AMERICAN ACADEMY of ACTUARIES

Report on Valuation Effects of a Principle Based Approach ("PBA")
For Accumulation Type Universal Life
From the American Academy of Actuaries' Life Reserves Work Group Modeling Subgroup

Presented to the National Association of Insurance Commissioners'
Life and Health Actuarial Task Force

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Life Reserves Work Group Modeling Subgroup

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Background

The objective of this report is to provide the Life and Health Actuarial Task Force (LHATF) of the NAIC with information regarding hypothetical reserve calculations for universal life products without secondary guarantees and primarily used for accumulation purposes, under the proposed Principle Based Reserve (PBR) procedures & actuarial guidelines. This Report contains illustrative modeling results along with comparisons to the Universal Life Insurance Model Regulation (or state equivalents).

The reader should be aware that the illustrations in this report apply to just one product, one investment strategy, and one set of economic conditions on the valuation date. The report does not explore other circumstances under which stochastic reserves may be significantly higher, such as when a company's investment portfolio yield is below the guaranteed crediting rate.

Marketplace

The Accumulation UL marketplace is competitive, but the focus of competition is not on low premiums, as it is with secondary guarantee UL. Most Accumulation UL products in the marketplace compete based on account value accumulation at various policy durations, and credit interest based on a portfolio rate strategy. The Modeling Team created a sample product similar to those in the market for purposes of the hypothetical analysis in this report.

The Modeling Team used industry comparative reports to ensure the sample product was competitive at various durations, based on fund value. The durations were 1, 5, 10, 20, 30, and 40 years. The Modeling Team set the policy mortality charges with a direct link to the underlying experience assumption. Exhibit 1 compares fund values and cash values of the sample product to six randomly selected UL products. The policy structure (loads and charges) was reviewed using those same reports to ensure the structure of the Modeling Team's product was reasonable.

The LRWG has already discussed the effects of PBA on a UL product with a secondary guarantee based on a shadow fund in a previous report like this one. Although the UL fund accumulation is similar for both the Shadow and the Accumulation ("Accum") products, the two produce significantly different reserves under a PBA. In the absence of the secondary guarantee, the cash surrender value (CSV) plays a more prominent role in the product design and the reserve for Accumulation products. As mentioned above, the Modeling Team chose to design different product loads (see Exhibit 2) for the Accum UL product to reflect the need for higher cash values on the Accum UL product. The Modeling Team observed that the funding level of the UL policy along with the margins used to compute the PBR does affect the relationship between the PBR and the CSV.

Model/Product Assumptions

The best estimate assumptions used for pricing and modeling the sample product are shown in Exhibit 3. Some of the more noteworthy assumptions deserve special comment.

Pricing and Profitability Targets

The Accumulation UL product was developed to meet a general industry profit objective. Based on the 2004 Tillinghast Pricing Methodology Survey, Statutory ROI and/or GAAP ROE are the current primary pricing metrics in use in today's market. The survey indicated that median targeted ROI/ROE for all products is 12%. As indicated above, we have used various profit measures for this modeling exercise, namely return on investment (ROI) or internal rate of return (IRR) along with a breakeven year (the number of years from issue in which accumulated surplus becomes positive and remains positive), and profit margin (profit as a percentage of premium). In any of these situations, the models assume the profits are distributable levels (e.g., book profit adjusted for federal taxes, target surplus and other asset reserve components, where applicable).

Non-Guaranteed Elements (NGE)

The flexible premium universal life product in the marketplace is often presented with two sets of policy charges, namely expense (product loads) and cost of insurance (COI). One set represents the current charges to the policyholder, and may be based on company experience or competitor attributes. A second set of charges represent the maximum level of charges that the company will be allowed to assess. The insurer has the right to increase the current charges as dictated by experience so long as they remain below the policy guarantees.

The following items are typically considered Non-Guaranteed Elements in a flexible premium UL contract:

- Monthly contract charges and policy loads
- COI charges
- Spreads on credited interest rates vs. the actual investment earned rate

Cash Surrender Value

Accumulation UL products are highly funded by nature. Under the current formulaic approach, the CRVM reserve for these products generally falls between the product's account value and cash surrender value (usually due to the relationship of the surrender charge scale to the amortization scale of the initial expense allowance). This result usually occurs after a few durations. Regardless of the UL Model Regulation reserve level, the cash surrender value is used as a floor.

Under PBA, the cash surrender value for a fully funded policy appears to be a good proxy for the deterministic reserve under a range of margins. In the early durations, the deterministic reserve is generally greater than the cash surrender value, with the difference dependent on the level of margins. The reserve appears to converge with the cash surrender value at the later durations.

