Z-Factor Analysis

Under a Principles-Based Approach

for U.S. Life Insurance Products

Prepared for:

Society of Actuaries

Prepared by:

John R. Roeger, FSA, MAAA
Yiping Yang, FSA, MAAA

October 18, 2007

Table of Contents

Section I

Introduction and Qualifications

Scope and Limitations

Milliman, Inc. (Milliman) was retained by the Society of Actuaries (SOA) to perform certain actuarial analyses with respect to the Z-Factor methodology under a principles-based approach (PBA) to statutory reserve and capital. Under PBA, the Z-Factor is a measure of margin in excess of the best estimate assumptions embedded in the statutory reserves of a life insurance product or block of business. Specifically, our assignment was to explore the applicability of the Z-Factor calculation when considering the risk margins and minimum required capital under PBA with the following questions examined:

1. Is the Z-Factor methodology mathematically sound?

2. How sensitive is the Z-Factor to different levels of capital?

3. Does the Z-Factor provide consistent results across all general account life insurance product lines such as term, universal life, equity indexed life and fixed deferred annuities?

4. Is the Z-Factor applicable to separate account products?

5. Under what circumstances would the Z-Factor fail, if any?

6. Are there alternative measures that should be considered?

In order to fully comprehend this report, any user of this document should be advised by an actuary with a substantial level of expertise in areas relevant to this analysis to appreciate the significance of the underlying assumptions and the impact of those assumptions on the illustrated results. This report must be read in its entirety to be understood.

This report has been prepared for the SOA and may be distributed to its membership and may be used by the American Academy of Actuaries' Life Reserves Work Group (LRWG) in developing its final recommendations on principles-based reserving to the National Association of Insurance Commissioners (NAIC). Any distribution of this report must be in its entirety.

Milliman is frequently engaged to perform analysis on multi-line life insurance products. We consider the modeled blocks of business for this report to be typical of products in the marketplace today. Key assumptions such as mortality, persistency and expenses are consistent with industry levels we have observed in the marketplace as well.

Z-Factor Overview

Under PBA, the Z-Factor is a measure of margin in excess of the best estimate assumptions embedded in the statutory reserve for a life insurance product or block of business. It is also thought of as the amount of discounted pre-tax return on capital (ROC) in excess of the pre-tax net investment earnings rate (NIER) over the life of the business. For example if the Z-Factor is 12.0 percent and the average NIER is 6.0 percent, the ROC is 18.0 percent.

The higher the Z-Factor, the higher the expected return on the business. A Z-Factor of zero or negative means that there are no margins above the best estimate assumptions built in the PBA reserve.

Under PBA, the amount of margins inherent in the reserve represents the present value of expected future profit under a projection with best estimate assumptions. This is referred to as the present value of release of margins. Since the present value of the release of margins is part of the PBA framework, the Z-Factor can be easily derived. The Z-Factor is assumed to be calculated for the life of the business. The Z-Factor at any time is calculated as:

Z-Factor =

[Total PBA Reserve with Margin less the Best Estimate Reserve] ÷ PV (required capital)

or

PV (release of margins) ÷ PV (required capital)

Where the present value is calculated over the life of the contracts in force.

The ROC =

ROC = Z-Factor + Avg. NIER

The ROC should approximate the “break-even” discount rate in which the present value of future release of margins (assuming best estimate assumptions are correct) is equal to the cost of capital on a pre-tax basis. The Avg. NIER is calculated from the deterministic best estimate projection. The ROC in this context is akin to the more familiar U.S. GAAP return on equity (ROE) but there are significant differences as described below:

1. PBA is part of a statutory accounting. The cash flows are assumed to be paid as incurred and expenses are not deferrable. There is no deferred acquisition cost (DAC) under PBA. If all else is

equal, the ROC on an in-force block will be higher than U.S. GAAP ROE because the cost of acquisition expenses and first year commissions are in the past.

2. Although there are similarities, the calculations of the policy reserves under PBA are different than U.S. GAAP. The PBA reserve calculation is described in detail in Section V.

3. The ROC is a discounted value based on pre-tax future profits and statutory required capital where ROE is generally current year, based on after-tax profits and represents return on GAAP equity. The Z-Factor and ROC exclude taxes in income and any balance sheet effect from deferred taxes.

Under PBA, the amount of margin related to the future economic environment is stochastically generated from the conditional tail expectation (CTE) calculation. Margins for actuarial assumptions such as lapse, mortality and expense are explicit resulting from the prudent best estimate assumptions. In this research, we explored the viability of the Z-Factor as it relates to various life insurance products and the various components of margin.

The Z-Factor analysis in this report focuses on five in-force blocks of business assuming five years of historical sales for each block to build up the in force as of the valuation date. In other words, this analysis focuses on the financial reporting implications of an in-force block of business as if PBA regulation were in place since the inception of the blocks. The blocks of business modeled in this analysis are:

1. Universal Life with Secondary Guarantee (ULSG). This is a shadow account design with the secondary guarantee in effect throughout the life of the policy.

2. Variable Universal Life with Secondary Guarantee (VULSG). This is a minimum premium design such that the policy is guaranteed to stay in force for 20 years as long as the minimum premium has been paid.

3. Equity Indexed Universal Life (EIUL). This is an annual reset index design where the policyholder's interest credited rate is based on the annual movements in the Standard & Poor's (S&P) 500 index.

4. Term. Modeled term includes 10-, 15- and 20-year level premium term. This analysis focuses on alternative cash flows:

   a) Level term period only (Term) and
   b) Including cash flows from beyond the level term period (Term with tail profits or "Term TP").

5. Fixed Deferred Annuity (MYGA): This is a five-year guaranteed interest product with a five-year surrender charge period.

We have illustrated the Z-Factors and PBA reserves for each product line by itself. We did not attempt to illustrate the impact of aggregation across product lines (e.g., ULSG and Term aggregated together). Although Term and Term TP would likely be exempt from stochastic testing in PBA, we have treated them as having full stochastic requirements in this analysis. Additionally, the impact of reinsurance or riders such as extended maturity options which are common with ULSG are excluded from this analysis.

Any impact from federal income taxes is not considered in this analysis.

Section II

Summary of Z-Factor Analysis

The objective of the research is to create a resource by demonstrating the applicability of the Z-Factor. Through this multi-line research analysis we have concluded the following:

1. The Z-Factor provides for a consistent measure of the total PBA reserve margin across all general account life insurance and annuity products.

2. The total amount of margin inherent in the PBA reserve is the numerator in the Z-Factor calculation and is a result of the PBA process.

3. The Z-Factor utilizes capital requirements which already capture risks inherent in the Company for asset type, asset quality, interest rates, etc.

    - The challenge from our prospective will be to calculate the capital requirements in all future periods under a deterministic projection with best estimate assumptions.

4. The Z-Factor would be an effective tool in measuring the adequacy of the total reserve margin under PBA.

Analysis

Table I summarizes the current PBA reserve, required capital, the Z-Factor and the ROC at alternative capital levels. The table is based on $20 billion of face amount in force for each life insurance product and $5 billion of account value in force for annuities as of the valuation date. Table II summarizes much of the same data except sample minimum PBA margin is summarized given a minimum Z-Factor. Under the Z-Factor methodology in PBA, this would allow a regulator to set the minimum PBA margin considering a reasonable expectation of profitability (or ROC). Table III summarizes the mean, standard deviations and other statistical measures for each line of business.

Table I

Table I
Summary of Results
(in millions)

	PBA Reserve Held	Best Estimate Reserve	Total Margin	Average NIER	RBC 100% Level	PV of Min Required Capital 100% Level	PV of Min Required Capital 200% Level	Z-Factor 100% Level	Z-Factor 200% Level	ROC 100% Level	ROC 200% Level
ULSG	$1,496.1	$1,144.8	$351.3	5.73%	$113.8	$3,681.9	$7,363.7	9.5%	4.8%	15.3%	10.5%
VULSG	143.8	51.2	92.6	5.77	15.8	275.3	550.6	33.6	16.8	39.4	22.6
EIUL	633.8	519.6	114.2	5.58	26.6	462.9	925.9	24.7	12.3	30.2	17.9
Term	76.9	41.0	35.9	5.68	12.2	160.6	321.2	22.4	11.2	28.0	16.9
Term TP	56.8	7.2	49.6	5.67	11.7	96.3	192.6	51.5	25.8	57.2	31.4
MYGA	4,899.7	4,726.5	173.2	5.36	123.8	593.4	1,186.8	29.2	14.6	34.5	20.0

The data in Table I can be described as follows. The PBA reserve is the actual reserve calculated as a result of the stochastic CTE process as of the valuation date. The best estimate reserve is the present value of cash flows under a deterministic projection without margins for lapse, mortality and expense, etc. The difference between the PBA reserve and the best estimate reserve is the total margin built in the PBA reserve (or present value of release of margins). The total margin is the numerator in the Z-Factor calculation. The required capital in the table is the NAIC RBC capital amount required at the 100 percent company action level where current RBC factors are applied for C-1, C-2 and C-4 risks. RBC C-3 risk is calculated under the CTE methodology and is described in Section V. The Present Value of Minimum Required Capital (PV of Min Required Capital) is summarized at both 100 percent and 200 percent RBC and represents the present value at the projected net earnings rate of the required capital. The Z-Factor is the total margin divided by the PV of Min Required Capital. This represents the amount of pre-tax expected return in excess of the average net earnings rate over the lifetime of the block as of the valuation date.

At the 200 percent RBC level, the Z-Factors vary from a low of 4.8 percent for ULSG to a high of 25.8 percent for Term TP and the ROC varies from 10.5 percent for ULSG to 31.4 percent for Term TP. Other than the ULSG block, the ROC might at first look high compared to a typical pricing internal rate of return (IRR) expectation. There are two reasons the ROC is higher than a typical pricing target.

