SOCIETY OF ACTUARIES

ERM Symposium
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B4-Call for Papers: Differing Risk Perspective

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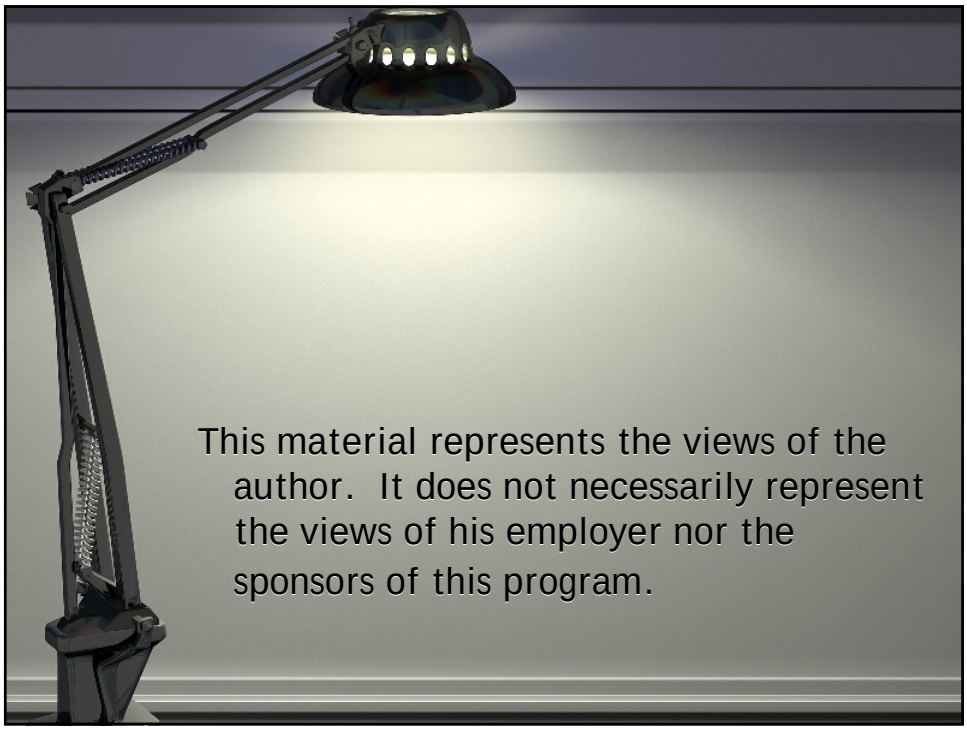
Moderator
Krzysztof Jajuga


Risk & Light
David Ingram, CERA, FRM, PRM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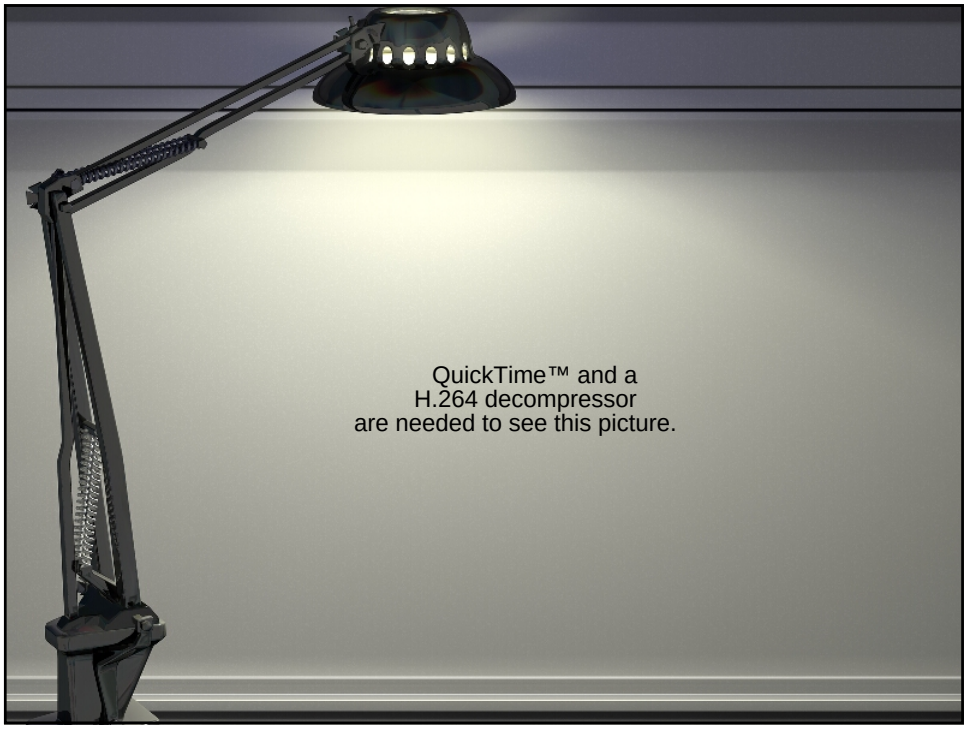
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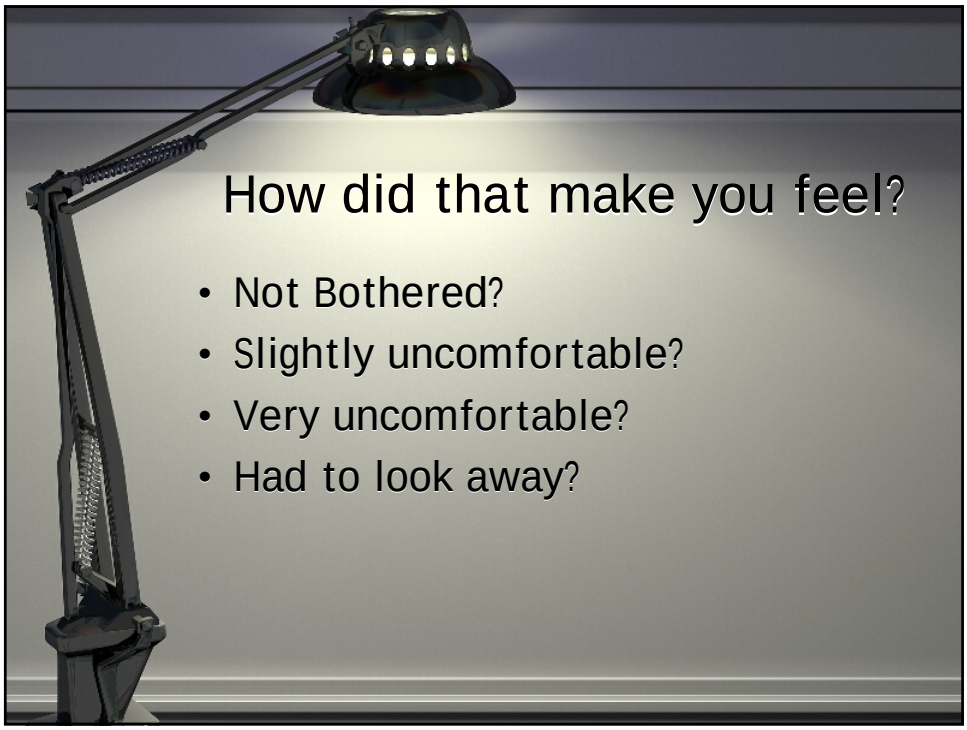
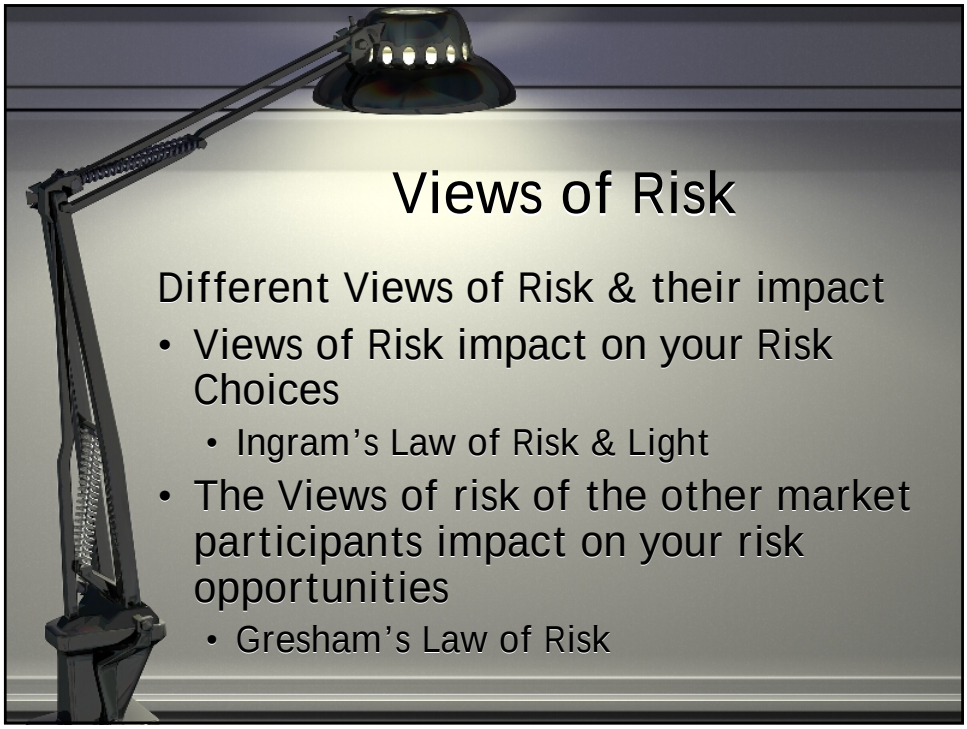
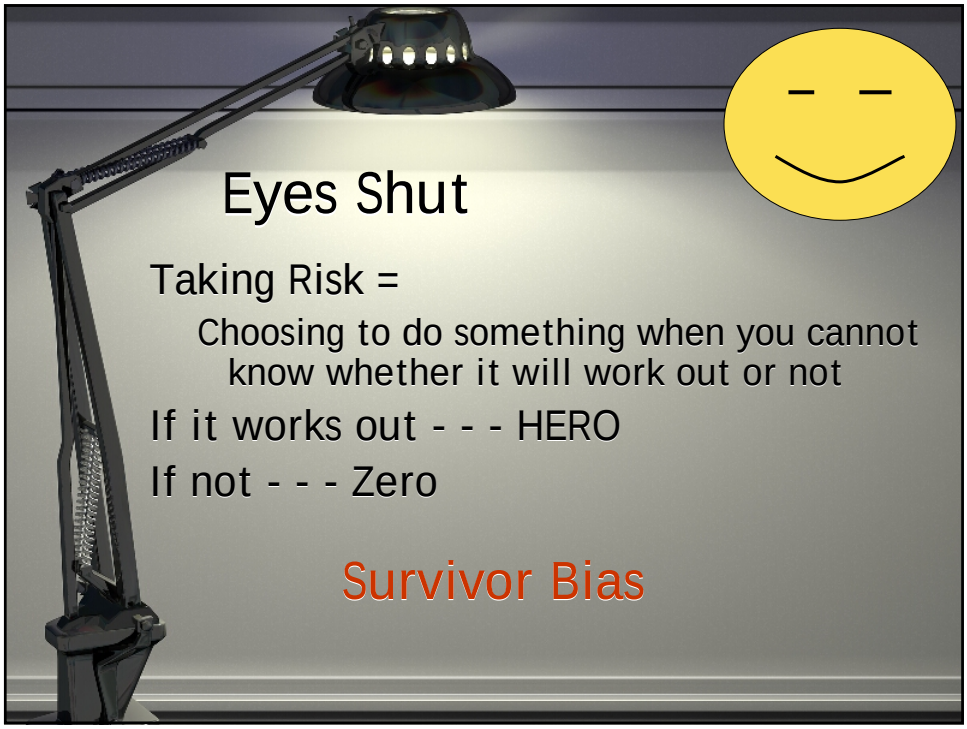
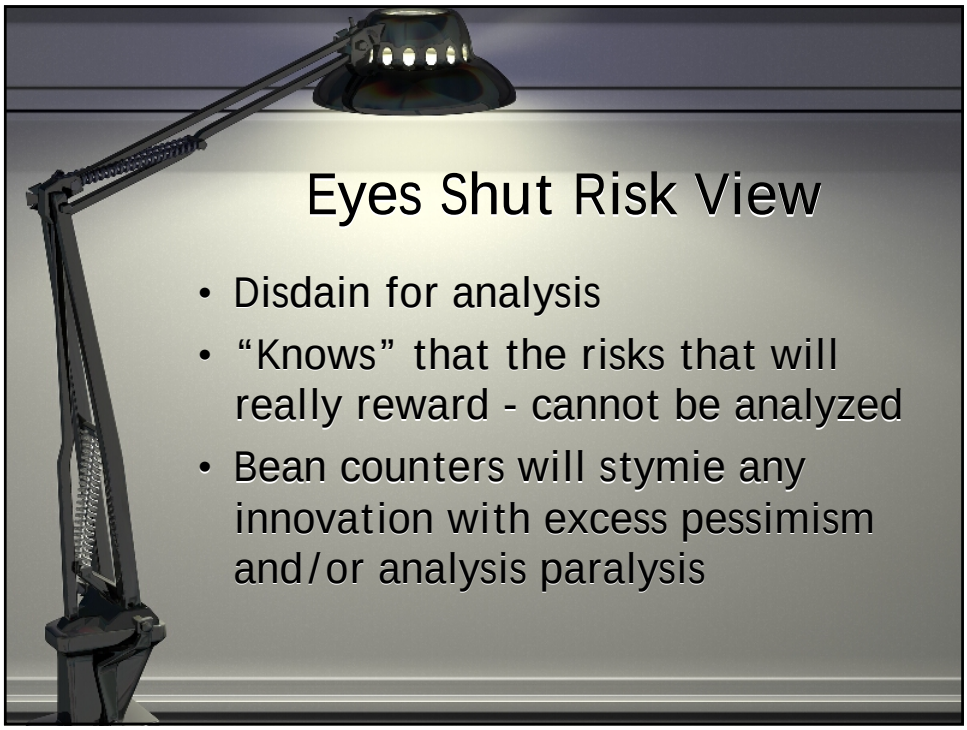
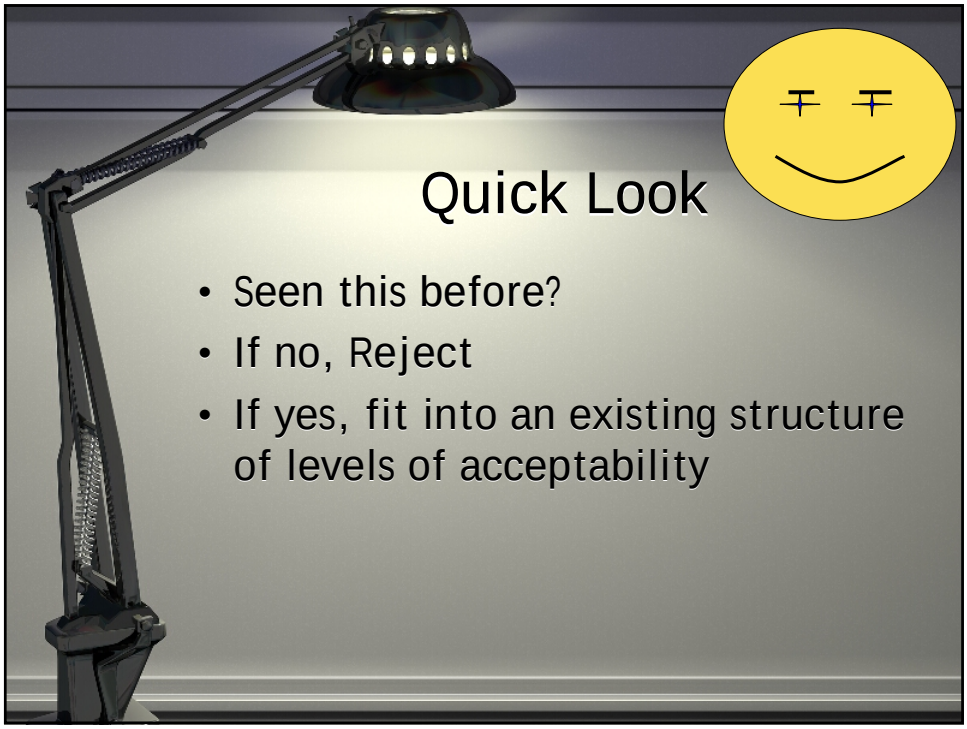

