

**How to Make Guarantees on VAs Worth
More than the Paper They're Written On**

or

**The NAIC is in my rearview mirror and gaining
fast - so which way do I turn?**

Ari Lindner, FSA, MAAA

ACE Tempest Life Re

SOA Spring Meeting 2004 - San Antonio, TX

Session 19

Overview

- **Magnitude of Reserve and Capital**
- **Risk Management Strategies**
- **Potential Impact of Reinsurance**
- **Conclusions**

Magnitude of Reserve and Capital

Assumptions

- **Model assumes direct writer's perspective**
- **M&E, commissions, etc. represent industry average**
- **Single policyholder - male age 65**
- **Equity allocation: 100%**
- **Rider charges:**
 - **ROP: 5 bp**
 - **MAV: 20 bp**
 - **RU: 30 bp**
 - **GMIB: 50 bp**

Magnitude of Reserve and Capital

Reserves at 65CTE

- **ROP GMDB = 0.3%**
- **MAV GMDB = 0.5%**
- **RU GMDB = 1.6%**
- **GMIB = 2.1%**

Magnitude of Reserve and Capital

Capital at 90CTE (in excess of reserves)

- **ROP GMDB = 1.2%**
- **MAV GMDB = 1.7%**
- **RU GMDB = 4.8%**
- **GMIB = 6.7%**

Risk Management Strategies

Product Design

- **Advantages**
 - **Limited only by imagination**
 - **Risk avoidance far easier than risk management**
- **Disadvantages**
 - **Competition impacts product design**
 - **Typically only minor risk reduction is achievable**
- **Eliminate anti-selective features**

		<p style="text-align: center;">Risk Management Strategies</p> <p>Run the Risk</p> <ul style="list-style-type: none"> • Advantages <ul style="list-style-type: none"> - Profit retention - Does not require 3rd party • Disadvantages <ul style="list-style-type: none"> - Full reserves and capital must be held - Only way to limit total exposure is to write less business - Analysts, rating agencies, management - Can you sleep at night?
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		<p style="text-align: center;">Risk Management Strategies</p> <p>Reinsurance</p> <ul style="list-style-type: none"> • Advantages <ul style="list-style-type: none"> - “Perfect Hedge” - typically pays claim exactly - Costs can mirror revenue stream - Flexible structure, yet relatively straightforward • Disadvantages <ul style="list-style-type: none"> - Availability / Cost - Claim limits - Credit risk
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Risk Management Strategies

Static Hedging

- **Advantages**
 - Easily obtained from highly rated counterparties at a predictable cost
 - Does not require huge investment in resources
- **Disadvantages**
 - Accounting mismatch
 - Revenue / cost mismatch
 - Claim payment mismatch (basis risk)
 - Infrequent rebalancing – favors cost over efficiency

Risk Management Strategies

Dynamic Hedging

- **Advantages**
 - Readily available at more predictable cost
 - Theoretically more efficient hedge (vs. static)
- **Disadvantages**
 - Accounting mismatch
 - Revenue / cost mismatch
 - Claim payment mismatch (basis risk)
 - Frequent rebalancing – favors efficiency over cost
 - Buy high / sell low
 - Requires large investment of resources

Potential Impact of Reinsurance

Assumptions

- **GMDB reinsurance**
 - Cost = 3 bp less than retail charge
 - Annual claim limit = 200 bp of AV
- **GMIB reinsurance**
 - Cost = 3 bp less than retail charge
 - Annual claim limit = 10% of GV
 - Annual annuitization limit = 15% of eligible GV

Potential Impact of Reinsurance

Reserve reduction

- **ROP GMDB: 88%**
- **MAV GMDB: 80%**
- **RU GMDB: 73%**
- **GMIB: 98%**

Potential Impact of Reinsurance

Capital Reduction

- **ROP GMDB: 89%**
- **MAV GMDB: 79%**
- **RU GMDB: 45%**
- **GMIB: 97%**

Potential Impact of Reinsurance

Also considered MAV at 20% ITM

- **Reserves 200% (vs. ATM)**
- **Capital 134% (vs. ATM)**
- **Reinsurance reduces reserves by 83% (80% for ATM)**
- **Reinsurance reduces capital by 72% (79% for ATM)**