1. As mentioned in the previous section, the illustration above represents only an in-force book of business since this would be the business reported in the financial statement. Therefore, the representative block excludes acquisitions costs and first year commissions which are in the past and would be included in the pricing return target.

2. These values represent pre-tax returns, so after-tax returns would be approximately 65 percent to 75 percent of the above amounts. For simplicity, assuming a 35 percent net tax rate would imply that ULSG has an expected return of 6.8 percent (10.5 percent * .65) and Term TP has expected return of 20.4 percent on an after-tax basis.

Table II

Table II Summary of Results (in millions)									
	Deterministic PBA Margin	Stochastic PBA Margin	Total PBA Margin (A)	PV of Min Required Capital @ 100% Level (B)	Net Earnings Rate (C)	Minimum Required ROC (D)	Minimum Required Z-Factor (E)=(D)-(C)	Implied Minimum Margin @ 100% Capital Level (F) = (E) * (B)	Additional Margin (G) = Max (0, (F)-(A)
ULSG	$246.0	$105.3	$351.3	$3,681.9	5.73%	15.00%	9.3%	$341.2	-
VULSG	80.9	11.7	92.6	275.3	5.77	15.00	9.2	25.4	-
EIUL	42.2	72.0	114.2	462.9	5.58	15.00	9.4	43.6	-
Term	34.4	1.5	35.9	160.6	5.68	15.00	9.3	15.0	-
Term TP	39.2	10.4	49.6	96.3	5.67	15.00	9.3	9.0	-
MYGA	59.2	114.0	173.2	593.4	5.36	15.00	9.6	57.2	-

Much of the data in Table II is described in Table I. The primary purpose of this table is to illustrate a concept of a minimum PBA margin required under the Z-Factor approach. From Table I, we see that ULSG has a low Z-Factor compared to the other products and more importantly compared to a reasonable pricing target. As described in Section III, this table illustrates what the additional margin (or reserve) an insurance company might be required to hold as a result of a low Z-Factor. For example, from the table, a minimum required ROC might be 15 percent at 100 percent RBC which results in a minimum Z-Factor of 9.2 percent to 9.6 percent depending on product. From this illustration, no additional reserve would be required although the ULSG block is basically at the minimum.

Table II also illustrates the PBA reserve margins broken up into two components: deterministic and stochastic. The deterministic margins are the margins inherent in the PBA calculation which are not stochastically generated (e.g., mortality margin). The stochastic margins are inherent in the CTE measurement which is stochastically generated and dependent on the economic scenario path. It is illustrative to look at these two separately since the Z-Factor is dependent on both types of margins. Not surprisingly, the term and term like products with low or zero cash values have low stochastic margins compared to the other products.

Table III

Table III Summary of Results (in millions)						
Percentile of Greatest Present Value of Accumulated Deficit	ULSG	VULSG	EIUL	Term	Term TP	MYGA
20%	$(514.4)	$ (63.0)	$(193.9)	$ (24.6)	$ (22.6)	$(110.9)
30%	(407.8)	(52.7)	(176.6)	(22.7)	(21.2)	(95.5)
40%	(323.2)	(45.6)	(166.4)	(21.5)	(20.2)	(78.3)
50%	(252.1)	(42.2)	(157.1)	(20.4)	(19.3)	(56.7)
60%	(196.4)	(37.2)	(149.2)	(19.5)	(18.7)	(34.7)
70%	(127.1)	(34.0)	(140.9)	(18.3)	(17.7)	(0.7)
80%	(61.4)	(28.3)	(131.7)	(17.3)	(16.9)	53.3
90%	47.7	(23.3)	(121.7)	(16.0)	(15.9)	133.8
95%	116.0	(17.4)	(113.8)	(14.8)	(15.1)	216.0
96%	134.9	(15.2)	(111.3)	(14.4)	(14.7)	235.8
97%	150.4	(13.8)	(108.5)	(14.1)	(14.5)	252.5
98%	177.4	(13.5)	(105.7)	(13.6)	(14.2)	279.4
99%	267.2	(4.8)	(100.2)	(13.2)	(13.9)	345.3
100%	585.3	(3.7)	(71.3)	(8.6)	(10.6)	603.2
CTE of Stochastic Reserve with Margin						
65CTE	$(9.2)	$(27.0)	$(127.5)	$(16.7)	$(16.5)	$99.6
75CTE	39.4	(23.8)	(122.1)	(16.0)	(15.9)	139.0
85CTE	103.4	(20.0)	(115.5)	(15.1)	(15.3)	196.4
90CTE	146.5	(17.3)	(111.2)	(14.5)	(14.9)	239.1
99CTE	383.3	(4.2)	(92.3)	(12.1)	(13.1)	468.2
Deterministic Reserve without CV Floor - Best Estimate	$1,144.8	$51.2	$519.6	$40.6	$7.2	$4,726.5
Deterministic Reserve without CV Floor - with Margin	1,390.8	132.1	561.8	75.4	46.5	4,785.8
Deterministic Reserve with CV Floor - with Margin (Initial Assets)	1,505.3	170.8	761.3	93.5	73.3	4,800.2
PBR Reserve (Initial Assets + 65CTE)	1,496.1	143.8	633.8	76.9	56.8	4,899.7
RBC C-3	101.2	6.4	10.6	1.4	1.0	90.7
C-3 as % of PBR Reserve	6.76%	4.43%	1.67%	1.80%	1.81%	1.85%
Standard Deviation of PV Cash Flows with Margin	461.8	63.1	72.0	12.0	6.2	148.7
Total Account Value	$1,825.0	$215.6	$894.9	n/a	n/a	$5,000.0
Total Cash Value	1,237.3	22.9	771.0	n/a	n/a	4,773.6
Total Face Amount	20,000.0	20,000.0	20,000.0	20,000.0	20,000.0	

Table III illustrates the statistical analysis of the values underlying the Z-Factor for each product. The PBA margin (numerator on the Z-Factor calculation) is calculated using a 65 CTE from the table above. The RBC C-3 amount is calculated as the 90 CTE minus 65 CTE with a tax adjustment. The table also illustrates three key points.

1. The cash flows as a result of the economic scenarios do not follow a normal distribution and the tail risk is much more pronounced for the ULSG and annuity business. The large tail risk leads to

a higher RBC C-3 amount as summarized in the table. Also the median of the greatest PV of accumulated deficits is negative (or positive accumulated profits) for all lines of business. This is due to the release of margins inherent in the prudent best estimate assumptions for each scenario.

2. The standard deviation of cash flows varies by product and is dependent on the longevity of the liability and the interest sensitive nature of the cash flows.

3. The RBC C-3 calculation as a result of the CTE methodology varies greatly by product from a high 6.76 percent of reserve for ULSG and a low of 1.67 percent of reserve for EIUL. These percentages are generally much higher than the current RBC C-3 factors for these products.

Graphs of the cash flow distribution for each of the products are outlined in Appendix G.

The tables above give the reader a snapshot of each block of business as of the valuation date. The interest sensitive block of business produces much more volatile cash flows and hence a larger stochastic margin. This is not surprising since the only assumptions that are stochastically tested are economic (i.e., yield curve, equity returns) under PBA. It is also interesting to note that although the volatility leads to larger PBA margins, it also leads to larger economic capital so the Z-Factor (PBA Margin ÷ PV of capital) can be a good indicator of potentially inadequate reserves.

What may be surprising to some are the lower volatility results of the VULSG and the EIUL blocks compared to ULSG. For VULSG, the account value is highly dependant on separate account returns. The smaller volatility of stochastic results can be attributed to:

1. The long term nature of the guarantee being 20 years (although not as long as the ULSG with shadow account design). Even in severe equity scenarios, the markets have time to recover and the guarantee is not in play in most scenarios.

2. The best estimate premium assumes that only the minimum premiums are paid. This product serves as a term product in downward scenarios which expires in 20 years so the tail risk is limited.

3. In downward separate account growth scenarios, the increasing COIs act as a revenue offset to the lost fees. The opposite happens for upward separate account growth scenarios.

The EIUL volatility is controlled by the hedging mechanism built in the projections. We have assumed a 100 percent hedge on all S&P 500 movements. The volatility is attributed to the gain or (loss) in spreads to the higher (or lower) account value as the S&P 500 changes through time.

Section III

Z-Factor Research Questions

1. Is the Z-Factor Methodology Mathematically Sound?

To answer this question, we first will illustrate the mathematical formula derivations and then apply the formulas to the blocks of business in our example. The end result of this should be that the ROC reasonably represents the break-even rate at which the present value of profits (or release of PBA margins) is equal to the cost of capital. Again, the ROC is represented as the Z-Factor plus NIER.

The Z-Factor for a block of business can be calculated as a series of one-year contracts. For any year, the Z-Factor as a one-year contract can be illustrated below.

$$Z^{(1)} = \frac{P^{(1)}}{C^{(1)}}$$

$$\mathrm{ROC}^{(1)} = \mathrm{Z}^{(1)} + \mathrm{N}^{(1)}$$

where	$\mathrm{P}^{(1)}$	=	profit (or release of margin) for the one year contract
	$\mathrm{C}^{(1)}$	=	the required capital for the one year contract
	$\mathrm{N}^{(1)}$	=	the net earnings rate for the one year contract

For a single-year contract, ROC represents the breakeven rate at which the expected profit is equal to the cost of capital supporting the business. This is illustrated as follows:

$$COC_D^{(1)} = C^{(1)} \text{ x } (D - N^{(1)})$$

where $COC_D^{(1)}$ = Cost of capital for the one year at the discount rate (D)

hence, if D=ROC, or expected return then

$$COC_{ROC_1}{}^{(1)} = C^{(1)} x\ (ROC_1^{(1)} - N^{(1)})$$

or

$$COC_{ROC_1}{}^{(1)} = C^{(1)} x\ Z^{(1)}$$

and

$$Z^{(1)} = \frac{COC_{ROC}{}^{(1)}}{C^{(1)}}\ and\ COC_{ROC_1}{}^{(1)} = P^{(1)}$$

As illustrated above, for one-year contracts the expected profit is equal to the cost of required capital at the expected return at which the expected return is equal to the Z-Factor plus NIER.