How did that make you feel?
• Not Bothered?
• Slightly uncomfortable?
• Very uncomfortable?
• Had to look away?


Views of Risk
Different Views of Risk & their impact
• Views of Risk impact on your Risk Choices
• Ingram's Law of Risk & Light
• The Views of risk of the other market participants impact on your risk opportunities
• Gresham's Law of Risk


Some views of Risk
• Eyes Shut
• Quick Look
• One Eye
• Two Eyes
• 360 View


Eyes Shut
Taking Risk =
Choosing to do something when you cannot know whether it will work out or not
If it works out - - - HERO
If not - - - Zero
Survivor Bias


Eyes Shut Risk View
• Disdain for analysis
• "Knows" that the risks that will really reward - cannot be analyzed
• Bean counters will stymie any innovation with excess pessimism and/or analysis paralysis


Quick Look
• Seen this before?
• If no, Reject
• If yes, fit into an existing structure of levels of acceptability

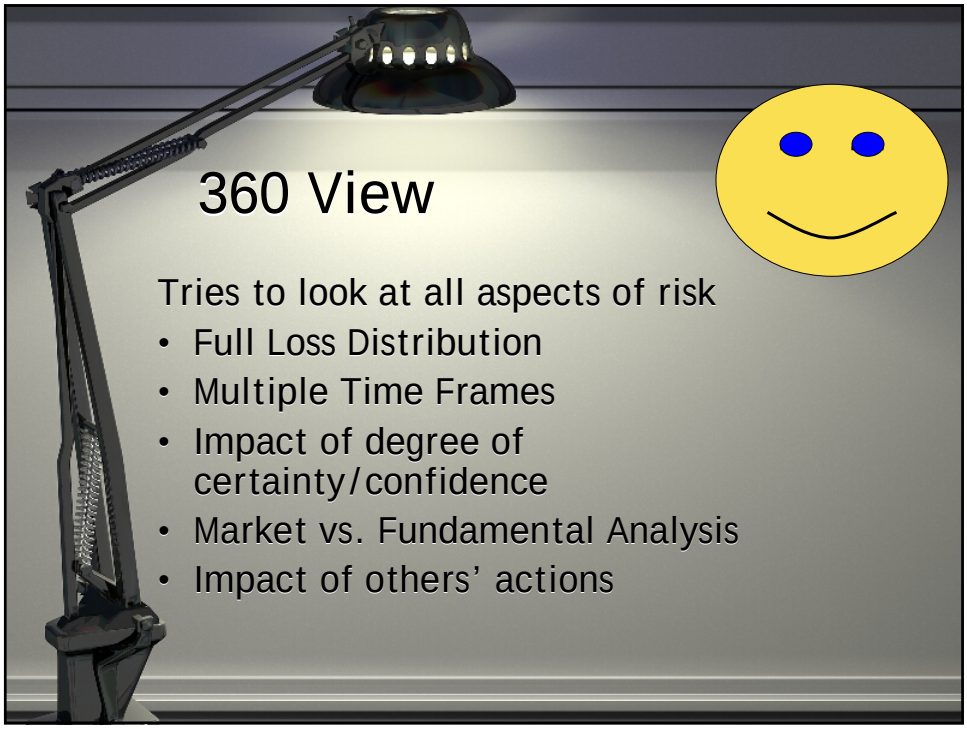

One Eye View
• Critical Quantitative Review of Risk
• Risk has a single, clear, widely accepted definition
• Risk is one of VaR, CTE, Volatility, Earnings at Risk, Economic Capital

One Eye Views

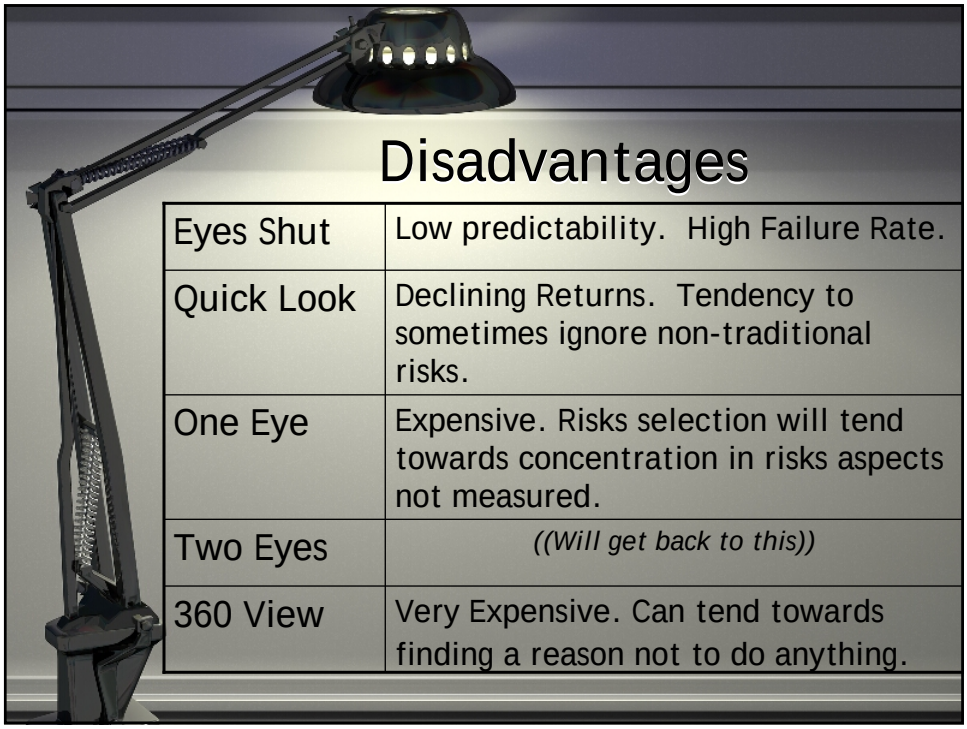
Short Term	Long Term	Intermediate Term
Volatility Oriented	Ruin/Capital Oriented	Earnings Oriented
Calibrated to Market	Calibrated to History	Calibrated to Future View

