



SOCIETY OF ACTUARIES

Article from:

Product Matters!

February 2010 – Issue 76

Will Sales Of A De-Risked VA Product Improve Reserve And Required **Capital Positions Under Principle-Based Approaches?**

By Yuhong Xue

Editors' note: The following article was written prior to the Dec. 31, 2009 implementation of AG43.

Over the past few years variable annuities have enjoyed healthy growth as a viable option for managing retirement because of the attractive guarantees embedded in the products and a rising equity market. During this period, to attract new business, there has been an intense competition to enrich the product features, especially in the riders, with complex financial guarantees. As a result, variable annuities have evolved from guaranteeing just the simple return of premium death benefit to the rich lifetime withdrawal benefit which guarantees a percentage of the initial premium if certain conditions are met. Such rich guaranteed benefits are financially equivalent to complex equity or interest rate derivatives. These riders can create big liabilities with adverse movements in equity and interest rate markets.

In the second half of 2008 and first quarter of 2009, equity markets and interest rates went down precipitously. The financial liabilities of the guaranteed benefits in the variable annuity products shot up, causing tremendous strain on risk-based capital and reserves of the VA writers. In fact, two large insurers took capital from the federal Troubled Asset Relief Program (TARP) partly due to exposures to the VA business.

In the wake of the market turmoil, it became apparent that the current VA products loaded with rich benefit guarantees will not withstand another test such as this one. In the past few months, the majority of the VA writers have already de-risked or are in the process of de-risking their VA offerings, making them less risky and more profitable. Some are even considering scaling back or stopping new sales.

In the mean time, the statutory reserving standard for VA contracts is moving from the current formulaic based approach as specified in Actuarial Guideline 33, 34 and 39 to a principle-based approach known as AG VACARVM (Actuarial Guideline covering the Commissioners' Annuity Reserving Valuation Method for VAs) which was adopted by the National Association of Insurance

Commissioners (NAIC) and became known as Actuarial Guideline 43 or AG 43. The effective implementation date is Dec. 31, 2009.

Unlike the current approach, AG 43 requires you to evaluate the financial outcomes under a wide range of economic scenarios taking the whole contract into consideration. Risk offsetting effects between base contract and riders, between different riders, between different scenarios and between timing of occurrence of deficiencies are now possible. This stochastic result is subject to a Standard Scenario floor which is calculated based on a deterministic scenario and a set of prescribed assumptions.

Companies are currently in the process of evaluating how exactly AG 43 will impact reserves and risk based capital (RBC) from their VA in-force block. According to a recent survey published by Towers Perrin, reserves are increasing for some companies and decreasing for others under AG 43 compared to the current standard. On the capital side, despite RBC C3 Phase II—which is based on an approach similar to AG 43—being adopted in 2005, the fact that RBC is defined as Total Asset Requirement (TAR) in excess of statutory reserve means that AG 43 will also impact required capital.



Yuhong (Jason) Xue, FSA, MAA, is an officer of Retirement Solutions at the Guardian Life Insurance of America in New York, NY. He can be reached at yuhong_xue@glic.com.



CONTINUED ON PAGE 6

Perhaps a more interesting question is what kind of reserve and capital impact AG 43 has on new business, especially in the context of the de-risked products. Should companies scale back or stop new sales—even for a less risky product—in light of the new reserving standard? Or should companies sustain or even increase sales levels given some of the potential benefits that the new standard brings?

The author argues that given the “right” product mix of an in-force block and a complimentary less-risky new product, companies’ statutory reserve and RBC positions can at least avoid additional stress, and possibly even benefit from, new business sales—even in “bad” economic conditions under AG 43—due to the various risk offsetting effects in the stochastic calculation. The author will illustrate his point through a specific example which will be discussed in detail in a later section.

Risk offsetting effects in AG 43 and RBC C3 phase II

As mentioned previously, statutory reserves for VAs are currently governed by AG 33, 34 and 39. AG 33 reserves merely represent features in the base contracts, ignoring the riders in the calculation. AG 34 only computes the additional liability in excess of AG 33 reserves due to the death benefit guarantees, and AG 39 reflects only the living benefit riders. This is a bifurcated approach where the base contract and the different types of riders are considered separately. However, in the AG 43 new reserving standard, the base contracts and the riders are considered together.