Mortality Improvement

There are many ways in which a company may reflect an assumption of future mortality improvement in its pricing. However, due to the sensitivity of flexible premium UL to changes in margins between experience and policy charges, it was deemed prudent to avoid the added complexity of including assumed mortality improvement in this report. The focus of this report is to expose LHATF to the effects of the NGEs on a PBA reserve rather than to demonstrate the impact of mortality improvement.

Valuation Margins and NGE Margins

The Modeling Team and the LRWG Modeling Subgroup debated at extensive lengths how to construct the various cases to illustrate the impact of both valuation margins and NGE pricing margins on a PBA reserve. To understand the cases, one must first understand the difference between valuation margins and NGE pricing margins.

NGE pricing margins are the spreads between actual experience and NGE levels that are set by the company to achieve a desired level of profitability. For example, a company may credit interest at a rate 0.50% less than its investment earnings rate. The 0.50% is the NGE interest margin. A company may set current COI charges at a level 10% higher than current mortality experience. That 10% is the NGE mortality margin.

Valuation margins are changes to assumed experience to make it adverse. For example, valuation basis mortality experience might be 5% higher than best estimate mortality.

When projecting NGEs for purposes of reserving, one must decide whether the NGE is set by applying the NGE margin to the experience assumption before or after the valuation margin is included. In reality, companies have the ability to adjust their NGEs in response to experience, so if experience is adverse, as assumed when the valuation margin is included, the company can reduce its NGEs. However, doing so in the reserve calculation largely offsets the effect of any valuation margin in the reserve. Therefore one might suggest that NGEs be projected for valuation purposes using NGE margins applied to experience before the valuation margin is added.

Six different cases were developed to illustrate these effects. The table below outlines the six cases, in addition to the best estimate case, for which the Modeling Team developed PBA results.

Assumptions	Best est.	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
			Experience without valuation margin				
Mortality	Qx	Qx	Qx	Qx	Qx	Qx	Qx
Interest	6.30%	6.30%	6.30%	6.30%	Graded	Graded	Graded
Expense	$40 / pol	$40 / pol	$40 / pol	$40 / pol	$40 / pol	$40 / pol	$40 / pol
			Valuation basis				
Mortality assumption	Qx	Qx + X#	Qx + Y#	Qx + Y	Qx + Y	Qx + Y + C	Qx + Y + C
Interest assumption	6.30%	6.30%	6.10%	6.10%	Det. Scenario	Det. Scenario	Det. Scenario
Expense assumption	$40 / pol	$44 / pol	$44 / pol	$44 / pol	$44 / pol	$44 / pol	$44 / pol
Mortality margin	none	X	Y	Y	Y	Y + C	Y + C
Interest margin	none	None	0.20%	0.20%	?	?	?
Expense margin	none	$4 / pol	$4 / pol	$4 / pol	$4 / pol	$4 / pol	$4 / pol
			Non-Guaranteed Elements				
Mortality margin &	20% * Qx	20% * Qx - X	20% * Qx - Y	20% * Qx	20% * Qx - Y	20% * Qx - Y - C	20% * Qx - Y
Interest margin &	1.30%	1.30%	1.10%	1.30%	1.10%	1.10%	1.10%
Expense margin &	$50 / pol	$46 / pol	$46 / pol	$50 / pol	$46 / pol	$46 / pol	$46 / pol
COI	1.2 * Qx	1.2 * Qx	1.2 * Qx	1.2 * Qx + Y	1.2 * Qx	1.2 * Qx	1.2 * Qx + C
Interest credited	5.00%	5.00%	5.00%	4.80%	Det Scen - 1.10%	Det Scen - 1.10%	Det Scen - 1.10%
Current expense charge	$90 / pol	$90 / pol	$90 / pol	$94 / pol	$90 / pol	$90 / pol	$90 / pol

 # indicates a value must be solved for to achieve no gain or loss at issue. X is solved for in case 1 and Y is solved for in case 2. NGE margins shown are (NGE re-determination margin - valuation margin). That is, they are relative to valuation assumptions.

Solved for values for Cases 1 to 6:
X = 52.6% of best estimate mortality
Y = 32.2% of Best Estimate mortality
C = 10% of Best Estimate mortality

Case Definitions

Case 1 - NGEs are best estimates, but valuation margins assumed in mortality and expense to achieve breakeven at issue

Case 2 - NGEs are best estimates, but valuation margins assumed in mortality, expense and interest to achieve breakeven at issue

Case 3 - Same as case 2, but NGEs are reduced by the amount of valuation margins

Case 4 - Same as case 2 except for use of the deterministic interest rate scenario (this scenario replaces the valuation interest margin)

Case 5 - Same as case 4 except valuation margins for mortality are increased by C due to non-credible experience

Case 6 - Same as case 5 except the increase in valuation mortality is paralleled with increased COI charges

Results

Exhibit 4 shows deterministic reserves by duration for each of the six cases (different combinations of valuation margins and NGE margins). Exhibit 5 shows a sample inforce block that was used to illustrate the stochastic reserve, along with percentile points and graphs of the stochastic distribution of the liability for that inforce block.

