Earnings at Risk: Real-world Risk Management

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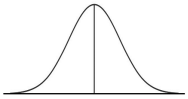
Jay Glacy
Cindy Sarna

Allstate
You're in good hands.

A VaR Refresher

- A monthly VAR of $10 million means that there is a 5% chance of "loss" in excess of $10 million.
- VaR = μ - 1.65σ.
- A fair-value metric.
- Of limited usefulness and determinability for life insurers.



Braving the Complexity Blizzard

- "Alphabet soup"
  - C-3a, SarbOx, OCI, 99-20, FAS 133, *et al*
- Can we strengthen the actionability of management information?
- Can we move decisioning away from subjective rules of thumb to a rigorous framework enabling optimality?

Shortcomings of Duration

- A fair-value, not accounting-based, metric
- Duration is a terminal or wind-up value
- Neglects important elements
  - Franchise value (renewal premiums, new issues)
  - Effects of reinvestment
- Does not capture distribution of value
- Need a different metric for other risk factors
- A trillion ways to create a portfolio of D = 5

Why Earnings at Risk?

- GAAP is how we measure the economic performance of a company.
- GAAP results explain 96% of the share price movements of life insurers.
- Investors prefer smooth, predictable and rising earnings.
- A direct connection to share price through analysts' DDM valuations.
- Low turnover requires understanding of how assets accommodate liabilities over time.

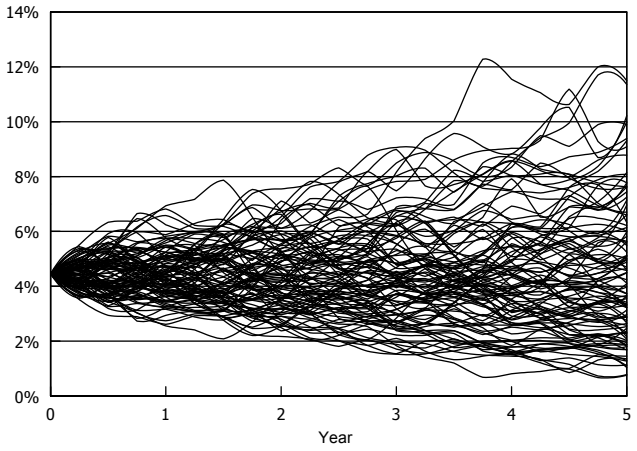
The Earnings at Risk Concept

- A concise measure of downside risk
- Built on existing ALM and CFT platforms
- Expresses results in accounting terms
- Captures all financial risks concurrently
- Proportionalizes exposures to various risks
- Enables a rich array of what-if exercises

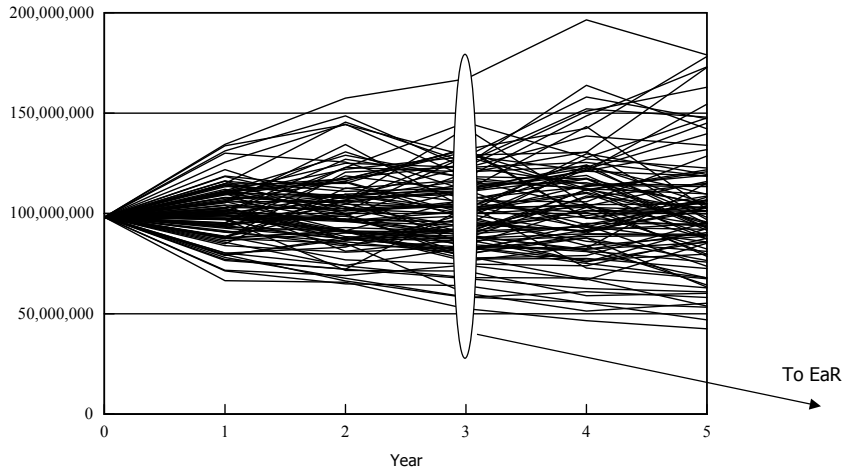
Key Functionality

- Robust economic scenario generation
  - Interest rate
  - Equity market
  - Credit
  - Mortality
  - Policyholder behavior
- Robust GAAP functionality
  - FAS 91: MBS amortization
  - FAS 97: dynamic DAC management
  - FAS 115: accounting for investments