Briefly, AG 43 has two components: the stochastic piece and the standard scenario floor. In the stochastic calculation, you are required to project the scenario Greatest Present Value of Accumulated Deficiencies (GPVAD) for each of many stochastic scenarios representing a wide range of economic conditions. The scenario GPVAD is the greatest of all deficiencies, in terms of present value, over all projected time periods and aggregating all contracts. The average of the worst 30 percent of the GPVADs is the so-called Conditional Tail Expectation (CTE) 70. This CTE 70 is compared to a standard scenario reserve and the greater of the two is the final AG 43 reserve. The standard scenario reserve is the sum of

a Basic Adjusted Reserve (BAR) and Accumulated Net Revenue (ANR). The BAR is similar to the AG 33 calculation with different treatment of rider charges and partial withdrawals. The ANR is defined somewhat similarly to GPVAD, but projected using a prescribed deterministic scenario and prescribed assumptions.

Now that the whole contract is projected together under AG 43, some risk offsetting effects can be observed in the stochastic calculation:

1. When combining the base contract with riders
 - In addition to the rider charges, the M&E fees, admin charges, and revenue sharing income from the base contracts can help offset the claims generated from the riders during a down market. The base contract is often priced with a profit while the riders are priced to break even. In a down market, the profit from the base contract is used to pay rider claims.
2. When combining different riders
 - If you were to calculate a GPVAD for each rider type for a given scenario, the periods at which the GPVADs occur are different for different rider types. For example, GPVAD occurs much earlier for DB riders than for WB riders. This means when combining the DB and WB riders, the GPVAD of the combined is less than the sum of the individual GPVADs of DB and WB for a particular scenario.
 - Secondly, a bad scenario, one which produces large GPVAD, for one rider is not necessarily a bad scenario for other riders. The worst 30 percent of the GPVADs of the WB riders are not necessarily the worst 30 percent scenarios for the DB riders. Therefore, CTE 70 of the combined is less than the CTE 70s of the riders individually.
3. When combining different years of issues and new business
 - When business is sold continuously throughout a volatile market, some policies are in the money while others are out of the money. The profits accumulated from the policies which are out of the money can be used to pay claims from the policies that are in the money in a bad scenario.

These risk offsetting effects will be illustrated in the example in the next section.

Similar to AG 43, RBC C3 phase II also defines the Total Asset Requirement (TAR) to be the bigger of a stochastic component and standard scenario component. The key differences in the stochastic part include CTE level (CTE70 vs. CTE90), tax treatment for cash flows, different rules for recognizing non-contractually guaranteed net revenue sharing, and discount rates. In addition, the standard scenario of RBC allows aggregation of different contracts while that of AG 43 is a seriatim calculation, no aggregation is allowed.

Given the conservative nature in the standard scenario of AG 43, the relevance of this floor can depend on many factors. This discussion only focuses on the stochastic component of AG 43 and RBC C3 phase II. Therefore, it is not applicable for companies where both the standard scenario amounts of AG 43 and RBC are dominant.

Illustrative Example

For illustration purposes, the author constructed an in-force block of VA business with \$100 million in account value as of Dec. 31, 2008. Many of the contracts have Guaranteed Minimum Death Benefit (GMDB) riders. Only a small proportion has Guaranteed Minimum Income Benefit (GMIB) riders. The business is projected one year forward to the end of 2009. Only contracts with lifetime Guaranteed Minimum Withdrawal Benefit (GMWB) riders are sold as new business during the year 2009. The projection is done under three market conditions and two new business volumes. The stochastic component of AG 43 and RBC C3 phase II are then calculated and analyzed.

Here are the six cases. The market decline is as of Dec. 31, 2009 compared to the Dec. 31, 2008 level.

