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Enterprise Risk Management for Insurance Companies

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The ERM Campaign

- **High Excitement & Growing Popularity**
  - Fortune 500 companies
  - Holds promise of innovation & value creation
- **External Drivers**
  - Sarbanes-Oxley (2002); COSO framework
  - Basel II for banks; Solvency II for insurers
- **Internal Drivers:** choose either risk management or crisis management

Rating Agency New ERM Initiative

- ERM for insurers is going to be part of S&P new ratings methodology – the latest news!
- S&P will not develop its own model, but rather review company internal models
- Favorable consideration shall be given to company internal risk models *that are used consistently for business decisions*

Q1: WHAT is ERM?

There are many definitions

ERM is about
Integrated Risk Management

- Integrated approach (not *silo*) with a holistic view of all major risks facing an enterprise
- Assess *interrelated* impacts on multiple units
  - asset/credit exposures of the same name
  - catastrophe exposures
- Take integrated responses, including (re)insurance buying decisions

ERM is about
Value Creation & Preservation

- Valuation is the king ---- my JARIP talk
- Value (wealth) can be created and destroyed quickly
- Wealth creation is about taking risks
- Corporations (or individuals) constantly face choices of what risks to take on and what risks to avoid

COSO framework focuses on risk identification & control

- ERM is a process, effected by an entity's board of directors, management and other personnel,
- applied in strategic setting and across the enterprise,
- designed to identify potential events that may affect the entity, and
- manage risks within its risk appetite, to provide reasonable assurance regarding the achievement of entity objectives.

Unique Features of Insurance ERM

- Insurance business is more complex
- Insurer is a huge risk warehouse
  - Simple auditing by checking boxes will not work
  - Naïve quantification can be misleading
- Need to truly capture the key risks and opportunities
- Actuaries can play dominant roles

Q2: WHY ERM?

ERM helps to define the Risk Appetite

- Risk taking /avoidance is a strategic choice
  - Berkshire Hathaway wrote terrorist insurance after Sept 11
  - Medical malpractice: it really depends on in which state you are offering coverage
- How aggressive on the investment side?
- International expansion, to be or not to be?
- How much to hedge and at what cost?

ERM can help reshape the business model

- Rather than holding the bag, companies can proactively hedge and off-load risks
- Some U.S. life companies sold equity-indexed annuities, and used capital market to hedge equity risks
  - They weathered better the stock market down-turn than peers who did not hedge
  - Created a new biz model based on “margins”

ERM supports strategic decisions and business planning

- A case example
  - The Board of an insurer wanted to cut back business volume in the middle of a soft market
  - Unable to do it due to concern that "*shrinking business may incur law suits by shareholders*"
  - A sound ERM framework could have helped supporting the Board's strategic decision

ERM facilitates better integration

- ERM promotes better coordination among different functions of the company
  - $100 million spending on a new IT database will be a waste without proper business inputs
- ERM helps reconcile multiple perspectives
  - Differing views at the top vs. local

Q3: Who?

Champions of Insurance ERM

Roles & Responsibilities

- The CEO is *ultimately* responsible and should assume ownership
- Board of directors provides oversight to ERM, and is aware of and concurs with the entity's risk appetite
- Appoint An ERM team (lead by the CRO)
- Identify risk owners and sponsors at operating units

ERM Team as Facilitator

- Work with operating units
- Identify and assess risks & opportunities across the enterprise
- Develop strategies for risk taking and hedging (reinsurance purchase)
- Risk reporting and monitoring risk tolerance
- Risk-based performance measure

