging costs to consumers (e.g., increase in rider fees). We estimate that assets under management will not return to 2007 levels for another 5 years.

In summary, we believe variable annuities will likely continue to represent a significant share of consumer flows. The share would, however, critically depend on the willingness of carriers to stay in this marketplace and weather the current volatility storm.

## Winning in the tail

The severity of the crisis and its impact on variable annuity writers creates major pressures on insurers in the near term. In fact, the survival of some carriers is unclear.

In addition, the uncertainty in the future of the variable annuity market described above requires those who will weather the storm to think now about the implications of these scenarios so that they can emerge from the crisis stronger, healthier, and more competitive. The current environment remains unpredictable and fraught with peril, but it also offers opportunities for carriers that are prepared to take decisive action to secure their financial position and opportunistically capture share.

This creates three sets of imperatives for all variable annuity writers as they face the current market conditions.

### 1. ASSESS RISK EXPOSURES

Before they can accurately respond to market conditions carriers need a clear understanding of their risk exposures. Most have an understanding of the value of their exposure at a point in time and in a given set of market conditions. However, recent market turmoil shows that a few additional steps are critical.

**Assess effectiveness of current hedging strategy.** The current crisis has put stress on the hedging strategy of most carriers. Taking stock of what happened is a critical first step to defining what the future hedging strategy ought to be. If they are to draw the right conclusions from 2008 events, carriers must then assess the magnitude of their unhedged exposures (the true economic value as well as the GAAP and STAT impact) and the effectiveness of the risk-mitigation structure (i.e., reinsurance, structured derivatives vs. dynamic hedging). They must also understand the cause of breakage in their dynamic hedging programs (e.g., basis risk, execution risk).

**Stress-test current product portfolios and hedge programs under multiple market scenarios.** Even in “normal” times, many carriers tend to consider a set of outcomes that is too narrow. This holds true in the current crisis. Understanding the largest loss possible and capital requirements under a broad set of market conditions and industry conduct scenarios is critical. In addition, most carriers have focused on understanding next quarter’s potential financial results. They should also assess what their business will look like in 3-5 years based on a distribution of future scenarios for the market and their response to it.

**Improve transparency of risk exposures.** Many executives had the feeling of “flying blind” during recent events. The speed of market movements tested the ability of reporting systems to feed into decisions in “real time.” Assessing the quality of reporting and governance systems is critical to the survival of the carriers.

### 2. DEVELOP A SHORT-TERM RISK MITIGATION PLAN

Based on exposures, carriers should take rapid action to minimize losses and de-risk the business. This requires action on three fronts:

### **A. Revise risk-mitigation strategy**

- A first step is to review the hedging objectives (e.g., accounting vs. economic). A vital insight from this crisis is that hedging to accounting can become risky (see appendix, “Accounting treatment of guarantees,” pp. 16-17), as the economic liability can become significant. How to minimize economic risk while managing accounting is a critical challenge for the industry in the coming years.
- For many players, adapting the structure of the hedging / risk mitigation program will also be critically important. Over-reliance on dynamic hedging can have significant drawbacks, as many players experienced. A mix of reinsurance, structured derivatives and dynamic hedging will likely be optimal in the future (see appendix, “Risk management options,” p. 18). Whatever hedging structure carriers employ, they will importantly have to account for non-linear effects (e.g., dynamic 3-greek hedge) in the design of their strategy.
- At the core of these decisions is an understanding of the bets companies are willing to make (e.g., mean reversion on volatility) versus those that they are not willing to make. In many situations, these choices were implicit or were made too low down in the organization. Given the magnitude of the impact of these decisions, the C-suite should be involved in validating these choices

### **B. Refine pricing to charge accurately for the cost of the embedded options**

- The current market environment is bringing into question fundamental assumptions about implied and realized volatility, consumer behaviour, and cost of hedging. While carriers have begun to move toward more financially engineered products with market neutral type modeling and pricing, current volatility levels demand a heavy price for the complex put options that carriers are selling in their living benefits.
- Not surprisingly, at 2007 price levels and current volatility levels, the living benefits embedded in variable annuity contracts are a money loser. Carriers need to adjust their pricing or benefits to better align with current market realities. Most carriers are pursuing these options on new business, while some are exploring re-pricing their existing contracts.