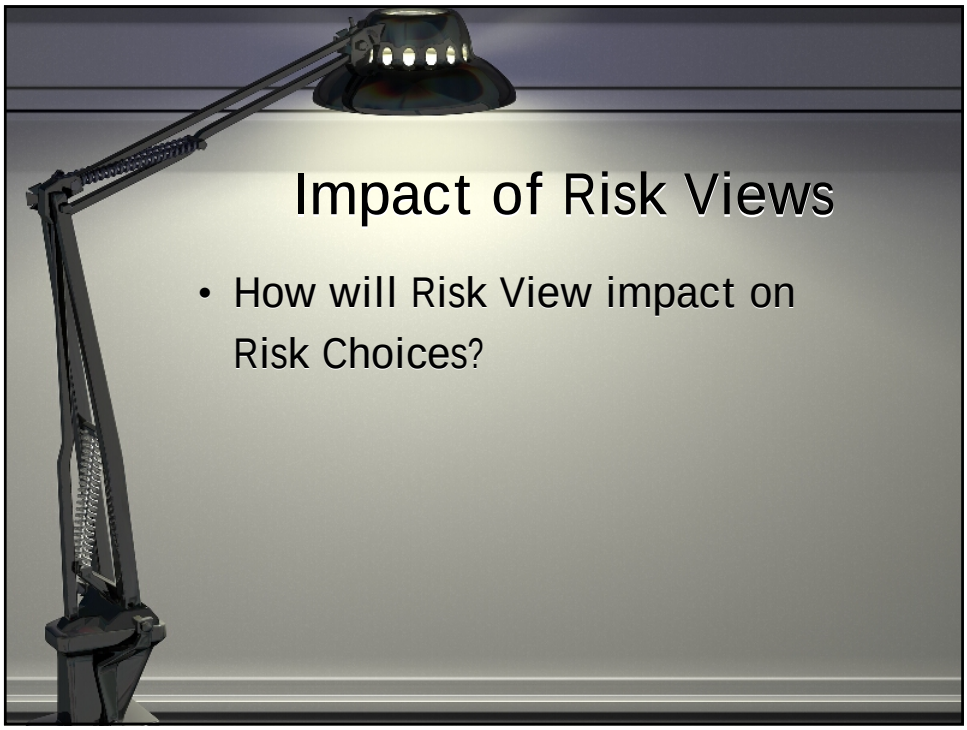
Two Eyes

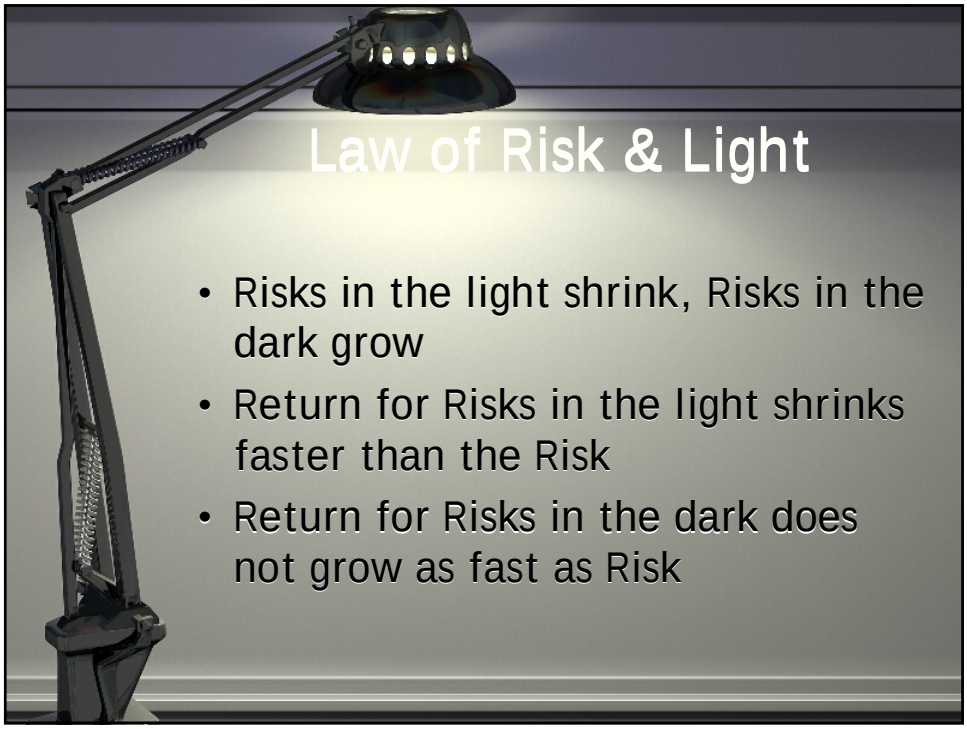
- Critical Quantitative view of risks
- Risk has two aspects
- Might be short term & long term, or ruin & earnings

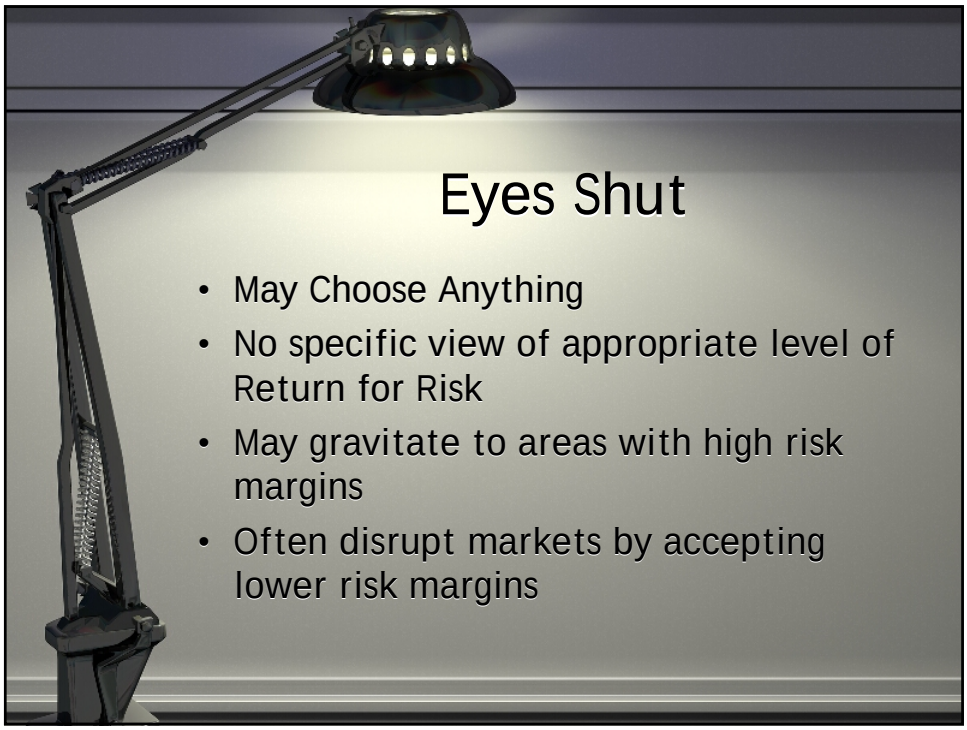

360 View
Tries to look at all aspects of risk
• Full Loss Distribution
• Multiple Time Frames
• Impact of degree of certainty/confidence
• Market vs. Fundamental Analysis
• Impact of others' actions

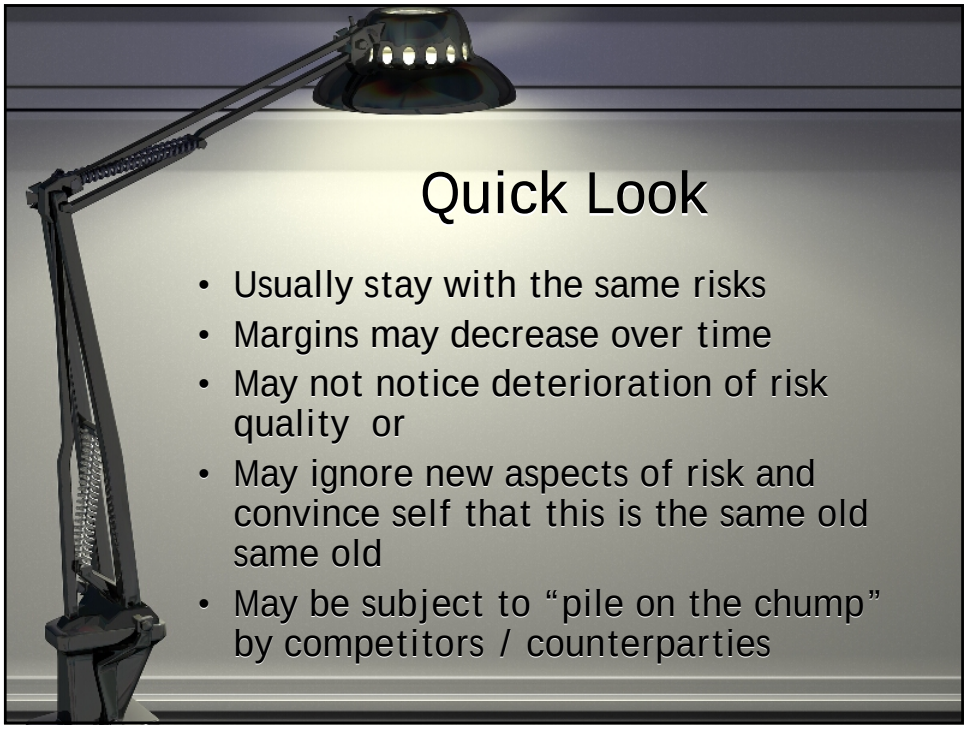

Advantages
Eyes Shut
Low cost. High Reward
Quick Look
It works. Low Cost.
One Eye
Can readily develop & explain risk reward trade-offs
Two Eyes
((Will get back to this))
360 View
Never have to say you're sorry.

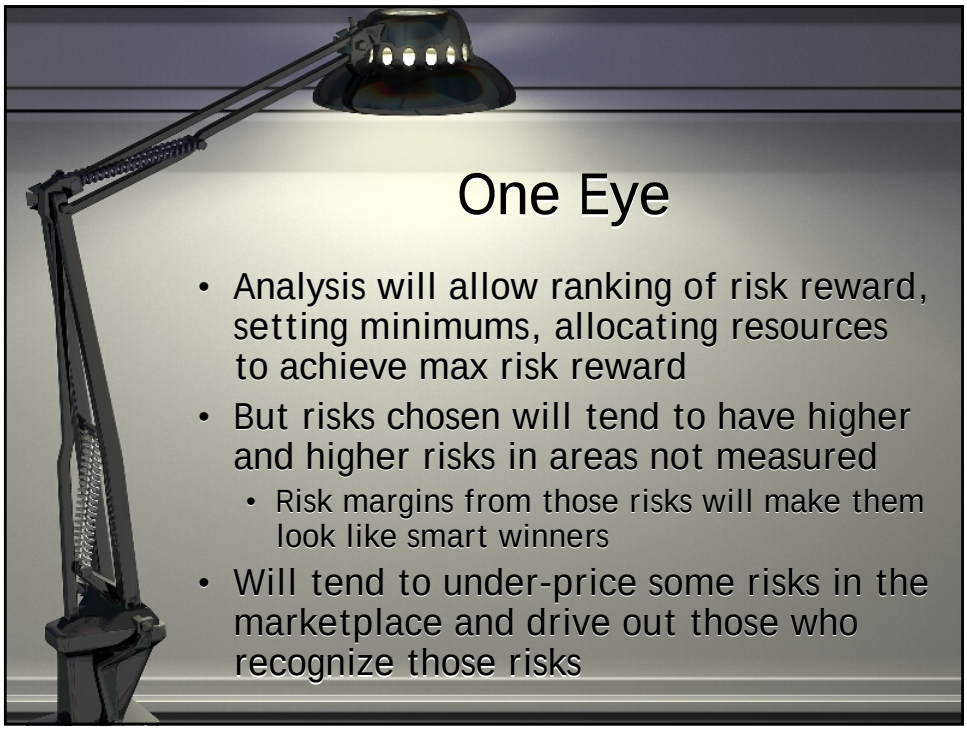

Disadvantages
Eyes Shut
Low predictability. High Failure Rate.
Quick Look
Declining Returns. Tendency to sometimes ignore non-traditional risks.
One Eye
Expensive. Risks selection will tend towards concentration in risks aspects not measured.
Two Eyes
((Will get back to this))
360 View
Very Expensive. Can tend towards finding a reason not to do anything.

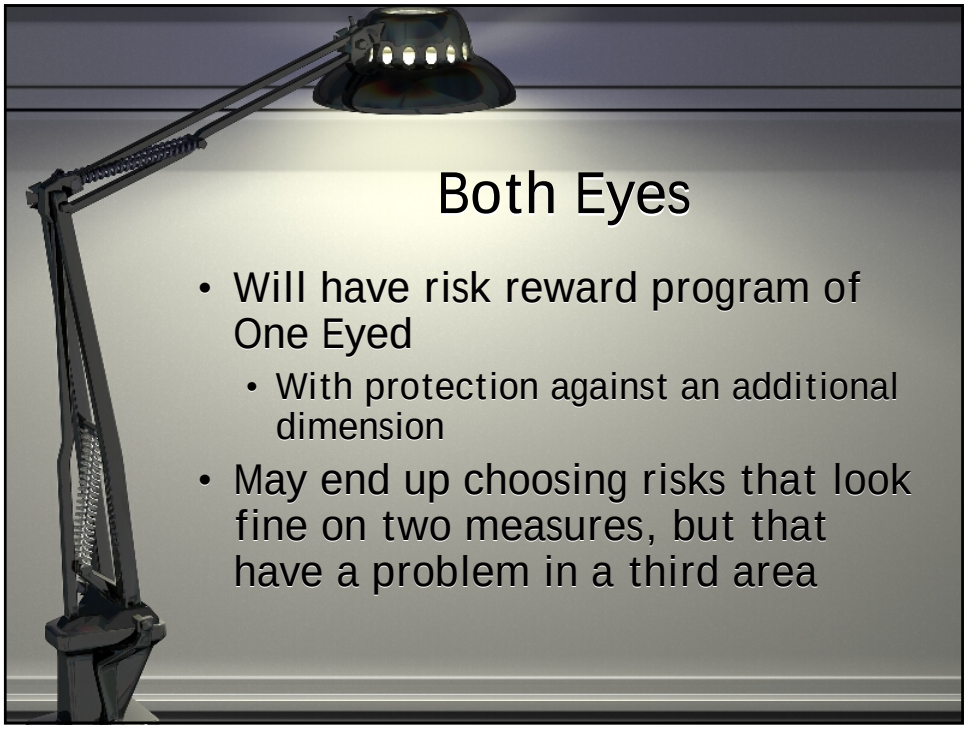

Impact of Risk Views
• How will Risk View impact on Risk Choices?

