AMERICAN ACADEMY of ACTUARIES

Report of the VAGLB Work Group
To the
NAIC's Life and Health Actuarial Task Force
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This report was prepared by the Academy's Variable Annuities with Guaranteed Living Benefits (VAGLB) Work Group of the Committee on State Life Insurance Issues.

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Comparison of General Valuation Approaches
United States vs. Canada

	United States	Canada
Governing Regulatory Body	States (in most cases following NAIC Models), with possible future Federal Oversight of Financial Services Holding Co.	Primarily Federally Regulated (OSFI).
Professional Body / Standards of Practice	Academy of Actuaries	Canadian Institute of Actuaries.
Statutory Reserves	Prospective, formula driven approaches, with conservative assumptions, no lapses, reflects assets held and implicit margins/ provisions for adverse deviations for guaranteed benefits only. For example, CARVM reserves based on greatest present value. Reserves are generally subject to asset adequacy analysis.	Prospective cash flow based approach, based on realistic assumptions, reflects assets held and expected future yields. Increased by explicit margins/provisions for adverse deviations (PADs). Framework is better suited to accommodate stochastic modeling.
Deferred Acquisition Costs	No company specific DAC permitted. Standardized DAC proxy equal to CARVM/ CRVM allowance.	Company specific DAC permitted. Starting in 2001, the DAC is explicitly shown.
GAAP Reserves	Different accounting model used for GAAP versus statutory. GAAP focuses more on matching revenues to benefits and expenses. Subject to the requirement that DAC must be recovered by future GAAP profits.	GAAP reserves and statutory reserves are equal.
Seriatim vs. Portfolio Basis	Statutory reserve calculation typically required to be done on a seriatim basis (i.e., diversification of risk not permitted).	CIA standards do not require a seriatim basis, so calculation may be done on a portfolio basis.
Asset Adequacy Analysis	Usually required for annual Actuarial Opinion for assets supporting reserves. Has no measurable standard other than “moderately adverse” and generally certifies aggregate reserves.	By its nature, reserve methodology is asset adequacy based. DAC recoverability testing is required, based on best estimate assumptions, increased by explicit PADs, both of which are generally determined by the actuary.

Comparison of General Valuation Approaches
United States vs. Canada (cont.)

	United States	Canada
Capital & Surplus:		
- Minimum Requirements	Generally agreed that intent is that RBC, in combination with reserves, is designed to cover 95th percentile. Companies typically manage surplus to a multiple of the NAIC Risk Based Capital.	Minimum Continuing Capital and Surplus Requirements (MCCSR) is a total balance sheet requirement, which appears to cover 95th percentile (although this is less clear than in the US). Companies also typically manage surplus to a multiple of the MCCSR, which may be different than that used by US companies.
- Integrated with Reserves	Except for scenario-tested C3a (interest rate risk), RBC and reserves are independently calculated. Thus, RBC is not adjusted to reflect actual reserve levels held.	MCCSR and reserve requirements are fully integrated. Thus, MCCSR provides a "credit" for the actual reserve level held.
- Dynamic Solvency Testing	Dynamic financial condition analysis used by some companies, but not required	Dynamic Capital Adequacy Testing (DCAT) required each year.
Asset Valuation	Book value basis for assets supporting general account liabilities. Market value basis for assets supporting most separate account liabilities.	Assets typically valued using methods consistent with liabilities and surplus valuation
Hedging and Reinsurance	Liability and surplus calculations are typically determined gross of reinsurance, with various types of reinsurance offsets and credits. Liability and surplus calculations typically ignore hedging programs.	Liability and surplus calculations generally reflect the impact of hedging programs (subject to limitations) and reinsurance.
Tax Considerations	Tax reserves are deductible; excess of statutory (or GAAP) over tax and surplus provisions are not deductible.	Statutory reserves and tax reserves are generally equal. Any excess of statutory over tax and surplus provisions are not deductible.

VAGLB's (US) Versus Segregated Fund Guarantees (Canada)
Product Comparison Summary

		United States	Canada
Base Product:			
	General Description	Variable Annuities – Mutual Funds with tax deferred insurance wrapper	Segregated Funds – Mutual Funds with insurance wrapper. (No tax advantage over Mutual Funds)
	Fee Structure	M&E fees, investment management fees, policy fees, surrender charges.	M&E fees, investment management fees, fund fees, policy fees, surrender charges.
	Fund Offerings	Wide variety	Wide variety
	Fixed Account Options	Generally offered, including MVA separate account options.	Not generally offered
	Investment Risk	Except for guaranteed living and death benefits and fixed account options, generally passed to contractholder.	Except for guaranteed maturity and death benefits, generally passed to contractholder.
	Tax Deferral	No tax on inside CV build-up until distributed.	No tax benefit versus mutual funds (because they can be held within an IRA-like account, so both are tax deferred).
Guaranteed Benefits:			
	MGDBs	Return of premium, rollups, ratchets.	Return of premium, ratchets and roll-ups becoming more common (but less aggressive than US).
	GMABs	A few products offering 100% premiums accumulated N years (typically 7-20), at 0%-3.5% rate.	75% of premium minimum required for securities exemption.100% of premium with 10-year term also offered. Most products have re-set features that ratchet guarantee to current fund value (with new term commencement if applicable).
	GMIBs	Annuitization based on roll-up at 5%-7% rate, applied to guaranteed purchase rates, with max roll-up attained ages and waiting periods.	None currently.
	GPAFs	Income payments guaranteed not to fall below specified level (e.g., 80% of initial payment) on variable pay-out annuities.	None currently.

VAGLB's (U.S.) vs. Segregated Fund Guarantees (CAN) Reserve Methodologies

	United States	Canada
Project Scope	AAA VAGLB Work Group (WG) recommended formula reserves to NAIC LHATF, together with a reserve practice note. AAA Life RBC group recommended interim VAGLB RBC solution to NAIC Life RBC Task Force, and beginning to address long-term RBC solution for equity products.	CIA Task Force on Segregated Fund Guarantees made one combined set of recommendations to OSFI for Reserves, MCCSR and DCAT.
General Methodology	Integrated prospective CARVM approach for entire contract. Embedded components for reserve include present value of future guaranteed benefits less present value of future fees.	Contract reserve equals base reserve (account value – DAC) plus standalone reserve for guaranteed benefits (equal to present value of future guaranteed benefits – present value of future risk premiums).
Stochastic Methodology	Draft Guideline MMMM requires integrated CARVM reserve based on 83 1/3rd percentile of stochastically determined fund return scenarios.	Standalone segregated fund reserve based on CTE(55)-CTE(80), which generally exceeds the 77th-90th percentile, respectively. CTE stands for "conditional tail expectation" and CTE(X) equals the average of the (100-X) percent worse scenarios. Choice of exact CTE level is based on the judgement of the actuary.
Stochastic Investment Return Models	Current MMMM draft requires lognormal (other distributions are currently under review) with specified mean and standard deviation by fund class to fit historical 38 year fund data varying by 5 fund classes.	No distribution specified, but results (primarily tail thickness) must be calibrated to fit historical market data by fund class. Calibration criteria based on three accepted equity return models, using TSE 300 monthly historical returns. Example provided in CIA report on how to fit data to lognormal distribution, which is widely used for its ease of implementation. Flexibility allowed as models evolve while maintaining consistent practice.
Provision for Diversification	No provision for mix of funds or diversity of timing of benefits.	Provisions for mix of funds and diversity of timing of benefits are permitted.

VAGLB's (U.S.) vs. Segregated Fund Guarantees (CAN) Reserve Methodologies (cont.)

