CARE
Comprehensive Actuarial Risk Evaluation

Panelists: **Linda Bjork**, FCAS, Munich Re; **Dave Ingram**, FSA, Willis Re; **Kevin Madigan**, FCAS, Pinnacle Actuarial Resources Inc.

Moderator: **Mei Dong**, FCAS, Munich Re

CAS Annual Meeting 2010
Washington DC, USA

CARE Report

Produced by the Working Group of the IAA Enterprise and Financial Risks Committee

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CARE Report Overview

- Idea
  - To explore areas where standards of practice for actuarial work in ERM can be drawn
- Additional such projects will be undertaken
  - Evaluation of ERM programs

CARE Report Contents

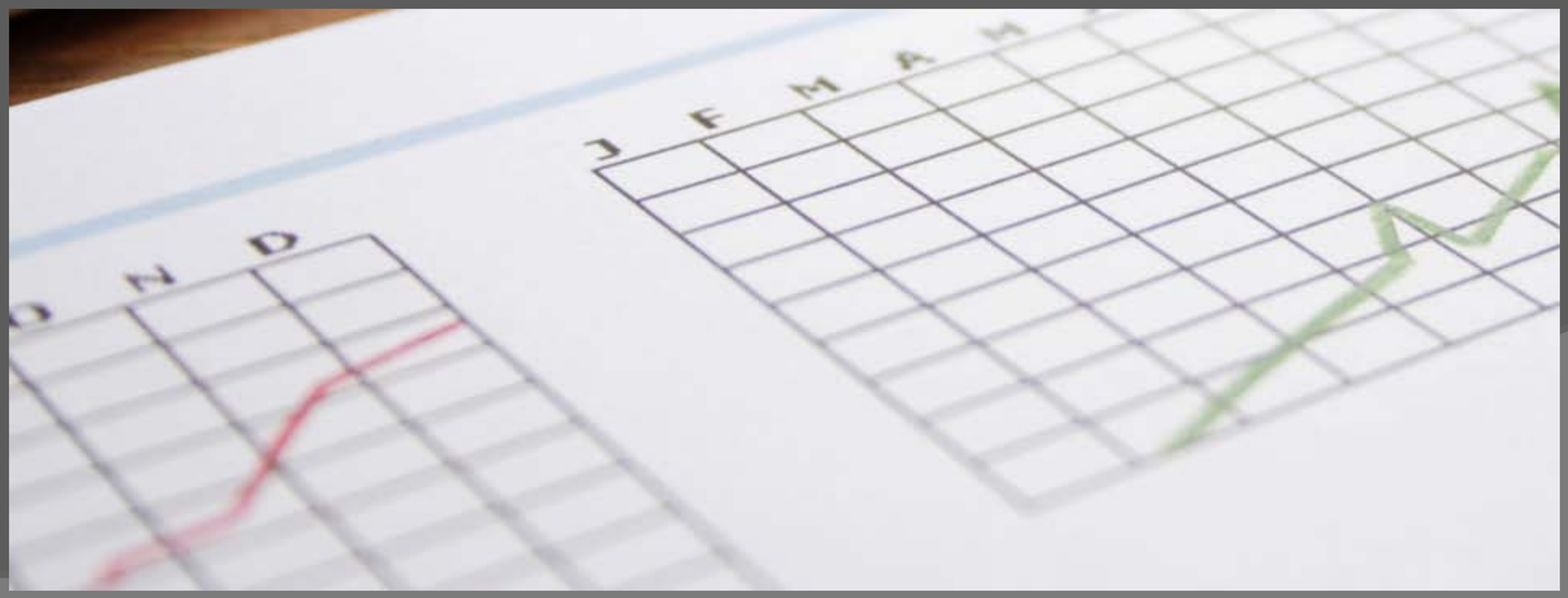
- **Why Care?**
- Uses of Risk Assessment
- Multi-Dimensionality of Risk
- Market Consistent Value vs. Fundamental Value
- **Accounting Basis vs. Economic Basis**
- **Regulatory Measure of Risk**
- Short Term vs. Long Term Risks
- **Known Risk and Emerging Risks**
- Earnings Volatility vs. Solvency Risk
- **Viewed Stand-Alone vs. Full Risk Portfolio**
- Liquidity Risk
- **Limitations of Risk Assessments**
- **Conclusion**

Why CARE?

