ARWG Report to LATF's VM-22 Subgroup
Concerning Potential VM-22 Reserve Methodology

Washington, DC – December 13, 2013

The Annuity Reserves Work Group (ARWG) of the American Academy of Actuaries[1] is pleased to provide you this update on its progress towards achieving the goals described in its August 22, 2013 Report to your Subgroup. This update provides the VM-22 Subgroup a brief description of the ARWG's efforts towards development of appropriate utilization assumptions for Guaranteed Lifetime Income Benefits (GLIBs) in the Floor Reserve calculation. In addition, it provides the Subgroup with an abbreviated description of the Floor Reserve and its similarities to Actuarial Guideline XXXIII (AG 33).

Recall that the ARWG's goal for the methodology underlying VM-22 requirements is to propose a sound principle-based reserve standard for annuities, other than variable annuities, incorporating:

1. an appropriate formulaic floor reserve that extends the current CARVM methodology to reflect its use as a minimum reserve instead of as the primary reserve,

2. an auditable modeled reserve that properly reflects the key risks of today's complex annuity product designs, and

3. assurance of an adequate reserve standard by exploring possible expansion of asset adequacy analysis requirements, if necessary.

Abbreviated Review and Update of Floor Reserve. The Floor Reserve being considered by the ARWG provides substantial protection for the contract owner and should result in values that are reasonably comparable to the reserves currently required under CARVM and Actuarial Guideline XXXIII (AG 33) / Actuarial Guideline XXXV (AG 35),[2] while at the same time reflecting the greater variety and complexity of current non-variable deferred annuity products. To provide greater flexibility in the formulaic Floor Reserve calculation, a designation of three types of benefits was created as a first step: (i) certain contract benefits referred to as Listed Benefits,[3] (ii) "rich" non-listed benefits (such as Guaranteed Minimum Death Benefits (GMDBs) with death

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[1] The American Academy of Actuaries is a 17,500-member professional association whose mission is to serve the public and 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.

[2] References within this document to AG 33 should generally be interpreted to also include AG 35 inasmuch as AG 35 must currently be followed regarding CARVM valuation of Equity Indexed Annuities (EIAs); most of the products for which GLIBs are currently offered are EIAs.

[3] Examples of Listed Benefits are GLIBs, annuitizations other than GLIB elections, and annuitization within the annuitization tier of a two-tiered annuity. LTC benefits provided under a deferred annuity may also be considered a Listed Benefit once the insured has qualified for the benefits.

benefits in excess of the contract account value), and (iii) all other benefits. Then, the Floor Reserve was defined as the greater of α and β, where:

α   represents the scenario in which the Listed Benefits are cancelled or terminated on the valuation date by the contract owner – therefore no future charges are deducted for these benefits after the valuation date and no cost for them is reflected. The reserve is computed as currently required by CARVM, except that prescribed lapse rates are utilized in every Integrated Benefit Stream (IBS).

β   represents the scenario in which the contract owner continues to pay for the Listed Benefits after the valuation date and intends to use them at some future point (unless death or an immediate need for cash intervenes, as represented in the valuation formulas as specified lapse rates). The reserve is the largest present value of IBSs, one for each Listed Benefit, and is defined by prescribed assumptions for all elective contract owner behavior. As such, there would need to be prescribed assumptions for election of those Listed Benefits and prescribed incidence rate assumptions for other elective behavior such as lapse rates.

Like current CARVM, the calculation of α considers all future Integrated Benefit Streams (except that prescribed lapse rates may be incorporated) while assuming that Listed Benefits have been terminated, whereas the calculation of β considers the group of Integrated Benefit Streams (one IBS for each Listed Benefit) in which the Listed Benefits are elected, with β being the largest present value of these IBS's.