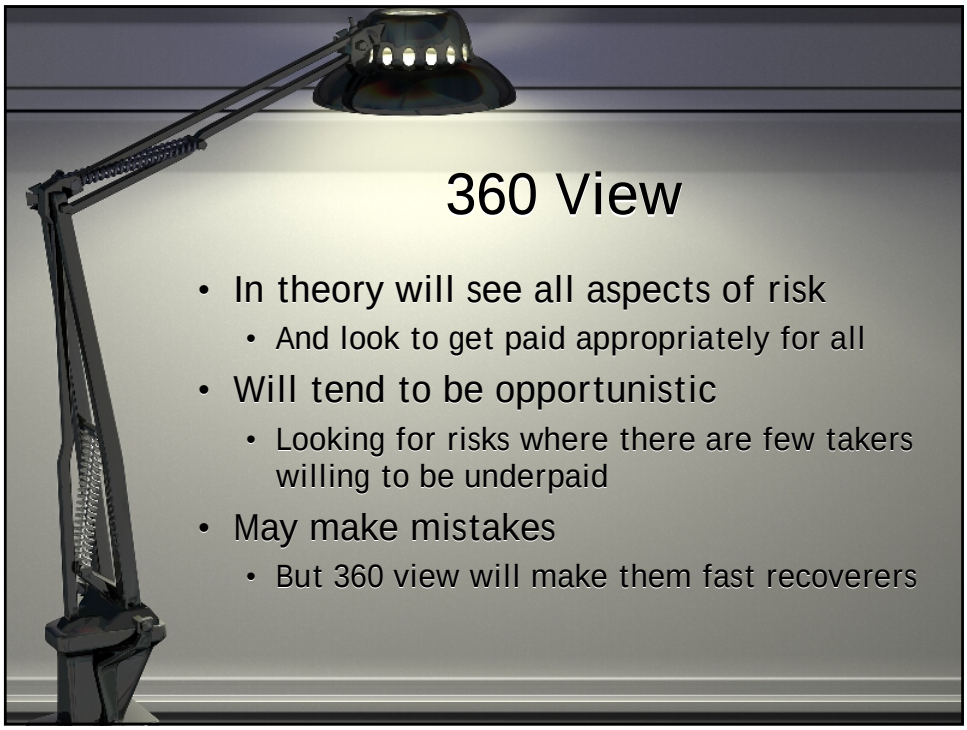

Law of Risk & Light
• Risks in the light shrink, Risks in the dark grow
• Return for Risks in the light shrinks faster than the Risk
• Return for Risks in the dark does not grow as fast as Risk


Eyes Shut
• May Choose Anything
• No specific view of appropriate level of Return for Risk
• May gravitate to areas with high risk margins
• Often disrupt markets by accepting lower risk margins

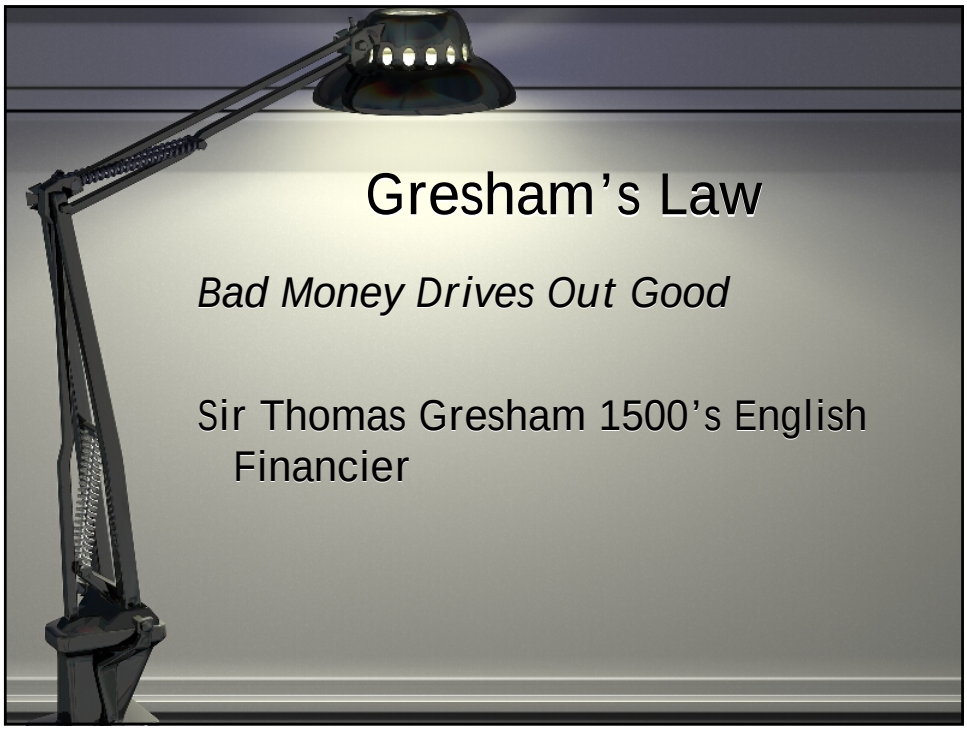

Quick Look
• Usually stay with the same risks
• Margins may decrease over time
• May not notice deterioration of risk quality or
• May ignore new aspects of risk and convince self that this is the same old same old
• May be subject to "pile on the chump" by competitors / counterparties

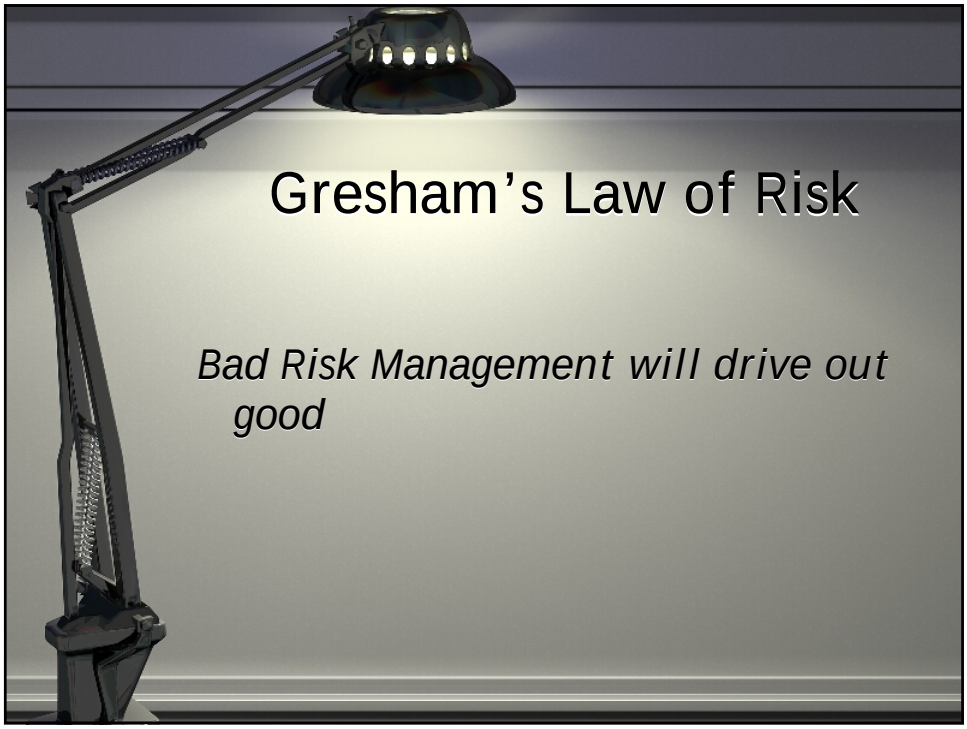

One Eye
• Analysis will allow ranking of risk reward, setting minimums, allocating resources to achieve max risk reward
• But risks chosen will tend to have higher and higher risks in areas not measured
• Risk margins from those risks will make them look like smart winners
• Will tend to under-price some risks in the marketplace and drive out those who recognize those risks

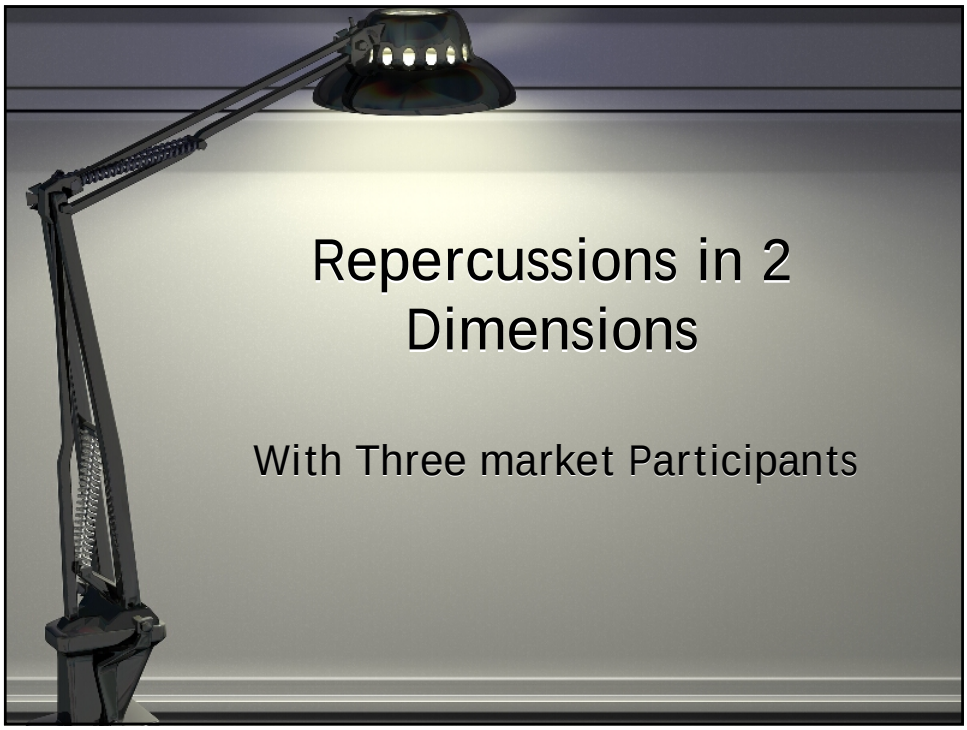

Both Eyes
• Will have risk reward program of One Eyed
• With protection against an additional dimension
• May end up choosing risks that look fine on two measures, but that have a problem in a third area


360 View
• In theory will see all aspects of risk
• And look to get paid appropriately for all
• Will tend to be opportunistic
• Looking for risks where there are few takers willing to be underpaid
• May make mistakes
• But 360 view will make them fast recoverers


How will these views interact in the market?