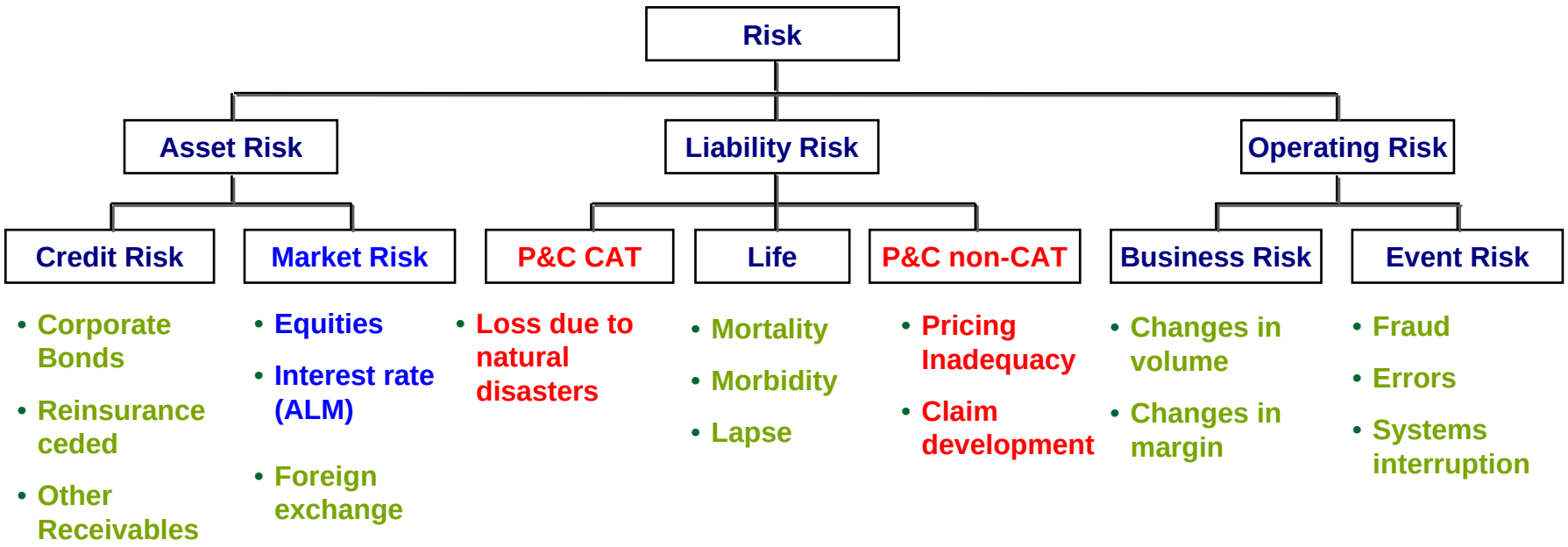
Q4: HOW to implement ERM?

I offer four(4) pieces of advice

My Advice #1:
Know Thy Risks and Opportunities