### **C. Change product designs.**

In a similar vein, carriers need to adjust the design of their products. Example changes might include limiting the number of resets, or mandating a percentage of fixed income in the VA portfolio. A natural alternative to pricing changes is an adjustment in the richness of the guarantee. This trend has already started with many carriers pulling certain guarantees off the shelf or decreasing guarantee levels. Carriers burned by active fund managers underperforming their benchmarks are adjusting their fund line-ups to minimize basis risk. Finally, some are restricting exposure to equity to limit the risk of the underlying mutual fund portfolio.

## **3. DEFINE THE VARIABLE ANNUITY STRATEGY UNDER UNCERTAIN CONDITIONS**

While the future of the VA market is uncertain, carriers will nonetheless have important decisions to make about this business during the course of 2009 and 2010. Below we highlight some of the critical decisions that carriers will have to grapple with over the coming months.

- **Setting a risk appetite.** Perhaps the most important element of a medium-term strategy will be for carriers to assess their appetite and willingness to write the business. In some sense, life insurers are not natural owners of the risk inherent in VA products. Unlike standard life insurance or even longevity protection, there is no risk pooling when it comes to market/equity risk, nor are insurers asset managers per se. Life insurers will have to review thoroughly all their lines of business and current VA products, and will need to define the extent of risk exposure they are willing to take on their VA book versus the rest of the enterprise.
- **Product and pricing strategy.** VA writers are already changing their product offering to respond to a more volatile environment, and they will have to continue to do this. In many cases, the decision to shift features or pricing will largely depend on the risk and capital position of the firm. As they decide, insurers should understand what features consumers and distributors value most and what they are willing to pay for. Based on this information and their improved understanding of the risk profile of these features, they should redefine the product line-up they are willing to compete with.
- **Distribution changes.** Over the past few years, wholesaling focused on selling the investment options available in the variable annuity in addition to the guarantees. Recent events, where even the hottest fund families have suffered, is changing the value proposition of different variable annuities. Along with changes to prices and guarantee levels, wholesalers will need to learn a new value proposition for the products they support. Also, significantly smaller sales volumes will mean smaller wholesale forces for most carriers. All told, this will mean a retrained and restructured salesforce for most carriers.
- **Operational efficiency.** Just like asset managers, VA writers will have to reduce their cost base to account for lower revenues on current assets and flows that will not match the records of 2006 and 2007. As long as the market grew, carriers were in constant need of talent and resources. With momentum shifting, it is critical that carriers take a closer look at operational, marketing and distribution costs and ensure that they are well aligned to deliver operating profits.

\* \* \*

For years, the popular press has lambasted the VA product and its living benefits as a poor deal for consumers. Decrying their high costs relative to standard mutual funds, personal finance columnists tried to dissuade investors from these products. In retrospect, VA policyholders with living benefits seem to have come out ahead and the product is working as intended for the consumer. The VA product has always been about balancing the needs of consumer, shareholder, and distributor. The next generation of products and business practices will surely rebalance that triangle once again.

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## Appendix

### TAXONOMY OF GUARANTEES

Guaranteed living benefits have emerged as the dominant benefit rider on variable annuities, with their sales growing at 11% per annum over the last few years as sales of riders with no living benefits slowly declined. Living benefits have succeeded because they provide for asset preservation, do not require annuitization, maintain upside in the withdrawal phase while still providing longevity protection. They come in different flavors:

#### Living benefits

In general the benefits and riders offered by insurers inside of VA policies can be thought of as complex and long-dated put options sold by the carrier to the policy holder. Brief explanations of the most common riders are given below:

- **Minimum withdrawal benefit (GMWB)** guarantees that a certain percentage of paid premiums (usually ~ 7%) can be withdrawn annually until the principal is depleted, whatever the portfolio's performance.
- **Lifetime guaranteed minimum withdrawal benefit (GWBL)** guarantees a lower withdrawal amount than does GMWB (i.e., 5-6%), but for the length of the policyholder's life, irrespective of the portfolio's performance or whether the principal is depleted. Like GMWBs, they provide for full liquidity of account value, even after withdrawals have begun.
- **Minimum accumulation benefit (GMAB)** guarantees that after a specified number of years, contract value will equal or exceed some minimum amount, whatever the portfolio's performance.
- **Minimum income benefit (GMIB)** guarantees that when the contract is annuitized, income payments will be based on value equalling or exceeding some minimum amount, whatever the portfolio's performance. Unlike with other GLBs, gaining access to GMIB benefits requires annuitization.