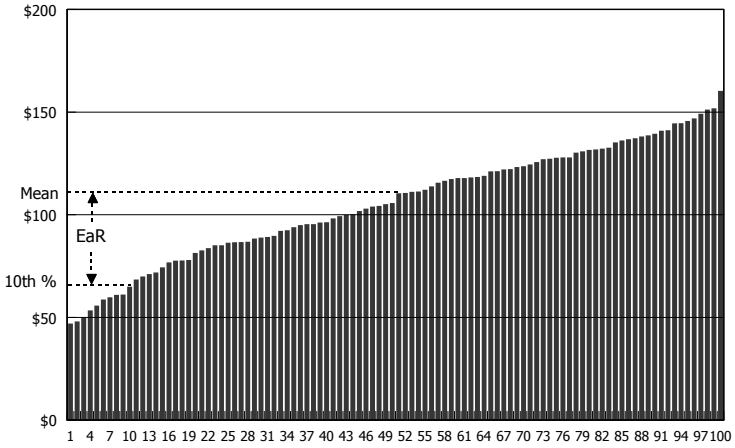
Evolution of 10-year Treasury Rates



Emergence of GAAP Earnings



Cross-section of Year 3 GAAP Net Income

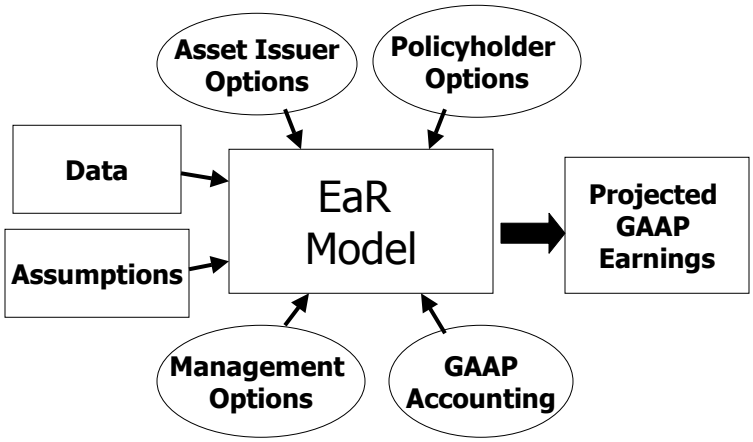


Implementation

Calculation of EaR

- EaR results from the convolution of the probability distributions of the individual risk factors
- In simple cases, closed-form solutions may be available
- However, business complexity in the insurance industry necessitates Monte Carlo simulation

Causes of Complexity



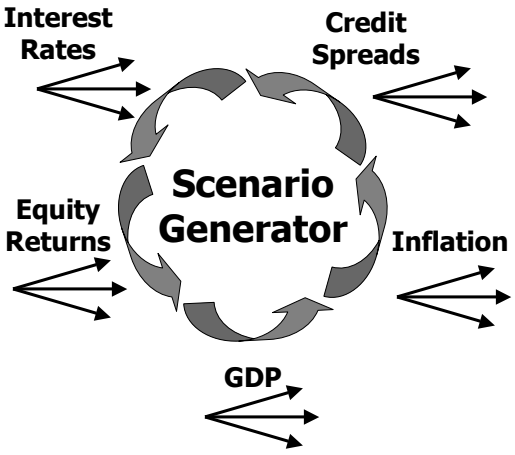
Calculation of Insurer EaR
(via Monte Carlo simulation)

- Need stochastic projection-type scenarios that
  - Include all relevant risk factors (capital market and other)
  - Extend over all modeling intervals
- Financial results are projected for each scenario
- EaR is observed from cumulative probability distribution of the resulting earnings outcomes
- Diversification Benefit =

  Multi-factor EaR – Σ Single-factor EaR

Capital Market Scenarios

- Scenarios should reflect company's capital market forecast
- Risk-neutral basis is not appropriate for EaR analysis
- Projected risk factors must be correlated



Modeling Credit Risk

- Stochastic credit drift and defaults
  - Asset by asset
  - Each month, determine whether rating stays or changes or asset defaults
- Use historical data to determine transition probabilities
- Probabilities vary with economic state
- Economic state correlates with other market risk factors