For multi-year contracts, the future profit and cost of capital would be discounted for the life of the business. If we break down each year of profit and required capital as a series of one-year contracts, then the present values of those one year streams would be:

$$PV_{ROC_t}(Profits) = PV_{ROC_t}(COC)$$

where the ROC_t would change each year as the single horizon Z-Factor and NIER would change each year on a multi-year contract.

For Z-Factor, if the discount rate is set to the NIER, then fundamentally we know that

$$PV_{NIER}(COC) = 0$$

and

$$PV_{NIER}(Profits) = PV_{NIER}(Margins)$$

and

$$PV_{NIER}(Profits) = Z \ x \ PV_{NIER}(Required \ Capital)$$

For single-year contracts the ROC represents the discount rates such that PV (Profits) = PV (COC). For multi-year contracts the ROC is represented from the following formula:

$$PV_{ROC}(Profits) \approx PV_{ROC}(COC)$$

To illustrate, the table below summarizes the present value of all future years of profit and cost of capital for the ULSG block with the discount rate equal to the NIER and the discounted ROC. The in-force value of the block should be close to zero discounted at the ROC and if the discount rate is set equal to the NIER then the in-force value should be equal to the margin inherent in the PBA reserve.

ULSG – In-Force Value ($ in millions)		
	Discount Rate	
	NIER	ROC
PV of Pre-Tax Profits	$351.3	$189.7
PV of Cost of Capital	$(0.0)	$(190.5)
Total Present Value of In-Force Block	$351.3	$(0.8)

Because the ROC is constant based on the average lifelong projected earnings rate, and the earnings rate fluctuates (as well as the Z-Factors in string single year contracts), the present value of profit does not quite equal the COC. They are close and the ROC reasonably re-projects the break-even discount rate.

The ROC is different than an IRR in a pricing exercise primarily because: 1) acquisition and first-year commission are not part of the up-front strain for an in-force block and 2) taxes are not considered in the calculation of profits for Z-Factor.

2. How Sensitive is the Z-Factor to Different Levels of Capital?

The Z-Factor result is inversely related to the level of capital which is the denominator as is observed in Table I. For this research, the RBC C-3 risk is stochastically tested and the C-3 amount is solved by using a similar methodology similar to VA RBC C-3 Phase II. The level of C-3 tail risk for this research is calculated as the difference between 90 and 65 CTE with margin and adjusted for taxes. The table below summarizes the Z-Factor for various levels of capital.

Table IV
Z-Factor Under Different Capital Requirements

Capital Requirement	ULSG	VULSG	EIUL	Term	Term TP	MYGA Annuity
100% RBC	9.5%	33.6%	24.7%	22.4%	51.5%	29.2%
200% RBC	4.8	16.8	12.3	11.2	25.8	14.6
300% RBC	3.2	11.2	8.2	7.5	17.2	9.7
200% RBC w /C-3 (90%CTE - 75 CTE)	6.4	20.9	14.4	11.6	26.7	17.6
200% RBC w/ C-3 = 1% of Reserve	15.1	31.9	14.9	11.7	27.0	20.1

Once the RBC C-3 risk amount is set, then the question becomes how much PBA margin is adequate to meet a minimum Z-Factor requirement. This is discussed below.

PBA Regulatory Minimum Margin

The Z-Factor could allow a regulator to define the minimum required PBA margin based on the inherent profit for a given block of business and a defined capital requirement. If the PBA margin produces an unreasonably low ROC, then the regulator may require higher margin. Table II summarizes the amount of minimum PBA margin required for each line of business if a regulatory minimum were set such that a pre-tax ROC is 15 percent. Since the average net earnings rate is approximately 5.7 percent, the Z-Factor would be 9.3 percent.

In the regulatory context, an issue arises with regard to the measure of margins in the numerator of the Z-Factor. Recall that the margin is the excess of the PBA reserve over the best-estimate liability. The regulatory issue is whether the best-estimate liability should be calculated as a gross premium reserve (GPV) or based on the greatest present value of accumulated deficits (GPVAD). For purposes of this paper, the best-estimate liability was calculated using GPV. However, the PBA reserve is calculated using GPVAD. The difference between the best-estimate liability measured using GPVAD and GPV may or may not be considered part of the margin in the reserve.

Potentially a PBA margin increase could be required like the current cash flow testing reserve. For following valuations, the margins (e.g., mortality) could be increased in the PBA calculation to cover the required minimum.

Conversely, if the Z-Factor for a given product is unreasonably high, then this might imply an overly conservative PBA reserve. Depending on the many PBA requirements for reserves and capital which are still in the development stage, the PBA margin potentially could be reduced as a result of the Z-Factor.

One could argue that additional reserve might be excessive in the case where a Z-Factor is low due to high RBC C-3 risk considering that capital is already set aside for the low probability tail risk.

3. Does the Z-Factor Provide Consistent Results Across All General Account Life Insurance Product Lines?

As summarized in Table I and Table II, the Z-Factor varies across product lines. This does not mean that the Z-Factor produces inconsistent results. It simply means that the future return expectations vary across products. For example, if a product has heavy front end loaded profits or is lapse supported, the Z-Factor might be low for this product on an in-force block of business.

Under PBA, it is possible that a term product produces a zero (or negative) reserve, particularly in the early years. This simply says that the present value of premiums is greater than the present value of prudent best estimate benefits and expenses. If under PBA, negative reserves are not allowed, then the PBA margin would be greater than the inherent margins since the total reserve is floored at zero, hence widening the gap between the PBA reserve and the best estimate reserve which is negative. The resulting Z-Factor could be large, but would still represent the best estimate return in excess of the average NIER. The term products in this research produce a positive reserve.

The Z-Factor depends on the level of margins built into the reserve (numerator), the factor generated RBC levels and the tail effect on stochastic testing in the capital requirement. A term product might have a large mortality margin but little capital requirements resulting in a possibly higher Z-Factor than a longer duration product such as ULSG where the capital requirements are significantly higher.

To reiterate, the Z-Factor represents the expected future return on capital in excess of the average NIER, regardless of product.

4. Is the Z-Factor Applicable to Separate Account Products?

For the separate account product in this research, VULSG, the Z-Factor is applicable. The PBA is being calculated assuming stochastic equity returns inherent in the separate account value. The PBA margin and RBC C-3 amount would still be calculated under the same fundamentals with assets in excess of the separate account value held in the general account and earning the general account net investment earnings rate. Likewise, the discount rate would follow the general account net earnings rate. The cash flows associated with these products would include mortality and expense (M&E) charges and revenue sharing from investment management fees. For this research, we have assumed all revenue sharing is included as a source of profit.

The primary concern with separate account products is the capital. It is possible that the required capital for a separate account product could be very low so the Z-Factor might be unusually large. For example, the RBC C-1 risk would be very small (maybe even negative) for separate account products. Furthermore, depending on product design, the C-3 risk might not be material for separate account products. There potentially will need to be enhancements on the Z-Factor in cases where the required capital is low. For example, a return on asset requirement may be considered as an alternative.

From our prospective, the proposed PBA requirements and likely RBC C-3 requirements under separate account products have similar analytics to RBC C-3 Phase II and proposed VACARVM for variable annuities, since the guarantees of these products would be stochastically tested.

5. Under What Circumstances Would the Z-Factor Fail, if Any?

We believe that the reliance on Z-Factor implies reliance on:

a. Sound best estimate assumptions.

b. The determination of required capital being based on a set of stochastic scenarios consistent with the PBA reserve determination.

For the first criterion, the best estimate assumptions are assumed to be correct. Since reality will always be different than expected, margins are built into the reserve. These margins represent the present value of future expected profits and the amount of uncertainty related to future cash flows. The higher the uncertainty surrounding risk factors, the higher the PBA margin on that risk factor should be as a result.

For the second criterion, and as described in Section V, we have assumed NAIC RBC C-3 (NAIC interest rate risk) is calculated stochastically as well. This is imperative in the Z-Factor framework. A large PBA margin, in and of itself, as a result of stochastic testing should not imply a large Z-Factor, and the fact that the required capital also reflects the stochastic uncertainty should prevent this from occurring. That is not to say that the Z-Factor is not impacted by the stochastic margin; it simply indicates that the effect is dampened—possibly reversed—depending on the tail losses in the RBC C-3 calculation. To illustrate, the table below summarizes the Z-Factor, the stochastic margin and RBC C-3 for the products researched.

Table V
Summary of Results
(in millions)

	Stochastic Margin	RBC C-3	Z-Factor @ 200% RBC
ULSG	105.3	101.2	4.8%
VULSG	11.7	6.4	16.8
EIUL	72.0	10.6	12.3
Term	1.5	1.4	11.2
Term TP	10.4	1.0	25.8
MYGA Annuity	114.0	90.7	14.6

From the perspective of this research, the challenge will be calculating the future capital level amounts to get the present value of projected capital. The correct calculation would be a stochastic calculation for RBC C-3 risk for each year in the future (i.e., nested stochastic calculations).

Other concerns for the Z-Factor include:

a. Cases where the required capital is small as could possibly be the case with separate account products.

b. Cases where there is potential for modeling errors, as may be true with PBA. There is a tremendous amount of work involved in setting up the projection models, building product specifications, inputting assumptions and reviewing for accuracy. The increasing complexity of life insurance products contributes to the potential for modeling error.