- Risks get more complex than before, as the Financial Crisis reveals
- Objective evaluation of risks becomes critically important to Senior Management
- Risk evaluation most effective when considered with company core competency
  - Profitability, market share, operating efficiency, reputation, market positioning
  - Guide company strategy and set risk appetite
- Must be comprehensive – Satisfy multiple stakeholders' views
  - Investors, Rating Agencies, Regulators, Policyholders
- How can actuaries play a role?
  - Rigorous education designed to understand risks involved in the insurance industry
  - Recognizing complexities and uncertainties of the risks
  - Healthy respect for the limitations of models
  - Ability to balance judgment with calculations

Accounting *vs.* Economic Basis

- Many company decisions are made based on accounting information
- Good risk evaluation function brings traditional balance sheet to economic basis
  - Adjusts for accounting deviations from actual cash flows
- A Risk Adjusted Economic BS lets management draw better strategic decisions
  - Based on a more real picture of the company
  - Market consistent view of replicable assets and liabilities
  - Management view of risks & cost of risks for non-replicables



Regulatory Measurement of Risk

- Solvency capital frameworks
  - RBC, MCCSR, Solvency II, Basel II, Rating Agencies
- Firm's view of risk vs. Regulator view
  - Lower: May ignore regulatory view - could lead to problems with meeting regulatory standards
  - Higher: May use lower regulatory view - could lead to excess risk taking
- Comprehensive view needed to balance needs of different stakeholders

Known Risk and Emerging Risks

- There is a degree of Knightian Uncertainty in all risks
  - Rather than “known” vs. “unknown” binary delineation
  - There is a continuum of degrees of uncertainty
- Emerging Risks – Unknown frequency, severity, even name
  - Taleb’s Black Swans not exactly the same
- Techniques for assessing emerging risks
  - Scenario Analysis
  - Delphi Techniques
  - Monte Carlo

Stand-Alone *vs.* Full Risk Portfolio

- Disaggregated (individual risk) view of risk
  - Allows user of risk evaluation to more readily asses exposure to shifts in outside factors

- Diversified (portfolio risk) view of risks
  - Allows top management to direct the risk taking of the firm

- Risk controlling, risk trading and risk steering
  - All benefit from information about risk from both stand alone and portfolio basis

Limitations of Risk Assessments

- Any model is a simplification of reality
  - Just as important to know what a model does not do as to know what it does
  - Important to use models, stress tests and expert judgment together in assessing risk
  - Degree of uncertainty is key
- Over-reliance on models caused by
  - Overconfidence
  - Survivorship bias
  - Abandonment of Judgment
  - Extrapolation to tails

- Communication challenge
  - Clearly identify situations where data was insufficient
  - Disconnect between market and model
  - Implicit Assumptions
  - Changes in Behavior

Summary

- Start of a discussion
  - Comprehensive evaluation of risk – Guide, principle, rule, framework
  - What would encompass the unique role of the actuary in the area of risk evaluation.
- The views put forward
  - Actuary as the professional can and will deal with the multi dimensional risk evaluation
  - Utilizing a combination of models, stress tests and professional judgment
  - Appropriate consider the limitations of each approach
- The working group welcomes reactions to the report

Actuarial Risk Evaluation and Applications

Kevin M. Madigan, PhD, ACAS, MAAA

CAS Annual Meeting
November 2010

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EXAMPLES / ILLUSTRATIONS

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Confirmation Bias

- Notice /seek information confirming preconceived notions
- Ignore, not look for, or undervalue the relevance of contradictory data
- Design experiments or frame data in ways that will tend to confirm beliefs. Compounded by proceeding in ways that avoid dealing with data that would contradict hypotheses
- "Numerous studies have demonstrated that people generally give an excessive amount of value to confirmatory information, that is, to positive or supportive data"