New business volume	\$20 million of GMWB sales	\$40 million of GMWB sales
Market return 0%	Case 1	Case 4
Market return (10%)	Case 2	Case 5
Market return (20%)	Case 3	Case 6

The above will provide a picture of reserve and capital levels at the end of 2009. Would this picture change in a multi-year scenario where new business is sold continu-

ously? For this, the author also projected the in-force and new business for five years and studied the reserve and capital positions at the end of the five-year period. The following two cases are used for this purpose:

	Case 7	Case 8
	\$20 million of GMWB sales every year	\$40 million of GMWB sales every year
Market return	(10%), (10%),0%,10%,10%	(10%), (10%),0%,10%,10%

Assumptions in the Example

In-force business assumptions

The in-force block consists of contracts with GMDB and GMIB riders:

Rider Type	Account Value (millions)	Guarantee Balance (millions)
Annual Ratchet GMDB (Dollar-for-Dollar)	26	33
Annual Ratchet GMDB (Pro Rata)	38	44
GMDB 3% roll-up	12	16
Return of Premium GMDB (ROP)	10	13
GMIB 5% roll-up (10 years wait period)	14	19
Total	100	125

Policies in this VA block were issued throughout the past 10 years. Accompanying base contracts are a mixture of B and L shares with equal amounts. Fund selection is limited to major index funds. Here are some additional statistics on this block:

Policy Count:	1,790
Average Size:	\$56,000
Average In-The-Money (ITM):	25%
Average Attained Age:	61
Gender Ratio:	50:50
Equity vs. Bond fund selection:	70:30

CONTINUED ON PAGE 8

New business assumptions

The new business contracts with lifetime GMWB riders are a mixture of two types of rider designs: the plain GMWB has no additional bonus except for an annual ratchet for delaying withdrawals. The bonus GMWB design will credit an additional 6 percent compound to the GMWB balance for each additional year of withdrawal delay until year 15.

The above GMWB riders are priced in the interest rate and equity environment of the first quarter of 2009 when the 30-year swap rate hovered around 3 percent. They are priced to break even using risk neutral techniques. The rider charge for the plain design is 75 bps and 140 bps for the bonus design. The lifetime withdrawal benefit ranges from 3 percent to 6 percent depending on the age at which withdrawals starts. This level of rider charge and benefit is comparable to the de-risked products currently sold in the VA market.

Here are some additional statistics on the assumed new business:

- Base contract B vs. L share: 50:50
- Single vs. Joint: 50:50
- Male vs. Female: 50:50
- Plain vs. Bonus GMWB: 20:80
- Average issue age: 60
- Age distribution: Older people tend to buy the plain design and younger people tend to buy the bonus design
- Average size: \$90,000
- Equity vs. Bond fund selection: 70:30

Modeling assumptions

A cash flow projection model is created for calculating the stochastic CTE levels as defined in AG 43 and RBC C3 phase II. The assumptions follow the guidelines or regulations. The margins required by AG 43 are assumed to be already built in the various assumptions.

Economic scenarios

One thousand scenarios are generated for equity returns

and interest rates. The equity model is a two-regime switching model with correlations between equity indices and the interest rates. The interest rate model is lognormal with mean reversion to a long term mean.

The scenarios are based on parameters derived from historical market data and are calibrated to the calibration points published by the Academy.

Fees and expenses

M&E fees	150 bps
Surrender charges	8% grade to 0% depending on schedule of B or L
Net revenue sharing	30 bps (all are assumed to be guaranteed)
Per policy maintenance expense	\$120
Asset based maintenance expense	50 bps
Trail commissions	1%

Policyholder behavior assumptions

The base lapse rate is assumed to be 4 percent within the surrender charge period and 10 percent beyond it. There is also a shock lapse of 20 percent or 30 percent at the end of the surrender charge period for B and L share respectively. A dynamic lapse formula is acting to reduce the base lapse rates when guarantees are in the money.

For policies with lifetime GMWB riders, the author adopted a cohort approach when it comes to withdrawal delay assumptions. Generally the assumption is that the policyholders are rational and efficient, they will choose to start withdrawing the full amount allowable by the contract at a time that is most beneficial to them financially. The author also assumed that a small cohort of policyholders will start withdrawing at a less optimal time due to other considerations.

Utilization of the GMIB benefits is also assumed to be dynamic based on in-the-moneyness of the guarantee.