Holistic View of Risks of Insurers

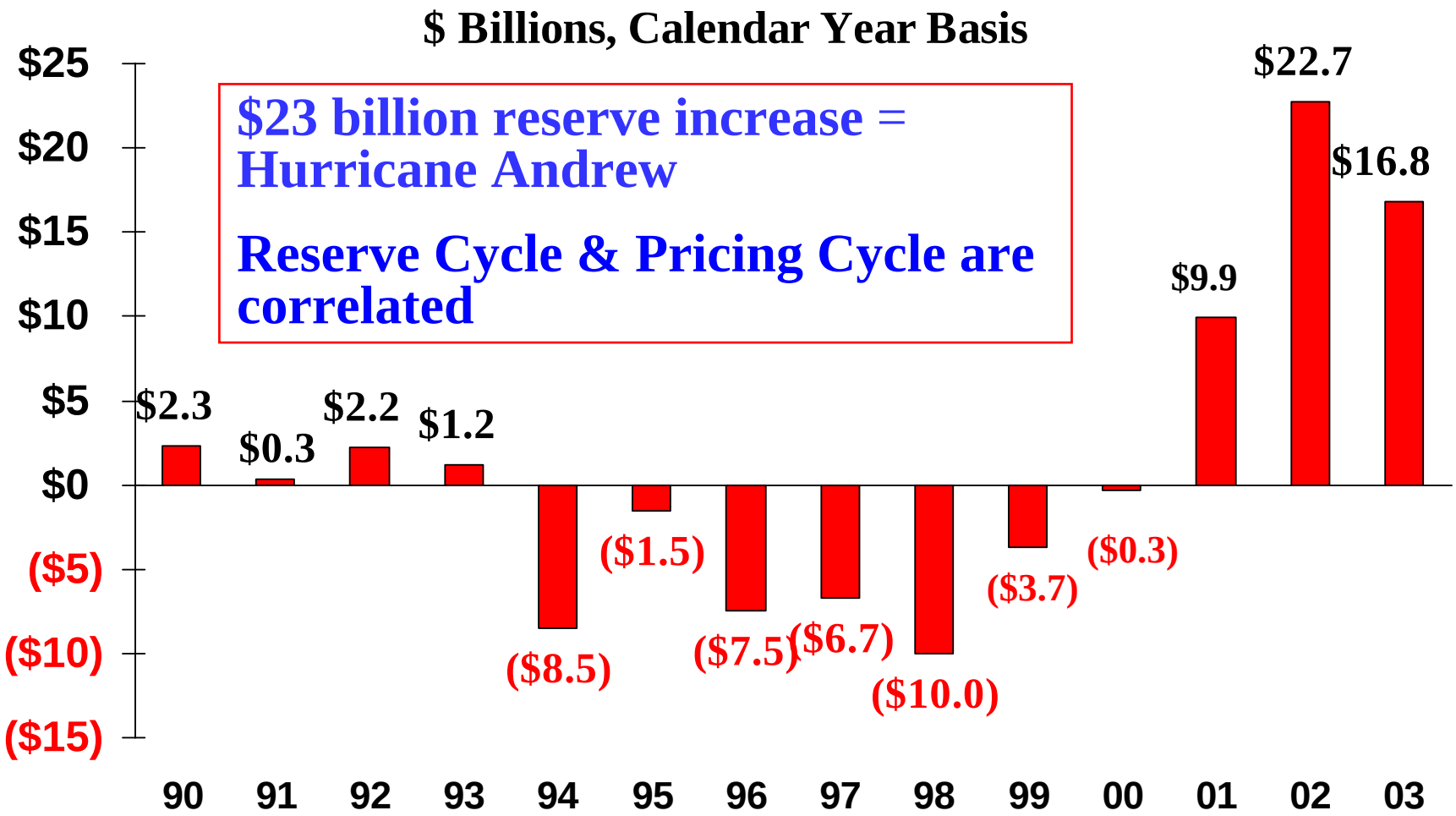
Life and P&C insurers may have different concerns