– *http://skepdic.com/confirmbias.html*

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Multiple Metrics

Allocated Capital by Method

Method	LOB 1	LOB 2	LOB 3	Total
M1	0.6%	-3.5%	102.9%	100.0%
M2	3.5%	23.2%	73.3%	100.0%
M3	0.9%	2.9%	96.3%	100.0%
M4	15.0%	16.6%	68.4%	100.0%
M5	2.6%	13.4%	84.0%	100.0%
M6	3.6%	24.0%	72.4%	100.0%
M7	2.6%	13.4%	84.0%	100.0%

- Trent Vaughn / Neil Bodoff June / July 2010 cotor-valcon e-mail exchange

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Multiple Metrics

"Fundamentally, we are seeking to allocate capital (which is additive and non-random) to risks (which are non-additive and random). This process will result in unavoidable distortions, every time. I think the most valuable thing we can do is tabulate how each measure responds to different types of risks. Then users can make a determination of which measure best suits their purpose."

- Daniel Heyer 6/25/2010 e-mail to cotor-valcon

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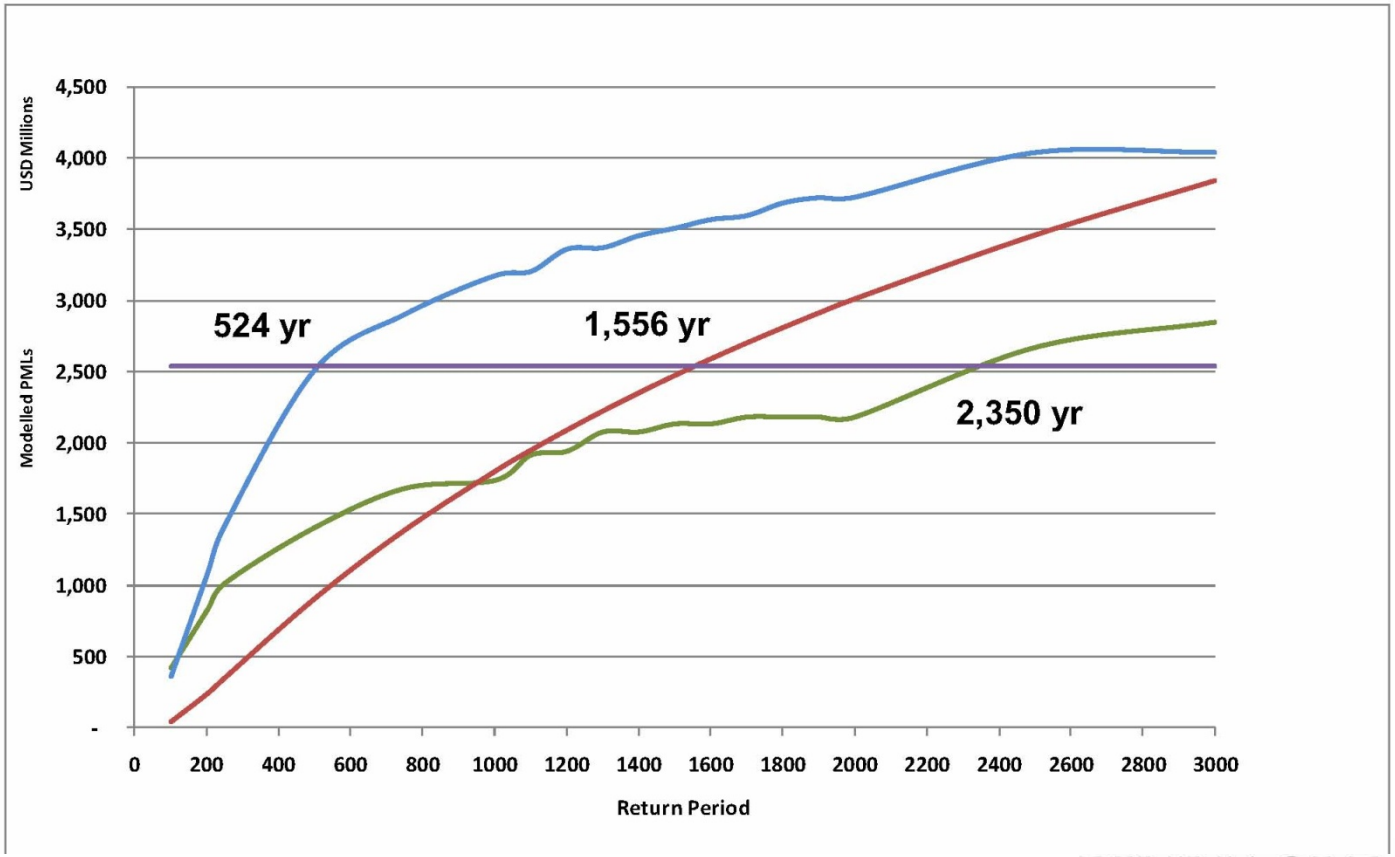
Multiple Metrics

