

Economic Capital Models

Regulatory Perspective

Panelist: Alan Seeley

Regulatory Capital vs. Economic Capital

- **Regulatory capital** is the capital an insurer must have in order to avoid regulatory intervention

Current U.S. System for Determining Regulatory Capital

- RBC (Risk-Based Capital) system in place since 1990's
- Separate standardized RBC models for P&C vs. Life vs. Health
- Not calibrated to confidence levels, time horizons, etc.
- RBC applied at solo entity level, not group level
- Company ("internal") models not allowed for determination of regulatory capital, other than for a few prescribed components of the standardized RBC model

Global Winds of Change

- European Union develops Solvency II, a "state of the art" insurance regulatory system
- International Association of Insurance Supervisors (IAIS) emerges as the global standard setter for "best practices" in insurance regulation
- Development of international financial reporting standards based on fair value accounting and explicit risk provisions

Solvency II

- Allows companies to determine their loss reserves ("technical provisions") and regulatory capital by either the "European Standard Formula" or by the company's own internal models
- Two levels of regulatory capital:
 - Solvency Capital Requirement ("SCR") for avoiding regulatory intervention
 - Minimum Capital Requirement ("MCR") for avoiding regulatory shut-down
- SCR calibrated to 99.5% probability of company meeting its obligations over next 12 months, using a Value-at-Risk measure
- Requires explicit risk margins in reserves, market-consistent valuation of assets and liabilities, and tiering of capital instruments according to their quality
- Encourages companies to develop an ERM culture through an "Own Risk and Solvency Assessment" (ORSA)
- Promotes regulatory oversight of insurance groups
- Solvency II is scheduled to be implemented in late 2012

Bermuda

- New risk-based solvency regime includes key components of Solvency II and IAIS
- Introduces "Bermuda Solvency Capital Requirement" (BSCR), a risk-based standardized regulatory capital model tailored to the P&C insurers and reinsurers predominant in Bermuda's market
- Requires companies to conduct specific stress tests
- Intends to introduce allowance for internal models in lieu of BSCR
- Intends to introduce group solvency capital requirements
- Full implementation by 2012

NAIC's "Solvency Modernization Initiative" (SMI)

- Critical self-examination of U.S. regulatory regime in light of international developments in solvency regulation
- Will include enhancements to current RBC models
- Will also consider whether (or how) to...
 - Include ORSAs and internal economic capital assessments into regulatory framework
 - Revise (or abandon) prudential statutory accounting
 - Enhance supervision of insurance groups

SMI Potential Enhancements to RBC

- Calibrate RBC to specified confidence levels
- Re-examine structure of risk factors
- Introduce catastrophe modeling into P&C RBC
- Expand market risk modeling in Life RBC
- Improve the calculation of covariance credits
- Retool regulatory intervention levels such as "Company Action Level" and "Mandatory Control Level"
- Develop RBC for title, mortgage guarantee, financial guarantee lines

SMI

Internal Economic Capital Models

- Solo entity models...
 - Likely to be used as additional input in risk-focused surveillance of insurers
 - Not likely to be allowed to substitute for RBC regulatory capital:
 - Most state regulators lack expertise to properly review internal models
 - Many regulators consider RBC to be "road tested" and effective at minimizing insolvencies
- Group models...
 - Likely to be used as input in yet-to-be-developed supervision/surveillance of insurance groups
 - U.S. regulators currently disinclined to develop group capital requirements