Gresham's Law
Bad Money Drives Out Good
Sir Thomas Gresham 1500's English Financier


Gresham's Law of Risk
Bad Risk Management will drive out good

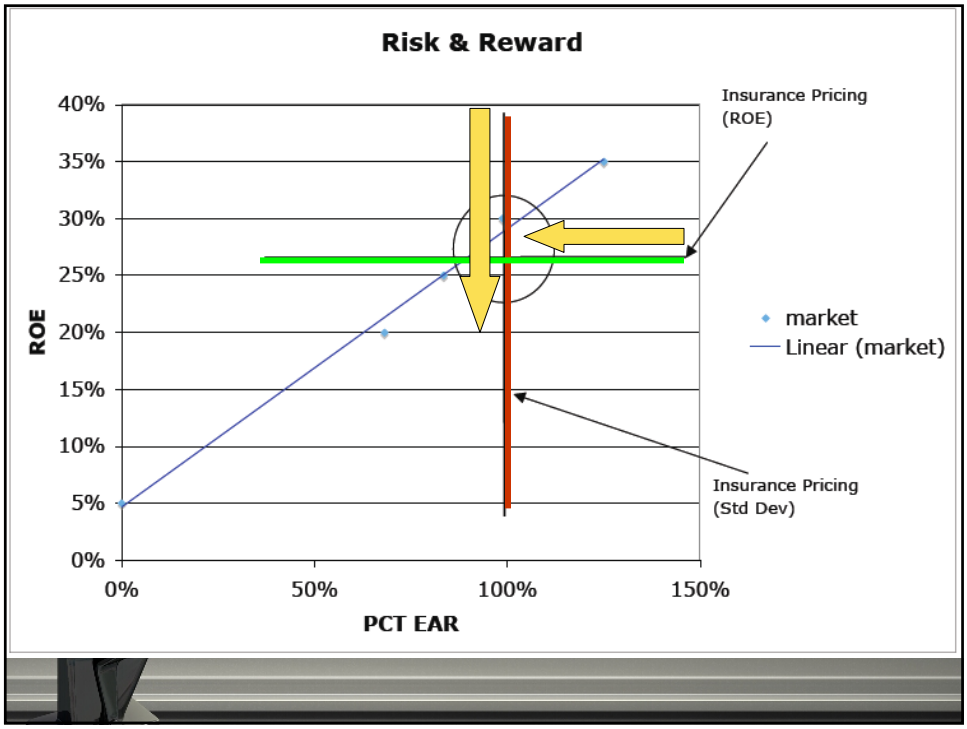

Repercussions in 2 Dimensions
With Three market Participants

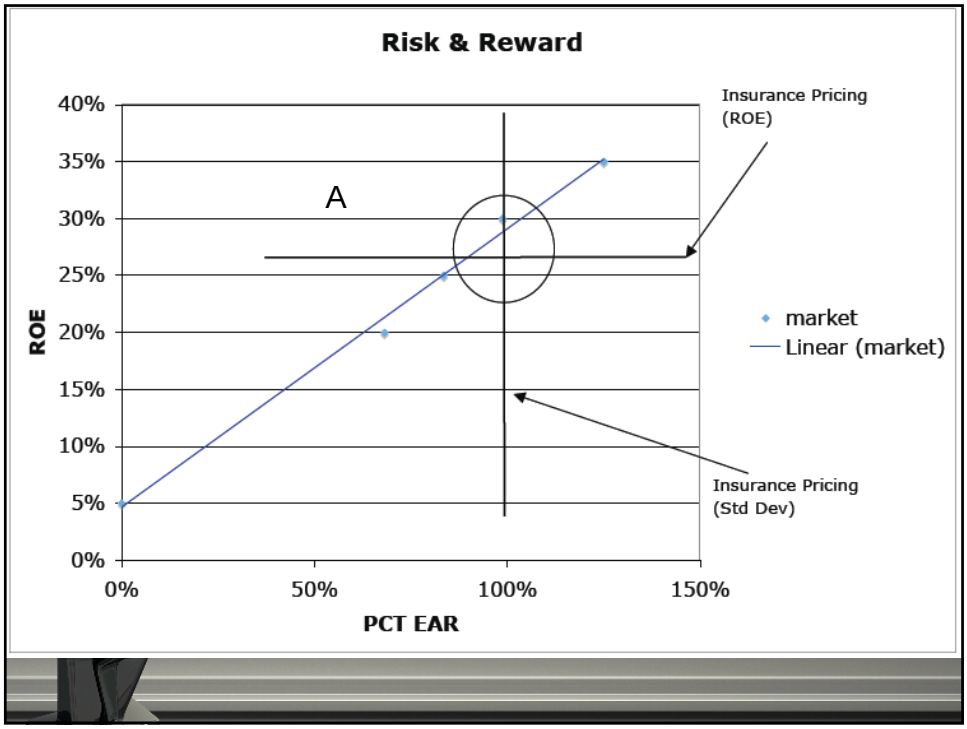
3 Players

Two versions of One Eyed Risk Views

- Ruin - Economic Capital is primary risk measure. ROE is Risk Reward.
- Volatility - Black Scholes, VaR, Standard Deviaton are risk measures. Usually use risk adjusted value