Industry Return Period of Ground Up Limit USD 2.5bn



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Stand-alone vs. Full Risk Portfolio

- Individual Transactions
  - Order dependency and limited capacity - especially in low frequency / high severity lines
- Lines of Business
  - New products
  - Changes in volume
  - Changing long-tail / short-tail mix
  - Long term Opportunity Costs
  - Capital Adequacy

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Dependency

Linear correlation

- tractable, understood
- inappropriate
  - The concept of correlation is only natural in the context of multivariate normal, or more generally, spherical and elliptical models
  - Spherical and elliptical models don't work in our world
  - Let $X \sim F_X(x)$ and $Y \sim F_Y(y)$. For many $F_X(x)$ and $F_Y(y)$, $|\rho|$ is STRICTLY smaller than 1
  - Sometimes much smaller, e.g. $X \sim Ln(0,1)$ and $Y \sim Ln(0,\sigma^2)$
  - See work of Embrecht, et. al., and Wang, e.g., for more on this

Dependency

- Rank correlation (Spearman or Kendall) appears better
- Iman Conover method
- Copulas; well developed theory, tractable once copula has been selected
  - Take care with selection, some inappropriate for insurance data (e.g. heavy left *and* right tails; tail independence)

Dependency

- OR … don't model explicitly, parameterize shared sources of uncertainty
  - loss trend
  - underwriting cycle
  - misestimation of rate change
  - management bias
  - do you know which are truly drivers across lines?
- "Right" amount is elusive
  - examine company and industry data with great care

Adding Risks Adds Risk

- "Diversifying risk"
  - Pricing vs. Managing Aggregates
- Negative required capital? Perhaps it is just the selected metric or *its application*

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2010 CAS ANNUAL MEETING

ACTUARIAL RISK EVALUATION AND APPLICATIONS EMERGING RISKS

November10, 2010

Linda Bjork, FCAS, MAAA
Enterprise Risk Manager,
Munich Reinsurance America, Inc.

Munich RE

Defining Emerging Risks

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An Emerging Risk is…

- Risk that is new, evolving, or previously benign which, if it develops, can affect the business plan and profitability of insurers and reinsurers
- Risk that can provide new business opportunities
- Risk yet to be classified as bona fide perils…phantom risks

Defining Emerging Risks

Munich RE

From a risk perspective:

- “New” technologies (e.g. EMF, GMO, Nanotechnology)
- Established, highly complex industries (e.g. asbestos), that require a global empirical analysis aimed at developing intelligent strategies

From a insurance perspective:

- A risk that is neither contemplated by the coverage being offered nor in the premium being charged for the policy
- A risk where coverage is desired but not addressed in existing policy forms

Defining Emerging Risks
Key Characteristics

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Major uncertainty

- Potential amount of loss is unclear and not yet predictable, therefore difficult to calculate
- Link between cause and effect not yet unambiguously proven

Risk of Change

- Often scientifically or technically based
- In some cases, driven by socio-political, economic, or legal changes
- Risk knowledge is evolving
- Public awareness is increasing