Casualty Actuarial Society's 2010 Spring Conference

Rating Agency Perspective on ERM & Economic Capital Models

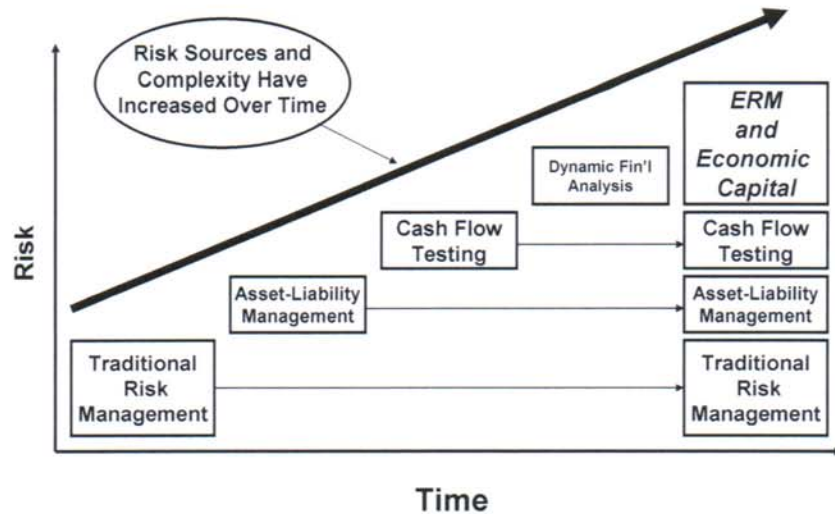
Stefan Holzberger CPA, ChFC
A.M. Best Company
May 2010



Discussion

- A.M. Best's ERM Framework
- Best's Capital Adequacy Ratio (BCAR)
- Economic Capital Models (ECM)
- Factoring ERM / ECM into Best's Credit Ratings

Insurance Industry Continues to Respond to Risk Dynamics



Enterprise Risk Management

- ERM is the process through which insurers identify, quantify, and manage risk on an enterprise wide basis.
- The underlying premise of ERM is based on increasing value to shareholders and providing financial security to the organization.

Best's Five Major Categories of Risk

Credit	Market	Underwriting	Operational	Strategic
<ul style="list-style-type: none"> ■ Default ■ Downgrade ■ Disputes ■ Sovereign ■ Concentration 	<ul style="list-style-type: none"> ■ Equities ■ Other assets ■ Currency ■ Concentration ■ Basis ■ Reinvestment ■ Liquidity ■ ALM ■ Interest rate sensitivity 	<ul style="list-style-type: none"> ■ Underwriting process ■ Pricing ■ Reserve development ■ Product design ■ Frequency ■ Severity ■ Lapse ■ Longevity ■ Mortality and morbidity ■ Policyholder optionality ■ Concentration ■ Economic environment 	<ul style="list-style-type: none"> ■ Monetary controls ■ Financial reporting ■ Legal controls ■ Distribution ■ IT systems ■ Regulatory ■ Training ■ Turnover ■ Data capture 	<ul style="list-style-type: none"> ■ Competition ■ Demographic/social change ■ Negative publicity ■ Rating downgrade ■ Customer demands ■ Regulatory/political capital

5

Enterprise Risk Management

ERM in the Rating Evaluation	Need for ERM based on...
<ul style="list-style-type: none"> • Not a separate component • Impacts all three areas of the rating evaluation <ul style="list-style-type: none"> –Capitalization –Operating performance –Business profile • Integrated into agenda • Clearly the potential to weigh heavily on a rating 	<ul style="list-style-type: none"> • Complexity of a company <ul style="list-style-type: none"> –Type of products offered –Number of products offered –Investments • Volatility of Earnings/potential significant capital loss (Risk profile) • Financial Flexibility • Strength of its Traditional Risk management

6

Sample ERM Questions

ERM — Culture

- To what extent does your company engage in risk management?
- What is your company's risk appetite and how is it established?

ERM — Identification and Management

- Are risks evaluated in an integrated framework?
- How does the company govern and control its top risk exposures?
- Identify your organization's largest risk scenarios
 - How are they monitored/mitigated?

ERM — Measurement of Risk

- How is risk quantified within the organization?
 - What models/data are used? Scenario testing?
- How are economic, geographic, regulatory, legislative and judicial risks handled?
- What capital modeling is performed?
- How is correlation contemplated among the top risks?