There is also a 2 percent partial withdrawal assumed for non-GMWB contracts.

Other assumptions

Mortality is 80 percent of the annuity 2000 table. The short rates specific to the economic scenario are used as discount rates. And finally, no dynamic hedging strategy is modeled.

Analysis of Results

As a reminder, on Dec. 31, 2008, we started with a block of \$100 million in account value that consists of policies with GMDB and GMIB riders. The guarantees are 25 percent in-the-money. We assumed \$20 million or \$40 million of new sales in 2009, all are policies with GMWB riders. We projected the in-force and new business to the end of 2009 under three market returns, flat 0 percent, down 10 percent and down 20 percent. Finally, we calcu-

lated CTE 70 and CTE 90 by projecting cash flows of the whole business as of Dec. 31, 2009 under 1000 economic scenarios. The average of the worst 30 percent of the pre-tax GPVADs is the pre-tax CTE 70. The average of the worst 10 percent of the post-tax GPVADs is the post-tax CTE 90.

The results are shown in the tables below. The negative values indicate deficiencies. The stochastic component of AG43 is the starting asset plus the absolute value of CTE 70. And the Total Asset Requirement (TAR) as defined in RBC C3 phase II is the starting asset plus the absolute value of CTE 90. In the following discussions, whenever CTE 70 or 90 is mentioned, it is referring to its absolute value.

Case	In-force Business (millions of Account Value)	New Business sales (millions of Premium)	Equity Market Return	Time Horizon (Years)	CTE 70 Pre-tax IF+NB (000s)	CTE 70 Pre-tax IF+NB (000s)	CTE 70 Pre-tax NB+NB (000s)
1	100	20	0%	1	(44)	(69)	(66)
2	100	20	(10)%	1	(72)	(202)	(85)
3	100	20	(20)%	1	(366)	(325)	(124)
4	100	40	0%	1	(96)	(69)	(133)
5	100	40	(10)%	1	(138)	(202)	(170)
6	100	40	(20)%	1	(392)	(325)	(249)

Case	In-force Business (millions of Account Value)	New Business Sales (millions of Premium)	Equity Market Return	Time Horizon (Years)	CTE 90 Post-tax IF+NB (000s)	CTE 90 Post-tax IF Only (000s)	CTE 90 Post-tax NB Only (000s)
1	100	20	0%	1	(122)	(129)	(187)
2	100	20	(10)%	1	(195)	(295)	(240)
3	100	20	(20)%	1	(495)	(396)	(351)
4	100	40	0%	1	(270)	(129)	(375)
5	100	40	(10)%	1	(390)	(295)	(480)
6	100	40	(20)%	1	(764)	(396)	(702)

CONTINUED ON PAGE 10

The following graph illustrates CTE 70 values for market returns at a flat 0 percent, down 10 percent and down 20 percent, corresponding to the cases 1, 2 and 3 above. We assumed \$20 million of new sales for the three cases.

The graph reveals a surprising result: when the market is flat or down 10 percent, the CTE 70 of the whole block (solid line) is less than the CTE 70 of the in-force (dotted line) or new business (wiggly line) individually. When the market is down 20 percent, the CTE 70 of the whole block is larger than that of the in-force or new business individually, but it is still much less than the sum of the two. This is also true for the CTE 70s and CTE 90s in the other cases.