Conclusions

- Reserves can be 2% of AV or higher
- Capital can be 7% of AV or higher
- Need to ensure appropriate return on capital
- Product design should be a key element in any risk management strategy
- Reinsurance and hedging can reduce reserves and capital - carefully weigh pros and cons of both
 - Hedging can dampen effect of disaster scenario
 - Reinsurance can be more useful for financial statement relief

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TOWERS
PERRIN
TILLINGHAST

How to Make Guarantees on VAs Worth More
than the Paper They're Written on – Impact of
C3P2

SOA Spring Meeting – Session 019PD, 2:00 PM

Jason Kehrberg

June 14, 2004

Outline

- Background, scope, and general approach for RBC C-3 Phase II
- Other considerations when calculating RBC C-3 Phase II
- Our model
- Results
- Updates and conclusion

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Background

- Move to scenario modeling started in early 1990s when asset adequacy analysis became part of the life insurance company reserve opinion
- RBC requirements introduced shortly thereafter were factor-based
- Regulators wanted RBC to better reflect the degree of asset/liability mismatch risk
- NAIC implemented phase I Dec. 31, 2000
 - Addressed interest rate risk for annuities and single premium life
 - Introduced scenario testing to RBC
- NAIC on target to implement phase II Dec. 31, 2004
 - Addresses both equity risk and interest rate risk

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Scope

- Includes
 - Variable annuities
 - Group annuities containing VAGLBs or GMDBs for their equity funds
 - Life insurance contracts with GMDBs for equity fund performance
- Excludes
 - Equity indexed products
 - Separate account products that guarantee an index are covered in another recommendation from AAA
 - Variable life insurance

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General approach

- Aggregate results of running stochastic scenarios through a cash flow testing model
 - Include cash flows from any fixed account options
 - Use prudent best estimate assumptions
 - Must use “calibrated” scenarios to ensure “fat tails”
- Grouping (of funds and of contracts), sampling, number of scenarios and simplification methods are up to the actuary, but subject to ASOPs, documentation and justification
- Use same models as for cash flow testing

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General approach (continued)

- Determine the Additional Asset Requirement (AAR) for each scenario
 - $AAR = - \text{Minimum}[S(t) \times pv(t)], t = 0, 1, 2, \dots$
 - $S(t)$ = statutory surplus at end of year t
 - $pv(t)$ = accumulated discount factor for t years
 - Starting assets = statutory reserves held
 - Modeled statutory reserve = cash surrender value
- Total Asset Requirement (TAR) = AAR + starting assets
- Unlike the 95th percentile standard in Phase I, Phase II uses a Conditional Tail Expectation (CTE) measure

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General approach (continued)

- The TARs are sorted, and the average of the highest 10% (i.e. TAR CTE90) is taken
- C3P2 RBC = TAR CTE90 - statutory reserves held
 - Combined with $C1_{CS}$ for covariance purposes
- A confidential actuarial memorandum/certification containing supporting documentation and justification must be prepared and made available to regulators upon request
 - Appropriate sensitivity tests should be included

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Credit for hedges

- Encourages prudent risk reduction strategies by recognizing:
 - Impact of hedge positions currently held
 - Costs and benefits of expected hedge positions held in the future under an approved hedging strategy
 - Approved hedging strategies must be clearly defined and approved by the board of directors or an authorized committee
 - Basis, gap, price, and assumption risk

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Interest rates

- Interest rates are used for:
 - Discounting future surplus needs,
 - Earnings on projected general account investments
 - GMIB purchase rate margins

- Stochastic
 - One-year treasury rates from an integrated scenario generator are allowed
 - Independent stochastic interest rates can be used if the actuary deems them appropriate
- Deterministic
 - Implied current forward rates from current swap yield curve
 - GMIB results need to reflect the impact of the uncertainty in interest rates