7

Impact of ERM on the Rating

ERM will benefit a company in one of two ways:

- ERM will motivate the company to reduce risk
 - Shift its business strategy away from volatile lines
 - Maximize efficiency of reinsurance purchases to protect the balance sheet
 - Choose less volatile investments
- ERM will motivate the company to require higher returns for its existing risk
 - Charge higher rates for high severity lines of business

8

BCAR - Structural Overview

$$\text{BCAR Ratio} = \text{Economic Surplus} / \text{Net Required Capital}$$

Economic Surplus (APHS)

Reported Surplus (PHS)

Equity Adjustments:

 Unearned Premiums

 Loss Reserves

 Assets

Debt Adjustments:

 Surplus Notes

 Debt Service Requirements

Stress Test Adjustments:

 Future Operating Losses

 Potential Catastrophe Exp.

 Other

Net Required Capital

Gross Required Capital (GRC):

 (B1) Fixed Income Securities

 (B2) Equity Securities

 (B3) Interest Rate

 (B4) Credit

 (B5) Loss and LAE Reserves

 (B6) Net Premiums Written

 (B7) Off-Balance Sheet

Less Covariance Adjustment

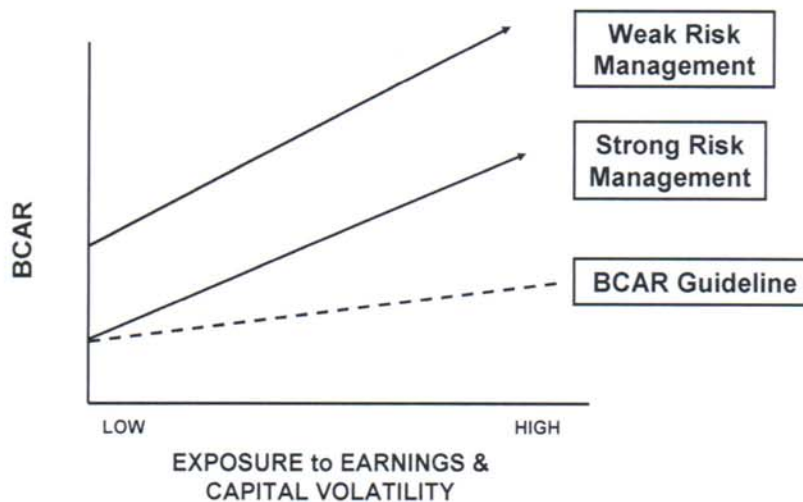
= Net Required Capital (NRC)*

$$*NRC = \sqrt{(B1)^2 + (B2)^2 + (B3)^2 + (0.5 \cdot B4)^2 + [(0.5 \cdot B4) + B5]^2 + (B6)^2} + B7$$

