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CARVM Reserves for Variable Annuities with Guaranteed Living Benefits

by James W. Lamson

This article provides an update on progress made so far by the NAIC's Life and Health Actuarial Task Force (LHATF) and the American Academy of Actuaries in developing reserve requirements for variable annuities providing guaranteed living benefits. For those who aren't familiar with these product features, a brief description is in order.

Current product offerings in the annuity marketplace often attempt to shield the policyholder from the downside risk of market value fluctuations or long-term underperformance. While most equity indexed annuities accomplish this by providing a guarantee equal to the 3% interest accumulation of 90% of premiums paid, many variable annuities express minimum guarantees in a variety of other innovative ways. Since these guarantees provide benefits only to contract holders who are still alive, they are called "Variable Annuity Guaranteed Living Benefits" (VAGLBs).

Example VAGLBs

In this article, two examples of VAGLBs are described — the Guaranteed Minimum Accumulation Benefit (GMAB) and the Guaranteed Minimum Income Benefit (GMIB). The former benefit guarantees that the deferred annuity account value will not be less than a minimum value at the end of a waiting period, such as 10 years. The latter benefit guarantees that if the contract is annuitized at the end of the waiting period, the income produced will not be less than a guaranteed minimum. For example, a contract might guarantee that, despite either long-term underperformance or drop in value of the assets backing up the variable annuity separate accounts, the account value at the end of the waiting period will not be less than the accumulation of premiums, less withdrawals, at a stated interest rate, such as 5% (i.e., a 5%

"rollup" of premiums). One simple type of GMIB would provide the contract holder an option to annuitize the account value at the end of the waiting period, and the income is guaranteed to be no less than that produced by applying annuitization rates specified in the contract to the 5% premium rollup described above.

Notice that in the examples, the GMAB benefit is automatic and applies to all contract holders, whereas the GMIB is an optional benefit and will only have financial value for those contract holders actually electing the option. A charge for these benefits is assessed against the account value and is typically expressed in terms of basis points, such as 100 or 150 annual basis points.

Risks Assumed by the Insurer

An insurer issuing contracts containing VAGLBs takes on the risk that the performance of the separate account assets is less than that guaranteed by the VAGLB. This can occur through long-term underperformance as compared with the performance inherent in the VAGLB benefit determination (e.g., the 5% rollup assumed in the GMAB or GMIB benefit of above). Alternatively, however, it may occur because of market value drops occurring in the period preceding the end of the waiting period.

Some VAGLB designs incorporate benefit determination that involves one or more previous account values. For example, a "maximum anniversary value" benefit is one for which the VAGLB is based on the largest of the account values on all prior contract anniversaries. As you can see, the value of VAGLB guarantees can be substantial, but very difficult to determine in advance.

Regulatory Efforts to Date

In January 1998, LHATF requested that the American Academy of Actuaries

appoint a VAGLB Work Group to recommend a reserve determination procedure for VAGLB benefits. Steve Preston and Tom Campbell, who you might remember co-chaired similar work groups for the development of Actuarial Guidelines XXXIII and XXXIV, were appointed to lead development of reserves for VAGLBs. The AAA VAGLB Work Group has done a tremendous amount of work thus far in developing a workable reserve methodology, but still has a way to go before finalizing its recommendations.

It is anticipated that LHATF will take steps toward adoption of a new actuarial guideline for the calculation of the Commissioner's Annuity Reserve Valuation Method (CARVM) reserves for variable annuities with VAGLB benefits. The Academy VAGLB work group plans to present its recommendations for such a guideline at the June 2000 meeting of LHATF.

The original charge of the VAGLB Work Group was to recommend methodology for reserve calculation for these benefits that could be accomplished under the CARVM reserve structure. It soon became apparent that using the same integrated CARVM structure as outlined in Actuarial Guideline XXXIV might prove workable. In other words, a benefit stream of "net amounts at risk" for the VAGLB could be added to the other benefits in a CARVM Integrated Benefit Stream to produce a single total Integrated Reserve. Then, the reserve for the VAGLB would be "solved for" as the excess of this reserve over the CARVM reserve obtained by ignoring the VAGLB benefits. This solved for reserve would be held in the general account of the insurer.

Consistency with CARVM

It was determined that any simplified proposed methodology for integrating the costs of VAGLB benefits with other contract benefits in applying CARVM should be judged by comparing the

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resulting reserve for the VAGLB with a stochastically determined "benchmark." The benchmark was determined by running 1,000 stochastic fund appreciation scenarios, calculating the same type of "solved for" VAGLB reserve using rates consistent with the scenario and reflecting the charge for the benefit and then ranking the results. The simplified methodology is deemed to be consistent with CARVM if its "solved for" reserve falls within a reasonable percentile of the ranked stochastically determined VAGLB reserves.

The search for, and testing of, a simplified methodology for determining VAGLB net amounts at risk resulted in what has become known as the Keel Method. Since the Keel Method does not produce acceptable results for certain types of VAGLBs, the work group is developing a "valuation actuary" approach under which deterministic scenarios for projection of VAGLB costs must be developed by the actuary and for which there is a limited degree of flexibility provided for showing the adequacy of the method developed.