Insurance and risk capital relevance

- Accumulation potential intra-line, multiline, and across balance sheet
- Long-term exposure (latency)
- Frequency and severity is not readily quantifiable

Life Span of Emerging Exposures

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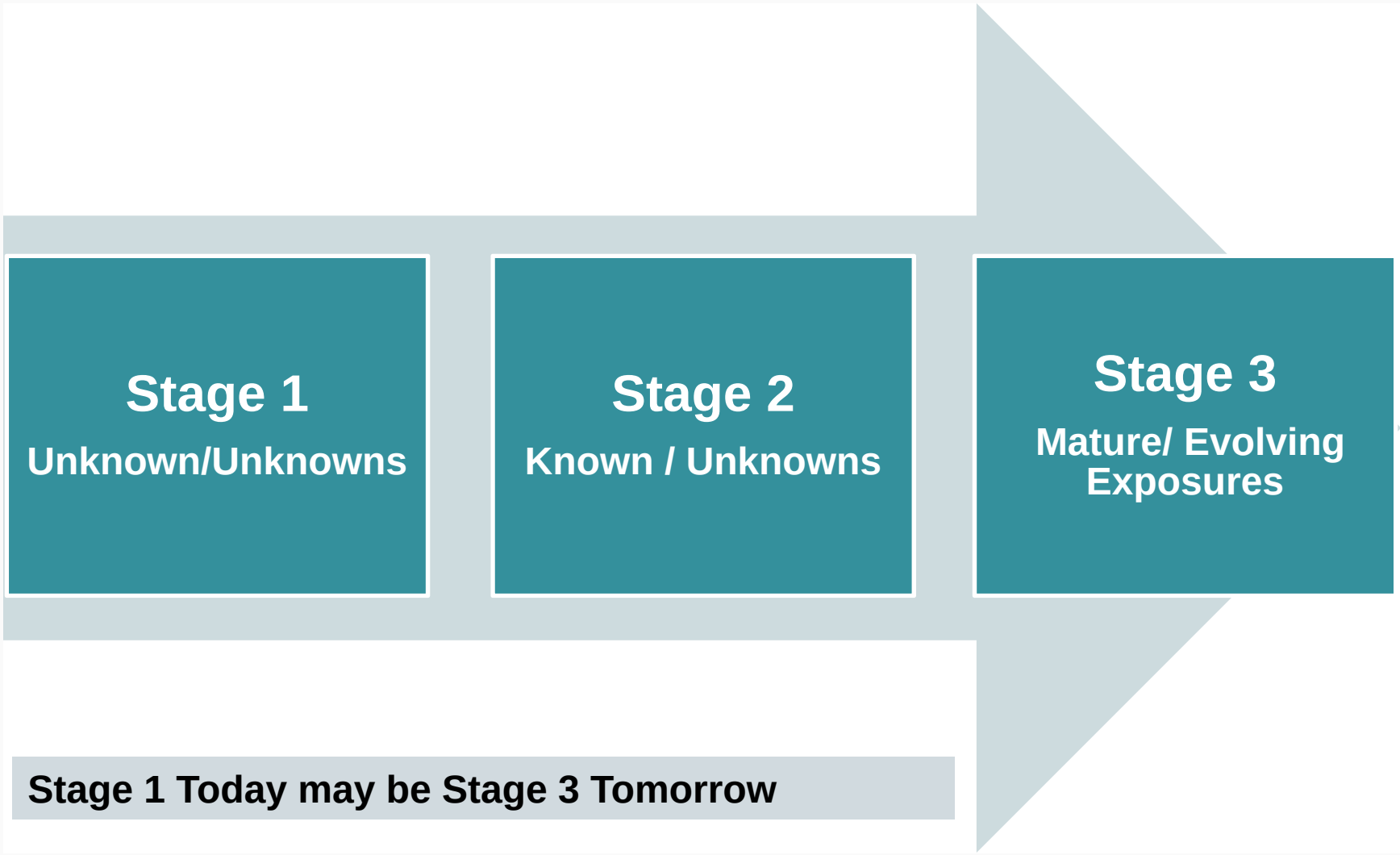