9

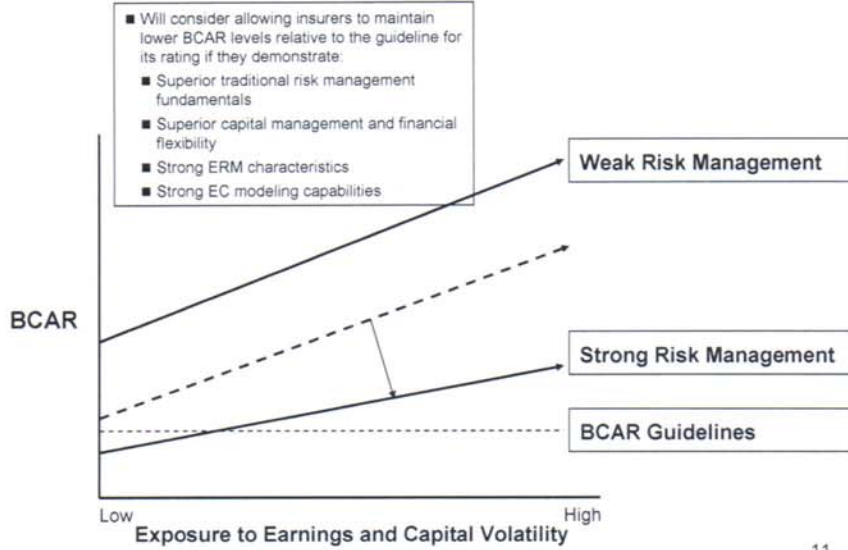
Risk Management and BCAR

Best's Traditional Approach



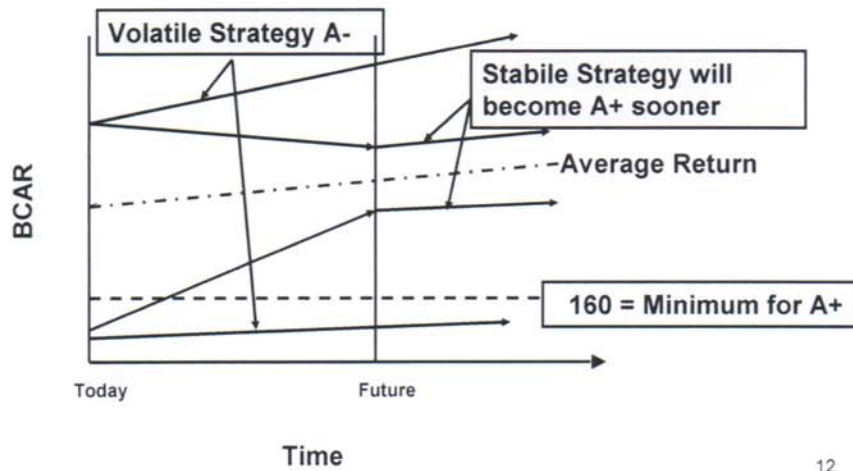
10

Best's Revised BCAR Approach



11

Impact of ERM - Changing Business Strategy To Reduce Volatility



12

Role of BCAR

- **BCAR lives on as a baseline for the assessment of risk-adjusted capital for all insurers**
 - Similar role to regulatory “standard” formula
 - One of many factors in assessment of Balance Sheet Strength
 - Many organizations do not have the scale and sophistication to support an Internal Capital Model
 - Value of BCAR in rating process proven over time through our default statistics
 - Operating Performance and Business Profile round out rating evaluation

13

Economic Capital Models

- **ERM Methodology**
 - *“A.M. Best will be expanding the use of company-provided capital models in developing capital requirements within the rating evaluation process.”*
 - How will AMB integrate internal economic capital model results into the rating analysis?