α is a Greatest Present Value calculation considering a potentially infinite set of IBSs, while β is the largest of a smaller number of Present Value calculations. For α and / or β, prescribed dynamic lapse rates may be utilized, which would be modified for adjustment by an in-the-money-ness (ITM) function of the respective benefits. The current working definition for ITM for GLIBs involves:

-   projecting a contract's account value and GLIB benefit base,
-   converting the benefit base into a stream of future lifetime withdrawals (while recognizing the death benefits that may be paid upon death),
-   calculating the present value of those benefits, and
-   computing the ITM ratio as the present value of lifetime withdrawals and death benefits divided by the projected account value.

Many GLIB designs offer both single life and joint life withdrawal options available at the point of GLIB exercise for both single and joint contract ownership. In at least some plans, the joint-life options are more valuable than the single-life options. The current plan of the ARWG is to blend the values of the single-life and joint-life options as of the ITM calculation date in the determination of the ITM ratio and in the resulting reserve present value calculation. This approach should result in a reasonably acceptable level of calculation complexity while preserving recognition of the potential value provided by joint withdrawal guarantees. The blending process may depend on the ownership status of the contract on the valuation date (i.e., single or joint).

The ARWG has expended considerable effort in developing prescribed incidence rates for GLIBs in the calculation of β. Rather than merely suggesting specific rates, the ARWG is working on a "rate generator" that recognizes various features of a GLIB product design and the actual historical

crediting of interest rates to the account value and GLIB benefit base that might influence when a contract owner would elect the GLIB withdrawal stream.

Commentary. While there are important differences between the ARWG's current approach to the floor reserve and AG 33, there are some similarities.

AG 33 states that, in incorporating Elective Benefits (such as GLIBs) in the calculation of CARVM's greatest present value, "in practice, such a greatest present value will typically occur by assuming an incidence rate of either 0% or 100%."

Note from the above that, in α, the assumption is made that the GLIB is terminated on the valuation date and that, thus, 0% of contract owners will elect it (and are also not charged for the benefit).

Further note that, in β, the assumption is that 100% of contract owners will eventually elect the benefit—it is just a matter of when. (An important deviation from AG 33 is that the most costly time to the company for election is not recognized.)

The GLIB utilization "rate generator" attempts to provide a conservative estimate of when contract owners will elect the benefit, recognizing the value of the benefit relative to the account value. At the same time, the generator recognizes that the purpose of an annuity is to provide retirement income at key ages at which most individuals want to begin receiving income.

The ARWG believes that conservatism is further enhanced by the ultimate reserve held being no less than the modeled reserve and no less than the contract cash value.

Appendix A

Documentation of Floor Reserve Formulas

$_nV_x = \max\{\alpha, \beta\}$

$\alpha =$ CARVM Reserve computed assuming all Listed Benefits have been terminated with no further charges assessed *

$= \max\limits_{i=1}^{i=\infty}\left\{{}^iPVIBS_x^n\right\}$

* further charges not to be deducted following the valuation date for all Listed Benefits

where:

i represents an index of the (generally) infinitely large number of Integrated Benefit Streams to be considered under CARVM,

$${}^iPVIBS_x^n = \sum_{NE}\sum_{t=1}^{\Omega-x-n} v^t \cdot {}_{t-1}^{i}p_{x+n} \cdot {}^iq_{x+n+t-1}^{NE} \cdot {}^iNEB_{n+t}^{NE} + \sum_{t=1}^{\Omega-x-n} v^t \cdot {}_t^ip_{x+n} \cdot {}^iq_{x+n+t}^{w} \cdot {}^iCV_{n+t} +$$
$$\sum_{t=1}^{\Omega-x-n} v^t \cdot {}_t^ip_{x+n} \cdot {}^iq_{x+n+t}^{f} \cdot {}^iFPW_{n+t}$$

