



AMERICAN ACADEMY *of* ACTUARIES

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**MEMORANDUM**

TO: Pete Weber, Chair, NAIC VM PBR Life Subgroup

FROM: Bruce Friedland, Chair, American Academy of Actuaries' Variable Universal Life Subgroup

DATE: September 23, 2010

SUBJECT: Deterministic Return Paths in VM-20

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The Variable Universal Life (VUL) Subgroup of the Life Reserves Work Group appreciates this opportunity to submit the attached report on the impact that different return path options have on the principle-based deterministic reserve calculation required by VM-20. Additionally, this report provides the VUL Subgroup's recommended option.

For questions or more information on this submission, please contact John Meetz, staff liaison to the VUL Subgroup, at (202) 785-6924 or [meetz@actuary.org](mailto:meetz@actuary.org).

# **Deterministic Return Paths – Impact on Reserves**

## **Background**

The American Academy of Actuaries’<sup>1</sup> Variable Universal Life (VUL) Subgroup of the Life Reserve Working Group (LRWG) has modeled the impact of different equity and bond return paths on the principle-based deterministic reserve as described in VM-20. The following report provides the results of that modeling as well as a recommended deterministic reserve return path approach to be included in VM-20.

The current draft of VM-20, dated 8/13/2010, contains a placeholder pending the outcome of this modeling work and, if appropriate, acceptance of this report’s recommendation. In essence, the VM-20 draft indicates, in section 7.G.1.c, that the deterministic equity return is the 10 year treasury rate path used in Scenario 12 of the stochastic exclusion test scenario set, plus 4% of the treasury rate path plus 0.25%. As described in VM-20, “The scenario 12 interest rate yield curves are based on a one standard deviation shock to the Economic conditions as of the projection start date, where the shock is spread uniformly over the first 20 years of the projection.”

## **Deterministic Return Paths Modeled and Recommendation**

The VUL Subgroup considered and discarded several return path options prior to arriving at the two options discussed further in this memorandum. We also ran the New York proposal of a 3% separate account growth rate.

The first option is similar to the VA CARVM return paths but the vector of rates was extended, reflecting the longer term nature of VUL contracts compared to variable annuities. The equity scenario consisted of a 13.5% immediate decline, no growth in year 1, 4% years 2-5, 5.5% years 6-20, 6.5% thereafter. The bond scenario consisted of no growth in year 1 and 4.5% in years 2+.

The second option is based on Scenario 12 of the stochastic exclusion test scenario set. The scenario 12 equity returns were roughly 3.98% for the first 20 years and 7.54% thereafter. The scenario 12 bond returns ranged from roughly 3.5% to 4.5% over the first 30 years, 3.98% thereafter.

While the VA CARVM option would provide some consistency with the return assumption for variable annuities, the Scenario 12 option is more responsive to changes in the economic environment over time.

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<sup>1</sup> The American Academy of Actuaries is a 17,000-member professional association whose mission is to serve the public on behalf of the U.S. actuarial profession. The Academy assists public policymakers on all levels by providing leadership, objective expertise, and actuarial advice on risk and financial security issues. The Academy also sets qualification, practice, and professionalism standards for actuaries in the United States.

Based on the results shown below, the VUL Subgroup recommends adoption of the second option, based on Scenario 12 of the stochastic exclusion test.

We further recommend that actual funds invested are mapped into the various funds that make up the Stochastic Exclusion Test set. This provides an accurate reflection of where money is invested for each policyholder. The resulting deterministic reserve will reflect long term returns of each asset class with some built in margin resulting from the use of Scenario 12. Any unusual volatility/tail risk is expected to be captured by the stochastic reserve.

### **Modeling**

The VUL Subgroup used the product (modified as described below) and the issue age 45 model cell that formed the basis for the VUL Subgroup report, *Report on Principles-Based Reserves for Variable Universal Life with Guaranteed Minimum Death Benefits* submitted to LHATF in March 2008. The product was a fairly aggressive secondary guarantee VUL priced on a 1980 CSO basis. The product was updated to be on the 2001 CSO basis. The secondary guarantee premium was assumed to be the same as the 1980 CSO product, paid to age 121 rather than to age 100.