Modeling Insurance Risks

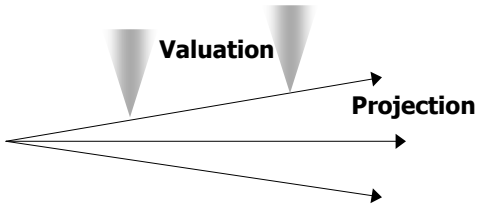
- Conceptually just another risk factor, like a bond subject to "death"
- Little established use in life insurance industry
- Mortality is best candidate
  - Reasonably well understood
  - Large volume of data -- good statistical credibility
  - Correlation with other risks probably immaterial

Modeling GAAP Accounting Treatments

- FAS133 – accounting for derivatives
- FAS97 – dynamic DAC unlocking
- FAS91 – amortization of premium or discount
- FAS115 – accounting for debt and equity securities

Nested Scenarios

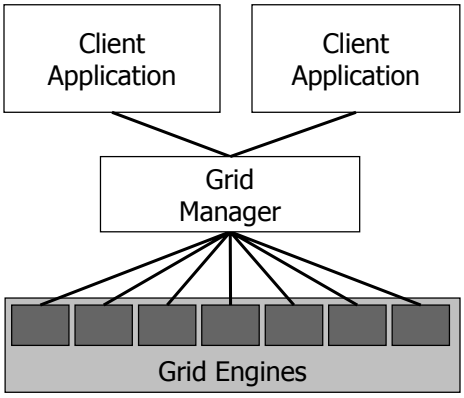
- Two types of scenarios
  - *Projection* scenarios -- projections of future outcomes
  - *Valuation* scenarios -- for asset valuation, reserve calculations, dynamic DAC unlocking



Software Application Decision

- Enterprise solution vs. specific use
  - Multi-user; Scalability
- Run times
  - Number of scenarios; Level of granularity
- Buy or Build
  - Vendor software; On-going support

Grid Powers EaR Analytics



Clients originate business processing

Managers distribute processing to engines

Engines perform specific calculations

Applications

Applications Enabled

- Strategic asset allocation
- Strategic line-of-business decisioning
- Inforce management strategizing
  - Dynamic liability repricing
  - Reinvestment/financing
  - Risk management
- Business planning exercises

Risk Decomposition Table

	Interest Rates	Credit	Equity Markets	Capital Markets Diversification Benefit	Total
Line A	50	40	30	10	110
Line B	40	40	40	50	70
Line C	30	40	50	10	110
Product Mix Diversification Benefit	20	30	20	70	
Total	100	90	100		290

Applying Optimization

- Optimization decision variables
  - Model time 0
    - Asset allocation
    - Business line mix
    - Derivatives (caps, floors) overlay
  - Model time 1+
    - Reinvestment/financing strategy
    - Renewal crediting strategy
    - New business generation algorithm

Optimization in Action

Microsoft Excel - EaR

File Edit View Insert Format Tools Data Window Help

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	A	B	C	D	E	F	G
1	**Earnings at Risk Illustration**	0	1	2	3	4	5
2							
3	Capital Markets						
4	S&P 500 Total Return	-	25.20%	12.81%	11.33%	-28.19%	28.56%
5	One-Year Spot	3.00%	2.98%	2.97%	3.20%	3.90%	4.10%
6	Five-Year Spot	4.00%	4.00%	3.92%	3.99%	4.98%	5.30%
7							
8	GIC						
9	Market Value of Asset	50.00	53.00	56.14	58.63	59.72	62.43
10	Fair Value of Liabilities	50.00	52.32	54.54	56.25	57.65	59.67
11	Scenario Net Income	-	0.69	0.92	0.78	-0.31	0.68
12							
13	VA						
14	Market Value of Asset	50.00	62.60	70.62	78.62	56.46	72.58
15	Fair Value of Liabilities	50.00	62.40	70.14	77.81	55.56	71.21
16	Scenario Net Income	-	0.20	0.28	0.33	0.08	0.48
17							
18	GIC + VA						
19	Scenario Net Income	-	0.89	1.19	1.11	-0.23	1.16
20	Mean Net Income	-	0.70	0.80	0.80	0.91	1.00
21	SD Net Income	-	0.46	0.46	0.51	0.54	0.61
22	EaR	-	0.60	0.58	0.66	0.70	0.77

By Changing

Minimize