Plus the 2 eyed view - both Ruin & Vol are considered

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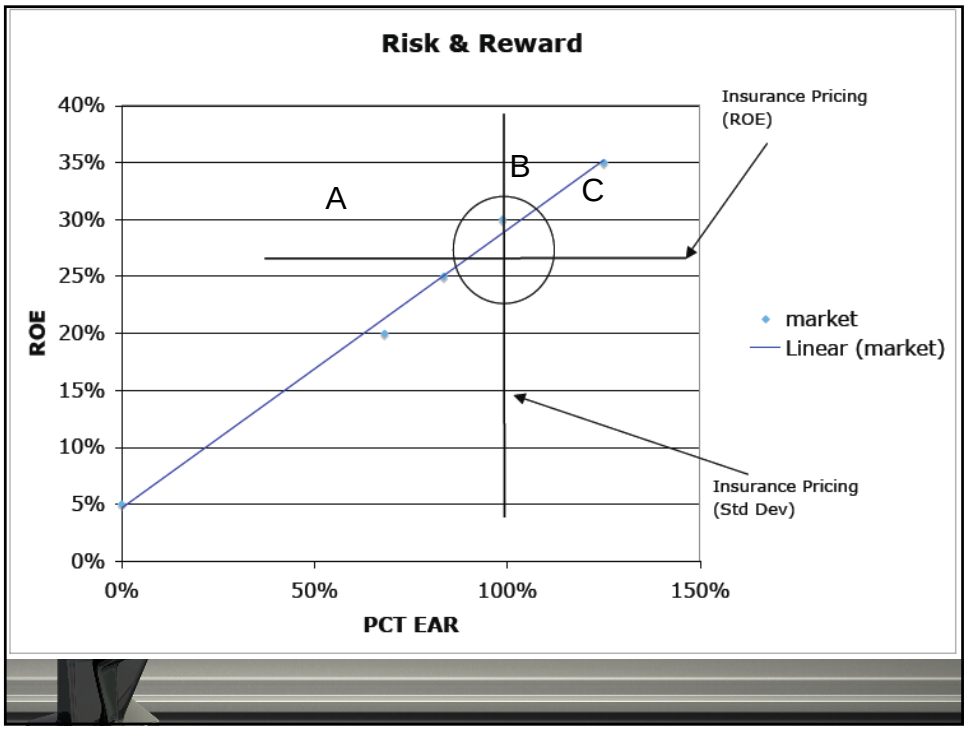
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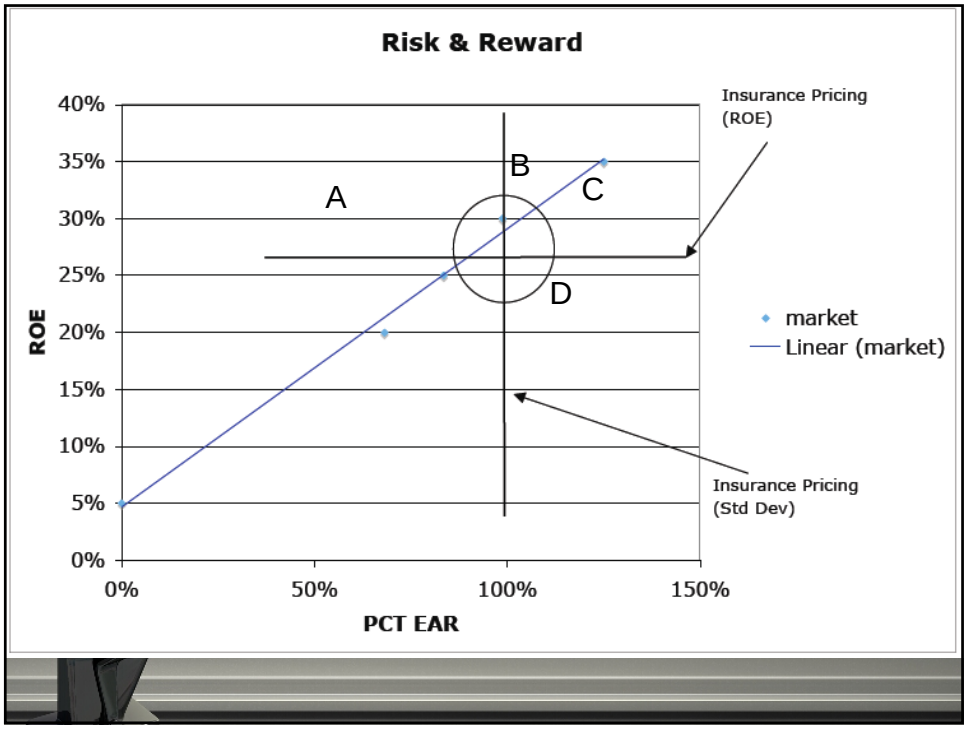
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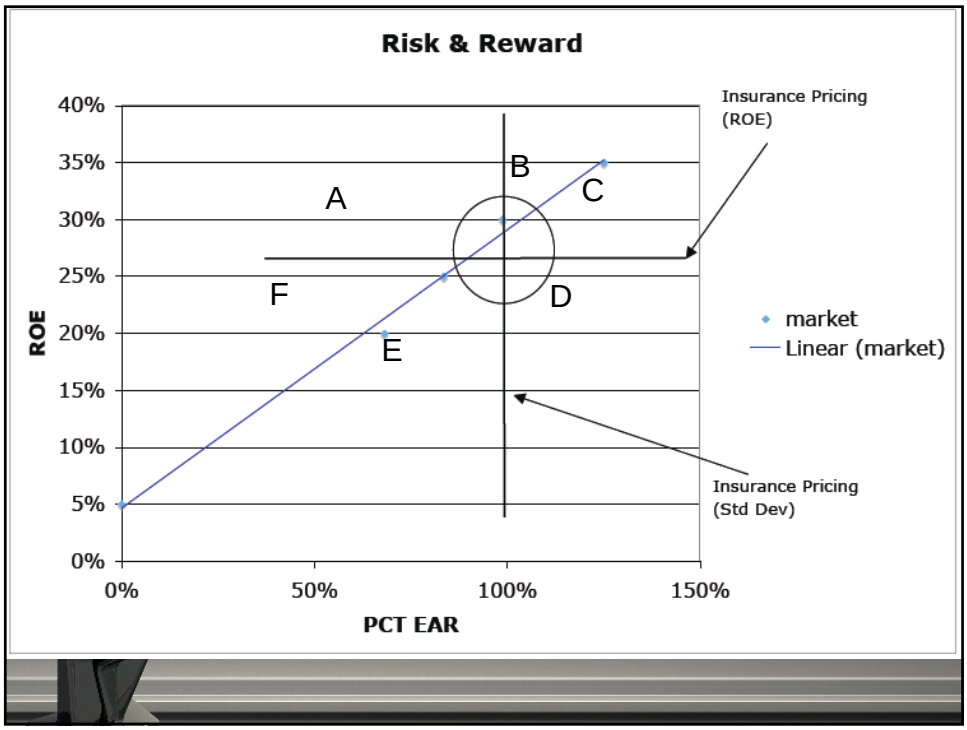
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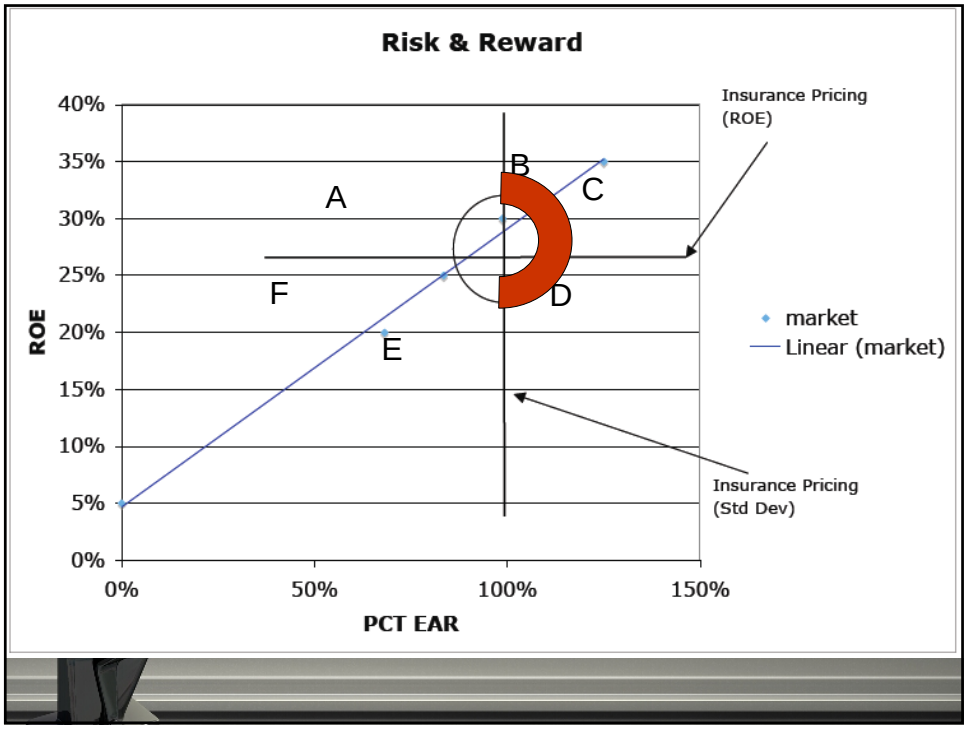
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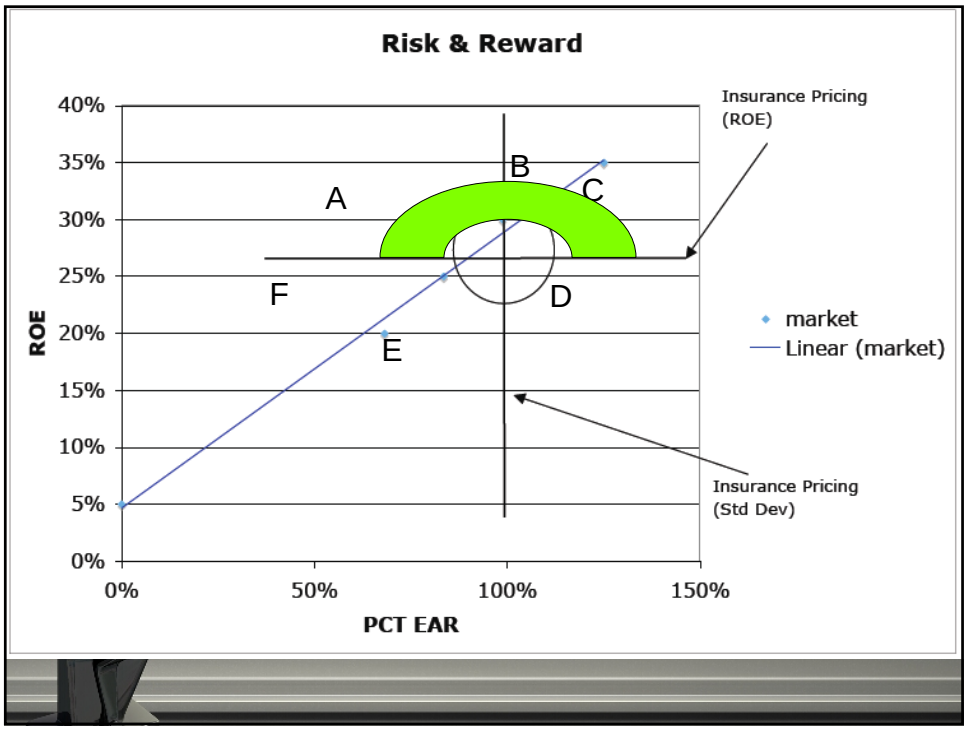
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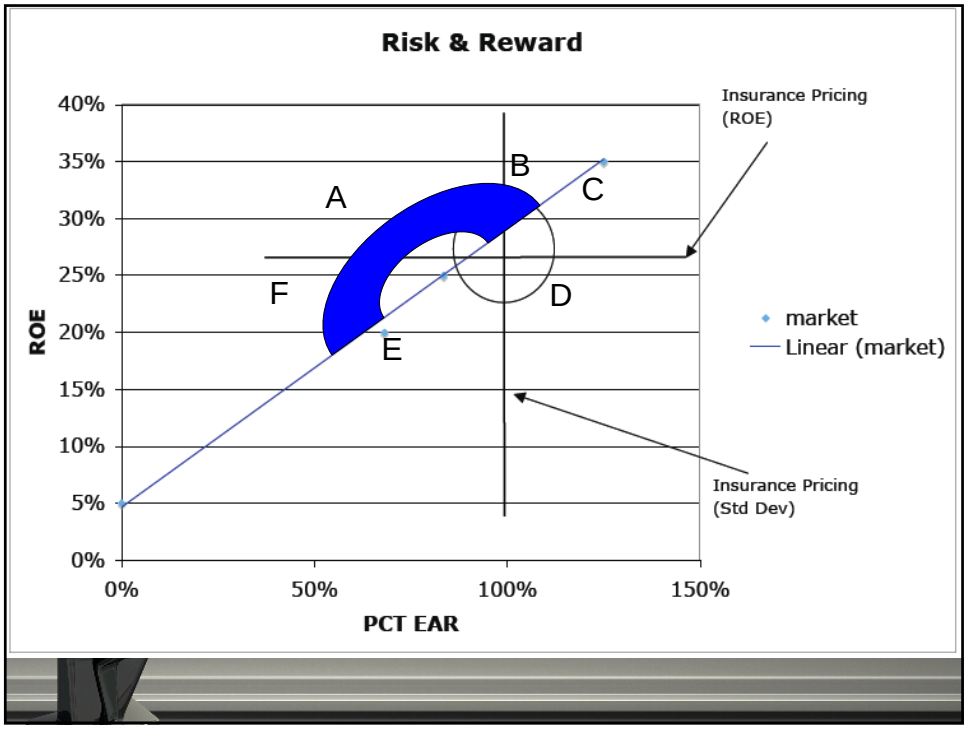
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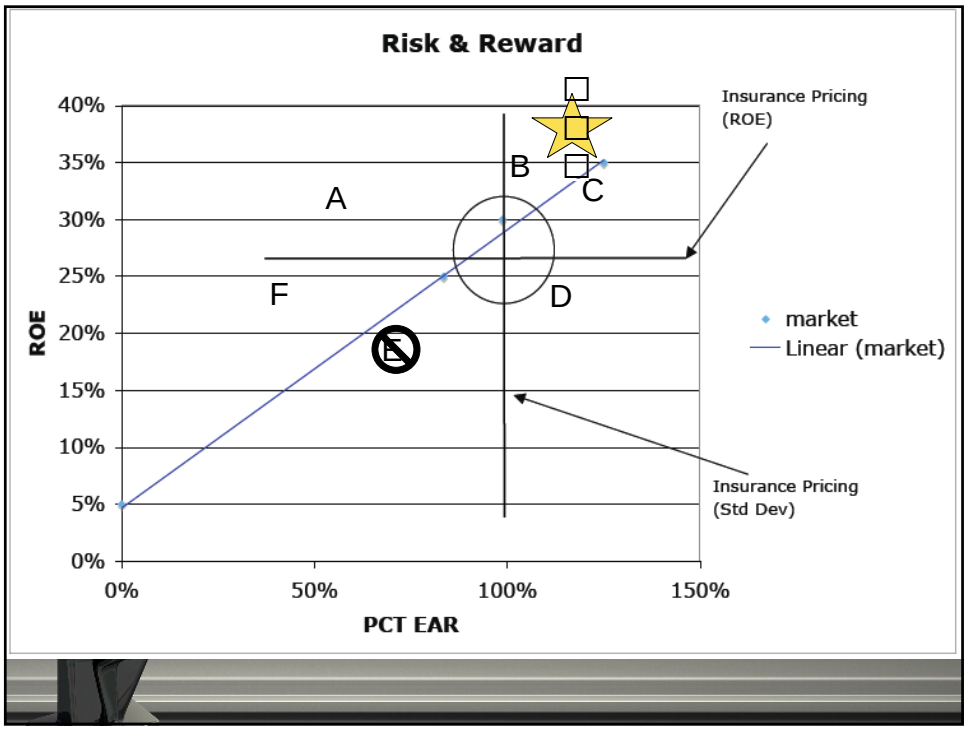
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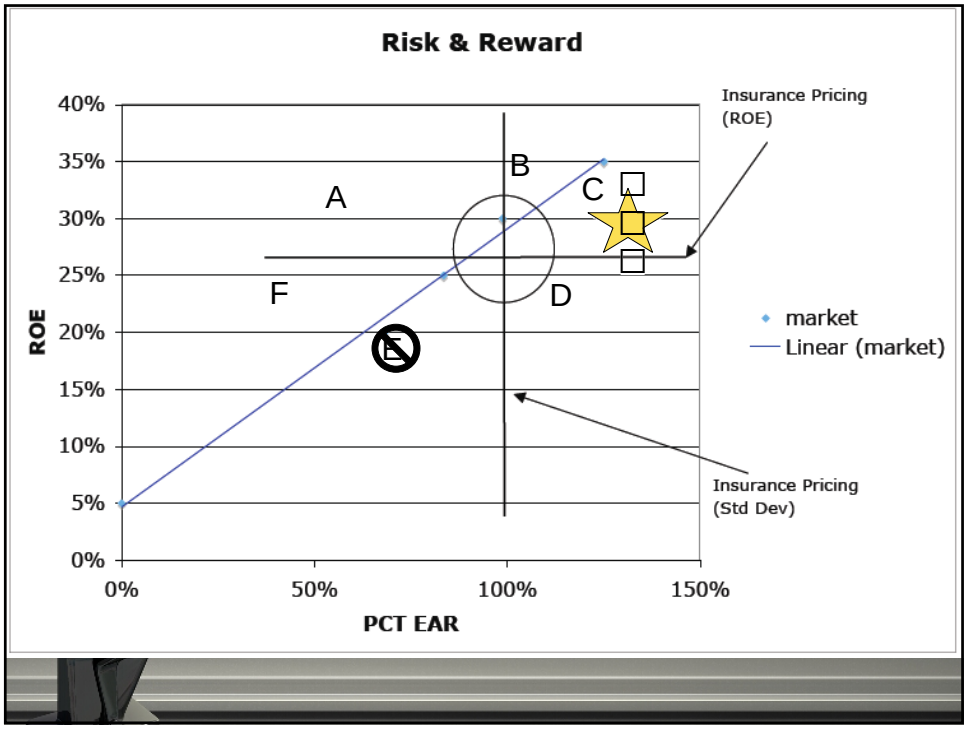
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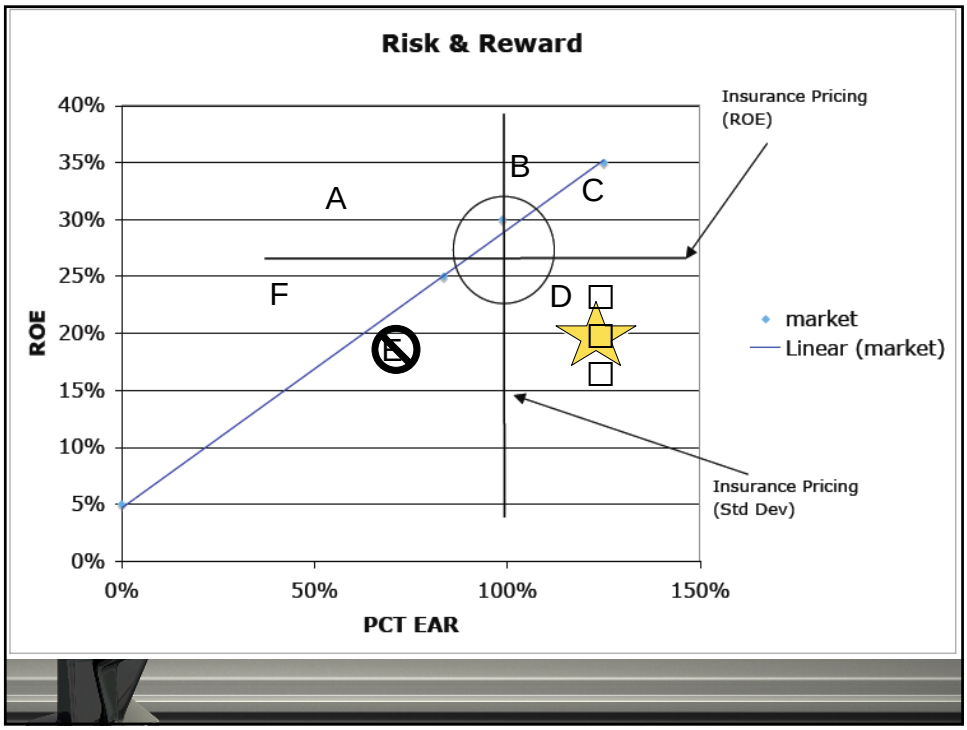
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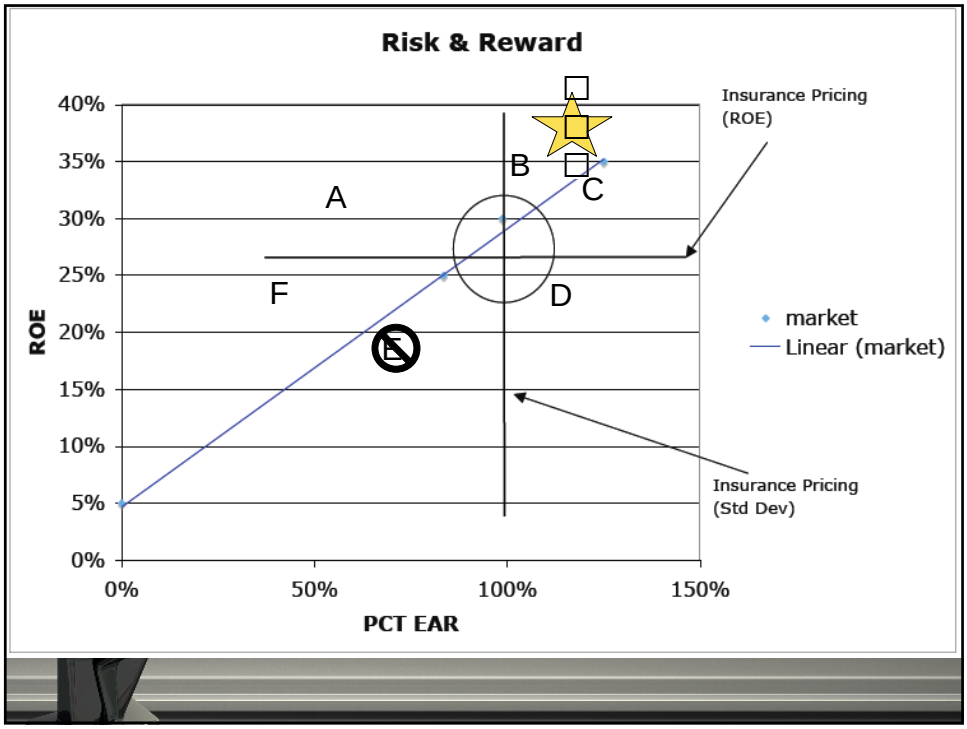
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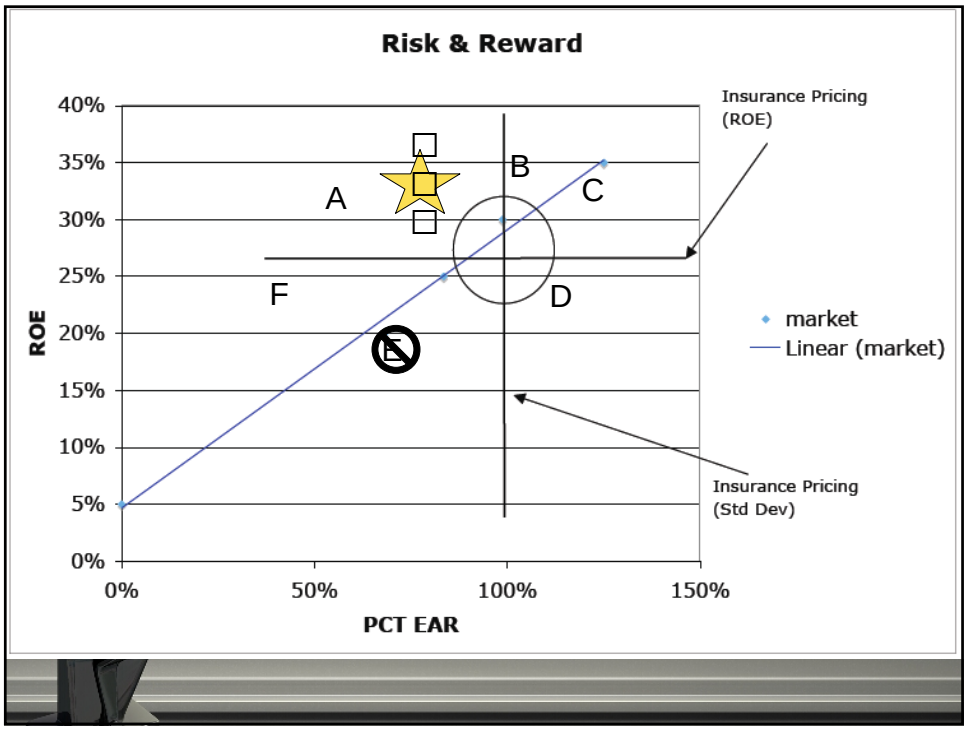
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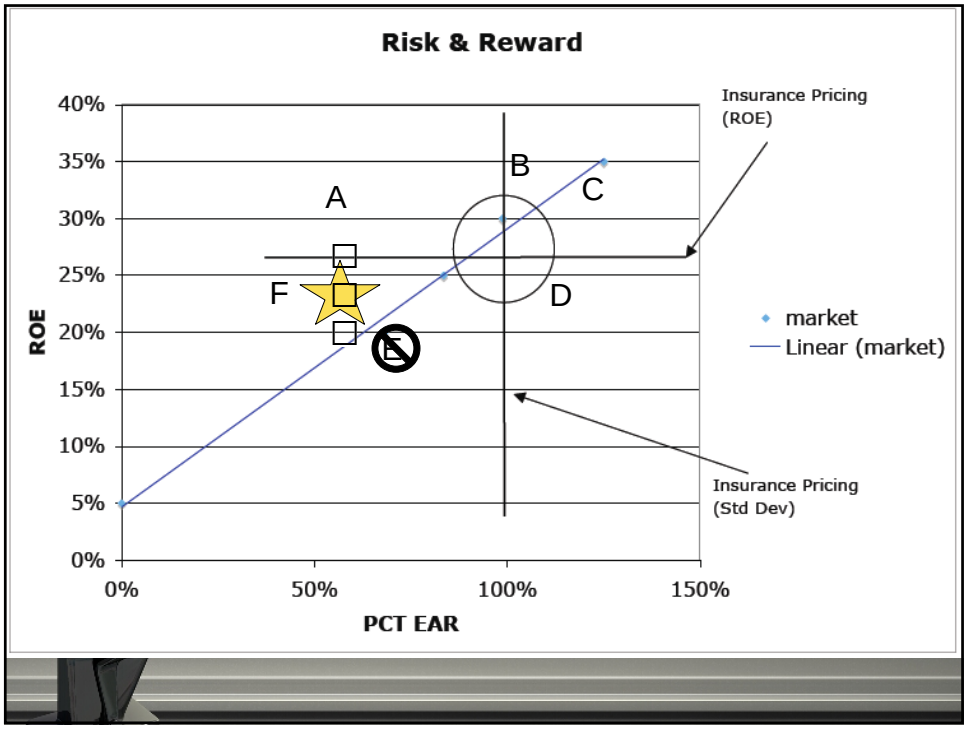
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2 Dimensions & 3 players
• Different views of risk lead to looking for different opportunities
• The views of the other market participants will impact on choices for everyone
• Opportunities will be driven in the direction that the less sophisticated risk views will allow