Exhibit 1 – Competitive Perspective

Issue Age 40 Nonsmoker [1]

Comparison of Fund Value for the LRWG UL Product & Six Industry UL Products											
Male Preferred NS 40 $250,000; $3,000 Premium (1/1/05)											
	age 40	<----- age 40 ---->									
										Difference	
Year	LRWG	Co 1	Co 2	Co 3	Co 4	Co 5	Co 6	Mean		LRWG - Mean	Diff%
1	2,618	2,113	2,225	2,715	2,047	2,723	2,425	2,375		243	10.2%
5	14,663	11,286	11,787	14,186	13,067	15,385	13,371	13,180		1,482	11.2%
10	32,672	26,263	26,224	31,431	30,818	35,531	31,923	30,365		2,307	7.6%
20	87,544	78,432	68,439	81,356	85,094	97,085	88,773	83,197		4,348	5.2%
30	180,914	169,605	134,284	161,621	175,846	207,651	184,359	172,228		8,687	5.0%
40	351,165	336,649	237,783	295,832	347,206	413,669	353,475	330,769		20,396	6.2%

Comparison of Cash Surrender Value for the LRWG UL Product & Six Industry UL Products											
Male Preferred NS 40 $250,000; $3,000 Premium (1/1/05)											
	age 40	<----- age 40 ---->									
										Difference	
Year	LRWG	Co 1	Co 2	Co 3	Co 4	Co 5	Co 6	Mean		LRWG - Mean	Diff%
1	-	0	2,675	0	0	2,723	645	1,007		(1,007)	100.0%
5	11,109	8,901	11,787	8,881	8,327	15,385	8,014	10,216		893	8.7%
10	30,228	26,263	26,224	27,575	26,078	35,531	30,051	28,620		1,608	5.6%
20	87,322	78,432	68,439	81,356	85,094	97,085	88,773	83,197		4,125	5.0%
30	180,914	169,605	134,284	161,621	175,846	207,651	184,359	172,228		8,687	5.0%
40	351,165	336,649	237,783	295,832	347,206	413,669	353,475	330,769		20,396	6.2%

[1] All competitive values were obtained from Blease Research, Inc., 7/1/2006 Full Disclosure Software

Exhibit 2 – Product Definitions

Pricing Assumptions

Cellular model Inputs

- Cell Grouping Splits The issue age - 40 male preferred nonsmoker.
- Average Size of policies $250,000 face
- Issue date within year 1/1/2005

Product Definition

Premiums

- Length of premium paying period (not the premium payment patterns) To Age 100
- Mode of premium payment (annual, monthly, etc) Annual
- Target Premium per unit* Defined as Term-to-100 (i.e. FV_{100}=0) $8.03 per unit (assumed to be annual)
- Gross premium per unit* Defined as FV_{100}=3 times Face $11.19 per unit (assumed to be annual)
- Premium Suspension None

* Target and the gross paid premium were computed assuming current loads, current COIs, and a level 5% crediting rate

Benefit Structure

- Maturity Age Age 120 (assume to 100 with maturity payout to fund after 100 activity)
- Face amount per unit 1,000
- Death Benefit option Level
- Is there a return of premium upon death? No

Product Structure

- Crediting strategy (portfolio less spread, etc.)
- Interest spread the company requires (in bps)

Duration	Base (bp)	Base with Persistency Bonus (bp)*	Actual Anticipated Credited Rate
1-10	130	130	5.00%
11-20	130	80	5.50%
21+	130	55	5.75%

* Nonguaranteed Interest Bonus (prospective)

- Retroactive Bonuses None
- Guaranteed credited interest rate 3%
- Net Amount at Risk (NAAR) FV before load deductions
- Current Cost of Insurance Charges 120% of the best estimate mortality assumption
- Guaranteed COI Charges 2001 CSO ANB Sex/Smoker Distinct
- Cap on Current COI Charges None

Product Structure (continued)