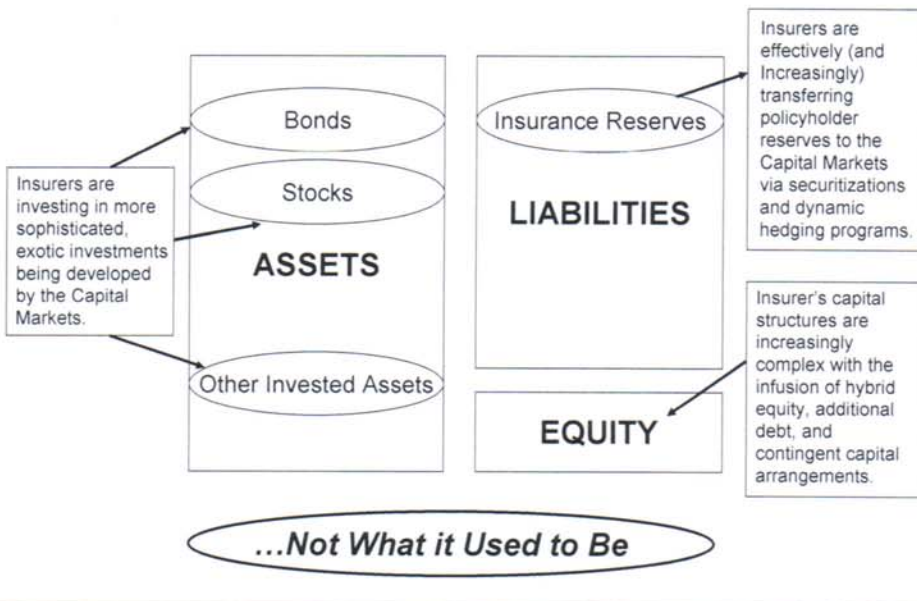
14

Economic Capital Models

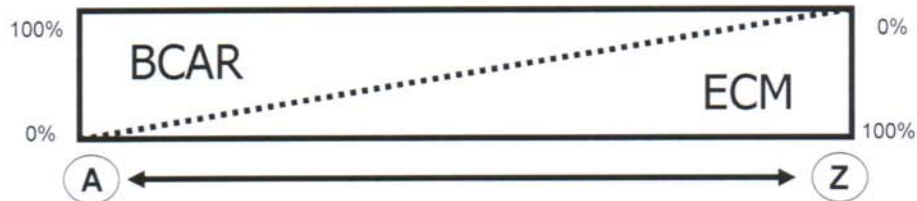
Understanding the ECM	Discussion Points	Additional Questions
<ul style="list-style-type: none"> • AMB review not an audit • Objective is to better understand ICM vs. BCAR or other metrics • Compare gross & net ECM results to BCAR <ul style="list-style-type: none"> –Pre-diversification –By LOB –By major risk type • Reconcile results for current time period and understand trends 	<ul style="list-style-type: none"> • Modeling approach for each major risk type • Valuation method • Time horizons • Risk metric VaR-TVaR-CTE • Assumptions & assumption development process • Stress & scenario testing • Copulas • Timeliness and availability of data 	<ul style="list-style-type: none"> • Applicability of data • Sample length and relevance • Operational, strategic and emerging risks • Disclosure • Parameter and model error • Audit findings • Fungibility of capital • Next steps in ICM development • Sensitivity & Key assumptions

15

Insurance Industry Balance Sheet



How will Best integrate ECM results in the rating analysis?



For Now:

- Qualitative credit given on a case-by-case basis
- ERM / ECM must be proven over time
- Many companies have gone back to the drawing board
- Discipline will continue to evolve, as will our methodology

17

Questions & Comments Welcome



Stefan Holzberger CPA, ChFC
908-439-2200 x 5699
stefan.holzberger@ambest.com



18

**Economic Capital Modeling
Building and Using an Internal Company Model**

Casualty Actuarial Society
Spring Meeting, 2010

Mark A. Verheyen, FCAS, ASA, CERA, MAAA



**Building And Using An
Internal Company Model**

Disclaimer

- The purpose of this presentation is to provide information, rather than advice or opinion. It is accurate to the best of the speaker's knowledge as of the date of the presentation. Accordingly, this presentation should not be viewed as a substitute for the guidance and recommendations of a retained professional. In addition, CNA does not endorse any coverages, systems, processes or protocols addressed herein unless they are produced or created by CNA.
- To the extent this presentation contains any examples, please note that they are for illustrative purposes only and any similarity to actual individuals, entities, places or situations is unintentional and purely coincidental. In addition, any examples are not intended to establish any standards of care, to serve as legal advice appropriate for any particular factual situations, or to provide an acknowledgement that any given factual situation is covered under any CNA insurance policy. Please remember that only the relevant insurance policy can provide the actual terms, coverages, amounts, conditions and exclusions for an insured. All CNA products and services may not be available in all states and may be subject to change without notice.
- CNA is a registered trademark of CNA Financial Corporation. Copyright © 2010 CNA. All rights reserved.

**Step 1 – Pick a Frame of Reference
or... “Never confuse an accounting convention with reality”**

Accounting is important to consider

- Drives regulatory capital models
- Drives rating agency capital models
- Drives investor views
- Drives management views

But current U.S. accounting frameworks have issues...

- GAAP / Statutory accounting fail to recognize underlying economics / cash flows
 - The IRS recognized the value of discounting P&C reserves in 1986, FASB still hasn't
- Fails to recognize prudent risk management
 - Matching long duration liabilities with long duration assets manages interest rate risk
 - Matching long duration liabilities with long duration assets increases volatility in GAAP Equity and Statutory Surplus

What accounting / economic framework do you want to use?

3

**Step 2 – Make a Decision on Taxes
or... “Heads – the IRS wins; Tails – the company loses”**

How do you want to treat taxes in your economic capital model?