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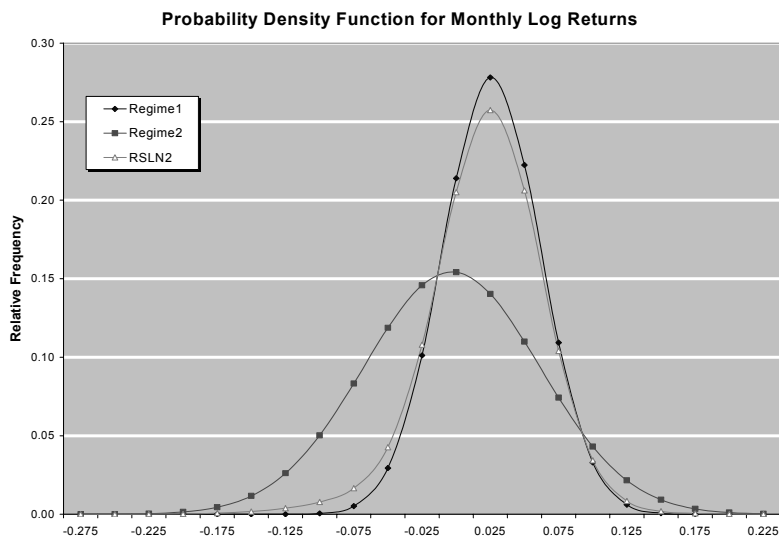
Scenario requirements

- Must meet specified distribution percentiles
 - Based on RSLN2 model & historical S&P 500 returns
 - Don't need to satisfy all calibration points, but you should be satisfied differences won't materially impact capital requirements
- Models that use mean-reversion or path-dependency must be well documented and supported by research

Calibration Point	One Year	Five Year	Ten Year
0.5%	0.65	0.58	0.67
2.5%	0.70	0.66	0.79
2.5%	0.77	0.78	1.00
5.0%	0.84	0.91	1.21
10.0%	0.91	1.07	1.51
90.0%	1.35	2.73	5.79
95.0%	1.42	3.07	6.86
97.5%	1.48	3.39	7.94
99.0%	1.55	3.79	9.37
99.5%	1.60	4.10	10.48

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Example of RSLN2



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Pre-packaged scenarios are available

- A supplement to the proposal provides 10,000 scenarios for the common asset classes typically needed in the stochastic cashflow projections of variable annuities
 - The supplement documents the models and parameters used to develop the scenarios and provides guidance on using them
- | | |
|--|--|
| <ul style="list-style-type: none"> ■ U.S. Treasury yields <ul style="list-style-type: none"> ■ 3-month ■ 7-year ■ 10-year ■ Money market ■ U.S. bonds <ul style="list-style-type: none"> ■ Intermediate-term gov't ■ Long-term corporate | <ul style="list-style-type: none"> ■ Diversified <ul style="list-style-type: none"> ■ Fixed income ■ Balanced ■ U.S. equity ■ International equity ■ Equity <ul style="list-style-type: none"> ■ Intermediate risk ■ Aggressive or specialized |
|--|--|

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Other considerations

- Interest rate risk
 - Recommend that C-3 interest rate risk of the guaranteed fixed fund option be recognized for all VAs in calculating RBC according to methods outlined in the proposal
- Policyholder behavior
 - Absent empirical data, the actuary should set conservative behavior assumptions
 - Prudent best estimate with margin for error directly related to uncertainty in the underlying risk factor
- Aggregation
 - For multiple products, aggregate results within scenarios if possible, else calculate RBC by product and add up
- Representative scenarios

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Alternative factors

- Life insurers offering only VAs with GMDBs may choose scenario testing or an alternative, factor-based approach
- GMDBs provided under group annuity contracts or insurance contracts, and all living benefit guarantees, must be evaluated by scenario testing
- Alternative factors allow an approximate sense of the impact for companies with known exposure data
- Factors will be developed using CTE 90
- Expected that Alternative Methodology will be applied on a seriatim basis
- Still not sure whether 65% or 100% of the MGDB 94 ALB table will be used