Dominant Risks For A Non-life Insurer

- The infamous ***underwriting & reserving cycle***
  - Pricing Rate level inadequacy
  - Reserve level inadequacy
- Risk concentration and Catastrophe exposure
- Rapid premium growth in a soft market
- Over-crowded competitive market
- Mismatch of underwriting expertise
  - International expansion
  - New lines of business

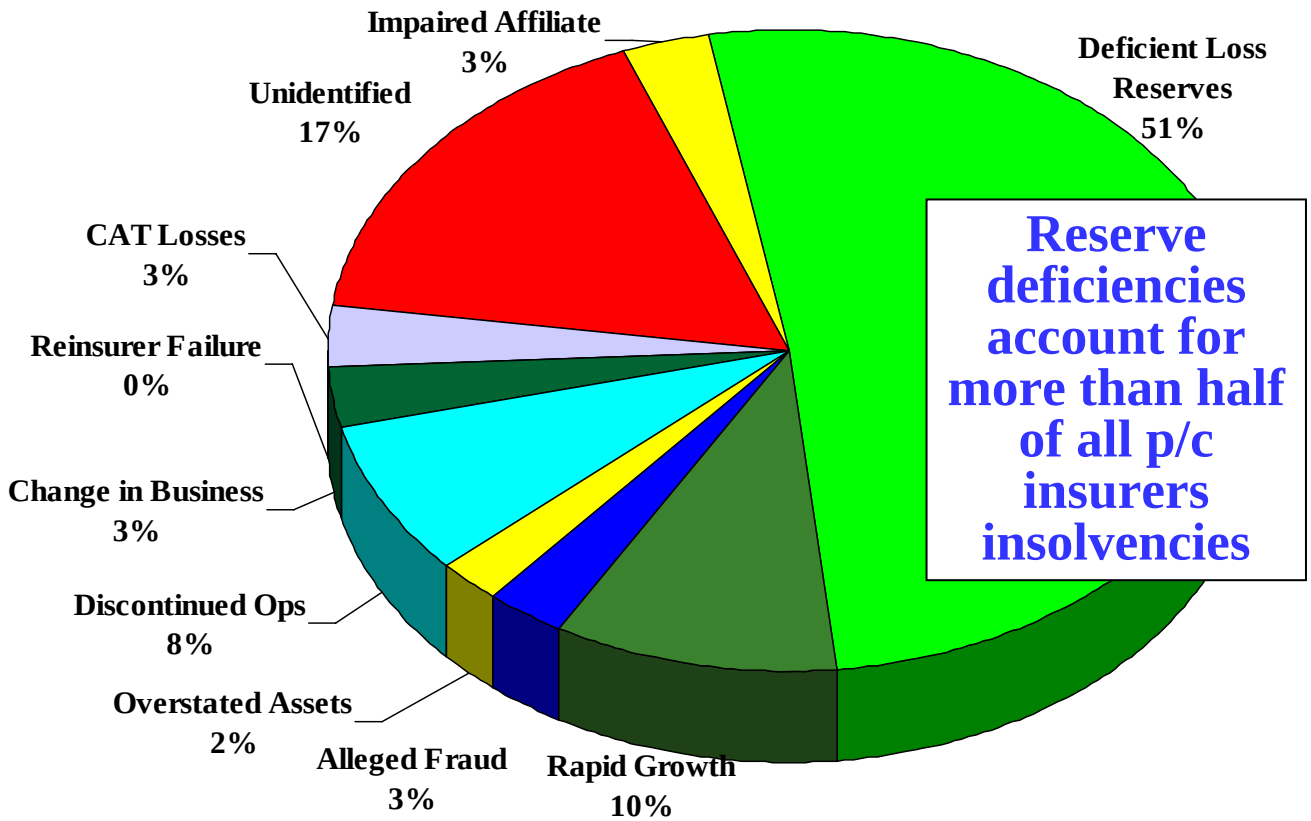
Non-life Insurance Industry Prior Year Reserve Development*