	United States	Canada
Simplified Approaches	1) Weighted reserve based on fewer representative scenarios is permitted if scenarios are calibrated to stochastic results for a sample of contracts; 2) Keel method scenario permitted for contracts/features that qualify (safe harbor).	For 2000, in lieu of the stochastic approach, companies may use prescribed 6-part factor-based approach, based on CTE(80), which generally exceeds the 90th percentile. This is an interim approach only.
Fund Classes	5 classes – Money Market, Bond, Balanced, Equity, and Specialty (11 classes were originally proposed by AAA MGDB Work Group).	Fund classes up to discretion of actuary for stochastic approach. 6 classes used for factor based simplified approach – Money Market, Bond, Balanced, Diversified Equity, Intermediate Equity, and Aggressive Equity.
Treatment of asset-based fees	Under proposed integrated CARVM approach, future fees are available to offset future guaranteed benefits.	Future fees available to offset future guaranteed benefits. Such fees may be allocated between the base contract and the guaranteed benefits based on the judgement of the actuary.
Decrements	The integrated CARVM approach requires utilization of elective benefits (e.g., lapse and withdrawal rates) that produce greatest present value. Mortality tables used are those specified in SVL. Actuarial judgement allowed for other non-elective benefits, with margin for conservatism.	Based on judgement of actuary. Dynamic lapse model suggested for stochastic approach; interim factor-based approach assumes 8% per year rate. Provisions for adverse deviation included in decrements and other non-stochastic assumptions.
Reinsurance	Recoveries and costs reflected in integrated reserve calculated per terms of treaty (e.g., proportional or non-proportional types).	Recoveries and costs reflected in stochastic modeling per terms of treaty.
Hedging	Not reflected (except for scenario tested C3a capital requirements)	50% reduction in balance sheet requirement on portion of exposure that stochastic modeling shows is transferred/hedged.

VAGLB's (U.S.) vs. Segregated Fund Guarantees (CAN) Required Capital & Surplus Methodologies

	United States	Canada
General Methodology	Simplified factor based method is used for RBC.	Complex factor based method is used for MCCSR. The Stochastic approach (currently used to determine reserves) to be proposed by CIA Task Force considered in 2001 for MCCSR, but is likely several years from full implementation.
Adequacy Level	Interim factors based on C-3 requirement for interest rate risk. For early policy durations, interim RBC factors, together with reserve, exceeded 95th percentile ranking of scenarios used by AAA VAGLB Work Group in testing.	Factors based on CTE(95) (i.e., average of worst 5% of scenarios). Resulting MCCSR produces a result greater than or equal to 97.5th percentile result. Full credit provided for actual guaranteed benefit reserves held.
Formula	RBC = Factor * (Base Contract Reserve + VAGLB Reserve).	MCCSR = Account Value* (A1*A2*B*C-D).
Factors	Single Factor (ranging between 1-3%), varying by: - Whether or not the VAGLB is "in the money" (i.e., whether or not the account value/VAGLB amount is less than 1). - Whether an unqualified Section 8 actuarial opinion is issued. - Product type (only adjustment is to reflect MGIB factor to determine "on the money" status).	Five factor formula, as follows: - A1 = "Basic Factor", varying by a matrix with 15 guar. benefit designs and 6 fund classes. Resulting factor ranges from .02% - 26%. - A2 = "Maturity Benefit Time Diversification Factor" (ranging between 0.88 and 1), to reflect how maturity benefit in force portfolio is spread out over time. Factor varies by a matrix with 7 maturity benefit designs and 6 fund classes. - B = "Status Factor", ranging between 0 and 7729, based on a matrix with 7 "in the money" ratios for each of 10 guaranteed benefit designs and 6 fund classes. B is set to 1 for guarantees that can be reset, regardless of "in the money" status.

VAGLB's (U.S.) vs. Segregated Fund Guarantees (CAN) Required Capital & Surplus Methodologies

	United States	Canada
		- C = "MER adjustment", to reflect the difference between the actual management expense ratio and a table based MER. This difference is applied to an "MER multiplier" (ranging between 10-63%) using a matrix of 3 guaranteed benefit designs, 6 equity funds, and whether or not the guaranteed benefit is "in the money". - D = "Margin offset adjustment" (ranging between 6-17% per 1% of margin) to reflect margins for the guaranteed benefit, based a matrix of 15 guaranteed benefit designs and 6 fund classes.
Hedging/Reinsurance Credit	Full credit for reinsurance. No credit for hedging.	Full credit for reinsurance. No credit through 2000, although OSFI may allow credit once appropriate criteria are developed.

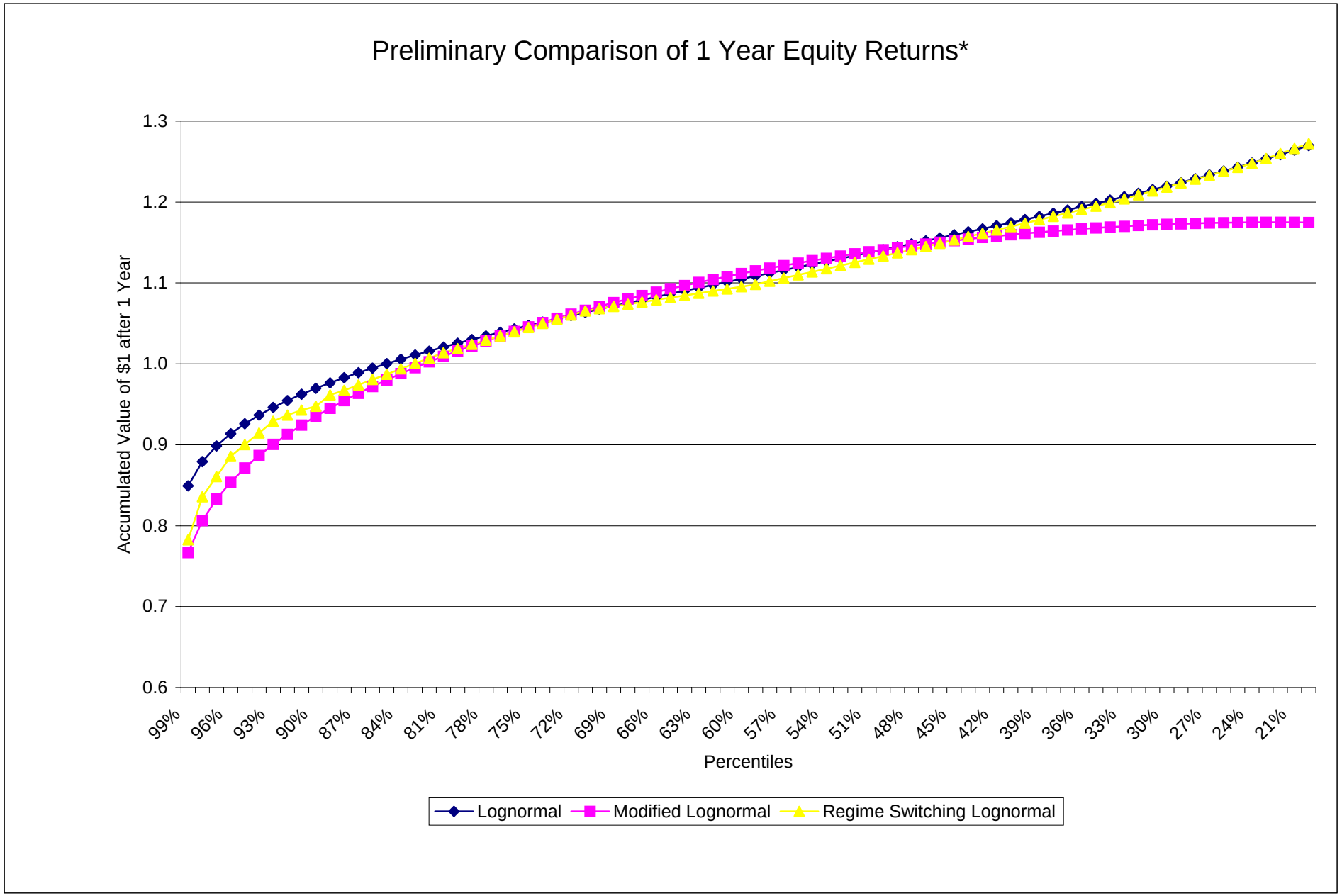
Comparison of Equity Return Distribution Models