#### Death benefits

- **Guaranteed minimum death benefit (GMDB)** guarantees payment of a minimum amount to the beneficiary should the policyholder die during the term of the contract, whatever the portfolio's performance.

#### Ratchets and roll-ups

Many of the riders noted above include provisions such as ratchets and roll-ups in addition to their headline payout rates.

- **Ratchets** refer to the resets of the benefit base. Typically these are allowed on an annual basis, and enable the policy holder to reset the benefit base to the new, presumably higher, account value at

intervals. For some policies ratchets require a specific enabling exercise and is done for a fee.

- **Roll-ups** refers to the guaranteed rates at which the benefit base will grow, regardless of market performance. These were typically set in the 5-7% range in the past few years.

## ACCOUNTING TREATMENT OF GUARANTEES

A variable annuity contract is composed of two pieces: a) a host contract and b) guarantees, which can be economically modeled as a derivative (i.e., a complicated put option). A variable annuity is typically valued at the value of the host contract less the value of these embedded guarantees.

Accounting rules, which vary significantly across guarantees, provide guidance on how the embedded guarantees should be valued and hence can lead to different risk management choices if carriers optimize for accounting instead of economics.

### GAAP accounting

**GMWB/GMAB:** FAS133 and FAS157 are used as guide to valuing these guarantees

- **FAS133** treats guarantees as embedded derivatives and mandates the application of fair valuation. Embedded derivatives are marked to market as long as the market exists. But, in the event, a market does not exist, they are marked to model using risk neutral market return assumptions.
  - *Risk management implications.* The economic-like accounting treatment of the guarantees has historically led most insurers to fully hedge these guarantees. However, some carriers have moved away from full-hedging in the past few months as riders became “marked-to-model” because of the lack of liquidity in the market for long-term options.
- **FAS157**, introduced in November 2007, mandates a framework for fair value calculations of embedded derivatives. Similar to FAS133, embedded derivatives are still marked to market as long as the market exists. But FAS157 now requires that the fair value measurement for a liability reflects its non-performance risk (i.e., the risk that the carrier might not be in the position to honour its obligation). Therefore the reporting entity’s credit risk will affect the fair value of the liability when determined in the mark-to-model approach.
  - *Risk management implications.* FAS157 can reduce the motivation for a carrier whose credit rating has been downgraded to fully hedge outstanding guarantees as the accounting value of those liabilities is significantly lower than the guaranteed amount given the use of higher than the risk free rate discount factor (characteristics of the entity’s credit risk) in mark-to-model calculations.

**GMIB/GMDB/GWBL:** SOP 03-01 is used to value guarantees which have a lifetime portion.

- **SOP 03-01** treats the guarantees as policy benefits and does not mark them to market. Benefit reserves are calculated by modelling more than 50 stochastic scenarios that are based on historical equity market mean and variance.

- *Risk management implications.* The disconnect between economics and accounting leads to unhedged liabilities. For example, when the equity markets were performing well, there was less incentive to hedge the GMIBs as only the changing value of hedges (which would have been showing losses) would have passed through to the P&L, which left many companies underhedged and heavily exposed to the market down-turn. According to a 2007 study, only 54% of variable annuity writers were hedging GMIB guarantees. Of those, the average percentage of risk hedged was only 38%.

**Hedge assets** are valued at their fair market value when the financial statement is issued; as such, there is full credit for the hedging strategy.

### Statutory accounting

- **Reserves.** VACARVM is a new reserve standard which will be effective by year end 2009. Capital requirements are based on loss as modelled using a standard scenario (e.g., 14% drop, then 4-5% annual recovery) and CTE70 (average of worst 30% of scenarios). It is designed to improve statutory reserving and has greater sensitivity to equity markets (delta and gamma) than the current methodology.
- **Capital.** C3 Phase II was adopted at the end of 2005 for capital. Like VACARVM, it marks a shift from a formula-based calculation to a principle-based calculation, using stochastic techniques. The minimum RBC is based on CTE 90 (the average of the worst 10% of outcomes over a range of scenarios), after subtracting the reserves (see above). A universe of acceptable stochastic scenarios has been provided. Alternatively, companies can use their own scenarios if the scenarios meet certain calibration requirements. The regulators have also defined an alternative minimum capital standard based on a deterministic scenario combined with prescribed assumptions. The aim is to allow some comparability among companies and to alleviate concern among some regulators about giving too much discretion to companies for setting assumptions.
- **Hedge Assets.** STAT accounting gives full credit for static hedging (i.e., hedge assets currently on the book.) However, it gives only partial credit for dynamic hedging (i.e., the subsequent rebalancing of these assets.)