*Year 2003 number is an estimate by S&P.

Source: A.M. Best, Morgan Stanley, Dowling & Partners Securities

Reason for Non-Life Insurance Insolvencies
(218 Insolvencies, 1993-2002)

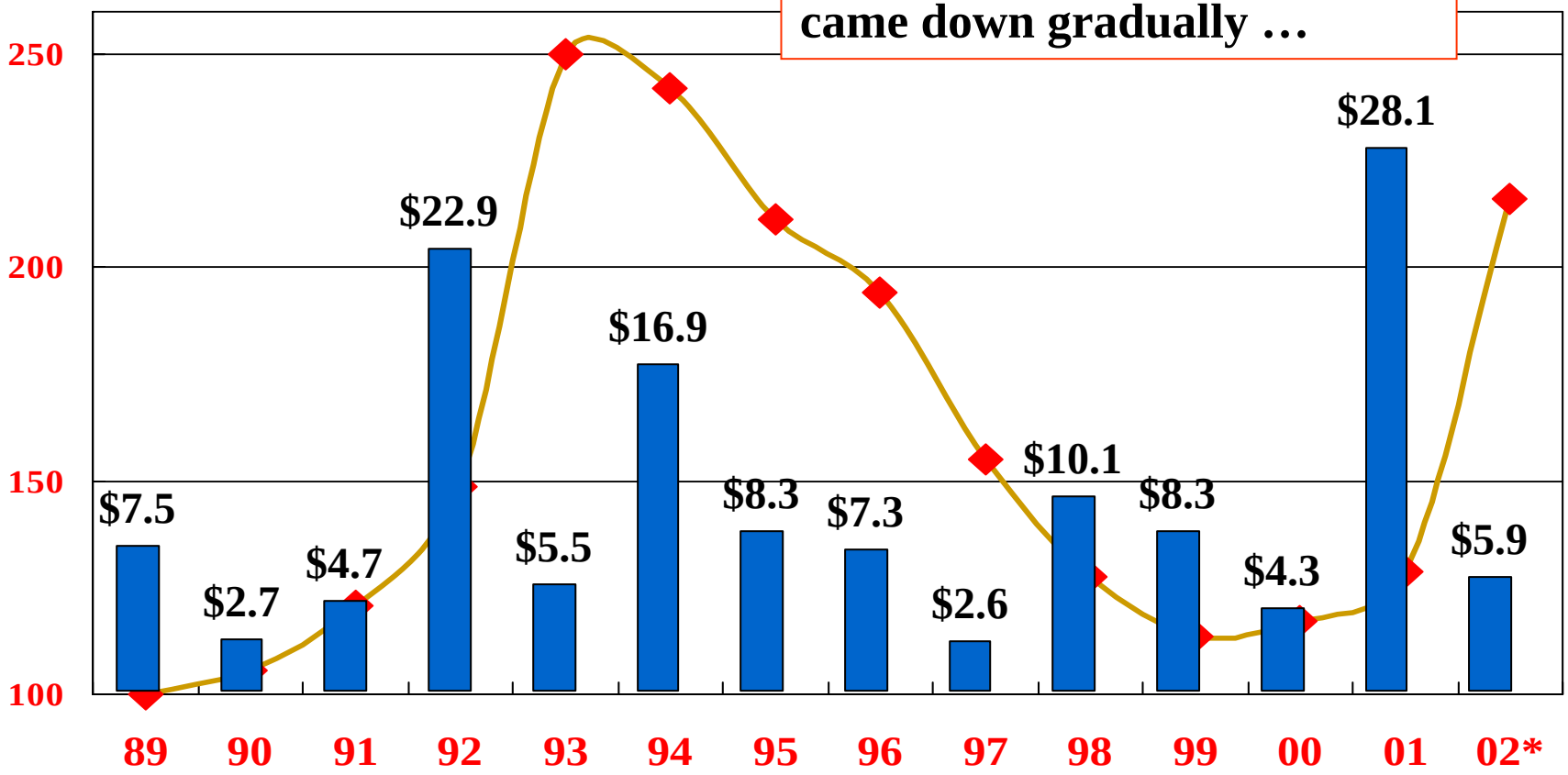


Source: A.M. Best, Insurance Information Institute

US Insured CAT Losses (in $billion) and Rate On Line Index (1989=100)

ROL showed big jump after major CAT losses, and then came down gradually …

Source: Guy Carpenter



The risk dynamics for the U/W cycle

- Not knowing the ultimate cost for years
  - A senior underwriter once said: if I am going to retire in 5 years, why should I care about claims being reported after 10 years.
- Performance measure based on premium revenue
  - Some underwriters often brag about how much business they have brought in, without knowing the profitability

Manage the dominant risks

- To know where you are in the market cycle
- Tie compensation with bottom-line result
- Monitor closely rating level and competition
- Hedge catastrophic risks through reinsurance and/or securitization
- Develop an effective ERM framework