	LogNormal	Modified LogNormal	Regime Switching LogNormal
1. Description	Text book lognormal distribution.	Lognormal distribution where the standard deviation increases as a function of time.	Lognormal distribution where the returns are based on whether you are in one of two volatility "regimes". i.e., in either a normal or volatile equity return period.
2. Input	Log(S(t+1) / S(t))	Log(S(t+1) / S(t))	Log(S(t+1) / S(t))
3. Implementation Steps	Estimate Parameters Compute Distribution	Estimate Parameters Compute Distribution	Estimate Parameters Compute Distribution
4. Number of Parameters	2 Parameters: Mean Standard Deviation	4 Parameters: Mean Standard Deviation 2 time adjustment factors	6 Parameters: 2 Means (one for each regime) 2 Standard Deviations (one for each regime) 2 Transition probabilities (from one regime to ano
5. Parameter Estimation	Calculate sample mean and standard deviation. (easy)	Calculate sample mean and standard deviation. (easy Use optimization to calculate 2 adjustment factors	Use optimization or Bayesian statistical estimation. (moderately difficult)
6. Parameter Verification	Transparent, easy to review.	Not transparent, but easy to review.	Not Transparent (somewhat black box). May require new ASOPs.
7. Computation of distribution	Table look - up (easy).	Table look - up (easy).	New computer programs needed (Moderately difficul
8. Comparison of tail values	Produced highest equity returns at all durations. Resulting tails are "thin" for longer duration return assumpti resulting in very poor results being underweighted.	Produced lowest equity returns at all durations. Resulting tails are the "fattest" for all 3 categories tested.	Produced equity returns at all durations below lognormal, but higher than modified lognormal Resulting tails are fatter than lognormal, but less fat than modified lognormal.
9. Matching to Empirical Results	Fair match to empirical results for short duration returns, poor match at longer term returns.	For 83rd percentile, good match to empirical results at most durations. Fit appears to be excessively conservative at extreme high and low percentiles. More review is needed to determine if adjustments to the distribution are needed.	Resulting returns not yet compared directly to empirical results, but a reasonably good fit is expe
10. VAGLB Reserve Testing*	Reserves generally small or zero until extreme percentiles, or at later durations where contract was substantially " in the money". Usually produced lowest reserves, although material differences only typically occur when the contract is substantially "in the money".	Reserves generally small or zero until extreme percentiles, or at later durations where contract was substantially " in the money". Usually produced the highest reserves, although material differences only typically occur when the contract is substantially "in the money".	Reserves generally small or zero until extreme percentiles, or at later durations where contract was substantially " in the money". Reserves generally greater than lognormal, smaller t modified lognormal.
11. Keel Methodology	Yes, has a closed form solution.	Yes, has a closed form solution.	No, has no closed form solution.
12. Application to other fund classes	Results consistent with equity class.	Results consistent with equity class.	Other fund classes not yet tested.

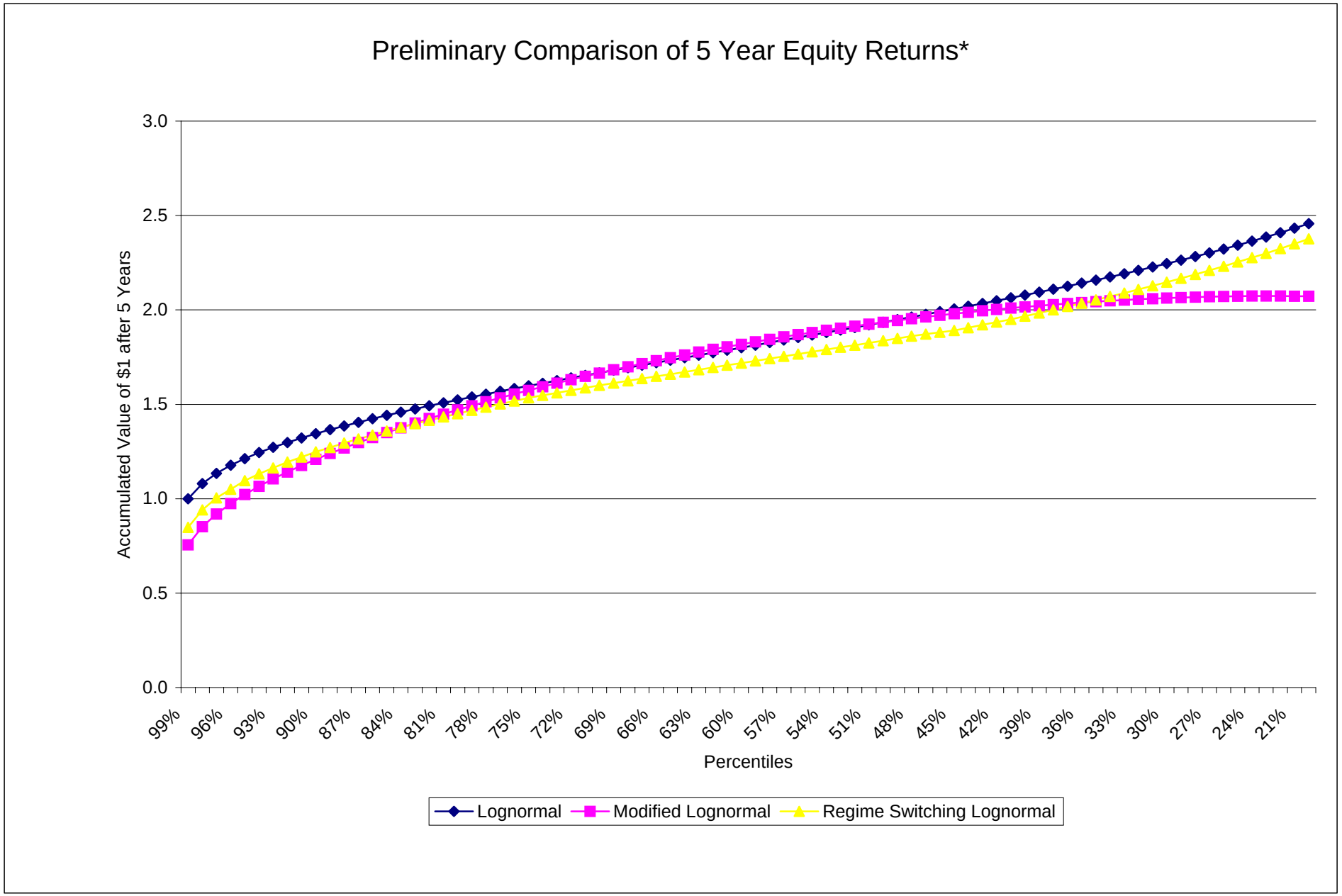
* Results are preliminary based on 10 year MGAB - testing of more products is needed before a final conclusion can be ready.

Comparison of Equity Returns for Various Distribution Models

Percentile	99%	95%	90%	83%	50%	25%	10%
Cumulative Returns							
1 Year							
Lognormal	-15.1%	-7.4%	-3.0%	**1.1%**	14.1%	24.3%	34.3%
Regime Switching Lognormal	-21.8%	-10.0%	-5.2%	**0.0%**	13.3%	24.3%	34.7%
Modified Lognormal	-23.3%	-12.9%	-6.5%	**-0.5%**	14.1%	17.5%	16.7%
5 Year							
Lognormal	-0.1%	21.3%	34.4%	**47.5%**	93.5%	134.3%	178.4%
Regime Switching Lognormal	-15.1%	9.6%	24.8%	**39.7%**	83.7%	125.4%	172.8%
Modified Lognormal	-24.4%	2.3%	20.9%	**40.1%**	93.5%	107.2%	103.8%
10 Year							
Lognormal	47.1%	93.3%	123.7%	**155.1%**	274.3%	390.7%	526.2%
Regime Switching Lognormal	0.0%	40.5%	70.4%	**101.8%**	222.9%	335.5%	484.2%
Modified Lognormal	-52.8%	-8.1%	32.8%	**83.7%**	274.3%	335.5%	320.0%
Annual Levelized Returns							
1 Year							
Lognormal	-15.1%	-7.4%	-3.0%	**1.1%**	14.1%	24.3%	34.3%
Regime Switching Lognormal	-21.8%	-10.0%	-5.2%	**0.0%**	13.3%	24.3%	34.7%
Modified Lognormal	-23.3%	-12.9%	-6.5%	**-0.5%**	14.1%	17.5%	16.7%
5 Year							
Lognormal	0.0%	3.9%	6.1%	**8.1%**	14.1%	18.6%	22.7%
Regime Switching Lognormal	-3.2%	1.8%	4.5%	**6.9%**	12.9%	17.6%	22.2%
Modified Lognormal	-5.4%	0.5%	3.9%	**7.0%**	14.1%	15.7%	15.3%
10 Year							
Lognormal	3.9%	6.8%	8.4%	**9.8%**	14.1%	17.2%	20.1%
Regime Switching Lognormal	0.0%	3.5%	5.5%	**7.3%**	12.4%	15.9%	19.3%
Modified Lognormal	-7.2%	-0.8%	2.9%	**6.3%**	14.1%	15.9%	15.4%