· Surrender Charges - per unit see table below

Duration	SC/$1,000	Duration	SC/$1,000
1	17.77	11	8.89
2	16.88	12	8.00
3	15.99	13	7.11
4	15.10	14	6.22
5	14.22	15	5.33
6	13.33	16	4.44
7	12.44	17	3.55
8	11.55	18	2.67
9	10.66	19	1.78
10	9.77	20	0.89
		21+	0.00

· Policy loads:

Duration	Per Policy (per month)	Per Policy (per month)	% of Premium (up to Target Premium)	% of Premium (excess of Target Premium)	% of Paid Premium	Per Unit	Per Unit
	Current	Guaranteed	Current	Current	Guaranteed	Current	Guaranteed
1	$7.5	$10	10%	5%	10%	$0.40	$0.40
2	$7.5	$10	10%	5%	10%	$0	$0.40
3	$7.5	$10	10%	5%	10%	$0	$0.40
4	$7.5	$10	10%	5%	10%	$0	$0.40
5	$7.5	$10	10%	5%	10%	$0	$0.40
6	$7.5	$10	10%	5%	10%	$0	$0.40
7	$7.5	$10	10%	5%	10%	$0	$0.40
8	$7.5	$10	10%	5%	10%	$0	$0.40
9	$7.5	$10	10%	5%	10%	$0	$0.40
10	$7.5	$10	10%	5%	10%	$0	$0.40
11	$5	$10	3%	3%	10%	$0	$0.40
12	$5	$10	3%	3%	10%	$0	$0.40
13	$5	$10	3%	3%	10%	$0	$0.40
14	$5	$10	3%	3%	10%	$0	$0.40
15	$5	$10	3%	3%	10%	$0	$0.40
16	$2.5	$10	3%	3%	10%	$0	$0.40
17	$2.5	$10	3%	3%	10%	$0	$0.40
18	$2.5	$10	3%	3%	10%	$0	$0.40
19	$2.5	$10	3%	3%	10%	$0	$0.40
20	$2.5	$10	3%	3%	10%	$0	$0.40
21+	$2.5	$10	0%	0%	10%	$0	$0.40

Exhibit 3 – Modeling Assumptions

Actuarial Assumptions

Investment Income 6.30% in all years (assumed to be net of defaults and investment expense)

Mortality 50% of 1990-95 S&U ANB with no mortality improvement

Lapses

Duration	1	2	3	4	5	6	7	8	9	10	11	12+
Rate*	9%	9%	9%	9%	8%	7%	6%	6%	6%	6%	5%	4%

* Lapses were based on U.S. Individual Life Persistency Update Report as released by the Society of Actuaries (SOA) in late March 2006.

Commissions	(% of Target)	(% of Excess)
Year 1	125%	5%
Year 2-10	5%	5%
Year 11+	2%	2%

- Percent of commission chargeback upon death None
- Percent of commission chargeback upon surrender None

Expenses

Non Acquisition

Per Policy	$40.00
% of Premium	0%
Per Unit	$0.00
Per Death	$100.00
Per Surrender	$20.00
Premium Taxes	2.50%

Acquisition

Per Policy	$73.74
% of Premium	10%
Per Unit	$1.29

Maintenance Expense Timing Monthly
Inflation None

Valuation

Formulaic Reserves

Statutory
SemiContinuous CRVM
3.0% interest
2001 CSO ANB MALE NS (no selection factors)
Tax Set equal to Statutory

Risk based capital

Target Surplus Ratio 250% of ACL (modeled using these factors below)
Formula - 2.500% of Annualized Premiums
0.125% of NAAR (Face less Account Value)
2.500% of Account Value

Federal Income Tax

Rate = 35% DAC Tax % = 7.70% and 100% is nonqualified

Exhibit 4 – Deterministic Reserve Results

The following dialogue aids the reader in interpreting the following tables. In essence, think of the first table as representing "mini-valuations" from the various durations shown adjacent to the fund value, cash value, UL Model reserve. The next seven columns represent various principles-based reserves (using different sets of assumptions) at those same durations as the row containing the fund value, cash value and UL Model reserve. The PBA was projected from that duration until the end of the product life and then discounted back to the duration in question.

As an example, duration 5 shows a fund value 13,596 and cash value of 10,041 with a UL Model reserve of 10,041. Under a PBA methodology, assume a company issued a policy 5 years ago and this policy was the only issue and is still currently active. Depending on the PBA assumptions, the company would run a PBA reserve valuation at this point on this policy. The 7 different PBA reserves are those produced as of duration 5 for this single policy using the various levels of assumptions and without any "flooring" to the cash surrender value.

The Modeling Team believes the typical results a company would exhibit under a PBA methodology for Accum UL products, assuming no cash surrender value floor, would be a PBA reserve normally negative during the first policy year. The PBA reserve would generally exceed the cash surrender value during the early to middle policy years and converge in the later durations. The level of funding would most likely increase the reserve differences seen among the various cases.