My Advice #2: Implement An Internal Market Approach

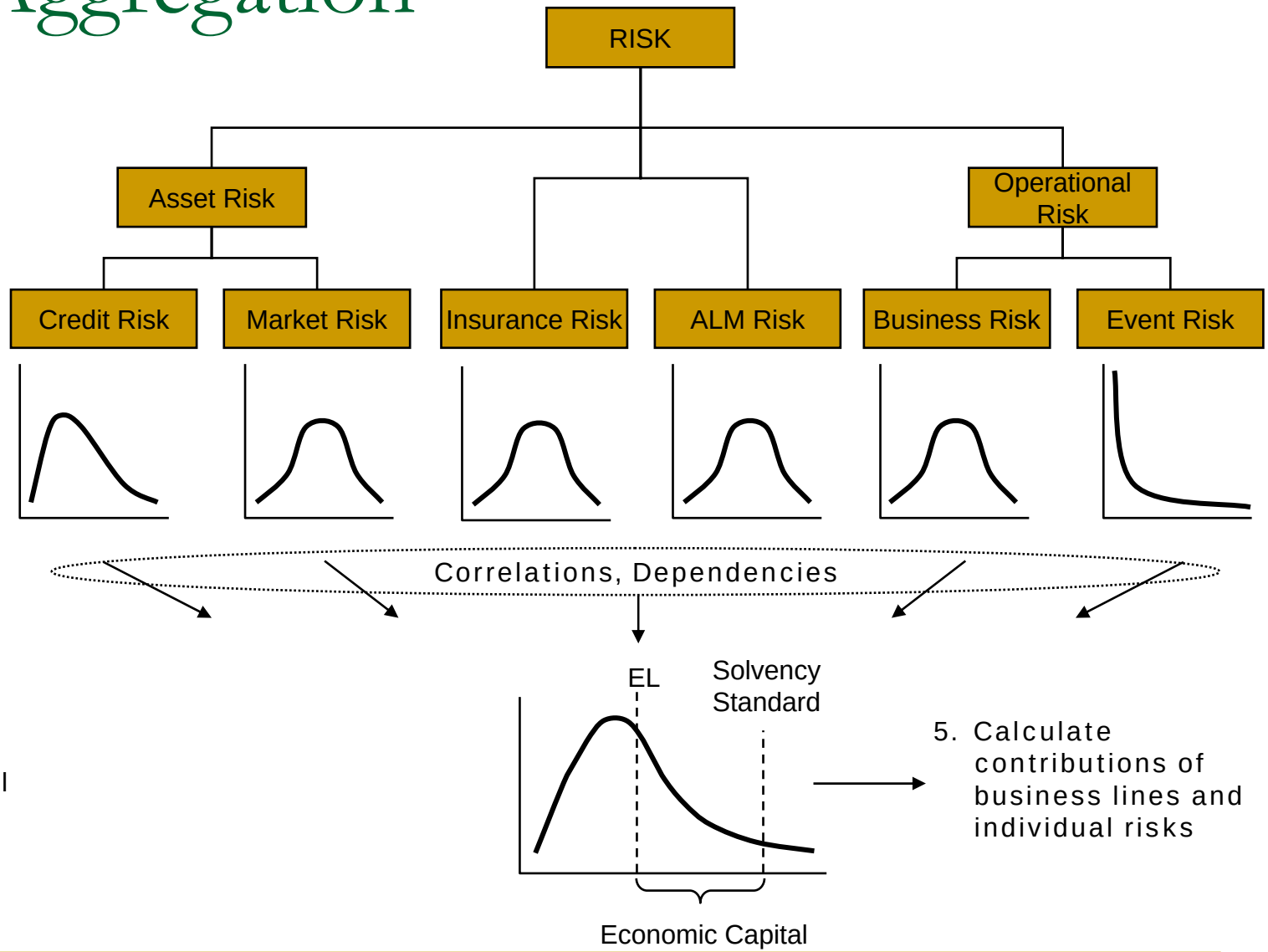
A conceptual innovation

Develop An Internal Risk Model

- An analytical framework can foster a culture of objective view of risks
  - Rather than staying at heated debates
- Risk parameters can be more important than models

Risk Aggregation

1. Identify all sources of risk
2. Characterize the distributions
3. Combine distributions
4. Measure required capital
5. Calculate contributions of business lines and individual risks



Select Robust Risk Metrics

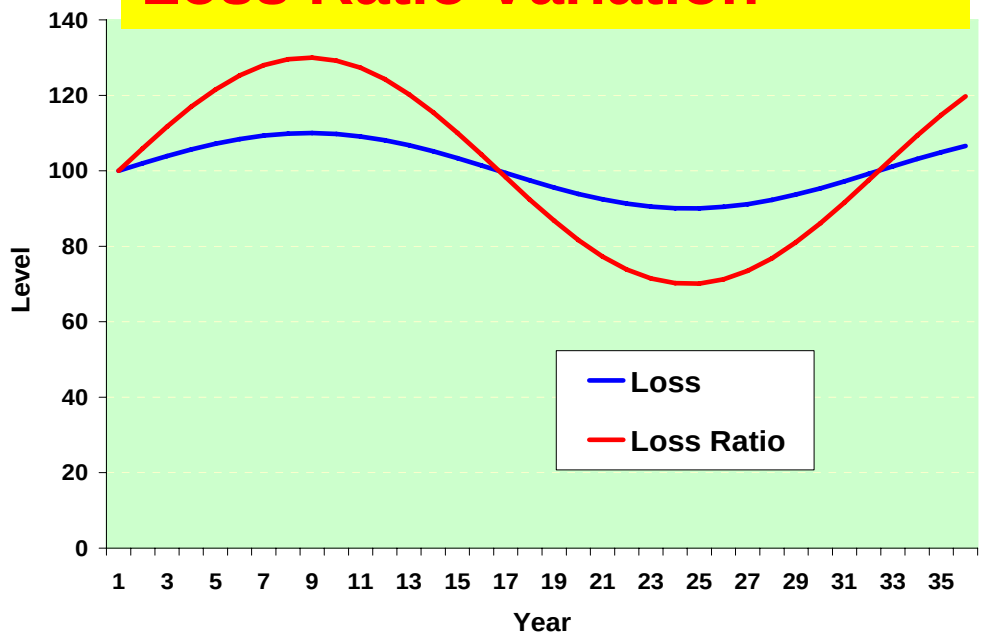
- A unifying risk metric is the Wang transform that extends Sharpe ratio to all types of risks
  - Can explain market transactions for a variety of risks
  - It can produce robust and consistent “capital charges” for the internal market model