**Key differences between STAT and GAAP:** three important differences should be highlighted between STAT and GAAP accounting. First STAT accounting is much less sensitive to changes in volatility, as it primarily projects historical volatility as opposed to GAAP using implied market volatility. Second, STAT accounting has a much more consistent treatment of the different riders and does not create the distortions that GAAP can create (e.g., more incentive to hedge FAS133 liabilities than SOP03-1 in GAAP). Third, STAT accounting provides less than full credit to dynamic hedging (30-50%).

Given current constraints on capital and focus by carriers on maintaining their financial strength rating, hedging for statutory accounting is likely to become more common. However, carriers cannot simultaneously optimize their hedging programs for GAAP, STAT capital, and economic exposure. Carriers will have to carefully consider the objectives of their hedging programs and their related impacts on capital and STAT and GAAP income.

## RISK MANAGEMENT OPTIONS

Variable Annuity guarantees expose carriers to long-term risks. Carriers have multiple options to manage risks associated with Variable Annuity guarantees:

- **Reinsurance** involves carriers ceding some or all of the risk associated with guarantees to another party. Insurers can reinsure the total benefit of the VA contract or only the guarantee amount. They can also pay claims up to a certain limit with the reinsurer taking on the rest or they can decide to reinsure against only the catastrophic risk (e.g., extreme spike in volatility). Reinsurance typically has the benefit of being the most complete hedge of the assumed liability. It does however have the drawbacks of exposing the insurer to counterparty risk and of not being a permanent source of capital. Hedging programs themselves emerged as reinsurers exited the VA space after the last market correction.
- **Structured/long-dated derivatives** involve using a mix of forward products and/or options to structure a portfolio to hedge against the changes in the underlying VA asset value. The most obvious drawback of this method is the relative illiquidity of the marketplace. These structures usually are constructed as custom-designed derivatives and require a counterparty seeking this long-dated derivative based exposure. When available and certainly in current market conditions these arrangements usually come with a hefty risk mark-up.
- **Exchange traded instruments** involve using short-dated exchange traded derivative instruments to replicate the option that has been sold in the liabilities with the goal of providing protection against changes in the performance of underlying assets, and changes in volatility and interest rates. Dynamic hedging provides most capital relief but requires careful implementation. Rapid changes in financial markets often require rapid trading and close tracking of assets and liabilities. Carriers have been frequently surprised by the balance sheet sensitivity of their positions relative to movements in equity and interest rate markets. Furthermore, successful execution requires a strong combination of actuarial, trading, technology and computational capabilities that are difficult to develop except for the largest writers.

## VA riders as financial options

As discussed above, VA benefits or riders are essentially complex put options sold by carriers to policyholders. As with options, their value is determined by five critical variables.

- **Spot.** For a typical equity option a critical driver is the value of the underlying asset generally referred to as the spot price. Analogizing to the VA market – the spot is essentially the account value – the value of the underlying mutual funds, which move with equity and bond markets.
- **Strike.** For a typical equity option, this would be the promised price at which the seller of the option has agreed to transact the underlying asset. In the case of a VA – the strike is essentially the present value of the promised benefit base. As the account value (spot) falls relative to the benefit base (strike), the value of the put (rider) can rise very quickly.

- **Volatility.** A critical determinant of the value of an option is the volatility of the underlying equity or instrument. Volatility has essentially the same meaning in a VA context though it here refers to the volatility of the underlying mutual funds. As volatility rises the value of the benefit will go up as well.
- **Risk-free interest rate.** The value of a put option is generally negatively correlated with interest rates because the put represents a future liability the discounting of which falls as interest rates fall.
- **Time to maturity.** Refers to the length of time that policy holder has to exercise the option inherent in the VA rider.
- **Policyholder behaviour.** It is also worth noting that the value of the benefits critically depends on the behaviour of policyholders. Unlike a typical financial trader, VA policy holders do not typically follow a completely rational policy for exercising their underlying options. In many cases, policy holders will not exercise their in-the-money options because they do not want to take the money as a stream but rather as a lump-sum, or simply because they prefer to wait. Large discontinuities in policyholder behaviour can surprise insurers and upset the careful modelling that underlies pricing and hedging strategies.



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