Margin Ratio

The LRWG is considering a way to provide regulators with a simple measure of the size of aggregate margin included in the reserve. The measure is a number we are calling the "Margin Ratio", and is defined as follows:

Margin Ratio = (Reserve held - Best estimate liability) / (present value of capital requirement), where

Reserve Held is the PBR computed using appropriate valuation margins and is the larger of the deterministic and stochastic reserves subject to the cash surrender value floor.

Best Estimate Liability is the deterministic PBR computed without any recognition of valuation margins.

Present Value of Capital Requirement is the present value of an annuity whose annual payment amount is the capital that must be held over and above reserves in connection with the liability each year in the future. The Modeling Team has computed this as the PV of target surplus using a discount rate of the pre-tax asset yield.

It can be shown that the Margin Ratio represents the amount by which the pre-tax return on capital is expected to exceed the return on invested assets. Given this connection with the return on equity, one can readily use intuition to grasp whether margins are within a reasonable range.

				Principle Based Reserves: Level of Margins						
Policy Dur	Fund Value	Cash Value	UL Model Reg	(1)	(2)	(3)	(4)	(5)	(6)	Best Estimate
0	-	-	-							
1	2,420	-	-	(673)	(655)	(1,928)	(651)	(366)	(676)	(1,872)
2	5,040	820	1,449	1,830	1,861	442	1,884	2,199	1,856	501
3	7,771	3,773	3,773	4,551	4,607	2,973	4,658	5,016	4,626	3,033
4	10,623	6,848	6,848	7,412	7,489	5,671	7,550	7,944	7,515	5,736
5	13,596	10,041	10,041	10,427	10,529	8,451	10,614	11,055	10,574	8,519
10	30,313	27,870	27,870	27,599	27,857	24,640	28,015	28,652	27,956	24,721
20	81,156	80,934	80,934	80,462	80,431	75,684	81,007	82,419	81,080	75,811
30	166,915	166,915	166,915	166,878	166,649	163,051	166,639	164,616	166,639	163,336
40	323,942	323,942	323,942	325,824	325,144	321,474	325,156	325,883	325,011	321,325
Z-value (Margin Ratio)										
1				13.8%	14.0%	-0.6%	14.0%	17.3%	13.7%	
10				14.5%	15.8%	-0.4%	16.6%	19.9%	16.3%	

Difference Between Best Estimate and Alternate Reserves (without CSV floor applied)

		Principle Based Reserves: Level of Margins						
Policy Dur	UL Model Reg	(1)	(2)	(3)	(4)	(5)	(6)	Best Estimate
0								-
1	1,872	1,198	1,217	(56)	1,221	1,506	1,196	-
2	948	1,329	1,360	(59)	1,383	1,698	1,355	-
3	740	1,517	1,574	(60)	1,624	1,983	1,592	-
4	1,112	1,676	1,753	(65)	1,814	2,208	1,779	-
5	1,522	1,907	2,009	(69)	2,095	2,535	2,055	-
10	3,149	2,877	3,136	(82)	3,294	3,931	3,235	-
20	5,123	4,651	4,620	(127)	5,196	6,608	5,269	-
30	3,579	3,542	3,313	(285)	3,303	1,280	3,303	-
40	2,617	4,499	3,819	149	3,831	4,558	3,686	-

Ratio of the Reserves (without CSV floor applied) to the Fund Value

				Principle Based Reserves: Level of Margins						
Policy Dur	Fund Value	Cash Value	UL Model Reg	(1)	(2)	(3)	(4)	(5)	(6)	Best Estimate
0										
1			0.0%	-27.8%	-27.1%	-79.6%	-26.9%	-15.1%	-27.9%	-77.3%
2			28.8%	36.3%	36.9%	8.8%	37.4%	43.6%	36.8%	9.9%
3			48.6%	58.6%	59.3%	38.3%	59.9%	64.6%	59.5%	39.0%
4			64.5%	69.8%	70.5%	53.4%	71.1%	74.8%	70.7%	54.0%
5			73.9%	76.7%	77.4%	62.2%	78.1%	81.3%	77.8%	62.7%
10			91.9%	91.0%	91.9%	81.3%	92.4%	94.5%	92.2%	81.6%
20			99.7%	99.1%	99.1%	93.3%	99.8%	101.6%	99.9%	93.4%
30			100.0%	100.0%	99.8%	97.7%	99.8%	98.6%	99.8%	97.9%
40			100.0%	100.6%	100.4%	99.2%	100.4%	100.6%	100.3%	99.2%

Some specific comments on the cases tested under this scope.