Focus on the overall "underwriting results", look beyond the losses

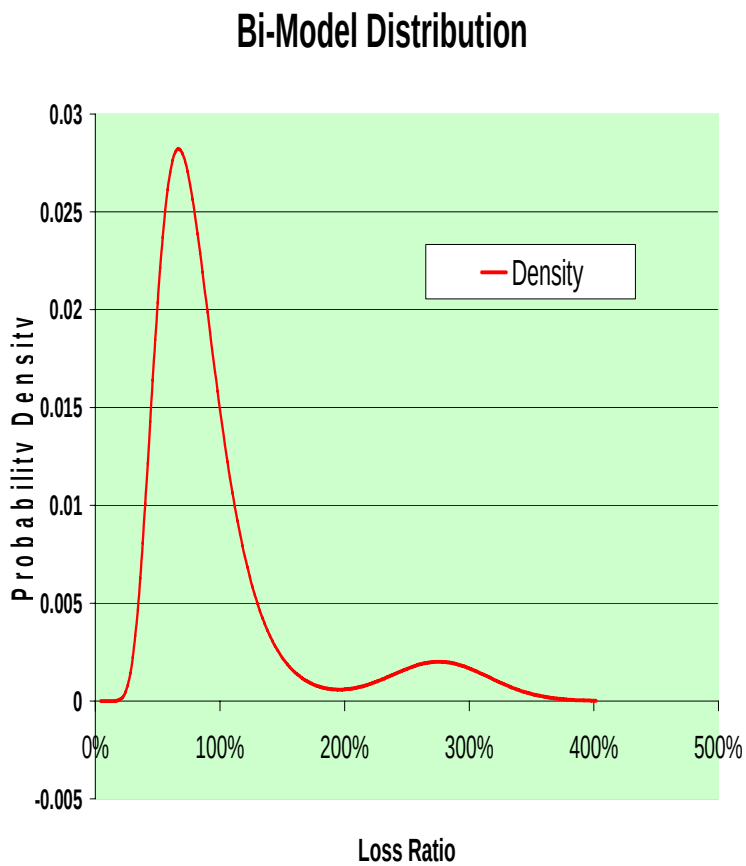
- Many factors
  - New regulation
  - New court ruling
  - Rate level
  - Unexpected inflation
  - …
  - Loss frequency
  - Loss severity

Loss Variation vs..

Loss Ratio Variation



Method for Calculating Capital Charges for Underwriting Operations



- Apply Wang transform to stylized loss ratio distribution for a line of business
- Use benchmark price to back out required capital charge

Use Wang transform to derive Capital Charge Factors for ground-up risks

		Sharpe Ratio		Target Excess Return Over Risk-free Rate
		0.3		10%
	UW Year	Payout	Annualized	Annual Capital
Line of Business	Volatility	Duration	Volatility	Charge Factor
PPA Liab	4.0%	2.3	2.6%	0.08
Prem/Ops Small	11.3%	3	6.5%	0.20
Prem/Ops Large	26.4%	6	10.8%	0.32
Comml Auto NonFleet	6.9%	3.8	3.5%	0.11
Comml Auto Fleet	37.1%	3.8	19.0%	0.57
Worker Comp Small	12.6%	10	4.0%	0.12
Worker Comp Large	28%	11.3	8.2%	0.25

Apply Wang transform to derive relativity (excess biz vs.. ground-up) in capital charge factors

	150 xs 100	250xs250	500xs500	1M xs 1M	3M xs 2M	5M xs 5M
Pers Auto Liab		1.67				
Comm Auto Liab NonFleet			1.67			
Comm Auto Liab Fleet	1.2	1.45	1.67	2	2.8	3.5
Prems/Op Small	1.2	1.45	1.67	2	2.8	3.5

An Internal Market Approach calculates capital charges for the utilization by operating units

- Reflect the inherent risks of the operating units
- Reflect internal diversification
- Reflect external hedging cost
- Provide right incentives for risk-taking at operating units
- Connect group's balance-sheet concern with operating-units income producing activities