6. Are There Alternative Measures that Should be Considered?

This research has focused on a discounted Z-Factor approach for statutory accounting. It is meant as a tool to assess the adequacy of margin built into the PBA reserve. Items that should be considered as alternative measures are:

a. <u>Impact of Each Margin Individually</u>

The Z-Factor measures the amount of total margin built into the PBA reserve. It would be instructive to calculate the Z-Factor measuring one margin at a time (mortality, lapse, expense, etc.). This would allow an actuary (or regulator) the ability to assess the source of margins (or profits) and assess of strength built into the margins for each assumption. It could give guidance as to which assumption margin might need strengthening in the current PBA reserve.

b. Variance Analysis

A very good analysis that should be considered as a reporting supplement would be to measure the actual vs. expected cash flows as built in the PBA reserve throughout the past year. The analysis would track and summarize the beginning of year reserve to the end of year reserve on both an actual and expected basis and use the variance analysis to explain the differences. This would also include any assumption or margin changes throughout the year. The corresponding Z-Factor could also be summarized on a before and after basis.

c. Reinsurance

Show the impact of reinsurance separately. We suggest doing this for the following reasons (or questions):

i. Are the profits highly leveraged on reinsurance?
ii. Are the reinsurance terms guaranteed?
iii. What is the Z-Factors measurement if reinsurance assumed is subject to recaptured by the cedant?

d. Aggregation

Show the impact of the Z-Factor calculation when considering grouping all of the projected lines of business together vs. separately.

e. Short Term Horizon

Show the year by year projected Z-Factor and ROC over the next five or ten years calculated on a one year horizon basis for each year. The one year horizon basis is described in question one of this section.

It is important to note again that the Z-Factor and PBA are statutory concepts. They would not be viewed as a substitute for GAAP.

Section IV

Sensitivity Analysis

The following table summarizes the sensitivity of results for ULSG. The sensitivities are meant to give the reader an idea of how the Z-Factor would change if a different set of best estimate assumptions were used in valuation. Additionally, we've summarized the results assuming two alternative mortality margins in the prudent best estimate assumptions under PBA. Another way to think of the table below is as if there are 12 companies with an identical block of business, but with each company having a different view of best estimate assumptions on PBA margin. The best estimate assumptions for ULSG are described in Appendix B.

Table VI
Summary of Sensitivities
(in millions)

	Reserve Held	Best Estimate Liability	Total Margin	Net Earning Rate	Minimum Required Capital 200% Level	PV of Min Required Capital 200% Level	Z-Factor 200% Level	ROC 200% Level
Base Case	1,496	1,145	351	5.73%	224.4	7,375.3	4.8%	10.5%
1. 105% of Mortality Rate	1,570	1,254	316	5.73	229.9	7,229.0	4.4	10.1
2. 95% of Mortality Rate	1,326	1,031	294	5.73	215.0	7,471.9	3.9	9.7
3. No Mortality Improvement[1]	1,448	1,215	232	5.73	219.2	7,158.6	3.2	9.0
4. 125% of Lapse Rate	1,408	1,112	296	5.73	210.8	6,616.2	4.5	10.2
5. 75% of Lapse Rate	1,491	1,183	308	5.73	234.7	8,124.5	3.8	9.5
6. No Dynamic Lapse	1,369	1,058	312	5.73	209.6	6,807.2	4.6	10.3
7. Base Premium with 5% Suspension	1,515	1,259	256	5.73	170.1	4,148.0	6.2	11.9
8. 90% of Base Premium	1,535	1,240	295	5.73	237.8	7,002.8	4.2	9.9
9. Sens 7 with Dynamic Premium	1,687	1,383	304	5.73	139.0	3,225.9	9.4	15.2
10. Margin Sens1 - 110% Mortality	1,612	1,145	467	5.73	169.4	5,068.1	9.2	15.0
11. Margin Sens2 - 120% Mortality	1,825	1,145	680	5.73	176.7	5,008.9	13.6	19.3

As can be seen from the above table, the reserves change dramatically depending on the best estimate assumptions, but the total margin is relatively stable across scenarios except for the no mortality improvement sensitivity.[1] This is because the assumption change affects both the best estimate reserve

[1] Current PBA Requirements do not allow mortality improvements in the prudent best estimate assumptions. Hence, if improvement is assumed as the best estimate mortality then there is an additional mortality margin.

and total reserve held. To reiterate, the PBA margin measures the expected pre-tax profits under a projection of best estimate assumptions.

The Z-Factor differences in sensitivities one through nine reflect the different best estimate assumptions for each. They do fluctuate and illustrate the importance of the best estimate assumptions.

Sensitivities 10 and 11 illustrate the effect on the Z-Factor calculation with alternative mortality margins for prudent best estimate assumptions. Obviously, the Z-Factor increases as the mortality margin inherent in the prudent best estimate assumption is increased.

The sensitivities are described in the table above. Sensitivity nine “Sens 7 with Dynamic Premium” can be described as premiums assumed to be at the base level throughout except:

i. 5 percent annual suspension is applied.

ii. Minimum additional premium is assumed at any point in the future in order to keep the shadow account from falling below zero.

Section V

Methodology and Product Descriptions

PBA Regime

For the PBA calculations in this research we have calculated PBA reserves according to the January 27, 2007 NAIC draft titled Requirements for Principles-Based Reserves for Life Products. We also have relied on the Report on Principles-Based Reserves for Universal Life with a Secondary Guarantee based on a Shadow Fund from the American Academy of Actuaries' Life Reserves Work Group, dated April 2006 (LRWG Report).

For the representative business, we have calculated PBA reserves as described in the following. Present values are calculated at the net investment earnings rate.

A full PBA calculation is performed at the valuation date to set the initial reserve.

A. Best Estimate Reserve = present value of cash flows over a single deterministic scenario at the best estimate assumptions for all policies.

B. Prudent Best Estimate Reserve = present value of cash flows over a single deterministic scenario at the best estimate assumptions with margins for all risk factors.

C. Prudent Best Estimate Reserve w/Cash Value floor = maximum of (B) and cash surrender value (CSV) for all policies. The CSV floor is at the policy level and is equal to zero for Term.

D. Total Starting Assets = sum of (C) for all policies.

E. Total PBA Reserve = Starting Assets + pre-tax CTE 65.

The CTE 65 is the average of the highest present value of accumulated deficit for the worst 35 percent scenarios (by setting the initial surplus and assets equal to (C)). This calculation is done at the block of business level. Assumptions for the CTE calculations are set equal to best estimate with margins with the yield curve being the only stochastically generated risk factor.

Margins for the risk factors of mortality, lapse and expense are consistent between scenarios and policies. They are defined in the Appendices. Interest margins are implicit in the CTE calculation.

Required Capital

Much of this research will involve the required capital since it is the amount of required capital that is inversely related to the Z-Factor. Said another way, the amount of required capital would increase for a block of business with higher margin given the same level of Z-Factor. Of course, a higher margin implies higher risk and return attributes.

For this research, we have assumed required capital to be a percentage of NAIC RBC for all years. However, rather than use a factor based NAIC RBC C-3, we calculated the C-3 component using a CTE measure on the stochastic amounts. For purposes of this research, the RBC C-3 amount is assumed to be (90 CTE – 65 CTE) * (1-FIT rate) where the CTEs are calculated as accumulated deficits as like the PBA reserve. The FIT rate is assumed to be 35 percent. By doing this for C-3, we are calculating a capital requirement consistent with the risks being measured under PBA reserves.

The C-1, C-2 and C-4 risks are not stochastically measured so the following factors at 100 percent RBC are assumed.

Risk Based Capital Factors (100% of NAIC Company Action Level)		
Risk Component	Base	Factor
C-1	General Account Liabilities	1.25%
C-2	Individual Life Net Amount at Risk	0.06%
C-4	General Account Premium	2.00%

The covariance effect has been reflected by applying an 80.0 percent factor to the sum of C-1, C-2 and C-3.

Economic Stochastic Assumptions

The economic rates stochastically generated for this research include the Treasury curve and the index funds such as the S&P 500 for VULSG and EIUL. The economic environment is assumed to change monthly in the projections. One thousand scenarios are assumed for each line of business. The starting Treasury curve is assumed to be December 31, 2006. For VULSG, we have assumed a model with six separate account funds with typical industry fund allocations by high, medium and low volatility bucket. The stochastically generated separate account funds are assumed equal to the RBC C-3 Phase II stochastic fund returns as published by the American Academy of Actuaries. The corresponding Treasury curve movement as published by the American Academy of Actuaries is assumed for VULSG as EIUL as well. For all other products, the Milliman economic generator is used for stochastically generating the Treasury Curve.

The starting yield curve in the models is as follows:

Treasury & Corporate Yield Curve	
Maturity	December 31, 2006
90-day	5.02%
1 year	5.00
2 year	4.82
3 year	4.74
5 year	4.70
7 year	4.70
10 year	4.71
20 year	4.91
30 year	4.81

Actuarial Assumptions

The assumptions for mortality, lapse, premium and expenses are based on experience which we have observed for similar products but are not meant to represent any view of the best (or worst) in class industry assumptions. Actuarial assumptions and experience vary from company to company. Complete documentation of the assumptions is outlined in the Appendices.

ULSG Product

The ULSG block consists of three plans, with $20 billion of face amount and $1.8 billion of account value as of December 31, 2006.

- UL01 and UL02 are universal life plans with a high load and high interest shadow account design. The products offer lifetime no lapse protection as part of the base product using this shadow account design. The shadow account has 35 percent to 50 percent of premium loads and 5 percent to 15 percent of interest crediting rate.

- UL03 is a universal life plan with post-July 2006 shadow account design. The product offers lifetime no lapse protection as part of the base product using a shadow account design (attained age 100). The shadow account has 10 percent of premium loads only for the first year and an average 5 percent interest crediting rate.

We have assumed a mix of single pay, ten pay and level pay premium levels to keep the shadow account positive throughout. Extended maturity options are not modeled.