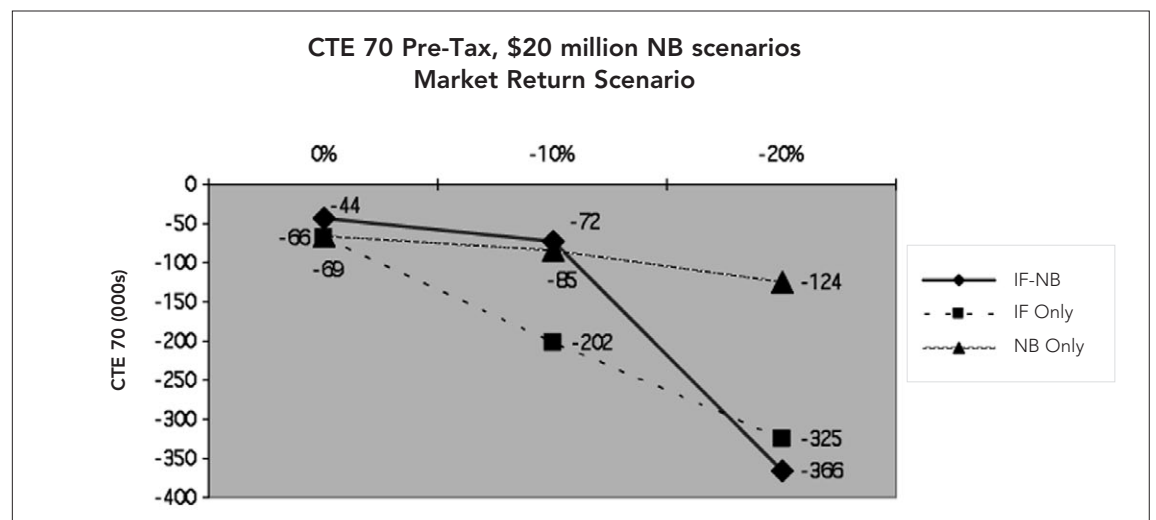
can soften the impact on reserves and capital of new business sales.