What can you DO with this?
1. Examine your organization's risk view.
• Self knowledge is always a good starting place
• Use principal component analysis to decdie need to expand view
2. Can you id your competitor's risk view?
3. Can you id the place where the market is on a 2 D risk chart?
4. Set your strategy to deal with the expected risk & risk reward drift


Thanks for your attention.
Watch your step on the way out…

ENTERPRISE RISK MANAGEMENT

ERM

Symposium

Where Cutting Edge Theory Meets State of the Art Practice

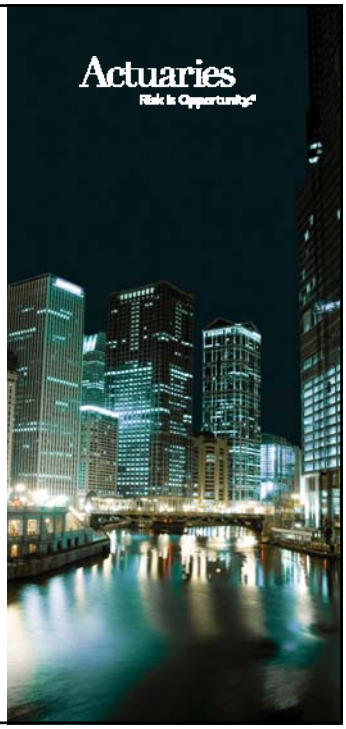
Integrated Risk Management in Life Insurance Companies

Dr. Etti G. Baranoff
Virginia Commonwealth University

Dr. Thomas W. Sager
The University of Texas at Austin

Canadian Institute of Actuaries / Institut canadien des actuaires

PRMIA



Overview

In this paper we use accounting data to map the spectrum of enterprise risks and enterprise risk management (ERM) tools of U.S. life insurers.

To our knowledge, these are the first risk and tool maps to be based on statistical analysis of objective data, rather than on surveys of *ex ante* best practice desiderata and *ex post* practices.

Outline

- We use a two-step methodology to map risk space:
  - (1) cluster analysis of about 150 risk-related variables to group associated risks together;
  - (2) factor analysis to uncover hidden themes of each cluster.
- We map ERM tool space variables by the same methodology.
- We relate the two maps by canonical correlation.

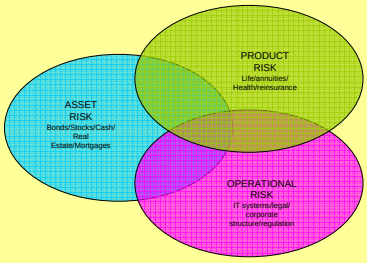
Expectations – Risk Space

- Theoretical conventional wisdom expects that risk space should be organized into the following risk categories:
  - Asset
  - Product
  - Operational
  - with significant cross-category overlap generated by financial risk (Capital structure) and the risk of asset/liability matching (ALM).

Figure 1. The Conventional View of Risk and ERM Tools (Part A: Risk Space)

Part A: Life Insurers' Enterprise Risks

SPECTRUM OF RISKS OF LIFE INSURERS



Capital Structure (Financial risk)

Asset/Liability Matching

ASSET RISK	PRODUCT RISK	OPERATIONAL RISK
•Default risk •Volatility risk (market risk) •Liquidity risk	•Catastrophe risk •Incomplete contracts risk •Reserves risk	•IT risk •Distribution risk •Regulatory risk •Legal risk •Globalization risk

- The RISK categories correspond to the three major activities of life insurers:
  - Investing
  - Underwriting
  - Operations
  - major category-straddling activities of structuring capital and ALM.

Figure 1. The Conventional View of Risk and ERM Tools (Part B: Tool Space)

Part B: Life Insurers' Enterprise risk Management Tools	Capital Structure (Financial risk) Management Tools		
	Asset/Liability Matching Management Tools		
	ASSET RISK Management Tools	PRODUCT RISK Management Tools	OPERATIONAL RISK Management Tools
	•Hedging/derivatives •Asset allocation management (Active vs. passive)	•Reinsurance •Reserving •Securitization •Diversification	•Control over agents and brokers •Organizational/corporate structure •Adherence to regulation •IT controls •Operational safety and loss controls

Expectations – ERM Space

- The organization of tool space is expected to mirror the hypothetical organization of risk space, since insurers deploy the tools to mitigate the risks.

Figure 1. The Conventional View of Risk and ERM Tools (Part C: Compare Risk Space with Tool Space)

	RISKS		ERM TOOLS
Part C: Comparison and visual overlay Risk and ERM Tools Spaces	Capital structure risk	<====>	Capital structure risk management
	Asset/Liability matching risk	<====>	Asset/Liability matching risk management
	Asset risk	<====>	Asset risk management
	Product risk	<====>	Product risk management
	Operational risk	<====>	Operational risk management

Summary of Results

- Risk Space - four risk clusters represent asset, product, and operational risks.
- Risk Space - four other risk clusters include aspects of financial and ALM risks.
- Tool Space - structure does not clearly match structure of risk space.
  - Tool space seems to be thematically clustered more by tool than by the risk to be mitigated.
  - Within each cluster, we find complex relationships.
  - Some clusters are thematically relatively pure, whereas others are mixed, and there is a fair degree of overlap.