Keel Method

After casting about for some time in the search for a deterministic method for calculating VAGLB net amounts at risk, a method was developed in 1999 based on statistically supportable mean returns and volatilities for the types of investments assumed to be made in a given class of variable annuity fund. Tim Hill, the member of the VAGLB Work Group that conducted most of the numerical testing during 1999, named the resulting methodology the "Keel Method" because a graph of the formula for calculating cumulative returns used to project account values to compare with the VAGLB benefit guarantee looks a bit like the keel of a boat. The formula is oriented toward producing expected long-term cumulative investment returns at a given statistical percentile assuming that such returns have a lognormal distribution.

The formula for the Keel Method projection of cumulative returns is shown below, along with a description of its parameters:

$$Index_t = Index_{t-s} \cdot e^{\mu s + N\sigma\sqrt{s}}$$

where:

$Index_t$ = the index at time t

μ = mean fund index return
(stationary over time)

σ = fund index volatility
(stationary over time)

s = period in years between
 $t - s$ and t

N = $1 - p$ percentile of standard
normal distribution

Through inspection of the formula, you can see that if you wanted to project cumulative fund performance that reflects an 83.33% confidence level of having "captured" the poorest cumulative returns, then you could use the index values produced by the formula (with $p=0.8333$) to calculate account values (or their annuitized values) at the end(s) of VAGLB waiting periods, and subtract the resulting account value(s) from the VAGLB guaranteed benefit(s) in order to calculate the net amount(s) at risk.

Results of Keel Method Testing

The Keel Method was tested for consistency with CARVM as outlined earlier. The results were very favorable for benefits such as the example GMAB and GMIB benefits described earlier in this article. However, it was determined that the Keel Method was not suitable for VAGLB designs that are "path dependent". What this means is that if the VAGLB benefit is a function of the growth of actual account values (which

depend on the path of projected cumulative returns), then the Keel Method does not produce suitable reserves. An example of such a path dependent design would be a "maximum anniversary value" VAGLB, as discussed earlier, or any other type of VAGLB where the benefit is based on prior account values.

Keel Method Applicability

Since the Keel Method has been demonstrated to produce adequate reserves for VAGLBs that meet certain criteria (the most important of which is not being path dependent), the work group intends to recommend a "safe harbor" for use of the Keel Method. This means that if a contract does not contain any path dependent VAGLBs and meets a few other criteria, the Keel Method may be used without preparation of a demonstration of its consistency with CARVM.

Valuation Actuary Method

The VAGLB Work Group intends to recommend that deferred variable annuities containing VAGLBs must have CARVM reserves computed according to a methodology that can be demonstrated by the issuing company to be consistent with CARVM as outlined above. Stochastic testing of the proposed methodology will be required.

As noted above, filing of products qualifying for the Keel Method safe harbor will not require stochastic testing. However, for all other products containing VAGLBs, the recommendations will require: a) discovery of one or more deterministic formulas to project VAGLB net amounts at risk; b) testing of the resulting "solved for" VAGLB reserves against those resulting from a large number of stochastically generated scenarios to test for consistency with CARVM; and c) filing, at the time of policy approval, of a demonstration that "solved-for" reserves produced using the deterministic formula are adequate in comparison to the stochastically generated "solved-for" reserves.

Whether or not the safe harbor Keel Method is used or if another deterministic formula is developed and a demonstration is filed, actuarial certifications as of policy approval and annually thereafter will be required, testifying to the qualifications for, and appropriateness of, the method used.

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If this update on the development of VAGLB reserve methodology has sparked your interest, please remember that information on developments at the VAGLB Work Group and at LHATF meetings is open to all members of the industry. Contact Damien McAndrews at the American Academy for information on contributing to the Work Group's efforts.

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Treasurer's Report: "Wait Until Next Year"

by Larry Gorski

By now everyone has recovered from the stresses and strains associated with financial statement preparation.

The dust has settled on the books of the Financial Reporting Section and it's time for our annual report. For the first time in several years, our Fund Balance has decreased. The Fund Balance decreased from \$298,094 as of December 31, 1998 to \$243,662 at the close of 1999. The decision to draw down the Fund Balance was thoroughly discussed by the Financial Reporting Section Council. The decision was made to fully participate in the celebration of the SOA's 50th anniversary at the annual meeting and to invest in

(\$26,250); and the cost of postage and mailing of the Section newsletter and monograph (\$25,194).

For the upcoming year, the Section has made financial commitments (\$77,938) with the bulk of the commitment (\$50,140) going towards the preparation of the GAAP textbook. Taking these commitments into consideration and Accounts Payable of \$47,836, the Section's Unrestricted Fund Balance as of December 31, 1999 was \$117,887.

The underlying reasons for the decrease in our Fund Balance were the expenses to date associated with the preparation of the GAAP textbook, the one-time costs associated with Section



the future by funding a new textbook on GAAP. The textbook will be a valuable educational resource as the SOA begins to implement changes in the educational and examination process.

Income for 1999 was \$135,425, while expenses were \$189,857. Membership dues (\$26,490) and seminar registration fees (\$89,384) were the major sources of income. The drivers of our Section's expenses were: printing of the newsletters, Section monograph, and seminar material (\$50,558); the costs associated with seminars and the annual meeting cruise (\$37,097), travel costs associated with the preparation of the new GAAP textbook and Section Council meetings (\$24,389); seminar management fees

monograph (\$52,926), and the excess of expenses (\$20,265) over revenue (\$9,590) for the annual meeting cruise. Of course, the last annual meeting was special, the SOA's 50th anniversary, and the Section expects to start receiving income from the sale of the GAAP textbook, so next year's Treasurer's Report should show a return to positive growth in our fund balance. So just like the Chicago Cubs, we will have to "wait until next year."

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