Variable Universal Life Product

The variable universal life block consists of one plan, with $20 billion of face amount and $215.6 million of account value as of December 31, 2006.

The plan offers 20 years of minimum premium no lapse protection assuming minimum premiums are paid. The mortality and expenses (M&E) charges are 90 basis points (bps) and the investment management fees are 100 bps of separate account assets. The premium assumption is set to satisfy the minimum premium requirement to prevent a policy from lapsing for the first 20 years.

Equity Indexed Universal Life Product

The equity indexed universal life block consists of one plan, with $20 billion of face amount and $895.0 million of account value as of December 31, 2006.

Credited rates are based on positive annual return in the S&P 500 index. The index growth is subject to a participation rate and an 8 percent cap. A 2 percent minimum interest rate is guaranteed on cash values. The interest is only credited to the account value at the end of the policy year; however 2 percent minimum interest rate is guaranteed throughout.

Level Term Products

The term block consists of 10-, 15- and 20-year level term products, with $20 billion of face amount as of December 31, 2006.

The three term plans have level premium during the term period followed by an ART premium schedule. Two alternative set of shock lapses are assumed after the level term period. The first assumes 100 percent shock lapse after the level term period. The second has three years of shock lapses (decreasing over time) followed by 15 percent ultimate lapse rates.

Annuity Products

The annuity block consists of one plan, with $5 billion of account value and $4.8 billion of cash value.

The plan offers an interest rate guarantee for five years and an annual reset thereafter. The ultimate guaranteed interest rate is 3 percent. A five-year surrender charge period is applied.

Appendix A

Summary of Asset and Investment Assumptions

New Investment Strategy

The table below summarizes the new investment strategy for each block of business. The strategy is based on market conditions as of December 29, 2006.

Z Factor Research
Investment Strategy Summary – ULSG, VUL and EIUL
Market Conditions on December 29, 2006

Asset Class	Allocation	Maturity	Treasury	Gross Spread	Gross Yield (BEY)	Gross Yield (AEY)	Investment Expenses	Expected Defaults	Net Yield (AEY)
Corporate Public, AA	10.0%	10	4.71%	0.76%	5.47%	5.55%	0.080%	0.01%	5.46%
Corporate Public, BBB	15.0	10	4.71	1.24	5.95	6.03	0.080	0.28	5.67
Corporate Public, BB	15.0	10	4.71	1.98	6.69	6.81	0.080	1.18	5.55
Corporate Public, AA	15.0	20	4.91	0.96	5.87	5.95	0.080	0.01	5.86
Corporate Public, BBB	20.0	20	4.91	1.43	6.34	6.44	0.080	0.28	6.08
Corporate Public, AA	15.0	30	4.81	1.00	5.81	5.89	0.080	0.01	5.80
Corporate Public, AAA	10.0	30	4.81	0.66	5.47	5.55	0.080	0.01	5.46
Total	100.0%	18.5	4.81%	1.21%	6.01%	6.10%	0.08%	0.28%	5.74%

Z Factor Research
Investment Strategy Summary – Term
Market Conditions on December 29, 2006

Asset Class	Allocation	Maturity	Treasury	Gross Spread	Gross Yield (BEY)	Gross Yield (AEY)	Investment Expenses	Expected Defaults	Net Yield (AEY)
Corporate Public, AA	10.0%	10	4.71%	0.76%	5.47%	5.55%	0.080%	0.01%	5.46%
Corporate Public, BBB	15.0	10	4.71	1.24	5.95	6.03	0.080	0.28	5.67
Corporate Public, BB	15.0	10	4.71	1.98	6.69	6.81	0.080	1.18	5.55
Corporate Public, AA	15.0	20	4.91	0.96	5.87	5.95	0.080	0.01	5.86
Corporate Public, BBB	20.0	20	4.91	1.43	6.34	6.44	0.080	0.28	6.08
Corporate Public, AA	15.0	5	4.70	0.56	5.26	5.33	0.080	0.01	5.24
Corporate Public, AAA	10.0	5	4.70	0.50	5.20	5.27	0.080	0.01	5.18
Total	100.0%	12.3	4.78%	1.12%	5.90%	5.99%	0.08%	0.28%	5.63

Z Factor Research
Investment Strategy Summary – Annuity
Market Conditions on December 29, 2006

Asset Class	Allocation	Maturity	Treasury	Gross Spread	Gross Yield (BEY)	Gross Yield (AEY)	Investment Expenses	Expected Defaults	Net Yield (AEY)
Corporate Public, AA	10.0%	5	4.70%	0.56%	5.26%	5.33%	0.080%	0.01%	5.24%
Corporate Public, BBB	25.0	5	4.70	0.91	5.61	5.69	0.080	0.28	5.33
Corporate Public, BB	20.0	5	4.70	1.55	6.25	6.35	0.080	1.18	5.09
Corporate Public, AA	15.0	10	4.71	0.76	5.47	5.55	0.080	0.01	5.46
Corporate Public, BBB	30.0	10	4.71	1.24	5.95	6.03	0.080	0.28	5.67
Total	100.0%	7.3	4.70%	1.08%	5.78%	5.87%	0.08%	0.28%	5.40

In-force Portfolio

For the in-force portfolio, a portfolio with the above parameters for each year of issue was created with initial book value equal to initial statutory reserve plus capital. Under the stochastic CTE calculation, the initial book value is set equal to the deterministic prudent best estimate reserve and cash surrender value floor.

Disinvestment Assumptions

Assets are liquidated on a pro-rata basis. Assets are liquid and available for sale. Capital gains and losses were amortized into income through the Interest Maintenance Reserve (IMR).

Prepayment Provisions

Prepayment rates on mortgage backed securities are based on market prepayment rate information found on Bloomberg. Multiples of the PSA are applied based on the difference between the coupon rate and the current market yield. The PSA multiple is interpolated for intermediate values.

Non-BondEdge Mortgage Prepayments	
Coupon Rate less Market Yield (bps)	PSA Multiple
-300	1.10
-200	1.24
-100	1.51
0	1.89
+100	5.71
+200	15.19
+300	19.69

Default Cost

Annual default costs are based on the Moody's data, covering the period from 1920 through 2005 as summarized below:
.

Quality	Default
Aaa	0.01%
Aa1	0.01%
Aa2	0.01
Aa3	0.01
A1	0.06%
A2	0.09
A3	0.12
Baa1	0.17%
Baa2	0.28
Baa3	0.34
Ba1	0.70%
Ba2	1.18
Ba3	1.66
B1	2.00%
B2	2.20
B3	3.05
Caa-C	5.24%

Investment Expenses

Investment expenses are assumed to be 8 basis points on all assets.

Treasury Yield Curve (Corporate Bond Equivalent)

The projections are based on the constant maturity Treasury yield curve as of December 31, 2006. Yields on intermediate Treasuries were interpolated.

Treasury & Corporate Yield Curve	
Maturity	**December 31, 2006**
90-day	5.02%
1 year	5.00
2 year	4.82
3 year	4.74
5 year	4.70
7 year	4.70
10 year	4.71
20 year	4.91
30 year	4.81

Appendix B

Universal Life Products with Shadow Account

Summary of Models

ULSG Sample Block – Z-Factor In-force Summary
($ millions)

Plan Code	Duration	Insurance In Force	Death Benefit	Account Value	Premium In Force	Target Premium	Cash Value	Shadow Account Value
UL01	5	$491.4	$491.4	$31.8	$18.7	$4.1	$17.7	$18.4
UL01	4	540.5	540.5	30.7	20.6	4.5	16.4	16.8
UL01	3	594.6	594.6	29.2	22.6	5.0	14.7	14.8
UL01	2	654.0	654.0	27.2	24.9	5.5	14.4	12.3
UL01	1	719.4	719.4	24.7	27.4	6.0	15.4	11.5
UL02	5	491.4	491.4	81.1	76.1	25.4	65.7	90.5
UL02	4	540.5	540.5	86.1	83.7	27.9	67.4	81.5
UL02	3	594.6	594.6	88.8	92.0	30.7	67.9	70.6
UL02	2	654.0	654.0	89.1	101.2	33.8	67.2	57.4
UL02	1	719.4	719.4	86.6	111.4	37.2	67.9	47.9
UL03	5	2,293.2	2,293.2	283.7	156.6	38.9	202.0	241.5
UL03	4	2,522.5	2,522.5	270.5	172.3	42.8	179.6	231.5
UL03	3	2,774.7	2,774.7	254.1	189.5	47.1	160.3	219.1
UL03	2	3,052.2	3,052.2	233.9	208.5	51.8	142.0	204.0
UL03	1	3,357.4	3,357.4	207.5	229.3	57.0	138.6	185.8
Total		$20,000	$20,000	$1,825	$1,535	$418	$1,237	$1,504

Model Plan	Description	Funding Level
UL01	Male 45, PNS	SP/10 Pay, Full Prm
UL02	Male 75, SNS	SP/10 Pay, Full Prm
UL03	Female/Male 45-55-65, PNS/SNS	SP/10 Pay, Full Prm

Premium

Three premium levels are assumed to have the following distribution:

1. Single Pay = 20%
2. Ten Pay = 35%
3. Full Pay = 45%

The premium amount for the above premium schedules is set at the minimum level to keep the shadow account positive throughout.

Lapse Rates

Policy Year	UL01	UL02	UL03
1	4.0%	2.2%	3.5%
2	3.8	2.0	3.0
3	3.6	2.0	2.5
4	3.4	2.0	2.0
5	3.2	2.0	2.0
6-10	3.0	2.0	2.0
11-15	1.8	2.0	2.0
16-20	1.8	2.0	2.0
21-45	1.2	2.0	2.0
46+	1.0	2.0	2.0

Lapse rates are adjusted by the following multiplier:

= Max (1, max (0, Account Value) / Shadow Account)

Mortality Rates

The mortality assumptions are based on the 1975-80 modified 15 year select-ultimate table. Additional multipliers are applied to the base table:

1. PNS: 35%
   SNS: 50%

   The multiples are level for 25 years and increase by 150bps year 26+.