${}^iq_{x+n+t-1}^{NE}$ and ${}^iq_{x+n+t}^{f}$ are elements of the ith set of assumed incidence rate vectors, $\left\{{}_V^iq_{x+n}^{NE}, {}_V^iq_{n+n}^{f}\right\}$ corresponding to ${}^iIBS_x^n$, the ith Integrated Benefit Stream, with the "V" left-subscript indicating "vector" and ${}_V^iq_{x+n}^{NE}$ representing a collection of vectors, one for each Non-Elective Benefit (such as ${}_V^iq_{x+n}^{d}$ for mortality rates), and for valuation at the nth duration, with ${}_V^iq_{x+n}^{d} = \left\{{}^iq_{x+n}^{d}, {}^iq_{x+n+1}^{d}, {}^iq_{x+n+2}^{d}, ..., {}^iq_{\Omega-1}^{d}\right\}$ and the other ${}_V^iq_{x+n}^{NE}$ vectors, ${}_V^iq_{n+n}^{f}$, of Elective Benefits defined similarly

${}^iq_{x+n+t}^{w}$ are elements of ${}_V^iq_{x+n}^{w}$, a prescribed vector of lapse (surrender) rates

${}_0^ip_{x+n} = 1$, with successive values defined recursively, where

$${}_t^ip_{x+n} = {}_{t-1}^ip_{x+n} \cdot \left(1 - {}^iq_{x+n+t-1}^{w} - {}^iq_{x+n+t-1}^{f}\right) \cdot \prod_{NE}\left(1 - {}^iq_{x+n+t-1}^{NE}\right)$$

${}^iNEB_{n+t}^{NE}$ is the Non-Elective Benefit amount at time n+t for the NE^{th} Non-Elective Benefit. For example, for the contract death benefit, this would be ${}^iDB_{n+t}$

and would include the death benefits provided by any Guaranteed Minimum Death Benefits

${}^iCV_{n+t}$ is the contract cash value at the end of year n+t. The contract cash value as of the valuation date will reflect all past premiums, charges and benefits.

${}^{i}FPW_{n+t}$ is the assumed amount of free withdrawal taken at the end of year n+t. Note that this is not necessarily the maximum free withdrawal amount, but rather the amount assumed as the free withdrawal. In practice, of course, this is typically set equal to the maximum free withdrawal amount.

$$\beta = \max_{L} \left\{ {}_{L}PVIBS_{x}^{n} \right\},$$

where

$$
\begin{aligned}
{}_{L}PVIBS_{x}^{n} = &\sum_{NE}\sum_{t=1}^{\Omega-x-n} v^{t} \cdot {}_{t-1}^{L}p_{x+n} \cdot {}^{L}q_{x+n+t-1}^{NE} \cdot {}^{L}NEB_{x+n+t}^{NE} + \sum_{t=1}^{\Omega-x-n} v^{t} \cdot {}_{t}^{L}p_{x+n} \cdot {}^{L}q_{x+n+t}^{wb} \cdot {}^{L}CV_{n+t} + \\
&\sum_{t=1}^{\Omega-x-n} v^{t} \cdot {}_{t}^{L}p_{x+n} \cdot {}^{L}q_{x+n+t}^{f} \cdot {}^{L}FPW_{n+t} + \\
&\sum_{t=1}^{\Omega-x-n} v^{t} \cdot {}_{t}^{L}p_{x+n} \cdot q_{x+n+t}^{L} \cdot \\
&\sum_{k=1}^{\Omega-(x+t)} \left[v^{k-1} \cdot {}_{k-1}^{L}p_{x+n+t}^{a} \cdot \left(\left(\sum_{NE} v \cdot {}^{L}q_{x+n+t+k-1}^{NEa} \cdot {}_{L}NEB_{n+t+k}^{a} \right) + {}_{L}AP_{n+t} + v \cdot {}^{L}q_{x+n+t+k}^{wa} \cdot {}^{L}CV_{n+t+k}^{a} \right) \right]
\end{aligned}
$$

where

L is among the set of Listed Benefits (GLIB, regular annuitization, upper tier annuitization of a two-tiered annuity, etc.) and indicates a particular such benefit, with the maximum over all values of L providing the contributions to the present value of all such Listed Benefits taken together.