(a) Cases 1 and 2 -- These are both reasonable ways of determining valuation margins that lead to no gain or loss at issue. The source of margin differs between the two cases, leading to slightly different patterns of reserves after issue. The differences might be greater for policies depending on the funding level.

(b) Case 3 vs. Case 2 -- If NGEs are adjusted downwards to reflect the valuation margins, the reserve is close to the best estimate and arguably too low because all expected profits are front-ended.

(c) Case 4 vs. Case 2 -- In the deterministic scenario, or any stochastic scenario, it isn't clear what the valuation margin for interest is, but we can treat the valuation margin for interest as if it were the same as in case 2 and use that result to set the interest crediting rate for the scenario.

(d) Cases 5 and 6 -- Increasing the valuation margins, due to non-credible experience, leads to higher reserves that exceed the cash value even at later durations (case 5). However, if the company is allowed to assume COIs will be reset to be consistent with experience as it emerges, then the effect of the higher valuation margins is much reduced (case 6).

Exhibit 5 – Inforce Valuation Results

The Modeling Team chose Case 4 as the representative set of margins to use to illustrate the stochastic reserve.

The table labeled "'Inforce' Liabilities…" provides a break down of the test inforce by policy duration. This inforce was developed using a similar approach as the other products tested using the PBR methods. Specifically, the inforce model assumes 100 policies were issued at the beginning of 1984 and the test company issued 5% more each year through to 2004. The inforce assumed a single-issue age cell with the same issue parameters each year.

Two observations can be made concerning the stochastic results. First, the distribution is very narrow. The excess of the 65CTE over the 05CTE is less than 4%. This demonstrates the ability of non-guaranteed elements to reduce risks to the company. Second, the 65CTE reserve for this inforce block is 98.9% of the deterministic reserve for Case 4 and 100.5% of the current UL Model Reserve.

"Inforce" Liabilities for valuation at 1/1/2005

								<< Per Policy Values >>			<< Model Inforce >>		
Cell	Plan	Policy Count	Iss Mo	Policy Dur	IA	Sex	DB option	Avg Face Amt at val date	Avg AV at val date	Avg CSV at Val Date	FACE	AV	CSV
1	UL	100	2	1	40	M	Level	250,000	2,415	-	25,000,000	241,546	-
2	UL	87	9	2	40	M	Level	250,000	5,035	815	21,750,000	438,051	70,911
3	UL	75	4	3	40	M	Level	250,000	7,762	3,764	18,750,000	582,141	282,329
4	UL	65	11	4	40	M	Level	250,000	10,602	6,827	16,250,000	689,101	443,726
5	UL	57	6	5	40	M	Level	250,000	13,551	9,996	14,250,000	772,390	569,755
6	UL	50	1	6	40	M	Level	250,000	16,602	13,270	12,500,000	830,106	663,481
7	UL	45	8	7	40	M	Level	250,000	19,746	16,636	11,250,000	888,556	748,606
8	UL	40	3	8	40	M	Level	250,000	22,989	20,101	10,000,000	919,555	804,055
9	UL	36	10	9	40	M	Level	250,000	26,340	23,675	9,000,000	948,244	852,304
10	UL	32	5	10	40	M	Level	250,000	29,799	27,356	8,000,000	953,557	875,397
11	UL	29	12	11	40	M	Level	250,000	33,720	31,497	7,250,000	977,867	913,414
12	UL	27	7	12	40	M	Level	250,000	37,769	35,769	6,750,000	1,019,750	965,750
13	UL	24	2	13	40	M	Level	250,000	41,940	40,163	6,000,000	1,006,569	963,909
14	UL	22	9	14	40	M	Level	250,000	46,236	44,681	5,500,000	1,017,196	982,986
15	UL	20	4	15	40	M	Level	250,000	50,663	49,331	5,000,000	1,013,264	986,614
16	UL	18	11	16	40	M	Level	250,000	55,227	54,117	4,500,000	994,089	974,109
17	UL	17	6	17	40	M	Level	250,000	59,908	59,021	4,250,000	1,018,442	1,003,354
18	UL	15	1	18	40	M	Level	250,000	64,698	64,030	3,750,000	970,463	960,451
19	UL	14	8	19	40	M	Level	250,000	69,619	69,174	3,500,000	974,672	968,442
20	UL	13	3	20	40	M	Level	250,000	74,667	74,444	3,250,000	970,666	967,774
Totals		786									196,500,000	17,226,227	14,997,368