*** Results are preliminary, and need further analysis before final conclusions can be ready.**



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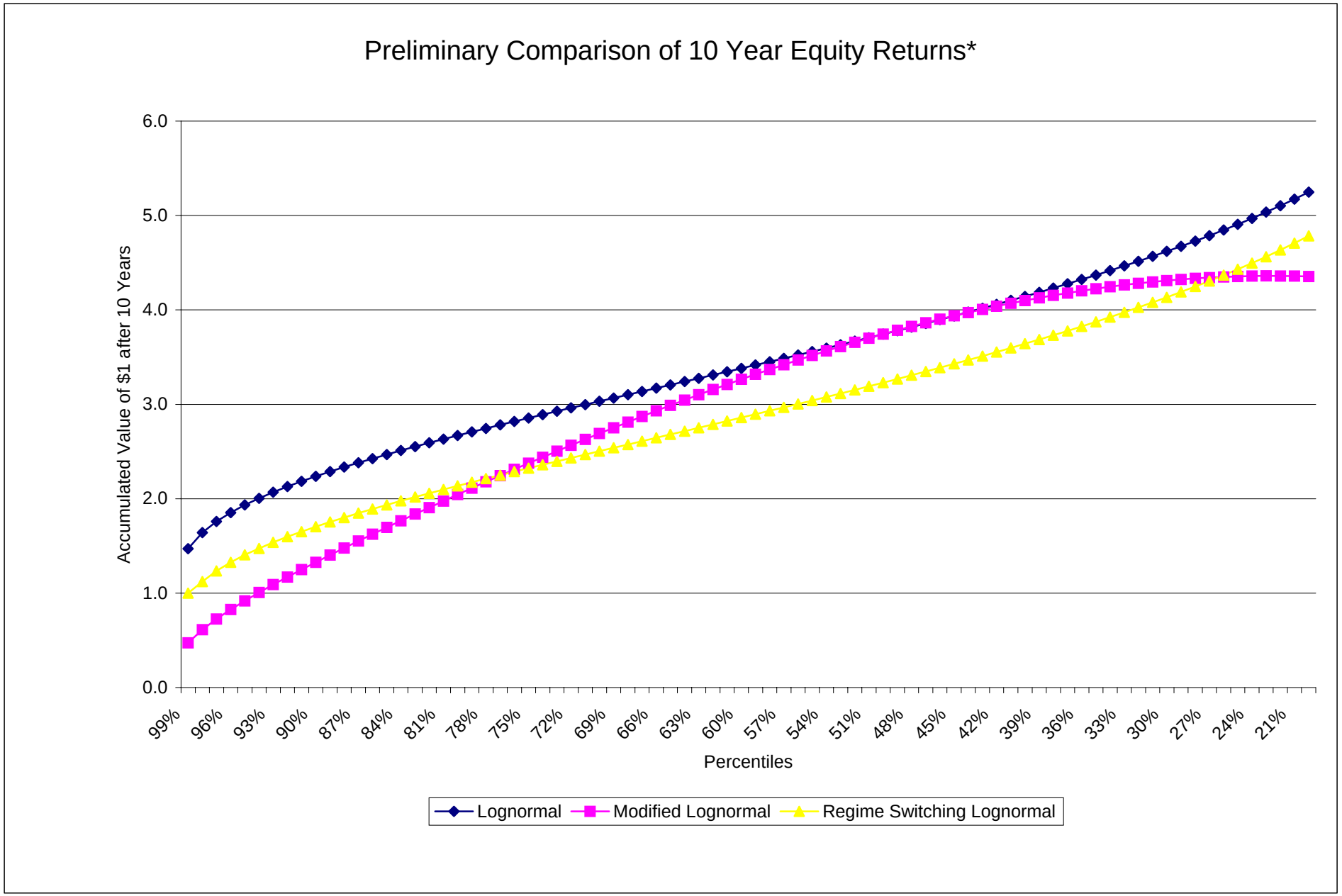

*** Results are preliminary, and need further analysis before final conclusions can be ready.**

		Lognormal	Modified Lognormal	Regime Switching Lognormal
0.01	0.99	0.849229	0.766887681	0.782417236
0.02	0.98	0.87914	0.806295123	0.835828933
0.03	0.97	0.898662	0.832923911	0.860773214
0.04	0.96	0.913632	0.853835847	0.885717494
0.05	0.95	0.925994	0.871406223	0.900157989
0.06	0.94	0.936647	0.886744878	0.914598484
0.07	0.93	0.946088	0.900467627	0.929038979
0.08	0.92	0.954622	0.912955252	0.936696625
0.09	0.91	0.962451	0.924460948	0.942822742
0.1	0.9	0.969714	0.935160627	0.947723636
0.11	0.89	0.976513	0.945183756	0.961644351
0.12	0.88	0.982925	0.9546282	0.96732721
0.13	0.87	0.989009	0.963569522	0.973957391
0.14	0.86	0.994812	0.972067036	0.980587572
0.15	0.85	1.000372	0.980169744	0.987217753
0.16	0.84	1.005718	0.987916464	0.993847934
0.17	0.83	1.010877	0.995340305	1.000478115
0.18	0.82	1.01587	1.00246859	1.007108296
0.19	0.81	1.020715	1.009325089	1.013738478
0.2	0.8	1.025427	1.015929669	1.01891148
0.21	0.79	1.030021	1.022299579	1.024084483
0.22	0.78	1.034508	1.028450078	1.029257485
0.23	0.77	1.038898	1.034394119	1.034430487
0.24	0.76	1.0432	1.04014331	1.03960349
0.25	0.75	1.047422	1.045707911	1.044776492
0.26	0.74	1.051573	1.051097457	1.049949495
0.27	0.73	1.055658	1.05631954	1.055122497
0.28	0.72	1.059684	1.061381964	1.0602955
0.29	0.71	1.063655	1.066290919	1.065468502
0.3	0.7	1.067577	1.071052506	1.068188647
0.31	0.69	1.071454	1.075672426	1.070908793
0.32	0.68	1.075291	1.080155115	1.073628938
0.33	0.67	1.079092	1.084505219	1.076349083
0.34	0.66	1.08286	1.088726996	1.079069228
0.35	0.65	1.086598	1.09282377	1.081789373
0.36	0.64	1.090311	1.096799346	1.084509518
0.37	0.63	1.094001	1.100656602	1.087229664
0.38	0.62	1.097671	1.104398616	1.089949809
0.39	0.61	1.101323	1.108027838	1.092669954
0.4	0.6	1.104962	1.111546908	1.095390099
0.41	0.59	1.108588	1.114957725	1.098110244
0.42	0.58	1.112205	1.118262637	1.102010152
0.43	0.57	1.115815	1.121463645	1.10591006
0.44	0.56	1.11942	1.124562168	1.109809969
0.45	0.55	1.123024	1.127560052	1.113709877
0.46	0.54	1.126627	1.130458808	1.117609785
0.47	0.53	1.130233	1.133259632	1.121509693
0.48	0.52	1.133843	1.135963877	1.125409601
0.49	0.51	1.137461	1.13857281	1.129309509
0.5	0.5	1.141087	1.141087382	1.133209417
0.51	0.49	1.144726	1.143508573	1.137109325