The age 45 cell was used so that we could evaluate results, both deterministic and stochastic, over a long projection horizon. The separate account gross appreciation rate from the policy issue date to the valuation date was assumed to be a level 9% per annum. All present values were calculated using a level 5% per annum discount rate. This is the assumed asset earned rate for any general account assets, less a 1% pad. The results are very sensitive to the discount rate. This sensitivity is evident in the table below when comparing the New York proposal results using both a 5% and 3% discount rate.

Premiums paid from policy issue to the valuation date were assumed to be the minimum annual premium (\$10,000 per year) required to maintain the secondary guarantee in force.

The product was priced to meet reasonable profit targets that exist in the current marketplace on an expected basis.

Stochastic reserves were run using the December 2007 American Academy of Actuaries C3P2 equity scenarios. The objective was to put the deterministic reserve options in context by identifying where they lie within the stochastic distribution.

For purposes of this demonstration, the policies are in duration 10 on the valuation date, similar to our original report.

The reserve that we considered in support of our recommendation was the reserve in excess of the account value ( $R_x > AV$ ). This was done to be able to compare the reserve that results from the benefits provided and any conservatism due to margins without consideration for the amount invested and accumulated by the policyholder.

Reserves at the 10<sup>th</sup> duration were considered with a comparison being drawn between the deterministic options and the stochastic reserve. This duration was selected because in general, there was a tendency to have larger Rx>AV in the 10 to 20 year valuation period than before or after. The rankings of the reserves for the different options (in terms of approximate CTE) could be different at other durations depending on many factors including product design and how in the money the secondary guarantee is on the valuation date. For example, a duration 2 reserve calculated under the first option will be less impacted by the initial shock and more by the long term return assumption. A later duration reserve would be more impacted by the initial shock.

The results presented reflect the pads inherent in the Margin 3 assumption set, from the 2008 report. The Margin 3 assumption set, consisted of a 1% lower interest rate, 5% higher expenses, mortality with the extra margin explicit in the 2001 CSO table, and a 1% lower lapse rate. This assumption set was selected because the lower lapse rate was viewed as being an appropriate pad for this lapses supported product. As noted in the 2008 report, a higher lapse rate does not always result in more conservative reserves and this was the case for the duration 10 results presented below. Also, as noted in the 2008 report, the level of margin is not necessarily being presented as prudent, merely illustrative.

## **Results**

The Rx>AV deterministic reserves varied significantly by return path with slightly higher reserves under option 2 compared to option 1. Within each option, the deterministic reserve was higher when corporate bond returns were used rather than equities. This is expected because the cumulative bond returns are lower than the equity returns. While assuming a more aggressive equity return appears to provide the benefit of a lower deterministic reserve, the increased risk and volatility associated with equity returns is expected to be captured by a correspondingly higher stochastic reserve. The 70%/30% equity/bond mix produced reserves that predictably fell between the bond and equity results. The New York proposal was significantly higher than any of the other paths.

Both options 1 and 2 give a reasonable deterministic Rx>AV as measured by how the deterministic reserve compared to the stochastic reserve. As noted above, the second option will be more dynamic and responsive to changes in the economic environment, resulting in a more principle-based outcome.

<u>Scenario Description</u>	<u>Margin 3 Rx&gt;AV</u>	<u>Approximate CTE</u>
Option 1 Equity	\$14,939	55
Option 1 Bond	\$23,778	70
Option 1 70/30	\$17,881	60
Option 2 Equity	\$12,874	55

Option 2 Bond	\$36,559	80
Option 2 70/30	\$20,871	65
NY Level 3%	\$48,610	90
NY Level 3%, 3% Discount	\$102,534	99

Note that the CTE is approximate because the stochastic distribution is based on equity returns rather than bond or blended returns.

The results presented relate to a particular product design focusing on a handful of possible options as to valuation date, historical growth rate, funding patterns, etc. Conclusions should be drawn carefully given the limited testing that was performed.