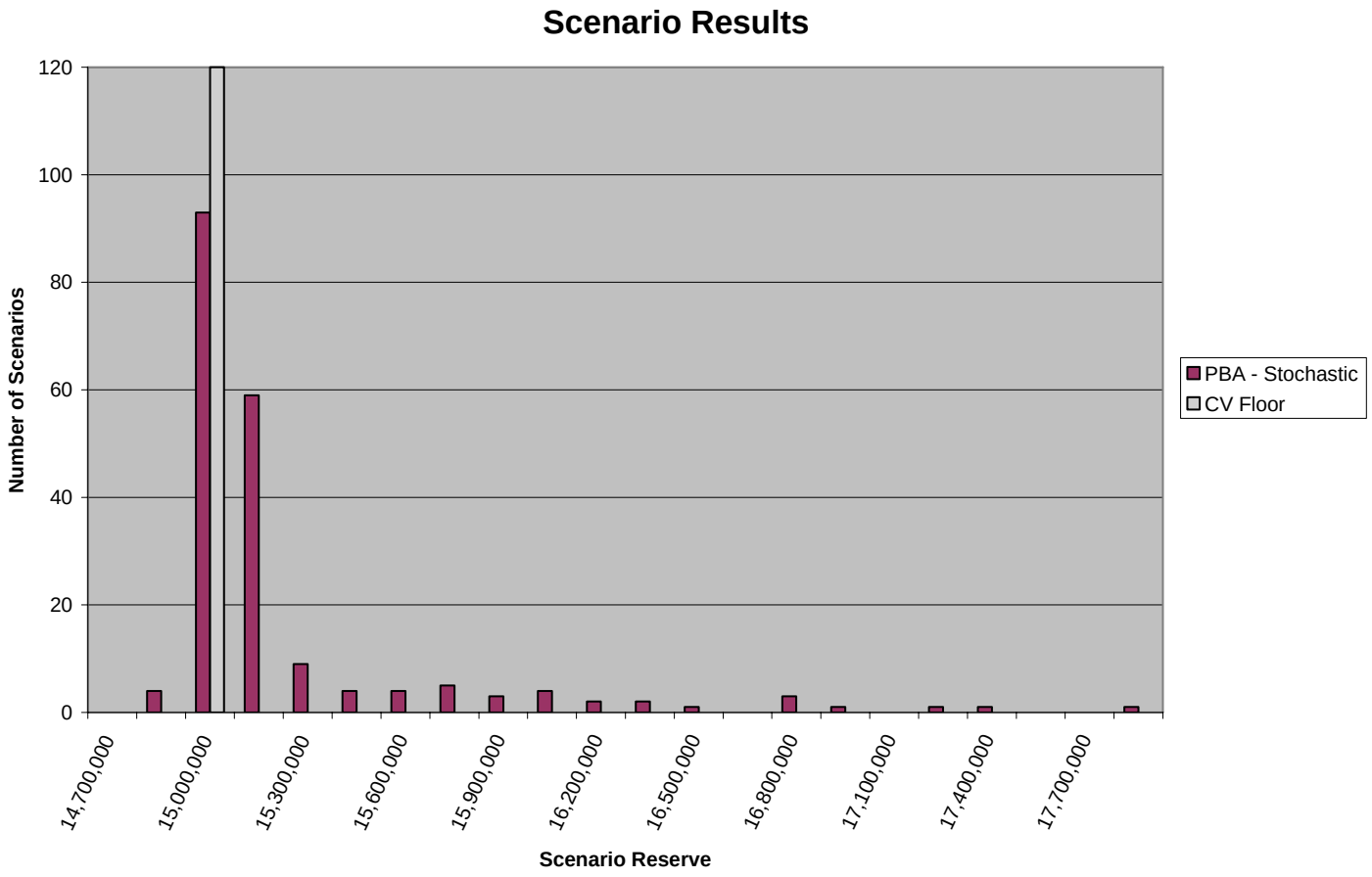
20 year Inforce Model Statistics

Fund Value	$	17,226,227
Cash Value	$	14,997,368
UL Model Reg reserve	$	15,598,752
Deterministic reseve	$	15,856,789

Stochastic reserve		Estimate	Std error *
CTE 95	$	17,432,814	$375,525
CTE 90	$	16,762,223	$250,978
CTE 75	$	15,923,450	$139,907
CTE 65	$	15,679,635	$ 97,500
CTE 50	$	15,484,858	$ 66,742
CTE 25	$	15,306,825	$ 44,425
CTE 5	$	15,216,464	$ 34,278

Stochastic estimates are based on 200 scenarios

* This is the standard error of the CTE estimator, as described by Manistre and Hancock's article "Variance of the CTE Estimator" (NAAJ, Vol.9 No.2)