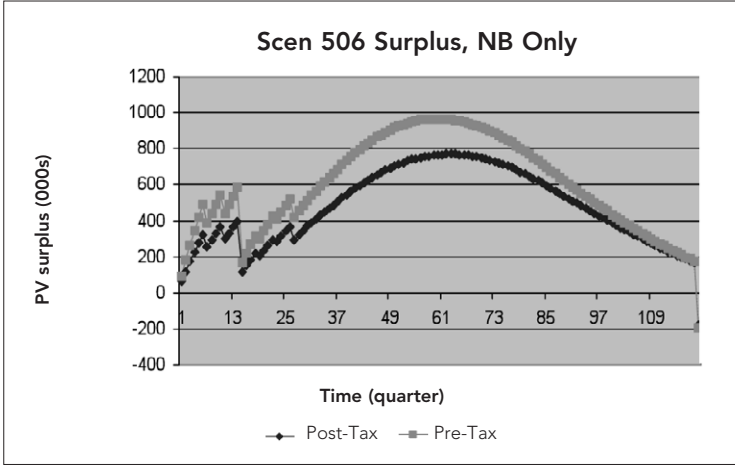
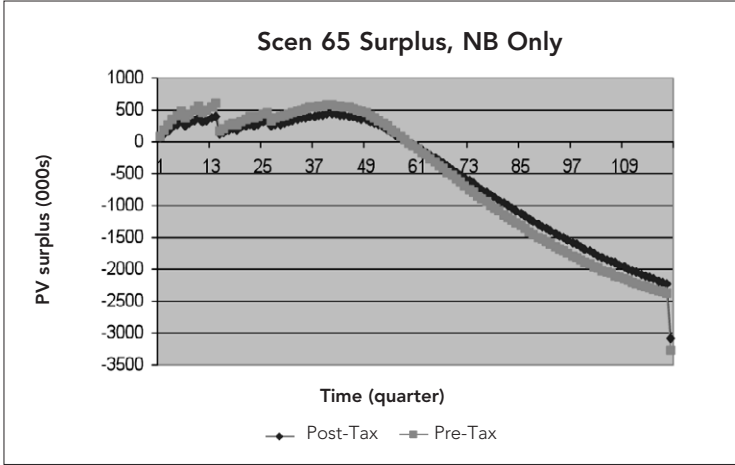
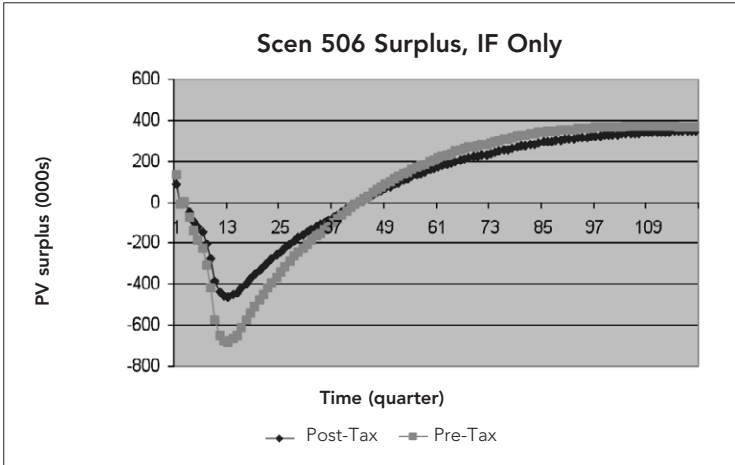
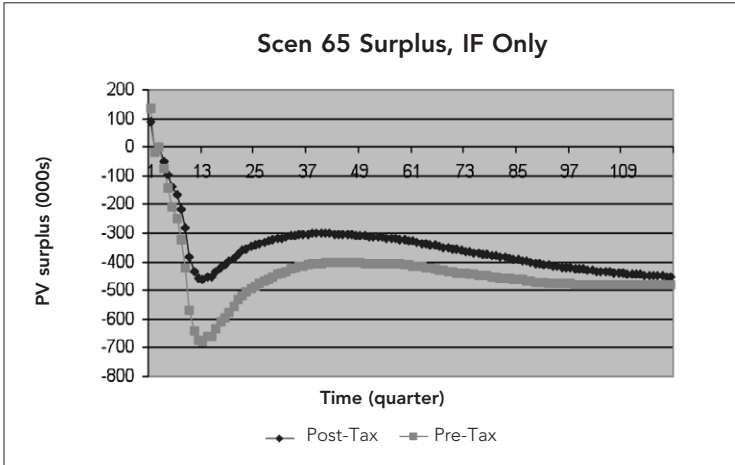
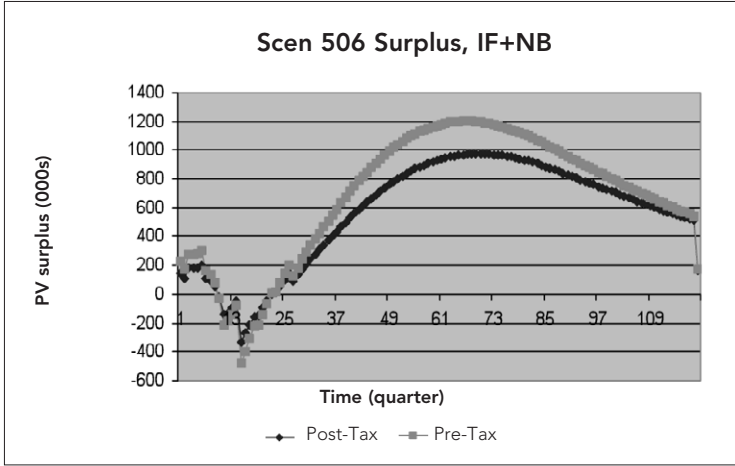
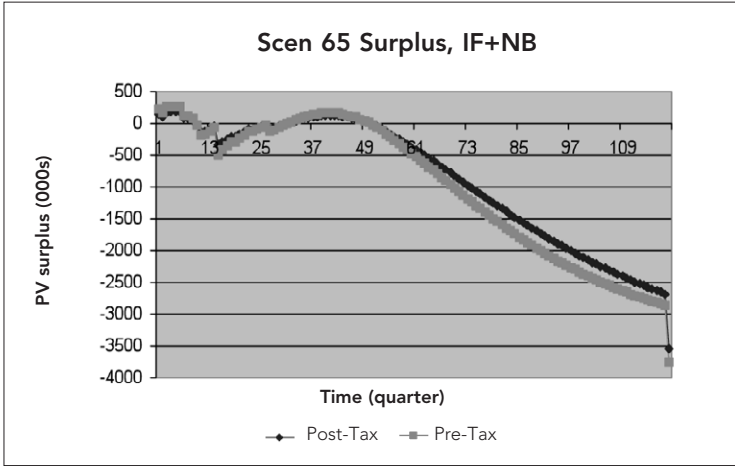
To understand the risk offsetting effects, let's study the stochastic results of a particular run: the case of \$20 million of new sales while the market is down 10 percent. Let's examine two scenarios out of the 1000: scenario 65, a bad scenario with low or negative market returns; and scenario 506, a rather benign scenario where market performance is slightly weak. The graphs on page 11 plot the present value (PV) of surpluses in all 120 quarters or 30 years of the projection under the two scenarios. The GPVAD of that scenario is the lowest of the PV of surpluses. The graph shows the PV of surpluses for the whole block, the in-force business, and new business separately.