0.52	0.48	1.148378	1.145837278	1.141009233
0.53	0.47	1.152046	1.148074193	1.144909142
0.54	0.46	1.155733	1.150220134	1.14880905
0.55	0.45	1.159442	1.152275819	1.152994536
0.56	0.44	1.163174	1.154241656	1.157180023
0.57	0.43	1.166932	1.15611816	1.16136551
0.58	0.42	1.17072	1.157905927	1.165550997
0.59	0.41	1.17454	1.159605053	1.169736484
0.6	0.4	1.178394	1.161215903	1.173921971
0.61	0.39	1.182287	1.162738889	1.178107457
0.62	0.38	1.186221	1.164173926	1.182292944
0.63	0.37	1.1902	1.165521239	1.186478431
0.64	0.36	1.194228	1.166780723	1.190663918
0.65	0.35	1.198309	1.167952454	1.194849405
0.66	0.34	1.202446	1.169036169	1.199034891
0.67	0.33	1.206645	1.170031895	1.20389539
0.68	0.32	1.21091	1.17093915	1.208755888
0.69	0.31	1.215246	1.171757695	1.213616387
0.7	0.3	1.21966	1.172487189	1.218476885
0.71	0.29	1.224157	1.173126906	1.223337384
0.72	0.28	1.228745	1.173676393	1.228197882
0.73	0.27	1.23343	1.174135012	1.233058381
0.74	0.26	1.238221	1.174501795	1.237918879
0.75	0.25	1.243128	1.174776019	1.242779378
0.76	0.24	1.24816	1.174956431	1.247639876
0.77	0.23	1.253329	1.175042009	1.253775374
0.78	0.22	1.258647	1.175031425	1.259910872
0.79	0.21	1.26413	1.174923186	1.26604637
0.8	0.2	1.269793	1.17471555	1.272181868
0.81	0.19	1.275656	1.174406695	1.278317366
0.82	0.18	1.28174	1.173994475	1.284452864
0.83	0.17	1.28807	1.173476445	1.290588361
0.84	0.16	1.294677	1.172849969	1.296723859
0.85	0.15	1.301597	1.172111884	1.305114993
0.86	0.14	1.308871	1.171258697	1.313506127
0.87	0.13	1.31655	1.170286178	1.321897261
0.88	0.12	1.3247	1.169189726	1.330288394
0.89	0.11	1.333398	1.167963694	1.338679528
0.9	0.1	1.342747	1.166601512	1.347070662
0.91	0.09	1.35288	1.165095335	1.359505138
0.92	0.08	1.363975	1.16343555	1.371939613
0.93	0.07	1.376279	1.16161005	1.384374089
0.94	0.06	1.390151	1.1596036	1.396808565
0.95	0.05	1.406144	1.157395977	1.416144878
0.96	0.04	1.425169	1.154959063	1.43548119
0.97	0.03	1.44891	1.15225117	1.464515938
0.98	0.02	1.481084	1.149203557	1.493550685
0.99	0.01	1.533249	1.145677034	1.548179655

AAA VAGLB Work Group - Recommended Next Steps

1. Complete analysis of Regime Switching, Modified Lognormal, Lognormal, and other potential return distributions.

   a) Complete analysis of underlying parameters

   b) Analyze fit with 38-year historical V/A database

   c) Analyze "tail calibration" approach used in Canada:

      - Would allow actuaries to determine their own distribution to be used in Actuarial Guideline MMMM

      - Distribution chosen must be "calibrated" to ensure that resulting tails meet predetermined "fatness criteria"

      - Could be applied to lognormal (or other distribution) to simplify calculations

   d) Complete reserve testing for different product designs, "in the money" percentages, etc.

   e) Explore potential simplification approaches:

      - Determine a method which balances simplicity, auditability, and empirical accuracy

      - Determine viability of Keel method for each distribution under consideration. If the Keel method does not work, consider suitable alternative methods

   f) Determine viability of distribution for all 5 asset classes (equity, bond, balanced, money market, specialty)

2. Once LHATF approves recommendations made on item #1 above, modify Draft Actuarial Guideline MMMM as appropriate:

   a) Make changes as needed to reflect recommended distribution approach

   b) Remove retrospective floor "placeholder"

   c) Recommend timely adoption MMMM to provide interim solution

3. Work with AAA Life RBC Task Force to pursue long-term non-formulaic VAGLB solution that addresses both reserve and RBC consideration.

Variable Annuity Guaranteed Living Benefit Practice Note

A draft Practice Note was developed by a subgroup of the Academy VAGLB Work Group to help actuaries better understand the requirements of the December 1, 2000 draft of proposed AG MMMM. The Practice Note is not intended to be a position of the work group, but rather a first attempt at answers to questions raised with respect to the proposed guideline. It is also intended to focus only on AG MMMM, and is not intended to directly address other reserving methods used.

The Practice Note contains eight sections listed below, dealing with various aspects of the proposed guideline. It also includes a bibliography to assist actuaries in obtaining further information.

I. General VAGLB Reserving Issues – dealing with general questions about applying the proposed guideline.

II. Minimum Reserve Requirement – addressing issues related to Section IV(I) of the proposed guideline, which was added in December.

III. Asset Adequacy Analysis – dealing with questions related to analyzing reserves for variable annuity products containing VAGLBs.

IV. Reinsurance – addressing questions related to ceded and assumed reinsurance reserves.

V. Guaranteed Living Benefits in combination with other guaranteed benefits – such as MGDBs.

VI. Valuation Interest Rate – dealing with the determination of valuation interest rates and charges deducted from those rates for the projection of benefits, as required by the proposed guideline.

VII. Development of Representative Scenarios – includes the use of these scenarios under the proposed guideline.

VIII. Guaranteed Payout Annuity Floors – addressing issues related to these benefits.

The Work Group will continue to update the Practice Note as AG MMMM continues to evolve.

A copy of the draft Practice Note is attached to this report (as a 12-page Q&A document).

DRAFT

Appendix 1:

Variable Annuity Guaranteed Living Benefits Practice Note

March, 2001

The following questions relate to the National Association of Insurance Commissioner's (NAIC) proposed Actuarial Guideline MMMM, and specific section references are to the December 1, 2000 draft of the Proposed Guideline as published on the NAIC's website (www.naic.org). The questions and answers in this Practice Note are in draft format and the reader should not consider them to be representative of the American Academy of Actuaries' Variable Annuities with Guaranteed Living Benefits (VAGLBs) Work Group, but rather, a first attempt at an answer to the question.

This draft Practice Note addresses the draft actuarial Guideline referenced above. It is intended that this draft Practice Note will be changed when the draft Guideline is finalized. Inasmuch as the proposed Guideline has not been adopted by the NAIC, compliance with it does not guarantee the acceptability of the resulting VAGLB reserves to any state insurance department. Nonetheless, this draft Practice Note may be helpful in understanding the requirements of the draft Guideline.

The American Academy of Actuaries is the public policy organization for actuaries practicing in all specialties within the United States. A major purpose of the Academy is to act as the public information organization for the profession. The Academy is non-partisan and assists the public policy process through the presentation of clear and objective actuarial analysis. The Academy regularly prepares testimony for Congress, provides information to federal elected officials, comments on proposed federal regulations, and works closely with state officials on issues related to insurance. The Academy also develops and upholds actuarial standards of conduct, qualification and practice and the Code of Professional Conduct for all actuaries practicing in the United States.

The American Academy of Actuaries (Academy) welcomes your comments and suggestions for additional questions to be addressed by this Practice Note. Please address all communications to Steve English (english@actuary.org).

The members of the work group that are responsible for the original draft Practice Note are as follows:

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Section I: General VAGLB Reserving Issues

The following are general questions about applying proposed Actuarial Guideline MMMM to the calculation of VAGLB reserves.

Q1. If the product is hedged, does the proposed Guideline permit a capital markets approach to reserving to be used?

A: A capital markets approach would involve using options available in the market to hedge the risk. On the asset side, the market value of these options is what is recorded on the statutory balance sheet. In order for surplus to not be affected by changes in the economic climate, the liabilities related to the option would need to be valued in the same way as the assets. This method of determining VAGLB liabilities may not technically be allowed under the proposed Guideline. However, if one wants to use this method, the actuary may want to consider discussing this with the state of domicile and any other state that one is licensed in that has adopted specific rules (e.g., California and New York) to see if this method would be allowed.

Q2. Are benefit streams that do not involve the payment of benefits enhanced by a VAGLB, included in the calculation of the Integrated Reserve?

