Presentation at the Institute of Actuaries of Japan

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
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 downturn 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*

- **Risk**
  - **Asset Risk**
    - **Credit Risk**
      - Corporate Bonds
      - Reinsurance ceded
      - Other Receivables
    - **Market Risk**
      - Equities
      - Interest rate (ALM)
      - Foreign exchange
  - **P&C CAT**
    - Loss due to natural disasters
  - **Liability Risk**
    - Life
      - Mortality
      - Morbidity
      - Lapse
    - P&C non-CAT
      - Pricing inadequacy
      - Claim development
  - **Operating Risk**
    - Business Risk
      - Changes in volume
      - Changes in margin
    - Event Risk
      - Fraud
      - Errors
      - Systems interruption

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*

$ Billion, Calendar Year Basis

$23 billion reserve increase = Hurricane Andrew

Reserve Cycle & Pricing Cycle are correlated

*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)

- Unidentified: 17%
- Impaired Affiliate: 3%
- CAT Losses: 3%
- Reinsurer Failure: 0%
- Overstated Assets: 2%
- Change in Business: 3%
- Discontinued Ops: 8%
- Alleged Fraud: 3%
- Rapid Growth: 10%
- Deficient Loss Reserves: 51%

Source: A.M. Best, Insurance Information Institute

Reserve deficiencies account for more than half of all p/c insurers insolvencies.
US Insured CAT Losses (in $billion) and Rate On Line Index (1989=100)

Source: Guy Carpenter

ROL showed big jump after major CAT losses, and then came down gradually …
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
   - Asset Risk
   - Credit Risk
   - Market Risk
   - Insurance Risk
   - ALM Risk
   - Business Risk
   - Event Risk
   - Operational Risk

2. Characterize the distributions

3. Combine distributions

4. Measure required capital

5. Calculate contributions of business lines and individual risks

Correlations, Dependencies

EL Solvency Standard

Economic Capital
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
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

<table>
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<tr>
<th>Line of Business</th>
<th>Volatility</th>
<th>Duration</th>
<th>Volatility</th>
<th>Annual Capital</th>
<th>Charge Factor</th>
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<td>Comml Auto NonFleet</td>
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<td>3.8</td>
<td>3.5%</td>
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<tr>
<td>Comml Auto Fleet</td>
<td>37.1%</td>
<td>3.8</td>
<td>19.0%</td>
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<tr>
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<tr>
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<td>28%</td>
<td>11.3</td>
<td>8.2%</td>
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Apply Wang transform to derive relativity (excess biz vs. ground-up) in capital charge factors

<table>
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<th></th>
<th>150 xs 100</th>
<th>250 xs 250</th>
<th>500 xs 500</th>
<th>1M xs 1M</th>
<th>3M xs 2M</th>
<th>5M xs 5M</th>
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<tr>
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<td>Comm Auto Liab Fleet</td>
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<td>1.67</td>
<td>2</td>
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<td>3.5</td>
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<td>Prems/Op Small</td>
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<td>1.67</td>
<td>2</td>
<td>2.8</td>
<td>3.5</td>
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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\{\text{Quote}_1, \ldots, \text{Quote}_k\} − \text{Loss},
where \text{Quote}_k \sim \text{Normal}(\mu_k, \sigma_k)

1. For long-tailed lines, delayed info \(\Rightarrow\) higher \(\sigma_k\) \(\Rightarrow\) higher chance of premium deficiency
2. more bidders \(k\) \(\Rightarrow\) 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

<table>
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<tr>
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<th>Philbrick &amp; Painter *</th>
<th>Bohra &amp; Weist **</th>
<th>Relative Ratio</th>
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<tr>
<td>Workers Comp</td>
<td>41%</td>
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<td>Auto Liab</td>
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<td>HO/CMP Prop</td>
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<td>1%</td>
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<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
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</table>

Ref: *Gary Venter, Feb 2002 Actuarial Review*

* 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: $\text{RiskCapital}(X_T) = T \times \text{RiskCapital}(X_1)$
- Bohra/Weist: $\text{RiskCapital}(X_T) = \text{RiskCapital}(X_1)$
- Wang transform: $\text{RiskCapital}(X_T) = \sqrt{T} \times \text{RiskCapital}(X_1)$
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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