“ ... sales of a de-risked GMWB rider can actually improve companies' overall reserve and capital positions due to the risk offsetting features embedded in AG 43 and RBC C3 Phase II. ”

This indicates, given the in-force block and certain market conditions, sales of a de-risked GMWB rider can actually improve companies' overall reserve and capital positions due to the risk offsetting features embedded in AG 43 and RBC C3 Phase II. Even under adverse market conditions, the risk offsetting effects

One of the risk offsetting effects is the fact that for different rider types, the GPVADs occur at different times in a given scenario. Take scenario 506 for example, the GPVAD of the in-force (GMDB and GMIB riders) occurs around quarter 13 while the GPVAD of new business (GMWB riders) occurs at quarter 120, the last projection period. When combining the whole block, the surplus at quarter 13 for the new business helps the deficiency of the in-force at that time. As a result, the GPVAD of the whole block still occurs at quarter 13, but is not as severe due to the surplus of the new business. Even in a bad scenario, scenario 65, the GPVAD of whole block is not a simple sum of the GPVADs of the in-force and new business because they do not occur at the same time.





CONTINUED ON PAGE 12

Another phenomenon acting to offset risk is that a bad scenario for one type of rider is not necessarily bad for another. Take a look at scenario 506 again, it created a big GPVAD for the in-force full of DB and IB riders. But it generates a benign result for the new business with WB riders.

Is the impact on capital and reserves still benign in a multi-year scenario where new business is sold continuously for a few years? Case 7 and 8 are designed to answer this question. The author projected the in-force and \$20 million and \$40 million of new business each year respectively for five years in a down and up market scenario. The pre-tax CTE 70 and post-tax CTE 90 at the end of five years for the two cases are listed below.

In both cases, the pre-tax CTE 70s are less than half a percent of the starting asset and post-tax CTE 90s are less than one percent of the starting asset. The impact on statutory reserves and RBC is still very manageable.

Conclusion

The recent market turmoil has highlighted just how much volatility the variable annuity business can bring to companies' overall statutory reserve and risk-based capital positions. To manage the risk, a new generation of de-risked VA products has been introduced to the market place. At the same time, AG 43, a new principle-based

statutory reserving standard, will be implemented at the end of 2009. The impact of AG 43 on companies' overall reserve and required capital needs to be understood very carefully especially in the context of the de-risked products.

The author has shown through an illustrative example that due to the risk offsetting effects embedded in the stochastic calculations of AG 43 and RBC C3 Phase II, sales of the de-risked VA products can sometimes reduce the total reserve and capital requirements in relatively normal market conditions. Even in a bad market, the risk offsetting benefits can make the new business sales less burdensome on capital and statutory reserves.

Under AG 43, companies have to decide whether to segment and how to segment the VA business for valuation purposes. Having a good understanding of the risk offsetting effects of stochastic calculations can guide this decision.

The author is aware, however, that despite trying to design the products and assumptions as generic as possible, the above conclusion is influenced by the product features, business mix, economic scenarios and various other assumptions assumed for the in-force and new business. Variations in these factors may lead to a different result. □

Case	In-force Business (millions of Account Value)	New Business Sales (millions of Premium)	Equity Market Return	Time Horizon (Years)	CTE 70 pre-tax IF+NB (000s)	CTE 90 post-tax IF+NB (000s)
7	100	20 million per year	(10%),(10%),0%, 10%,10%	5	(345)	(976)
8	100	40 million per year	(10%),(10%),0%, 10%,10%	5	(649)	(1,838)