- The Deferred Tax Asset includes operating and capital loss carry-forwards
 - Serves essentially as the “Tax-Affecting” item in the balance sheet when tax accounting and statutory / GAAP accounting disagree, converting a \$100 pre-tax loss into a \$65 after-tax loss via a \$35 increase in the DTA (vastly oversimplified accounting here!)
- The DTA exists until the company doesn't, so to speak
 - GAAP applies a “more likely than not” test to realizability
 - Statutory follows this, but applies additional limitations (1 year realizable/10% of surplus)
 - At some magnitude of loss the DTA goes from being worth a lot to being worth nothing

4



Step 3 – Incorporating the Time Value of Money or... “Everything looks fine if you just change the discount factor”

The only clear consensus on discounting is there is no clear consensus.

- RBC – No adjustment to stat surplus for embedded discount, reserve risk charges reduced for investment income offset (less capital needed because of discounting)
- S&P – Embedded discount calculated using 10-year treasuries, and reduced by 1/3; discount added to surplus (the company has more actual capital because of discounting)
- A.M. Best – Tax-effected embedded discount added to surplus; capital factors applied to discounted reserves as well (the company has more capital and needs less)
- International Actuarial Association Risk Margin Working Group “Risk Free” Alternatives
 - Government bond rates
 - Government bond rates plus an adjustment to approximate corporates
 - Corporate bond rates minus an adjustment for defaults
 - Swaps / Adjusted Swaps

5



Step 4 – Parameterizing and Backtesting a Model or... “It’s probably not 1 in 1000 if it happened last Tuesday”

How do I know my model is reasonable?

Sources of data

- Internal company volatility
 - Most appropriate but how credible is all the data?
- Rating agency / regulatory analyses
 - Schedule P line level limitations, but a broad swath of data
- Other sources?

But, how do you incorporate correlations and systemic estimation errors across lines?

- Generic correlation matrices and copulas are useful for thickening the tail of the distribution, but are they useful for managing risk?
- Can you build a model that parameterizes the shared sources of uncertainty?
 - Loss trend across lines
 - Expansion or contraction in terms & conditions
 - Management bias

6



Step 5 - Uses

Or... “If you build It, will they come?”

- Risk-adjusted performance measures
 - By line, by geography, etc.
- Reinsurance purchasing
 - How much risk is too much?
 - How best to lay off risk
- Commutation pricing
 - Reserve risk / credit risk trade-off
- M&A
- Share buybacks
- Others?

7



Step 6 – Fungibility of Capital

or... “Who ordered mushrooms?”

- Does group capitalization matter?
 - Clearly it does if you're a shareholder
 - Not so clearly if you're a local regulator and said group capital is in another country
- How should you recognize a modeled capital shortfall in a subsidiary?
 - Do you assume the parent makes up shortfalls?
 - Do you assume the parent makes up shortfalls... to a point?
 - Do you assume the parent lets the subsidiary go?

8



Step 7 – Operational Risk

Or... “What do we do if there are parts left over?”

- No standard definition of operational risk for insurance companies
- Banking definition (Basel II) includes:
 - **Intentional mismarking of position – isn’t this underreserving?**
 - **Model error – two words.... Hurricane Katrina**
 - **Outsourcing – delegated underwriting authorities, anyone?**
 - **Fraud – we’ve got that one too!**
 - **Lack or Failure of Internal Controls – anyone ever read the Dingell report, “Failed Promises”?**
- Significant aspects of operational risk are embedded in insurers’ underwriting results already
- Adequate backtesting and incorporation of parameter risk / market cycle effect encompasses many areas considered operational risk

Economic Capital: One Practical Approach

Gene Connell, Senior Vice President – Actuarial
Erie Insurance Group

Casualty Actuarial Society Spring Meeting – June 2010



Perspective

- Erie Insurance
 - Regional Reciprocal
 - \$4 billion net written premium
 - \$5 billion in surplus
 - \$10 billion in invested assets
 - Large enough to spend on hardware, software and data
 - Small enough to want a very practical approach
 - Note: All the following examples and charts are illustrative. The data has been changed for presentation purposes.