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Our model

- Focused on RBC C3-II
- A variable annuity (or segregated fund) model was used to calculate capital requirements
- The model was started one month after issue
 - Effectively ignores point-of-sale costs
- Special statutory reserves
- Specifications and assumptions based on typical variable annuities available in the marketplace
 - (see next two slides)

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Guarantees modeled

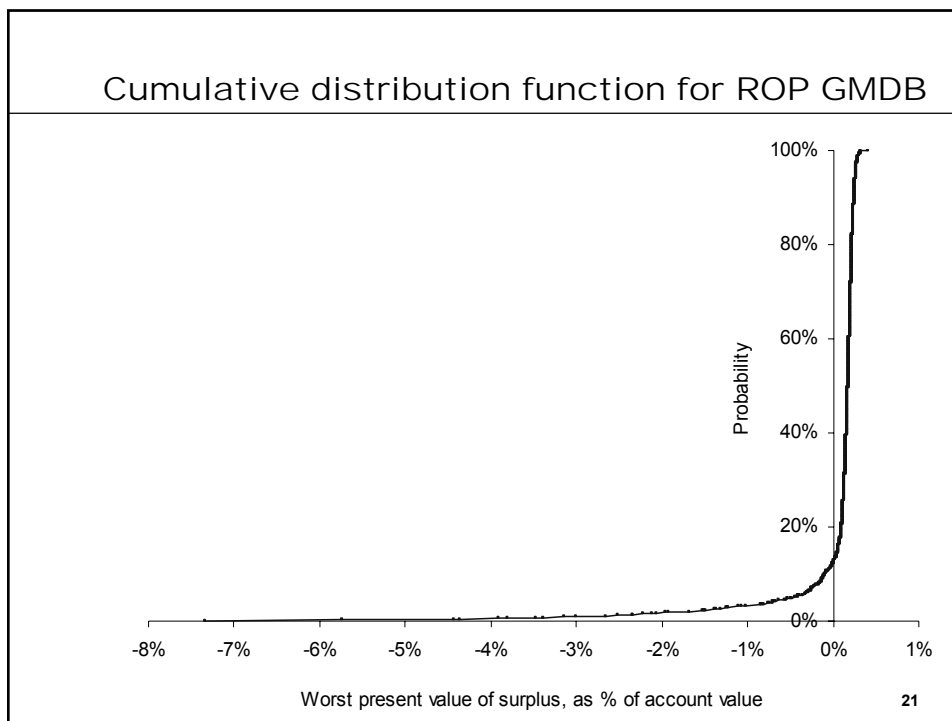
Type	Name	Description	Fees
GMDB	ROP	Return of Premium	5 bps
GMDB	Rollup	5% rollup, capped at 2.5x premium, frozen at age 80	20 bps
GMDB	Ratchet or MAV	Annual ratchet (maximum anniversary value), frozen at age 80	15 bps
GMDB	Max or High	Max (Rollup, Ratchet)	25 bps
GMDB	EDB	ROP + 40% enhanced death benefit (capped at 40% of deposit), incl. ROP	25 bps (20 EDB, 5 ROP)
GMIB	Rollup	5% rollup, capped at 2.5x premium, frozen at age 80, incl. Rollup GMDB	35 bps
GMIB	Max or High	Max (Rollup, Ratchet), both stop at age 75, incl. ROP GMDB	45 bps

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Other key specifications and assumptions for the variable annuity

- Single \$50,000 policy issued to male, aged 65
- 100% invested in S&P 500 Total Return
- M&E risk charge = 1.5% fund value
- Advisory fee = 1.0% fund value
- Fund revenue share = 0.25% fund value
- Surplus earned (discount) rate = 5.77%, 3.75% after-tax
- Annual expenses = \$85 per policy, 0.05% fund value
- Surrender charge = 7, 6, 5, 4, 3, 2, 1, & 0% of premium
- Lapse rates = 2, 4.5, 5, 5.5, 6, 7, 8, 35, 20, & 12.5%
- No front end loads or annual fees