A: According to the proposed Guideline, the Integrated Reserve is to reflect all the benefits provided under the contract. As such, benefit streams that do not involve a VAGLB benefit would also need to be considered in the reserve calculation.

Q3. How do I ensure that the "Y" benefit stream for Projected Base Contract Values is consistent with the "X" Projected Net Amounts at Risk benefit stream?

A: According to the proposed Guideline, the "X" Projected Net Amounts at Risk represent the value of the VAGLB benefit as of the time a benefit (that may be enhanced by a VAGLB) is to be paid. According to the proposed Guideline, this is determined by subtracting the Projected Contract Values from the Projected Living Benefit Amounts: both the Projected Contract Values and the Projected Living Benefit Amounts are contract values on the valuation date projected into the future, based on a set of Net Assumed Returns. The Projected Living Benefit Amounts reflect any enhancement due to the VAGLB, while the Projected Contract Values do not.

According to the proposed Guideline, the "Y" Projected Base Contract Values are the contract values on the valuation date projected into the future, using a return based on valuation rate(s) less appropriate asset based charges. Except for the projected returns, a methodology under which these values are determined using the same assumptions, such as partial withdrawal incidence, mortality incidence, etc. for both Non-elective Benefits and Elective Benefits, as those used in the determination of the Projected Contract Values, ensures that the "X" and "Y" benefit streams will have been consistently determined.

Q4. Where can I get further information regarding VAGLB testing and formulas that may be useful in the development and analysis of scenarios for Representative Scenarios?

A: A short bibliography is included in Appendix A to this draft Practice Note.

Section II: Minimum Reserve Requirements

The following questions relate to the minimum reserve requirements in Section IV(I) of the proposed Guideline.

Q5. According to the proposed Guideline, what fund and other charges should be accumulated? What if there are no explicit charges made?

A: The proposed Guideline indicates that actual fund and other charges made for the benefit should be accumulated, and that in the event no explicit charges are made for the benefit, a reasonable charge should be imputed and used for the accumulation. The proposed Guideline states that the actuary should be prepared to demonstrate that the reserve is reasonable, appropriate, and adequate under moderately adverse conditions.

Q6. What premiums does a reinsurer generally use to determine the retrospective accumulation, the premium the direct writer charged or the reinsurance premium?

A: Consistent with the answer to Q5, many actuaries feel that the reinsurance premiums are the minimum basis to be used for the retrospective accumulation for the reinsurer.

Q7. If a combined charge is made for both VAGLBs and Guaranteed Minimum Death Benefits (GMDBs), how is the charge usually determined for just the VAGLB piece to calculate the retrospective charge accumulation?

A: Many actuaries feel that actuarial judgment is needed to separate the combined charge and reach a reasonable result. For example, if the Guaranteed Minimum Death Benefit were return of premiums, but the VAGLB is a GMIB based on accumulations at 5% per year for 10 years, the actuary may want to consider that the charge be considered mostly for the GMIB and the remainder for the GMDB.

Q8. Are surrenders considered when determining the amount of accumulated charges that must be held?

A: Some actuaries feel that a reasonable interpretation of the proposed Guideline would be to calculate the accumulated charges only for policies in force on the valuation date.

Q9. On what basis or bases is the accumulation to be done ?

A: Seriatim is what is technically required, but the actuary may want to consider if reasonable approximations may be acceptable. For example, if accounting entries are made, as deductions of charges for the benefit occur, then an account balance may serve as a reasonable reserve estimate in some cases.

Q10. Are the charges accumulated at interest?

A: The proposed Guideline does not state that interest need be considered.

Section III: Asset Adequacy Analysis

The following questions relate to asset adequacy analysis of statutory reserves for variable annuity products containing VAGLB benefits.

Q11. What methods are used to perform asset adequacy analysis for VAGLBs?

A: Cash flow testing is considered by some actuaries to be the most appropriate form of asset adequacy analysis for VAGLBs. Both stochastic and deterministic scenarios can be used to perform such testing on VAGLBs. Consistent with Actuarial Standard of Practice Number 22 (ASOP 22), the actuary may consider performing sufficiently thorough modeling to satisfy himself/herself that all VAGLB cash flow risks have been adequately measured. In particular, the actuary may want to consider the impact on fund returns of financial market means and volatilities for a sufficient number of asset classes.

In considering the materiality of the VAGLB reserves in the construction of asset adequacy models, the actuary may want to consider looking beyond the size of the current reserves, and consider the risks assumed by the company. For example, the current VAGLB reserves might be relatively small in comparison with total variable annuity reserves, but the risks assumed by the company might be disproportionately large in comparison to the reserves. Increases in financial market volatility or changes in market value may result in very large VAGLB cash flows, as the VAGLB benefit becomes significantly "in the money."

Q12. How are the scenarios determined for VAGLB asset adequacy analysis?

A: As stated in ASOP 22, the appointed actuary should be satisfied that the assumption bases chosen are adequate. This may depend on a number of considerations. For example, if there is a significant potential exposure to VAGLB market risk, the actuary may determine that relatively extensive scenario modeling may be necessary. Many actuaries feel that the scenarios can be determined using stochastic or deterministic methods, reflecting the impact of market volatility on fund returns and the resulting VAGLB cash flows. In certain situations, the actuary may decide that conservative simplified testing may be reasonable (e.g., using drops and small recoveries). As stated in ASOP 14, Section 5.6, the effort expended may vary in as much as – "[t]he analysis needs to be refined to the point where, in the judgement of the actuary, further refinement would not result in a materially different opinion or recommendation." One consideration may be the potential exposure for the company. In some cases, the actuary may determine that conservative simplified testing may be all that is needed. However, in other cases, the actuary may determine that stochastic scenarios and modeling will need to be developed.

Section IV: Reinsurance

The following questions relate to ceded and assumed reinsurance reserves.

Q13. How is the credit for reinsurance determined if there is a dollar limit on the yearly amount that would be paid as benefits under a reinsurance treaty?

A: A dollar limit on yearly reinsurance benefits is normally expressed as an aggregate value (e.g., a percentage of aggregate account values or aggregate guaranteed amounts). As such, some actuaries feel that it can only be accurately measured with an aggregate projection of the inforce policy block. However, according to the proposed Guideline, Integrated Commissioners' Annuity Reserve Method (CARVM) was intended to be calculated on a seriatim basis, and it would be difficult, in any case, to do an aggregate projection of all of the various benefit streams.

It may be possible to do a stand-alone aggregate projection of the expected reinsurance benefits using the assumptions in the proposed Guideline and recognizing the dollar limit. The average portion of benefits paid by reinsurance can then be calculated and used as an approximation in the

seriatim Integrated CARVM calculations. However, there are various items the actuary may decide to consider in making this determination (e.g., that the greatest present value for the reinsurance benefit may not be consistent with the greatest present value on an integrated basis, or that the year that would produce the highest reserves in one policy may not be the same for other policies). This is an area where actuarial judgment may be needed.

Q14. If 100% of the VAGLB is reinsured, what is the reinsurance credit?

A: Where a company cedes some or all of the VAGLB risk and is entitled to take a reinsurance reserve credit, the proposed Guideline defines the reinsurance credit as the Integrated Reserve with Reinsurance less the Integrated Reserve without Reinsurance.

According to the proposed Guideline, the Integrated Reserve with Reinsurance is calculated by altering the X stream to reflect the payment of VAGLB benefits by the reinsurer (that is, the normal X stream, reduced by the future Projected Net Amount(s) at Risk that would be recovered from the reinsurer) and introducing another stream Z which represents the future projected reinsurance gross premiums determined using Projected Contract Values.

The Integrated Reserve without Reinsurance is calculated as described elsewhere in this draft Practice Note in accordance with the proposed Guideline. It represents the total reserve that would be held by the company in support of the entire variable annuity contract ignoring the costs and benefits of reinsuring the VAGLB.

According to the proposed Guideline, each of these Integrated Reserves is calculated independently as the greatest present value considering all possible benefit streams. It is possible for the reinsurance credit to be either positive or negative. A negative credit could arise, for example, when the cost of reinsuring the VAGLB is more than the Projected Net Amount(s) at Risk. The amount of the reinsurance credit could either increase or decrease the size of the VAGLB reserve.