2. The rates of mortality improvement used were 1% per year for attained age 0-60, declining by 0.04% per year for each age over 60, to zero at attained age 85. The improvement was applied exponentially based on the policy duration.

Credit Rates

The credit rates are set equal to the net earnings rate less the target spread subject to the guarantee.

Plan	Target Spread	Guaranteed Rate
UL01 UL02	1% for policy year 1-10, 0.75% policy year 11-20 and 0.50% policy year 21+	3%
UL03	3.25%	3%

Expenses

Per policy:	$65
Premium tax:	2.5%

Commission

Policy Year	Target Commission			Excess Commission		
	UL01	UL02	UL03	UL01	UL02	UL03
1	120%	120%	120%	5%	5%	5%
2-5	5	5	5	5	5	5
6-10	5	5	3	5	5	4
11-15	2	2	3	2	2	4
16+	2	2	0	2	2	0

Acquisition

	Percent of Target Premium	Per Policy	Per Unit
UL01	10%	$100	$1.00
UL02	10	100	1.00
UL03	10	100	1.00

Other Product Specifications

	% of Target Premium Load	% of Excess Premium Load	Per Policy Load	Per Unit Load	Surrender Charge Per Unit
UL01	5%	5%	$90	$1.21 yr 1 0 yr 2+	Vary by duration 20 yr schedule
UL02	5%	5%	$90	$1.21 yr 1 0 yr 2+	Vary by duration 20 yr schedule
UL03	5% yr 1-10 4% yr 11+	4%	$170 yr 1 $50 yr 2+	$0.7 yr 1 $0 yr 2+	Vary by duration 15 yr schedule

Shadow Account

	Shadow Account Load As % of Target Premium	Shadow Account Load As % of Excess Premium
UL01	35%	50%
UL02	35%	50%
UL03	10% 1st year only	10% 1st year only

Shadow account load per policy: $0 for UL01 and UL02, $120 for UL03.

Shadow account crediting rate:

Policy Year	UL01	UL02	UL03
1-10	5.0%	9.5%	5.25%
11-20	5.5	9.5	5.25
21-30	15.0	10.0	5.00
31+	15.0	15.0	4.75

PBR Reserve Margins

Mortality Margin =	103% of Best Estimate Assumption. No mortality improvement
Lapse Margin =	70% of Lapse Best Estimate.
Expense Margin =	105% of Best Estimate Expenses.

Appendix C

Variable Universal Life Products with Minimum Premium Guarantee

Summary Models

Variable Universal Life Block Summary
(in millions)

Plan	Volatility Bucket	Death Benefit	General Account Value	Separate Account Value	Cash Value	Separate Account Fund Allocation: S&P 500	Russell	Nasdaq	SBBig	EAFE	Money Market
VUL1	H	$6,666.7	$7.6	$64.9	$40.7	$22.1	$13.0	$16.2	$1.9	$9.7	$2.6
	L	6,666.7	7.7	65.3	41.0	9.8	12.4	3.3	10.4	6.5	22.9
	M	6,666.7	7.6	62.5	38.7	16.9	16.9	6.2	4.4	11.9	6.2
Total		$20,000.0	$22.9	$192.7	$120.3	$48.7	$42.3	$25.7	$16.8	$28.1	$31.7

Issue Age	45-65
Sex	M, F
Class	PNS, NS

Premiums

Three premium levels are assumed to have the following distribution. The allocation of premium between general account and separate account is 10% to 90%.

1. 20 times minimum premium as single premium. (10%).

2. Target premium as level premium (target premium = 1.75 x minimum premium) for 20 years and 125% * target premium as level premium thereafter. (20%)

3. Minimum premium as level premium for 20 years and 125% * minimum premium as level premium thereafter. (70%)

Lapse Rates

Policy Duration	Premium Level 1	Premium Level 2	Premium Level 3
1	2	5	5
2	2	5	5
3	3	5	5
4	3	5	5
5	4	5	5
6	4	5	5
7	5	5	5

Lapse rates are adjusted further by the following multiplier:

$$\max\left(0, \min\left(1, \frac{\text{Account Value}}{\text{Accumulated Gross Premium}}\right)\right)$$

Mortality Rates

The mortality assumptions are based on the 1975-80 modified 15 year select ultimate table. Additional multiples are applied to the base table;

1. PNS: 55%
   SNS: 70%

   The multiples are level for 25 years and increased by 150 bps year 26+.

2. Mortality improvement factor of 1% is applied for 15 years.

Crediting Rates

The general account crediting rate is assumed to be 3%.

Separate Account

Separate account return is assumed to be 8% in the deterministic scenario. In stochastic projections, the separate amount funds are allocated among six indices. They are S&P 500, Russell 2000, NASDAQ, SBBIG, EAFA and Money Market. Academy's C-3 Phase II package is used to simulate the return of the six indices.

M&E Fees

M&E fees are 90 bps of separate account value.

Investment Management Fees and Profit Sharing

Investment management fees are 100 bps of separate account assets. Profit sharing is 30 bps.

Expenses

Per Policy: $75
Premium Tax: 2.5%

Commission

Policy Year	Target Commission	Excess Commission
1	115%	5%
2-10	5	5
11+	0	0

Other Product Specifications

% of Target Premium Load	% of Excess Premium Load	Per Policy Load	Surrender Charge Per Unit
3.5%	3.5%	$60	Vary by duration

Secondary Guarantee

The VUL product has a 20 year minimum premium secondary guarantee protection. The policy remains in-force as long as the cumulative gross premium is greater than the cumulative minimum premium, even though the account value is negative.

PBR Reserve Margin

Mortality Margin = 105% of base mortality assumption.
No mortality improvement

Lapse Margin = 70% of base assumption

Expense Margin = 105% of base assumption

Appendix D

Equity Indexed Universal Life

Model Summary

Equity Indexed Universal Life Block Summary (in Millions)						
Model Age	Sex	Class	Policy Count	Death Benefit	Account Value	Cash Value
25	F	N	320	$320	$6.2	$4.4
		P	1,280	1,280	20.3	13.4
	Female Total		1,600	$1,600	$26.5	$17.8
	M	N	480	$480	$11.4	$8.5
		P	1,920	1,920	39.0	28.0
	Male Total		2,400	$2,400	$50.5	$36.5
Age 25 Total			4,000	$4,000	$77.0	$54.3
35	F	N	560	$560	$18.4	$14.6
		P	2,240	2,240	49.4	36.2
	Female Total		2,800	$2,800	$67.7	$50.8
	M	N	840	$840	$30.1	$24.3
		P	3,360	3,360	95.7	74.4
	Male Total		4,200	$4,200	$125.7	$98.7
Age 35 Total			7,000	$7,000	$193.5	$149.5
45	F	N	560	$560	$31.9	$27.4
		P	2,240	2,240	97.4	81.1
	Female Total		2,800	$2,800	$129.3	$108.5
	M	N	840	$840	$63.9	$56.2
		P	3,360	3,360	191.8	164.7
	Male Total		4,200	$4,200	$255.8	$220.9
Age 45 Total			7,000	$7,000	$385.1	$329.4
55	F	N	160	$160	$20.3	$18.3
		P	640	640	53.9	47.7
	Female Total		800	$800	$74.2	$66.0
	M	N	240	$240	$45.0	$41.3
		P	960	960	120.2	108.8
	Male Total		1,200	$1,200	$165.2	$150.1
Age 55 Total			2,000	$2,000	$239.4	$216.1
Total EIUL Block			20,000	$20,000	$894.9	$749.2

Premiums

Four premium levels are assumed to have the following distribution.

1. 15 x target premium as pour in premium at issue and target premium as renewal premium. (25%)

2. 5 x target premium as pour in and target premium as renewal premium. (25%)

3. 2 x target premium as pour in and target premium as renewal premium. (25%)

4. Target premium as level premium. (25%)

Lapse Rates

Policy Duration	Lapse Rates
1	4
2	6
3	6
4	6
5	5
6	5
7	5

The lapse only happens at the end of the policy year, after the interest is credited. If the index return is negative, an additional 2% lapse is assumed.

Mortality Rates

The mortality assumptions are based on the 1975-80 modified 15 year select-ultimate table. Additional multiples are applied to the base table:

1. PNS: 55%
   SNS: 70%

   The multiples are level for 25 years and increased by 150 bps year 26+.

2. Mortality improvement factor of 1% is applied for 15 years.

Crediting Rates

The crediting rate is based on one year point to point return on S&P 500 index. The participation rate is 100% for year 1 and 70% thereafter. The net policyholder return is capped at 8%. 2% of minimum annual effective interest rate is guaranteed on cash surrender value.

The option on S&P 500 index is purchased at the beginning of each policy year.

The return of S&P 500 index is assumed to be 6% in the deterministic scenario. The American Academy of Actuaries C-3 Phase II U.S. equity index is used to simulate the S&P 500 index in the stochastic projections.