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Results - Duration 0

EXHIBIT 2
Baseline Results - Duration 0

ITM%	GMDB					GMIB	
	ROP	Rollup	Ratchet	Max	EDB	Max	Rollup
100%	1.0%	3.3%	1.1%	3.3%	0.7%	6.0%	7.7%

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Results - Duration 3.5

EXHIBIT 3
Baseline Results - Duration 3.5

ITM%	GMDB					GMIB	
	ROP	Rollup	Ratchet	Max	EDB	Max	Rollup
60%	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%	0.3%
80%	0.0%	0.3%	0.1%	0.3%	0.0%	2.3%	2.1%
100%	0.3%	1.3%	0.2%	1.1%	0.2%	6.0%	7.9%
120%	1.5%	3.9%	0.8%	3.6%	1.1%	13.4%	16.1%
140%	3.0%	7.8%	2.1%	7.3%	2.6%	22.1%	24.6%

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Results - Duration 6.5

EXHIBIT 4 Baseline Results - Duration 6.5							
ITM%	GMDB					GMIB	
	ROP	Rollup	Ratchet	Max	EDB	Max	Rollup
60%	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%	0.2%
80%	0.0%	0.1%	0.0%	0.0%	0.0%	1.7%	1.3%
100%	0.0%	0.4%	0.0%	0.2%	0.0%	3.0%	5.9%
120%	0.3%	1.5%	0.1%	0.9%	0.2%	7.9%	14.1%
140%	1.0%	3.9%	0.5%	2.4%	0.8%	15.4%	23.5%

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Results - Duration 9.5

EXHIBIT 5 Baseline Results - Duration 9.5							
ITM%	GMDB					GMIB	
	ROP	Rollup	Ratchet	Max	EDB	Max	Rollup
60%	0.0%	0.0%	0.0%	0.0%	0.0%	2.4%	0.3%
80%	0.0%	0.0%	0.0%	0.0%	0.0%	2.5%	1.8%
100%	0.0%	0.3%	0.0%	0.1%	0.0%	3.7%	7.4%
120%	0.2%	1.1%	0.1%	0.5%	0.2%	9.3%	16.5%
140%	0.6%	2.9%	0.4%	1.4%	0.5%	18.1%	26.1%

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Current C-1 and C-3 RBC

EXHIBIT 6**Current C-1 and C-3 RBC (as a percentage of account value)**

Dur- ation	GMDB	GMIB
0	0.57%	1.57%
3.5	0.07% for ITM 60%, 80%, and 100% 0.32% for ITM 120% and 140%	1.07% for ITM 60%, 80%, and 100% 1.32% for ITM 120% 2.32% for ITM 140%
6.5	0.02% for ITM 60%, 80%, & 100% 0.08% for ITM 120% and 140%*	1.02% for ITM 60%, 80%, 100%, & 120% 2.05% for ITM 140%
9.5	0.00%	1.00% for ITM 60%, 80%, 100%, & 120% 2.00% for ITM 140%

* for duration 6.5, the MAV and HIGH GMDB products had factors of 0.02% for all ITM percentages

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Sensitivity tests

EXHIBIT 7 – Results of Sensitivity Tests (duration 0)