Appendix 1 - Modeling Procedures

The Modeling Team followed these processes:

1. Incorporate all modeling inputs for each version of the product into each individual's modeling software. This Subgroup used three of the more common software vendors in the US. Each model is coded to include all necessary inputs for liabilities (policy features, actuarial assumptions, etc.) as well as for assets (interest rate scenarios, investment strategies, etc). While each of the three systems were calibrated outside their respective systems in a spreadsheet medium, due to time constraints the Modeling Team decided the results from different systems would be used to generate the values in the various exhibits (e.g., MG-ALFA was used for Exhibit 4 and Classic Solutions/Tillinghast TAS was used for most of the tables in Exhibit 5). The Modeling Team plans to review and replicate the results with the other systems.

2. The Modeling Team performed a "pricing" exercise to make sure that all inputs will arrive at a reasonable product output.

(i) Picked Age 40 Male Preferred Nontobacco cell to initially test the three models under a set of single deterministic assumptions, called Best Estimates. Best Estimate assumptions (discussed below) were developed to result in an IRR (ROI) of 10% using after-tax distributable earnings (i.e., inclusive of target surplus)

(ii) From each model, validate output needed to create the reserves and the reserve amount generated at various points in time (1 year from issue, 5 years from issue, monthly for a few years, etc.).

(iii) Each modeling system is engineered, when necessary, to ensure harmony amongst the output.

In the setting of those assumptions, the Modeling Team categorized them into two groupings:

Assumptions not stochastically modeled include:

- Mortality
- Policyholder Behavior* (optionality available – "excess surrenders")
- Expenses*
- Asset Defaults
- Non-guaranteed elements*

Assumptions stochastically modeled include:

- Interest rate movements
- Equity Returns (not applicable for the Accum UL)

* Dynamically modeled (i.e. will vary by scenario)

The Modeling Team followed the draft Actuarial Guidelines in describing the types of assumptions & level of margins under PBA. Specifically:

Best Estimate: Most reasonable estimate of the risk, with no provision for adverse deviation or estimation error.
Prudent Best Estimate: Best estimate adjusted for a margin for adverse deviation and estimation error.
Margin: Determined by the actuary using actuarial judgment.

3. Once the modeling system was calibrated with the Best Estimate assumptions, a single batch of "mini-valuations" took place using an inforce that represented our issue age 40 pricing cell and corresponding projected policy values over the projection period, assuming no decrements. In essence, it was assumed 100 issue-age-40 cells were issued and projected into the future assuming no lapse or mortality to create a set of projected, modeled fund values and cash surrender values. Using this set of projected "inforce cells", the Modeling Team prepared a valuation which created a set of "Best Estimate" PBA reserves for each of the "inforce" durational fund values, et al.

4. Using the assumptions outlined under each of the cases, in some cases determined for the first time using a "natural reserve" approach (i.e., break even or ROI = 0%), the Modeling Team constructed other PBA reserve sets to demonstrate the effects of PBA mechanics at various durations and assumptions. Exhibit 4 displays the various PBR levels under each of the cases.

5. The cases were constructed to illustrate the effects of adding margin to the experience assumption, the NGE assumption, or a combination of both. In all cases, no asset portfolio was used in the models, as the Modeling Team did not believe there was a material change with the ultimate pattern of results.

6. The Modeling Team set up an asset model in conjunction with the development of a 20-year inforce model. The 20-year inforce assumes 100 policies were issued at the beginning of each years 1984 through 2003. The inforce was decremented

using lapse and mortality assumptions as defined in the product specs. Those persisting policies were assumed to have a fund value equal to the fund value projection performed at issue (i.e., illustrated values). The investment strategy was to invest any available cash in 10-year corporate bonds earning a spread of 70 bps over Treasuries, net of defaults and expenses.

7. The Modeling Team used the American Academy of Actuaries' Life Capital Adequacy Subcommittee C-3 Phase 1 interest rate model with the SS8(b) parameterization to generate 200 stochastic scenarios. This parameterization includes a mean reversion point of 5.4% for the 20-year Treasury rate.

8. The Modeling Team produced the desired stochastic results (shown in Exhibit 5) for the inforce model. This model assumed valuation margins as defined in Case 4 (defined above) along with the investment strategy as described in "process 6" above.

9. The Modeling Team used two different approaches in calculating the deterministic reserve, each on a seriatim basis. One used the deterministic interest scenario as mandated and one used the same 200 stochastic scenarios. In the latter situation, all computations were made with the 50% CTE level. Those results are shown in Exhibit 5 for the latter approach.