All vectors of incidence rates (except those specifically noted below) are as defined as for the calculation of ${}^{i}PVIBS_{x}^{n}$ except that they are specific prescribed values for the

L^{th} Listed Benefit instead of being elements of the assumption vectors for the ith Integrated Benefit Stream

Drafting Note: Benefits and incidence rates below are annotated with L to indicate that that their value may be dependent on or different after utilization of the listed benefit.

${}^{L}NEB_{n+t}^{NE}$ is the Non-Elective Benefit amount at time n+t for the NE^{th} Non-Elective Benefit. For example, for the contract death benefit, this would be ${}^{L}DB_{n+t}$

and would include any death benefits provided by the Listed Benefit and any Guaranteed Minimum Death Benefit

${}^{L}CV_{n+t+k}^{a}$ is the contract cash value at the end of year n+t+k and reflects any changes from ${}^{L}CV_{n+t}$ (the cash value derived assuming Listed Benefit L is in force but prior to election of the Listed Benefit) that result from election of Listed Benefit L. For example, if Benefit L is a GLIB, then withdrawals made under the GLIB will typically also be deducted from the contract accumulation value and a consequent

reduction in ${}^{L}CV_{n+t}$ will result. Note that both these values are distinct from ${}^{i}CV_{n+t}$ for the ith Integrated Benefit Stream in the calculation of α where it is assumed that the Listed Benefits are terminated on the valuation date.

${}^{L}FPW_{n+t}$ is the assumed amount of free withdrawal taken at the end of year n+t on a basis consistent with the calculation of ${}^{i}PVIBS_{x}^{n}$ and thus also reflects election of Listed Benefit L.

${}^{L}q_{x+n+t}^{wb}$ is the prescribed lapse rate applicable *before* utilization or election of a listed benefit

${}^{L}q_{x+n+t+k}^{wa}$ is the prescribed lapse rate, if any, applicable *after* utilization or election of a listed benefit

DRAFTING NOTE:
*An example of prescribed lapse rates might be that the lapse rate is a constant percentage that does not vary except by In-The-Moneyness Percentage (ITM%) category. ITM% = 100 * ((Max PV (Benefit) / CV) – 1):*

ITM% Category	Lapse%
ITM% < 10%	1.00 * Lapse%
10% <= ITM% < 20%	0.50 * Lapse%
20% <= ITM% < 50%	0.25 * Lapse%
50% <= ITM%	0.00%

When the policy cash value is depleted, Lapse% = 0%.

${}_{L}NEB_{n+t+k}^{NEa}$ is the Non-Elective Benefit amount at time n+t for the NE^{th} Non-Elective Benefit *after* election of benefit L.

${}_{L}AP_{n+t}$ is the "annuity payment" (or GLIB withdrawal amount) under benefit L.

q_{x+n+t}^{L} is the prescribed incidence rate for benefit L

${}_{k-1}^{L}p_{x+n+t}^{a}$ survivorship values reflect the mortality and lapse rates *after* election of benefit L, so that ${}_{0}^{L}p_{x+n+t}^{a} = {}_{t}^{L}p_{x+n}$ and ${}_{k}^{L}p_{x+n+t}^{a} = {}_{k-1}^{L}p_{x+n+t}^{a} \cdot (1 - {}^{L}q_{x+n+t+k-1}^{wa}) \cdot \prod_{NE}(1 - {}^{L}q_{x+n+t+k-1}^{NEa})$

${}_{0}^{L}p_{x+n} = 1$, with successive values defined recursively, where
$${}_{t}^{L}p_{x+n} = {}_{t-1}^{L}p_{x+n} \cdot \left(1 - {}^{L}q_{x+n+t-1}^{w} - {}^{L}q_{x+n+t-1}^{f}\right) \cdot \prod_{NE}\left(1 - {}^{L}q_{x+n+t-1}^{NE}\right)$$