Section V: Guaranteed Living Benefits in combination with other guaranteed benefits

The following questions relate to reserve calculation for policies containing other guaranteed benefits other than VAGLBs, such as GMDBs.

Q15. How are reserves developed under the proposed Guideline for contracts with both GMDBs and VAGLBs?

A: The proposed Guideline states that the combined General Account reserve for an GMDB together with a VAGLB in the same contract should be determined as the difference between: i) an Integrated Reserve representing the total reserve held by the company in support of the entire variable annuity contract, and ii) a Separate Account reserve representing the total reserve that would have been held by the company in the absence of both the GMDBs and the VAGLBs.

Under the proposed Guideline, both the Integrated Reserve and the Separate Account Reserve are determined using CARVM principles. The Standard Valuation Law states that "[r]eserves according to the commissioners annuity reserve method … shall be the greatest of the respective excesses of the present values … of the future guaranteed benefits." Many actuaries feel that this means that all the benefits valued within the CARVM approach to determining the Separate Account Reserve should also be valued within the CARVM approach to determining the Integrated Reserve and in addition, the Integrated Reserve must reflect the benefit streams under

CARVM arising from GMDBs and VAGLBs. However, a different benefit stream may generate the greatest present value under CARVM for each of the Separate Account Reserve and the Integrated Reserve.

The proposed Guideline indicates in section IV-H that "[a]ctuarial judgment may also be needed if it is necessary to split up the 'solved for' guaranteed benefit reserve into reserve components for each guaranteed benefit."

Q16. Would a death benefit that offered to pay a percentage of the gain, (e.g., excess of the account value over the premiums less withdrawals), upon the death of the owner be covered under the proposed Guideline or under Actuarial Guideline 34? What principles would be used to calculate the reserve?

A: Assuming that any such benefit is viewed as an incidental benefit to a variable annuity product rather than a life insurance coverage that is offered in conjunction with an annuity, the natural starting point is to see if such a benefit would be covered under either the proposed Guideline or Actuarial Guideline 34.

Since the proposed Guideline defines a VAGLB as one or more guaranteed benefit amounts payable to a living contractholder or a living annuitant that have the potential to be enhanced, a death benefit would not appear to be covered by this proposed Guideline. Actuarial Guideline 34 states its purpose as interpreting the standards for the valuation of reserves for Guaranteed Minimum Death Benefits. The Scope section states in part that, "[h]owever, the actuary should also exercise judgment in determining the applicability of this Guideline. For example, it may be inappropriate to utilize this Guideline for a contract with a GMDB where the associated net amount at risk (NAR) decreases when the underlying funds experience a drop in market value or period of underperformance." The net amount at risk with this death benefit does indeed decrease when there is a drop in market value or period of underperformance, and increases after a period of over-performance. Both the proposed Guideline and Actuarial Guideline 34 specify the future investment performance to be used. However, both Guidelines emphasize underperformance since that is typically the risk with a GMDB or VAGLB. Although neither Guideline appears to apply to such a benefit, there are many principles in each Guideline that may be used to obtain a reserve consistent with the spirit of these Guidelines.

Section VI: Valuation Interest Rates

The following questions relate to the determination of valuation interest rates and charges deducted from the valuation interest rate for the projection of benefits for CARVM reserve calculation (not for Projected Net Amounts at Risk).

Q17. In calculating the reserve for a contract with an optional GMIB with an identified charge, what charges would be deducted from the valuation rate to determine the rate at which to project future benefits? Would the same answer apply to the Integrated Reserve with the VAGLB as that without?

A: According to the proposed Guideline, both the Integrated Reserve and the Separate Account Reserve, calculated for VAGLB reserve determination, reflect benefits other than VAGLB and/or MGDB benefits (which are represented as Projected Net Amounts at Risk) projected using valuation interest rate(s) less asset based charges (including asset based charges for the VAGLB benefit).

Section VII: Development of Representative Scenarios

The following questions relate to the development and use of Representative Scenarios.

Q18. Are Representative Scenarios generated from a formula?

A: According to the proposed Guideline, the development of Representative Scenarios is completely at the discretion of the Valuation Actuary, except that the requirements of Section IV(D) of the proposed Guideline must be satisfied. To facilitate the development of them, and in performing the resulting calculations, it may be desirable for the Representative Scenarios to take on a closed form (e.g., the Keel formula). However, the proposed Guideline does not require a formula. For example, Representative Scenarios may consist of a set of individual scenarios chosen purposely to represent a larger set of stochastically generated scenarios with weights designed to result in reserves that satisfy the requirements of Section IV(D) of the proposed Guideline.

Q19. If my company is developing a new product that incorporates a VAGLB benefit, how are the key assumptions determined for testing the appropriateness of proposed Representative Scenarios since my company has not yet written any business?

A: According to the proposed Guideline, key assumptions must reflect the business characteristics and other factors specified in the proposed Guideline, but are otherwise determined by the valuation actuary, using professional judgment, and are intended to represent the business anticipated to be issued. The purpose of Representative Scenarios is to conservatively project the value of VAGLB benefits payable in the future. By selecting an appropriate number of test values for the key assumptions, a lattice of reserve comparison testing points can be developed to compare VAGLB reserves for the Representative Scenario to VAGLB reserves derived from stochastically determined return scenarios. The key assumptions represent the important characteristics of the business, together with critical assumptions, such as the degree to which the VAGLB benefit is "in the money" as of the valuation date. As the company actually writes business under the new product, the actuary may consider performing the Representative Scenario testing using the actual distribution of business and other relevant factors to determine if they are still appropriate.

Q20. Do the requirements of IV(D)(3) have to be met for every one of the key assumption test values before Representative Scenarios can be used?

A: According to the proposed Guideline, this is up to the Valuation Actuary, using professional judgment. However, many actuaries believe it is not generally possible to satisfy these requirements at each and every test value for the key assumptions. Keeping in mind the relative proportion of business at each such test value, and the impact it may have on the adequacy of overall reserves, the actuary uses professional judgment to decide if the Representative Scenarios and corresponding weights are appropriate.

Q21. How often do actuaries do the testing of Representative Scenarios before continuing to use them?

A: It may be necessary to develop Representative Scenarios prior to attaining policy form approval in some states. In any event, since according to the proposed Guideline, the actuary must annually certify the appropriateness of the Representative Scenarios, the actuary may want to consider performing the testing as frequently as he/she deems necessary to continue to make the

certification. As economic environment factors change, if the mix of business changes over time, or changes in other relevant factors occur, the actuary may want to consider re-performing the testing to ensure the appropriateness of the Representative Scenarios.

Q22. Do actuaries ever use two or more sets of Representative Scenarios for a single VAGLB benefit?

A: Some actuaries anticipate that there may be circumstances where a single set of Representative Scenarios may be difficult or impossible to develop, or may result in redundant reserves. As a result, it may be appropriate to use one set of Representative Scenarios for a portion of the business written on a particular product, and a different set of Representative Scenarios for the rest of that product's business. For example, if a product provided a benefit guarantee with a waiting period of 10 years or age 70, if earlier, it may be appropriate to subdivide the business in force into groups by period to benefit maturity, with different Representative Scenarios for each group.

Q23. How many Representative Scenarios are usually appropriate, and in what circumstances?

A: This is generally determined by the actuary in the development of the Representative Scenarios through analytical methods to satisfy the requirements of section IV(D) of the proposed Guideline. There are obvious calculational advantages to having fewer, rather than more, scenarios, but the primary concern is whether the Representative Scenarios appropriately represent stochastically determined scenarios in reserve calculation.

Q24. If more than one Representative Scenario is required under the judgment of the actuary, how are results combined to calculate the Projected Net Amounts at Risk and VAGLB reserve for the policy?

A: Part of the work involved in the development of Representative Scenarios is the determination of weighting factors to apply to the VAGLB reserves that result from Projected Net Amounts at Risk for each Scenario. Thus, according to the proposed Guideline, for a given policy, Projected Net Amounts at Risk and an Integrated Reserve is calculated that correspond to each Representative Scenario and the CARVM reserve determined by ignoring the VAGLB is deducted to determine a VAGLB reserve that corresponds to that Scenario. Finally, the VAGLB reserve for the policy is determined by applying the associated weights to these Representative Scenario VAGLB reserves.