Forward-looking Capital Charges

- Should avoid the drawbacks of U.S. Risk-based Capital Charges:
  - ✓ Factor based reserve charges ignored the bigger issue of reserve adequacy
  - ✓ Disincentives for putting up adequate reserves
  - ✓ Same capital charge *factor* for premium written in a hard market versus in a soft market
- Should reflect the current phase of U/W cycle, and projected *future direction* and *sensitivity*

Internal Market Approach Should be built upon a New Portfolio Theory

- Reflect area of expertise, competitive advantage, and risk appetite
- Reflect confidence level in estimated risk curves
- Reflect transaction cost & long payout cash-flow
- Reflect diverse time horizons in liabilities
- Anticipate potential moves of competitors & policy-holder behaviors

Quantifying Market Competition Risk:

A Simple Model Can Go A Long Way

- **Result = Min{Quote$_1$, …, Quote$_k$} – Loss,** where Quote$_k$ ~ Normal(μ_k, σ_k)
  1. For long-tailed lines, delayed info ➔ higher σ_k ➔ higher chance of premium deficiency
  2. more bidders *k* ➔ higher chance of premium deficiency
- **Competitive market analysis**: Premium and losses; market player behaviors (e.g. CA WC)

My Advice #3:
To Avoid Pitfalls in some of the "popular" Quantitative Approaches

Some Pitfalls of Current Analytical Practices – A Crisis of Credibility

- So-called 100-year events now happen every 2-3 years
- The “claim” of 99.97% threshold is “non-sense”
- Some management consultants use giant matrix of 500 by 500 (you need to make up 1,225,000 correlation coefficients)

Avoid Wildly Unstable Capital Allocation Methods

In 2001, the CAS called for papers to analyze a hypothetical insurer, recommend a reinsurance program, allocate capital, etc

Ref: *Gary Venter, Feb 2002 Actuarial Review*

	Philbrick & Painter *	Bohra & Weist **	
	% of Surplus Allocated	% of Surplus Allocated	Relative Ratio
Workers Comp	41%	11%	3.73
Auto Liab	26%	29%	0.90
HO/CMP Prop	11%	51%	0.22
Auto Phys Dmg	1%	1%	1.00
GL/CMP Liab	21%	8%	2.63
Total	100%	100%	

* From Swiss Re

** From Munich-American Re

By comparison: Wang transform method gives more robust numbers

- Let "T" be the average duration of insurance payout
- Let X_T be the risk for time horizon T
- Phibrick/Painter: $\text{RiskCapital}(X_T) = T * \text{RiskCapital}(X_1)$
- Bohra/Weist: $\text{RiskCapital}(X_T) = \text{RiskCapital}(X_1)$
- Wang transform: $\text{RiskCapital}(X_T)$

  $= \text{Sqrt}(T) * \text{RiskCapital}(X_1)$

Diversification benefit

- One of the most challenging issues
- Banking Basel II factor-based approach implies additive capital charges
- Insurance RBC has a square-root formula
  - Very different incentives effects from that of Banking Basel II
- Theoretical underpinning:
  - Historical correlation vs. cost-implied correlation

A well-kept *secret* about *integrated* risk management

- Integrated Risk Covers
  - Multi-line aggregate stop-loss
  - Combining hazard insurance with financial risk
  - There is a "*theoretical loophole*" that gives too much credit for diversification benefits.
  - "*Bundling risks*" can help brokers to find cheaper coverage for buyers. Sellers be aware.

My Advice #4:
Don't lose big-picture perspectives

Data vs. information

- Famous quote of Sir. David R. Cox
  - "Lots of data, but little information"
- We can spend much time doing data mining and trying various analytical machinery
- Often times there are bigger issues …

Unknown vs. Randomness

- Unknown (the states of world) is different from random
- Guess from observing movements of shadows
- Why don’t we go inside and look at the actions

Accuracy vs. Precision

- Once an actuary brought his analysis to a senior underwriter
- Actuary: “Here is my estimated cost: 5.723411%”
- Underwriter: “What. How do you know so precisely?”

Concluding Remarks

The Pace of Change is Accelerating

- Rule of thumb:
- The changes took place in the past 100 years = that in the prior 2000 years
- The changes in the past 20 years = the prior 80 years
- Future changes within the next 20 years = changes in the past 100 years

Embrace Her

- ERM will bring fresh thinking and will take us to the next level
- ERM can help us embrace the exciting future through innovation in education, research, training and business practice

Thank You
for Hosting My Visit!

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