Sensitivity	GMDB					GMIB	
	ROP	Rollup	Ratchet	High	EDB	High	Rollup
Baseline	1.04%	3.27%	1.11%	3.25%	0.73%	5.99%	7.68%
No fees	1.13%	3.81%	1.44%	3.93%	1.44%	6.11%	7.98%
Reserve = fund value	0.04%	0.93%	0.07%	0.93%	0.04%	2.57%	3.73%
100% Female	0.57%	1.52%	0.53%	1.47%	0.36%	5.95%	7.25%
Issue age 55	0.32%	0.74%	0.26%	0.69%	0.18%	6.26%	7.02%
Issue age 75	2.90%	5.47%	3.71%	5.65%	2.57%	2.79%	4.58%
110% baseline mortality	1.16%	3.75%	1.28%	3.74%	0.83%	6.00%	7.79%
100% 2000 annuity table	1.00%	3.32%	1.08%	3.30%	0.73%	5.97%	7.67%
110% baseline lapses	1.01%	3.02%	1.06%	2.99%	0.71%	5.60%	7.29%
No dynamic lapses	0.88%	1.87%	0.84%	1.79%	0.59%	4.88%	5.39%
Flat purch int rate 3.68%	NA	NA	NA	NA	NA	8.79%	10.7%
10yr life certain annuity	NA	NA	NA	NA	NA	4.35%	5.88%
No dynamic annuitization	NA	NA	NA	NA	NA	1.78%	3.88%
Cap rollups at 2.0 x prem	NA	3.16%	NA	3.13%	NA	5.99%	7.68%
4% rollup percentage	NA	2.29%	NA	2.30%	NA	5.06%	5.80%

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The total asset requirement can be quite volatile

- C3P2 capital can vary substantially from period to period due to market movements
 - Excess asset requirements can change significantly as guarantees move from 20% ITM to 20% OTM
 - From a fraction of a percent to several percent for GMDBs
 - From one or two percent to the low or mid teens for GLBs
 - Views vary as to whether this volatility is desirable or not
- Potential methods to dampen volatility
 - Use a range for CTE(α), e.g. $0.85 \leq \alpha \leq 0.95$
 - Objectively defined, not subject to manipulation
 - Use a weighted average of capital standards over time
 - E.g. a weighted average of the current quarter result and the previous three quarters
 - Take advantage of “good” fluctuations to build a buffer that could then be gradually released

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Variable annuity reserve working group

- Would revise the statutory reserve standards and methodology for variable annuities to make them consistent with the C-3 Phase II approach.
- The reserve methodology being developed, if adopted, could be applicable to all variable annuity products.
- Such a methodology could replace, where appropriate, the application of Actuarial Guideline XXXIII to variable annuity contracts and totally replace Actuarial Guidelines XXXIV and XXXIX.

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The standard scenario alternative minimum

- In addition to stochastic scenario analysis, insurers would be required to perform a seriatim valuation using a “single standard scenario”, which would have prescribed fund returns and liability (actuarial) assumptions.
 - There would be a single scenario “floor” for VA RBC and another single scenario “floor” for VA reserves.
 - The reserve scenario result could be a floor reserve, such that reserves would be the larger of the standard or the stochastic results.
- Advantages
 - Regulators could compare the standard results for different companies.
 - The standard scenario could be used to get a “formula” reserve on a policy by policy basis.

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The standard scenario alternative minimum
(continued)

- With regard to the equity scenario, the capital scenario has a 20% drop in year one, followed by annual returns equal to 10-year treasury plus 0.50%.
- Some are okay with the concept for reserves, but not for capital. Regulators respond that companies already do seriatim valuations for AG 34, so what's the big deal?
- They probably will not include the standard scenario for RBC in order to get year-end 2004 adoption, but will probably continue working on it for reserves.

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Conclusions

- The AAA has put considerable effort into the proposal
 - Addresses the shortcomings of factor-based approaches to setting capital
- Adopting the proposal will require significant effort in order to avoid the likely higher capital requirements associated with the alternative method factors
 - Regardless, capital required under the proposal will likely be higher than that previously required
- Companies will be affected differently, depending on product design, asset mix and economic conditions
 - Companies with substantial enhanced VA guarantees could face significant RBC at today's equity market levels

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Conclusions (continued)

- Companies are likely to much more closely examine and implement risk management strategies
 - Greater use will be made of asset allocation mixes and hedging, otherwise fees necessary to provide for the additional capital may become prohibitive
- Far from being just another regulatory requirement, this approach can provide companies with a far better understanding of their risk exposure
 - Enabling companies to price products appropriately and find the best risk mitigation strategies

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