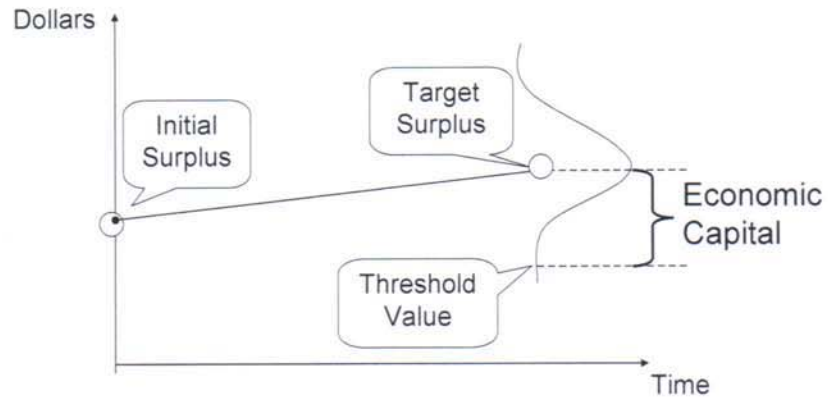
Questions

- What is economic capital?
- How do we measure it?
- What do we use it for?
 - Does anyone else understand it or care?

“Traditional” Required Capital

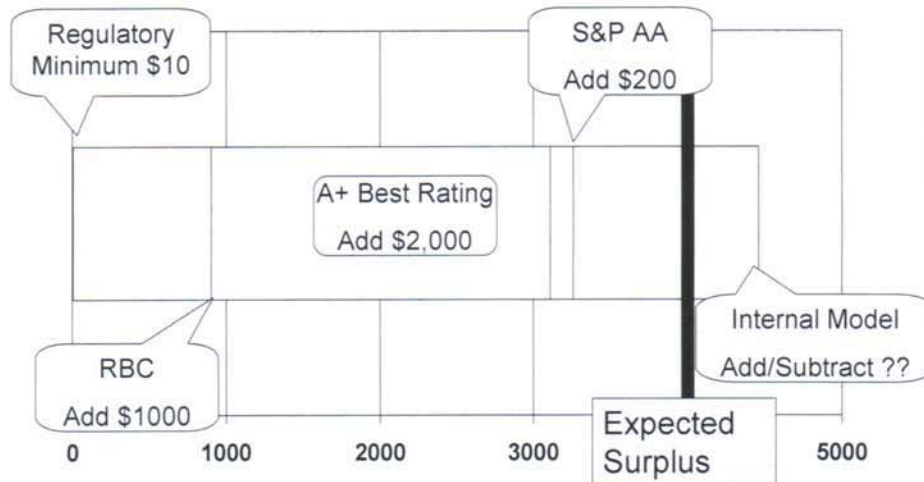


Economic Capital



Threshold example: 95% degree of confidence that there'll be no need for regulator intervention in one year.