Expenses

Per Policy: $75
Premium Tax: 2.5%

Commission

Policy Year	Target Premium Commission	Excess Premium Commission
1	115%	5%
2-10	5	5
11+	0	0

Other Product Specifications

% of Target Premium Load	% of Excess Premium Load	Per Policy Load	Surrender Charge Per Unit
3.5%	3.5%	$60	Vary by duration

PBR Reserve Margin

Mortality Margin = 105% of base mortality assumption.
No mortality improvement

Lapse Margin = 70% of base assumption

Expense Margin = 105% of base assumption

Appendix E

Term Business

Model Summary

Term Block Summary (in millions)			
Plan	Description	Policy Count	Face Amount
TE10	10 Year Term	6,667	$5,000
TE15	15 Year Term	4,000	3,000
TE20	20 Year Term	16,000	12,000
Total Term		26,667	$20,000

Age		
Age	10 Year Term	Other
25	10%	10%
35	35%	45%
45	40%	35%
55	15%	10%

Sex	
Male	70%
Female	30%

Class	
The Best Preferred NS	50%
The Second Best Preferred NS	25%
The Third Best Preferred NS	10%
Standard NS	10%
Preferred Smoker	3%
Standard Smoker	2%

Lapse Rates

10 Year Level Term			
Policy Duration	Preferred NS	Residual NS	Smoker
1	5%	9%	13%
2	7	9	12
3	7	8	11
4	7	8	11
5	7	8	10
6	7	8	8
7-9	7	7	7
10	70	70	70
11	55	55	55
12	25	25	25
13+	15	15	15

15 Year Level Term			
Policy Duration	Preferred NS	Residual NS	Smoker
1	4%	7%	10%
2	4	7	9
3	4	6	9
4	5	6	9
5	6	6	8
6	6	6	7
7	6	6	7
8	5	6	6
9	4	4	6
10	4	4	5
15	70	70	70
16	55	55	55
17	25	25	25
18	15	15	15

20 Year Level Term			
Policy Duration	Preferred NS	Residual NS	Smoker
1	4%	8%	13%
2	4	7	11
3	4	6	9
4	4	5	8
5	4	5	8
6	4	5	7
7	4	5	7
8	4	5	6
9	4	5	5
10	4	4	5
11-15	4	4	5
16-19	3.5	3.5	5
20	80	80	80
21	55	55	55
22	25	25	25
23	15	15	15

Mortality

The mortality assumptions are based on the 1975-80 modified 15 year select-ultimate table. Additional multiples are applied to the base table;

1. | | |
   |---|---|
   | The Best Preferred NS | 27% |
   | The Second Best Preferred NS | 34 |
   | The Third Best Preferred NS | 41 |
   | Standard NS | 55 |
   | Preferred Smoker | 70 |
   | Standard Smoker | 105 |

   The multiples are level for 25 years and increased by 150 bps (additive) per year starting in policy year 26 for non-smokers. The multiples are level for smokers.

2. Mortality improvement factor of 1% is applied for 15 years.

3. Mortality anti-selection is assumed utilizing Dukes-MacDonald theory with 80% effectiveness of excess lapses at the end of level term period.

Expenses

Per policy:	$40
Premium Tax:	2.5%

PBR Reserve Margin

Mortality Margin	=	105% of base mortality assumption. No mortality improvement
Lapse Margin	=	70% of base lapse before level term period and 130% afterwards
Expense Margin	=	105% of base assumption

Appendix F

5-Year Guaranteed Annuity

Model Summary

Annuity Block Summary (in millions)				
Age	Sex	Policy Count	Account Value	Cash Value
45	F	9,531.60	$625.00	$591.80
	M	9,531.60	625.00	591.80
Total Age 45		19,063.21	$1,250.00	$1,183.60
55	F	15,250.57	$1,000.00	$946.88
	M	15,250.57	1,000.00	946.88
Total Age 55		30,501.14	$2,000.00	$1,893.75
65	F	13,344.25	$875.00	$828.52
	M	13,344.25	875.00	828.52
Total Age 65		26,688.49	$1,750.00	$1,657.03
Total Annuities		76,252.84	$5,000.00	$4,734.38

Premiums

$60,000 of single deposit is assumed for each policy. There is no renewal premium.

Lapse Rates

Policy Duration	Lapse Rates
1	1%
2	2
3	3
4	4
5	5
6	50
7	20
8+	12

Interest sensitive lapse adjustments, expressed as a percentage, were added to the lapse rates based on the following formulas:

$Z \text{ x } (MR - CR - SC/4)^2$ if $(MR > CR + SC/4)$

0 $CR < MR <= CR + SC/4$

Where,

Z = 2
MR = Market rate of interest, as a percent, defined as 7 year treasury rate minus 50bps
CR = Credited rate of interest, as a percent.
SC = Surrender charge as percent of account value.

The total lapse rate is capped at 75%

Partial Withdrawal

2% of partial withdrawal is assumed.

Mortality Rates

The mortality assumptions are 90% of Annuity 2000 Basic Table. Mortality improvement factor of 1% is applied for 15 years.

Crediting Rates

During the 5 year guaranteed period, 4.68% of interest rate is credited to the account value. The crediting rate out of the guaranteed period is the assets net earned rate less 300bps target spread, floored at 3% guaranteed rate.

Expenses

Per Policy: $45

Commission

No renewal commission is included in the projections.

Other Product Specifications
Surrender charge schedule: 7-6-5-4-4-0

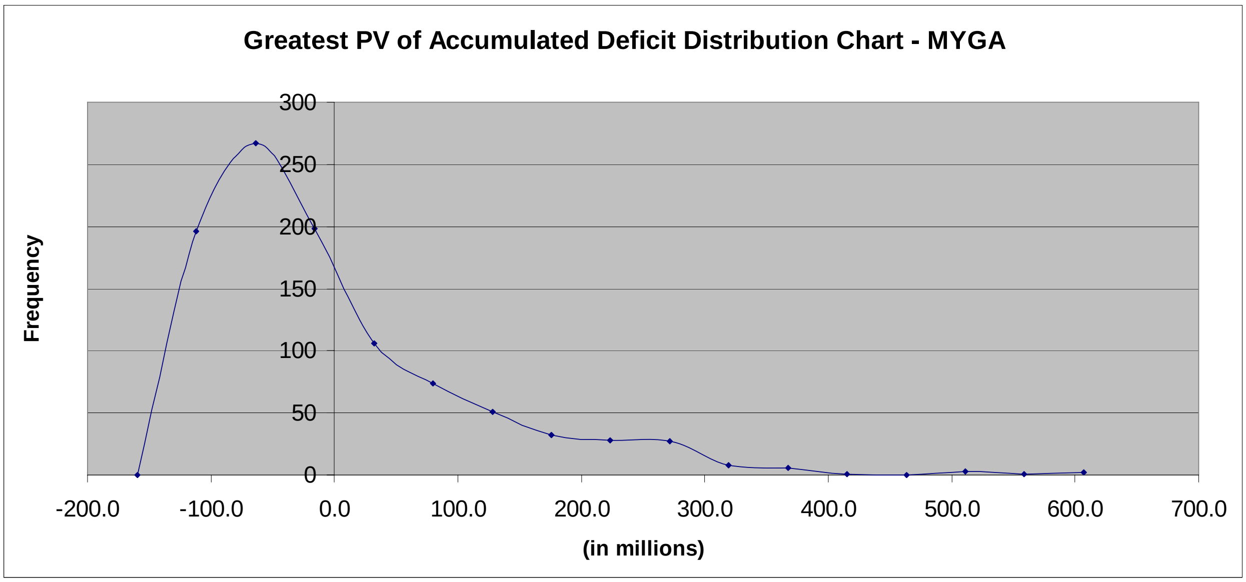
PBR Reserve Margin

Mortality Margin	=	105% of base mortality assumption. No mortality improvement
Lapse Margin	=	110% of base assumption during the surrender charge period 130% of base assumption out of the surrender charge period
Expense Margin	=	105% of base assumption