Q25. What tolerances are generally appropriate in comparing representative scenario results to stochastic results?

A: The proposed Guideline states that the VAGLB reserve derived as the weighted average of the VAGLB reserves determined for each Representative Scenario may not be materially less than the VAGLB reserve based on the 83 1/3 rd percentile of the Benchmark Reserves. Many actuaries feel that the Valuation Actuary must use professional judgment in determining materiality for these purposes. Reference to the reports of the Academy's VAGLB Work Group (see Appendix A) regarding development and testing of the Keel Method formula may provide some guidance in this regard.

Q26. How are Representative Scenarios constructed from the stochastic scenarios?

A: As specified in the proposed Guideline, the Valuation Actuary may choose to generate individual policy VAGLB reserves by ranking the reserves arising from a large number of stochastically generated Net Assumed Return scenarios for the policy and then setting that policy's reserve at the 83 1/3 percentile.

As an alternative to generating VAGLB reserves in this manner, which would involve a very large number of calculations for each policy, the proposed Guideline provides that the Valuation Actuary may use the weighted average of VAGLB reserves generated for each of a suitable number of Representative Scenarios. These Representative Scenarios may be determined in any manner such that the weighted average of the VAGLB reserves determined for a Representative Scenario (across the key assumption sets) is not materially different from the VAGLB reserve based on the 83 1/3 percentile of the VAGLB reserves determined by the stochastic scenarios.

Many actuaries believe that the appropriateness of the Representative Scenarios will be established by testing key assumptions that represent the entire block of VAGLB business, such as by demographic and risk profile distribution, contract duration over time, asset class distributions and the degree of "in the moneyness" on the valuation date. Considering overall combinations of key assumptions, many actuaries believe that the reserves determined by the Representative Scenarios must not be materially different from those at the 83 1/3 percentiles of VAGLB reserves resulting from the stochastic scenarios.

Q27. How do actuaries develop the Benchmark Reserves used to validate the Representative Scenarios?

A: As specified in the proposed Guideline, Benchmark Reserves may be determined by stochastically generating a large number, such as 1,000, of Net Assumed Returns for each combination of key assumptions and using them to project net amounts at risk. Each net amount at risk is equal to the value of the benefit provided by the VAGLB at the end of its waiting period less the benefit that would be provided by the projected contract value derived assuming the Net Assumed Returns were earned during the waiting period.

Each such net amount at risk is used to compute a CARVM reserve for the Net Assumed Return scenario giving rise to the net amount at risk. As a result, a large number, such as 1,000, of such reserves will be obtained for each combination of key assumption sets. To get the 83 1/3 percentile, many actuaries rank these reserves from smallest to largest to determine the reserve amount corresponding to the 83 1/3 percentile. The array of reserve amounts, across all key assumption sets, constitutes the benchmark against which Representative Scenarios may be compared for appropriateness of the proposed Representative Scenarios, and are thus referred to as Benchmark Reserves.

Section VIII: Guaranteed Payout Annuity Floors

The following questions relate to reserves for Guaranteed Payout Annuity Floor (GPAF) benefits.

Q28. For a Guaranteed Payout Annuity Floor on a Variable Immediate Annuity, how would the extra reserve for the guaranteed minimum payment usually be calculated?

A: The proposed Guideline applies to a GPAF type of VAGLB, which guarantees that one or more of the periodic payments (under a variable immediate annuity) will not be less than a

minimum amount. Some actuaries interpret the proposed Guideline's application to GPAFs as follows:

1. As with any CARVM calculation, each possible benefit stream is considered and the CARVM reserve would be the present value of benefits using the benefit stream that produces the greatest present value. For many variable immediate annuities, there may only be one benefit stream to consider. For others (such as those which provide a partial withdrawal benefit), there would often be many possible benefit streams to consider.

2. The reserve for the GPAF would be the difference of two CARVM reserves. One would include the effect of the GPAF in the universe of benefit streams that would be considered. This would be the Integrated Reserve. (The Integrated Reserve equals the greatest present value of future Integrated Benefit Streams, which include VAGLBs available under the terms of the contract). The other would not include the GPAF in the benefit streams that are being considered.

3. An Integrated Benefit Stream combines two separate benefit streams, the Projected Net Amounts at Risk (the X stream) with the Projected Base Contract Values underlying the Base Benefit Streams (the Y stream).

4. In determining the X stream for a GPAF, gross returns are projected for each of the future years and all asset-based charges under the contract are deducted to obtain Net Assumed Returns. The gross returns could be obtained from stochastic scenarios, Representative Scenarios, or the Keel Method, as appropriate. The asset-based charges deducted from the gross returns to determine Net Assumed Returns would include those for administration, fund charges, mortality and expense risks, and any asset-based charges for the guarantee of a minimum payment amount.

5. Using these Net Assumed Returns, the annuity income payments to be paid in the future would be calculated without the existence of the minimum guarantee. These are the Projected Contract Values. The Projected Living Benefits would also be determined using the Net Assumed Returns. The Net Amount at Risk is equal to the actual income payment that would be paid (the Projected Living Benefit Amount) less the income payment in the absence of the minimum guarantee (the Projected Contract Value). Unlike many other VAGLBs, the Projected Net Amount of Risk for a GPAF would generally be a series of numbers rather than a single number.

6. The Base Benefit Stream is a stream of projected benefit amounts, reflecting the Projected Base Contract Values and ignoring any VAGLBs in the contract. These contract values would be projected into the future using a return based on the valuation rate(s) less asset-based charges appropriate for this purpose.

7. The Integrated Benefit Stream and Base Benefit Streams would be discounted using valuation interest and, where applicable, mortality.

Section IX: Keel Method

The following questions relate to application of the Keel Method to determination of Projected Net Amounts at Risk.

Q29. Are the calculations used for the development of the Keel Method available as a starting point in case I need to modify it for use with my VAGLB benefit?

A: Yes, an Excel spreadsheet is available from the Academy (see Appendix A) that illustrates the types of calculations and comparisons that were performed in the testing of the Keel Method.

Additionally, an example of application of the Keel Method to the calculation of VAGLB reserves is included in Appendix V of the June 15, 2000 VAGLB Work Group report to the Life and Health Actuarial Task Force and is titled "Numerical Example of VAGLB Reserve Calculation." See Appendix A of this draft Practice Note to obtain a copy of that report.

Q30. Suppose my product contains two VAGLB benefits, and one qualifies for use of the Keel Method under the proposed Guideline's safe harbor, and the other does not. Will the proposed Guideline allow me to use the Keel Method for the qualifying benefit without following the requirements for developing Representative Scenarios as referenced in Section D of the proposed Guideline?

A: According to the proposed Guideline, the answer is no. As illustrated in Example 11 of the proposed Guideline's Appendix 3, the safe harbor determination is made on a contract level basis, and not on a benefit level basis. The actuary may still be able to use the Keel Method as a representative scenario, but he/she would have to follow the requirements of Section D of the proposed Guideline.

APPENDIX A

Below are some papers that may be of help in considering the level of reserves for VAGLBs:

American Academy of Actuaries VAGLB Work Group reports: These reports detail some of the considerations involved when developing proposed Actuarial Guideline MMMM (www.actuary.org/naic.htm).

The Canadian Institute of Actuaries (CIA) Task Force on Segregated Fund Investment Guarantees: This is a well-researched paper on the equivalent Canadian product to VAGLBs, called segregated funds. It discusses equity scenarios that should be developed for these products. It is available from the CIA (www.actuaries.ca)

1999 and 2000 Valuation Actuary Symposium: There were sessions on VAGLBs that discussed the considerations in reserving and other issues. The 1999 session is currently available on the SOA website (www.soa.org). The 2000 session should be available shortly.

1999 and 2000 SOA Annual meeting: There was a session on VAGLBs at the SOA's 1999 Annual meeting in San Francisco and the SOA's Annual meeting in Chicago. The 1999 session is currently available on the SOA website (www.soa.org). The 2000 session should be available shortly.

Options, Futures, and Other Derivative Securities by John C Hull.

Black-Scholes and Beyond, Option Pricing Models by Neil A. Chriss.