Themes of Risk Space Clusters

1. Mixed asset risks/liquidity
2. Product/financial
3. Mixed/miscellaneous
4. Reinsurance/miscellaneous
5. Financial/miscellaneous
6. Operational
7. Asset risk
8. Mixed/miscellaneous

Themes of Tool Space Clusters

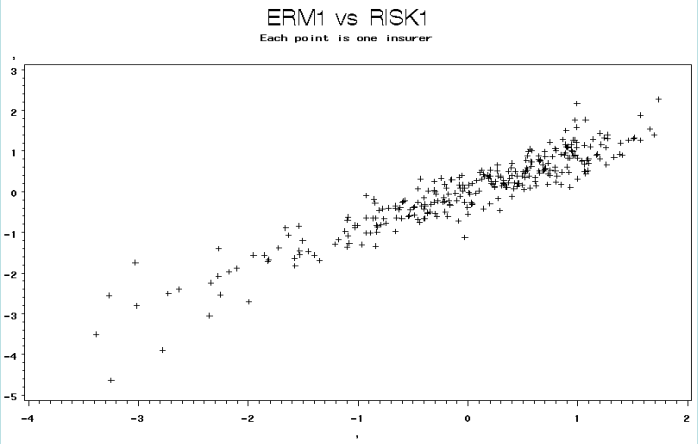
1. Size and derivatives
2. Capital structure
3. Reinsurance
4. Reserving and oversight
5. Capital structure
6. Cap structure/reserving (liabilities)
7. Mixed (liabilities, oversight, reinsurance)
8. Operational/distribution

Relationships between the Spaces

- Methodology: Canonical Correlation

$$W_1 = \alpha_{11} X_1 + \alpha_{12} X_2 + \ldots + \alpha_{1p} X_p$$

$$V_1 = \beta_{11} Y_1 + \beta_{12} Y_2 + \ldots + \beta_{1q} Y_q$$



Relationships between the Spaces

- RISK1 vs. ERM1
  - dimension characterized by reliance upon sophistication both in capital and derivatives management with exploitation of size on the ERM side while taking more asset risk and less product risk on the risk map side
- RISK2 vs. ERM2
  - product dimension on the risk side, with small operational contributions, while on the ERM side it overlaps all functions in both health ALM and capital management.
- RISK3 vs. ERM3
  - firms with significant asset allocation and reserve measures (product risk) coupled with low ALM for life products

Relationships between the Spaces

- RISK4 vs. ERM4 and RISK5 vs. ERM5
  - asset risks with asset allocation and reserve strategies. The fifth relates reinsurance risks (assumed) with reinsurance tools (ceded).

Economic Measurement of Insurance Liabilities: *The Risk and Capital Perspective*

Larry Rubin
May 1, 2009

How insurance company creates shareholder value

- Sell polices at or in excess of their economic value
- Acquire polices below their economic value
- Exit(sell/ transfer/clear) business above
- Enhance value through various investment activities or efficient operation
- Risk management activities

Key question:

- **Whether this value exists?**
- **When to recognize the value created?**

Market Consistent Embedded Value (MCEV)

Improvement from EV

- Guarantees and options are explicitly valued using financial economic technique
- Modelled stochastically
- Or using closed form approaches such a the Black-Scholes formula
- A risk-neutral approach is adopted for setting investment assumptions and discount rates.

For example:

- It was noted that a guaranteed minimum death benefit(GMDB) on a variable annuity was the same as a traditional put option with the minor inconvenience that the owner of the option must die to exercise it
- Therefore, model was calibrated to recreate the traditional put option prices observed in the market then used to determine the value of the GMDB.

MCEV vs. Fair Value

Difference in three key areas

1 The Definition of non-market assumption

MCEV	Based on company specific best estimates
Fair Value	Market consistent

2 The calculation and calibration of risk margins

MCEV	Does not explicitly refer to risk margin
Fair Value	Market Consistent

3 The use of internal model for determining capital in lieu of the market value of cost

MCEV	Use a capital rate applied to the appropriate level of capital
Fair Value	Market Consistent

MCEV

- Although still under debate, MCEV has gained momentum
- More major European companies used MCEV approach in last few years.
- The move to MCEV has increased transparency and comparability
- So, what are the implication of this move for the investors' risk margin calibration?

Approach to determining risk margins

Risk margin determination can mean many different things to interested parties:

- IASB suggested that risk margins should be determined such that they compensate entities for bearing risk
- For life insurance company, includes compensation for the guarantee and options provided to policyholders

Determining risk margins

Imagine a perfect frictionless world:

- ❑ No regulations
- ❑ No transactional costs or liquidity concerns
- ❑ Perfect readily available information

1. Investors in insurance enterprise– would want to receive the highest possible return for bearing risk.
2. Insurance seeker– would look to pay the lowest return.
3. The market clearing price in a transaction- acquisition cost – include risk margin.

Determining risk margins

However, in the real world, there are:

- ❑ Various regulatory restrictions
- ❑ Various actual and perceived competitive advantages
- ❑ Significant disparities in information
- ❑ A variety of frictional costs
- ❑ Insurance contract have the additional complication of having very different value to different individuals.
- ❑ Policyholder emotional drive

Two arguments on GAI and NGAI

Therefore, why would we assume policyholder would demonstrate any more efficiency in the purchase of insurance contract?

These inefficiencies in the market bring to two arguments

- Gain at Issue (GAI)
- No Gain at Issue (NGAI)

Argument of Gain at Issue (1/2)

- **Policyholders' inefficiencies in purchasing insurance are Insurer's advantages:**
  - More information than individual
  - Comparative advantages over competitors
    - Proprietary investment strategies
    - More efficient distribution network
    - Regulatory advantages
  - Determine the minimum price they would accept for bearing the risk in insurance contract
  - The ability to capture the economic rent represented by the present value of the difference between what they expect to receive from the policyholder and the minimum amount the investors would require to enter a new transaction

Argument of Gain at Issue (2/2)

- The activity of selling an insurance contract also represents an economic activity
- The sales process should reflect a return on the capital invested in distribution
- Insured may accept a higher price
  - Lack of complete information
  - Being convinced of the value of the transaction by the sales process.

Arguments for No Gain at issue

Model used to determine the explicit risk margin

Model used to determine the explicit risk margin:

1. Include thousands of potential economic scenarios
2. Include a variety of demographic scenarios
3. Process countless path-dependent calculation
4. **Theses scenarios reflect the insurers' view of the risk and not the market view of risk.**
5. **Market clear premiums**

Arguments for No Gain at issue

Model used to determine the explicit risk margin

- **If economic rents do exist, whether a reliable and credible method can be developed to measure them?**
- **Even assuming economic and demographic scenarios are appropriate, it is hard to confirm the path-dependent calculation are appropriate.**
- **Assumption are based on unobserved information.**
- **Role of accounting is to record past activities**

Gain at Issue might be subjective and not consistent with role of accounting

Investor Benefits

Investor Benefits

GAI

Demonstrate these additional gains through income

Calibrate the risk margin to the market clearing premium

Provide significant additional disclosure to investors

NGAI

- How the company determine its risk margins and economic capital
- What the key assumptions are
- How they are determined
- How experience has evolved relative to those assumption.

- Company's economic capital and market clearing premium

Market Consistent Economic Capital (1/3)

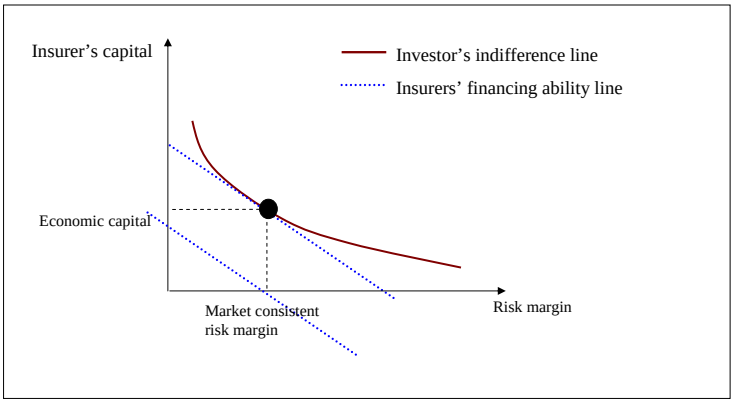
- ❑ Current economic capital model focuses on “Fat tailed events”
- ❑ Under Solvency II, economic capital is defined to absorb all losses within a year with a 99.5% probability.
- ❑ Northerrn Rock, a British bank, demonstrates the difficulties of re-capitalizing, without taxpayer assistance, after a loss event.
- ❑ An alternative view of economic capital: “mark-to-market” economic capital.

Market Consistent Economic Capital (2/3)

- ❑ In 1999 the Shadow Financial Regulatory Committee of the American Enterprise Institute advocated requiring banks to issue a mandatory minimum level of subordinated debt to serve as a market mechanism for bank regulation.
- ❑ This proposal was further developed in a paper by Mark E. Van Der Weide and Satish M. Kini entitled "*Subordinated Debt: A Capital Markets Approach to Bank Regulation"* and a comprehensive study by staff of the Board of Governors of the Federal Reserve System was somewhat supportive of subordinated debt requirements to enlist the bond market into efforts to supervise banking institutions.

Market Priced Economic Capital (3/3)

- Illustration – Market Priced Economic Capital



Market price of risks is probably higher than Solvency II definition (1/2)

Solvency II definition of economic capital:

The amount that an insurance company needs so that it can absorb all losses within a one-year time horizon with 99.5 percent probability.

Compare market price of risks vs. Solvency II level capital (internal model approach) by looking at A rated bond:

- Use historical default rates and rating transition probabilities published in Moody's study (Feb 2008)
- Simulate the loss distribution of this bond. Capital was set equal to the 99.5 percentile of this distribution over average loss (i.e. the 50th percentile of credit losses) over one year period.
- Run the model using a 5-year time horizon
- Define the average excess historical spread over expected defaults was the market consistent return on capital (for A-rated bond issuers)
- Assume cost of capital 9%

	Basis Points of Notional Amount
Market price Economic Capital	265
99.5% Percentile over one year	65
99.5% Percentile over five years	122

Market price of risks is probably higher than Solvency II definition (2/2)

Implications from prior slide:

- ❑ **The economic capital defined under Solvency II is significantly lower than the market implied economic level of capital.**
- ❑ **Even under a 5-year loss (Solvency II defines one year) time horizon, the internal EC is lower than the market priced number, although the gap is narrower.**

There are a number of reasons for the differences:

- ❑ **The historical data represents only one sample of potential outcomes that could have happened and is not necessarily the mean;**
- ❑ **The market is pricing risks that are currently unknown (such as black swans and paradigm shifts).**
- ❑ **Economic Capital modeling may have failed to adequately consider the level of liquidity risk that is priced for in the market**

Market Consistent Cost of Capital

- ❑ **Cost of capital should be a market consistent number as well**
- ❑ **If economic capital is funded by equity, then cost of capital should be market consistent cost of equity!**

Economic capital $100

Total Capital $150

(meet rating agency or regulatory requirements)

WACC Method

70% Equity with 500bp over LIBOR

30% Debt with 50bp over LIBOR

Company's weighted average cost capital = LIBOR +3.65%*(0.7*5.00%+0.3*0.50%)

Risk charge = $100*3.65% = 3.65%

Proposed Method

Cost of Capital is based on the price of equity times economic capital+ the price of debt times excess capital

Risk charge = $100*(100%*5.0%)+($50*3.65%)

= 5.25%

Reasons of different level of economic capital between companies

- Information disparity
- Frictional costs and operational risks
- Unknown Unknowns

Performance Measurement Approach (1/2)

Develop an approach to determine the appropriate level of economic capital:

- This approach should maximize the use of market information and be as transparent as possible while recognizing that all internally created models will not be explicitly or objectively capture all the risks.
- The minimum capital to satisfy a target debt rating may serve as a source.
- The capital set aside in securitization deals or in financial reinsurance transactions provides some direct evidence of the appropriate level of capital.

Performance Measurement Approach (2/2)

- Economic capital created from an internal projection of cash flows can be adjusted for risk premiums observed in more liquid markets.
- The market will ultimately reach a consensus on these values resulting in a market view on the exit value of risk margin.
- Finally, any changes in these values form one period to the next need to be transparent.
- Companies will need to develop stable and understandable analytics to enable this work.
- For example, these analytics could split the market and non-market information or could attempt to address each of the relevant risk margins individually.

Conclusion

- Measuring performance, or capital adequacy, of an insurance company depends on the type, amount and transparency of information.
- Economic capital based on market view of risk becomes more transparent and comparable across entities.
- Theoretically every company should have the same economic capital requirement for a given type and level of insurance risk assumed.
- The difference in approach to assuming risk and assumptions in estimating the theoretical value would create market differences.
- Insurance industry has many tools available to assist in providing clearer, cleaner and useful information to interested parties.

The ideas of this presentation are fully developed in the following paper:

"Economic Valuation of Insurance Liabilities: The Risk and Capital Perspective"

http://www.soa.org/library/journals/actuarial-practice-forum/2009/march/apf-2009-03-rubin-lockerman-tillis-shi.pdf

Thank you!

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