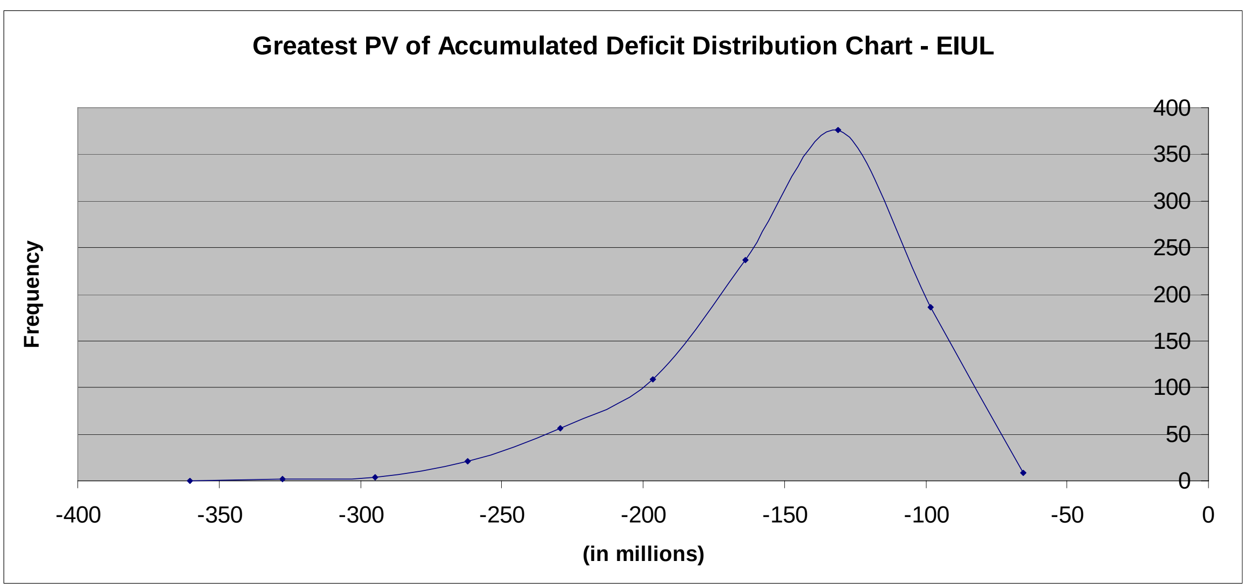
Appendix G

Distribution Graphs by Line of Business

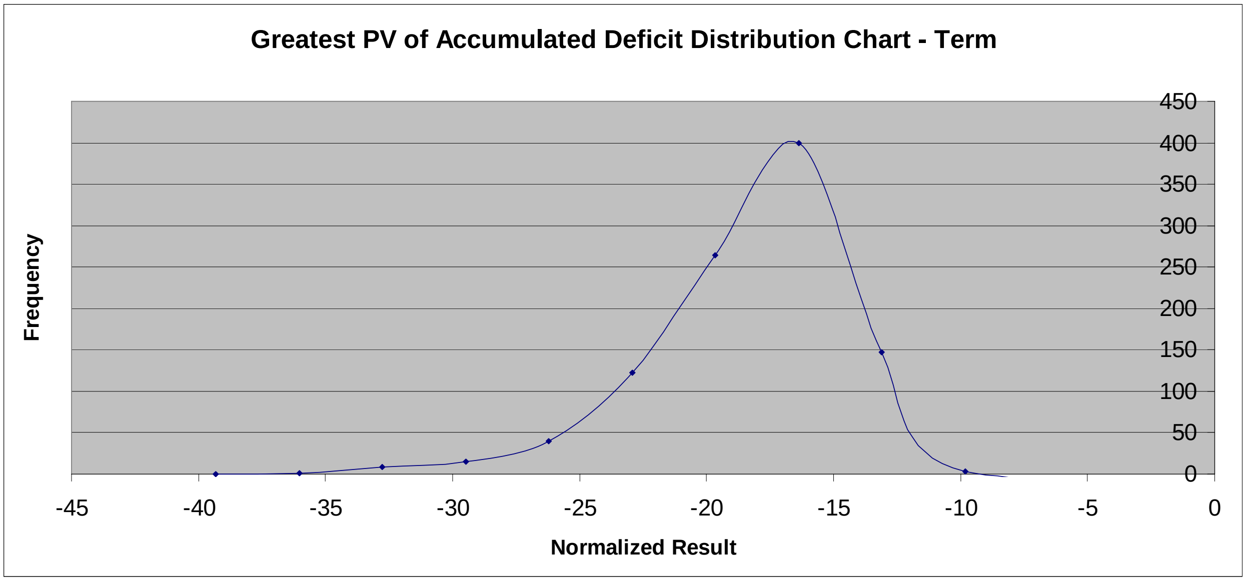
Annuities



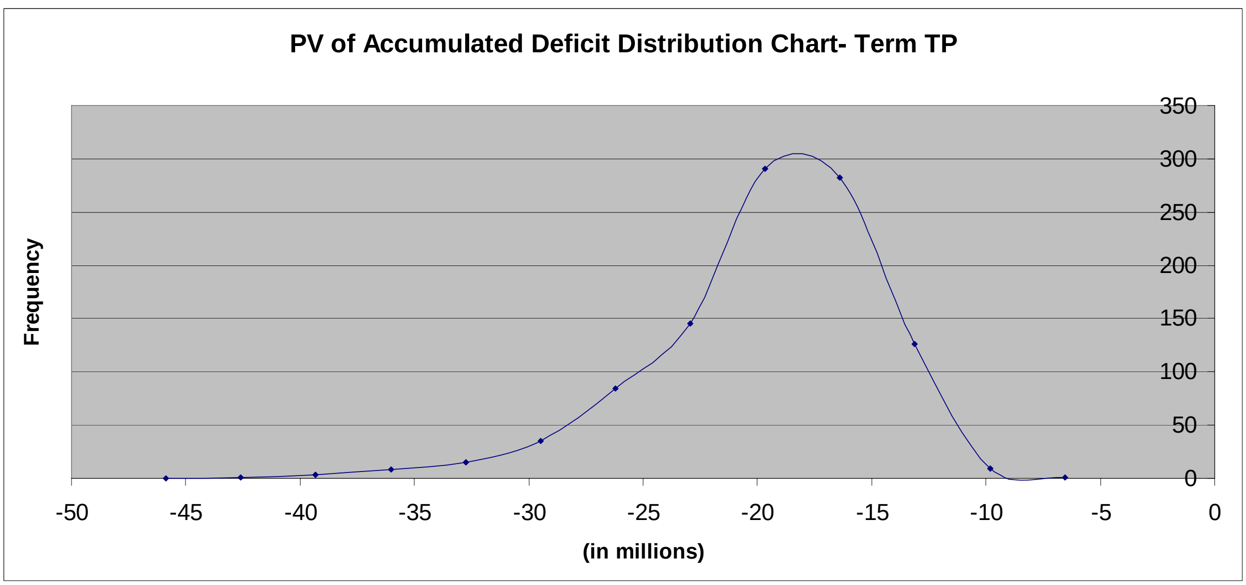
EIUL



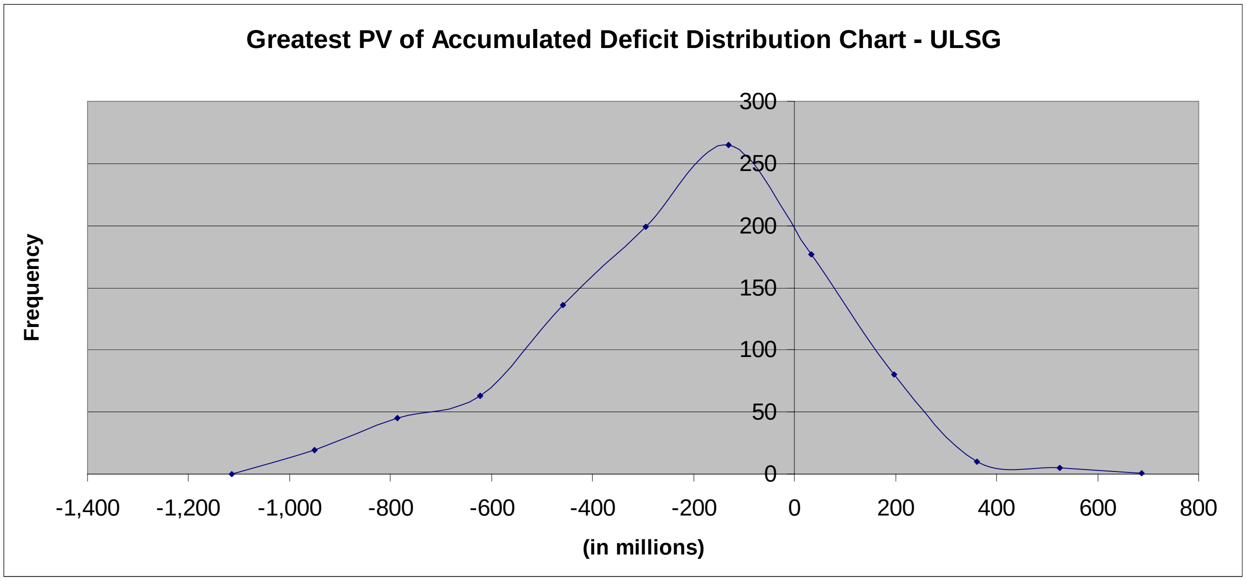
Term with 100% Shock Lapse



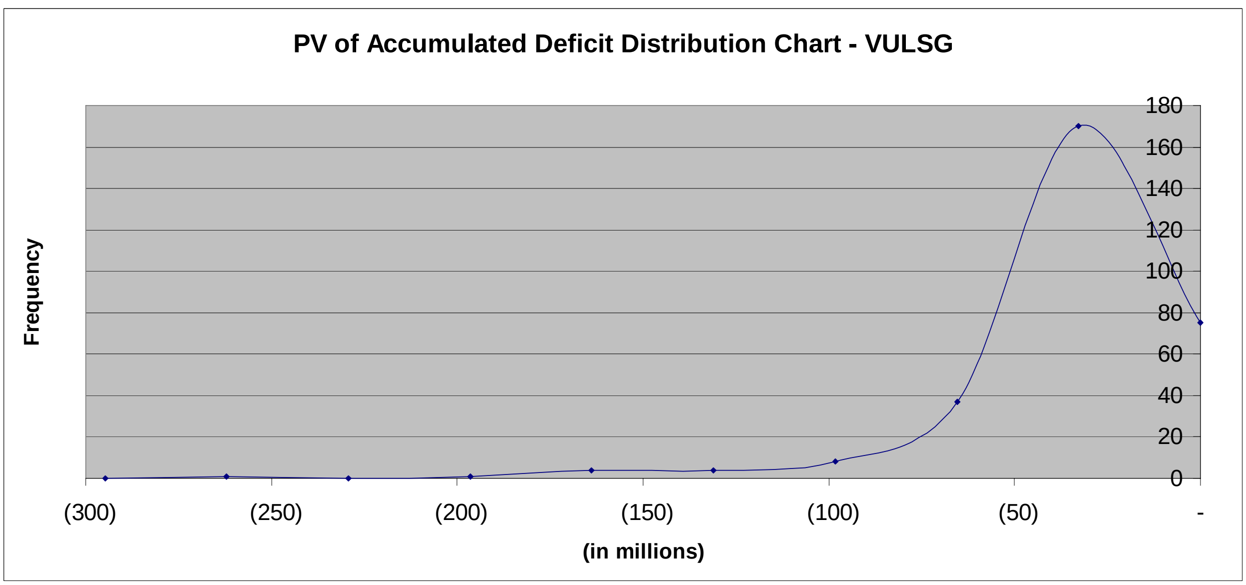
Term with Tail Profits



ULSG


Greatest PV of Accumulated Deficit Distribution Chart - ULSG
Frequency
300
250
200
150
100
50
0
-1,400
-1,200
-1,000
-800
-600
-400
-200
0
200
400
600
800
(in millions)

VULSG


PV of Accumulated Deficit Distribution Chart - VULSG
Frequency
180
160
140
120
100
80
60
40
20
0
(300)
(250)
(200)
(150)
(100)
(50)
-
(in millions)