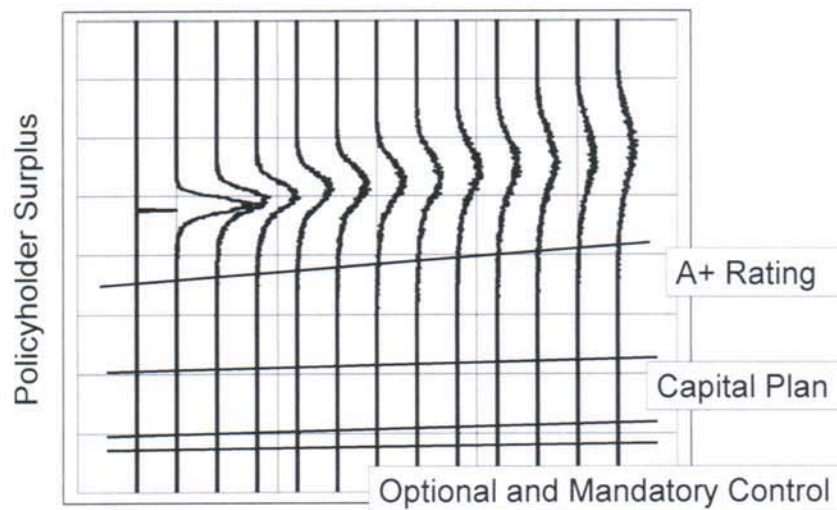
Revised View of Required Capital



How To Measure EC

- Generate a range of results
 - Simulation (Monte Carlo)
 - Modeled distributions
- Threshold choices
 - Probability of ruin
 - Best, S&P ratings
- Technical approach choices
 - VaR, TVaR, etc.
 - Confidence level and time horizon

Forecasts and Distributions



What Do We Do With EC?

- Does anyone else understand it or care?
- External Agencies – for sure
- Internal?
 - Communication/education
 - Risk appetite discussion
 - Can change decision making behavior

Management Communication

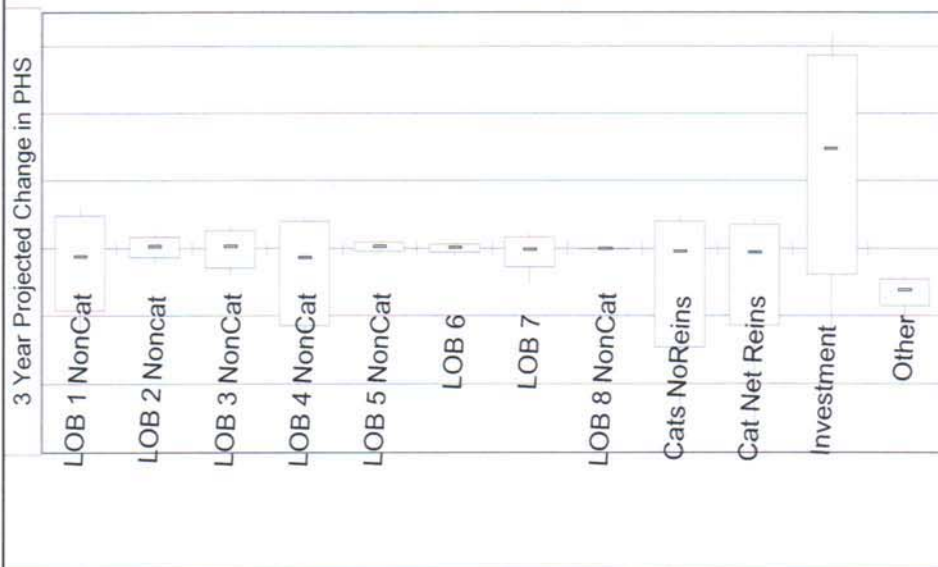
<u>Surplus Change</u>	<u>In 1 Year</u>	<u>In 2 Years</u>	<u>In 3 Years</u>
Surplus Gain	80%	86%	89%
0-10% loss	15%	8%	6%
11-20% loss	3%	3%	2%
21-30% loss	0.7%	1%	1%
31-40% loss	0.1%	0.6%	0.7%
41-50% loss	0.0%	0.2%	0.3%
51-60% loss	0.05%	0.06%	0.12%
61-70% loss	0.02%	0.02%	0.08%
71-80% loss	0.00%	0.01%	0.02%
81-90% loss	0.00%	0.00%	0.02%
91-99% loss	0.00%	0.001%	0.001%
Insolvency	0.001%	0.002%	0.002%

More Questions

- Management asks “Why?”
 - Identify source of risk to surplus target
 - Identify mitigation strategies and evaluate them
 - Obvious example: Reinsurance
- Evaluate alternative operational/strategic choices
 - Investment, geographic expansion
- Incorporate into pricing, performance metrics

Source of Variation in Policyholder Surplus

3 Year Time Horizon



Capital Allocation by Zip



- Allocate capital by line
- Exposure and value by zip code do not measure expected loss
- Capital allocation depends on variability, not average expected loss
- Very different pricing and underwriting conclusions vs traditional methods