Emerging Exposure
Key Drivers/Sources

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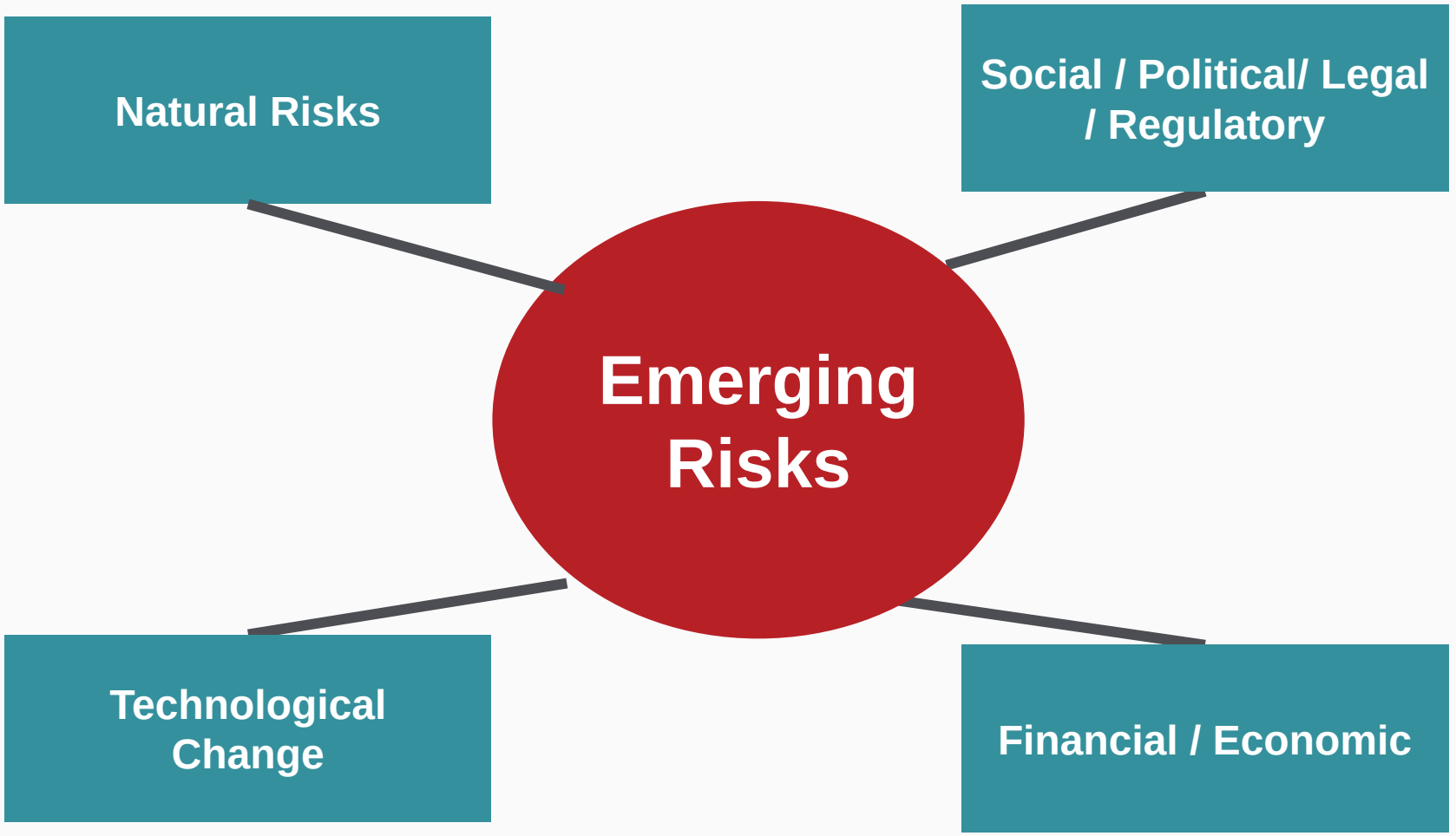

Why is it important to track & understand Emerging Exposures?

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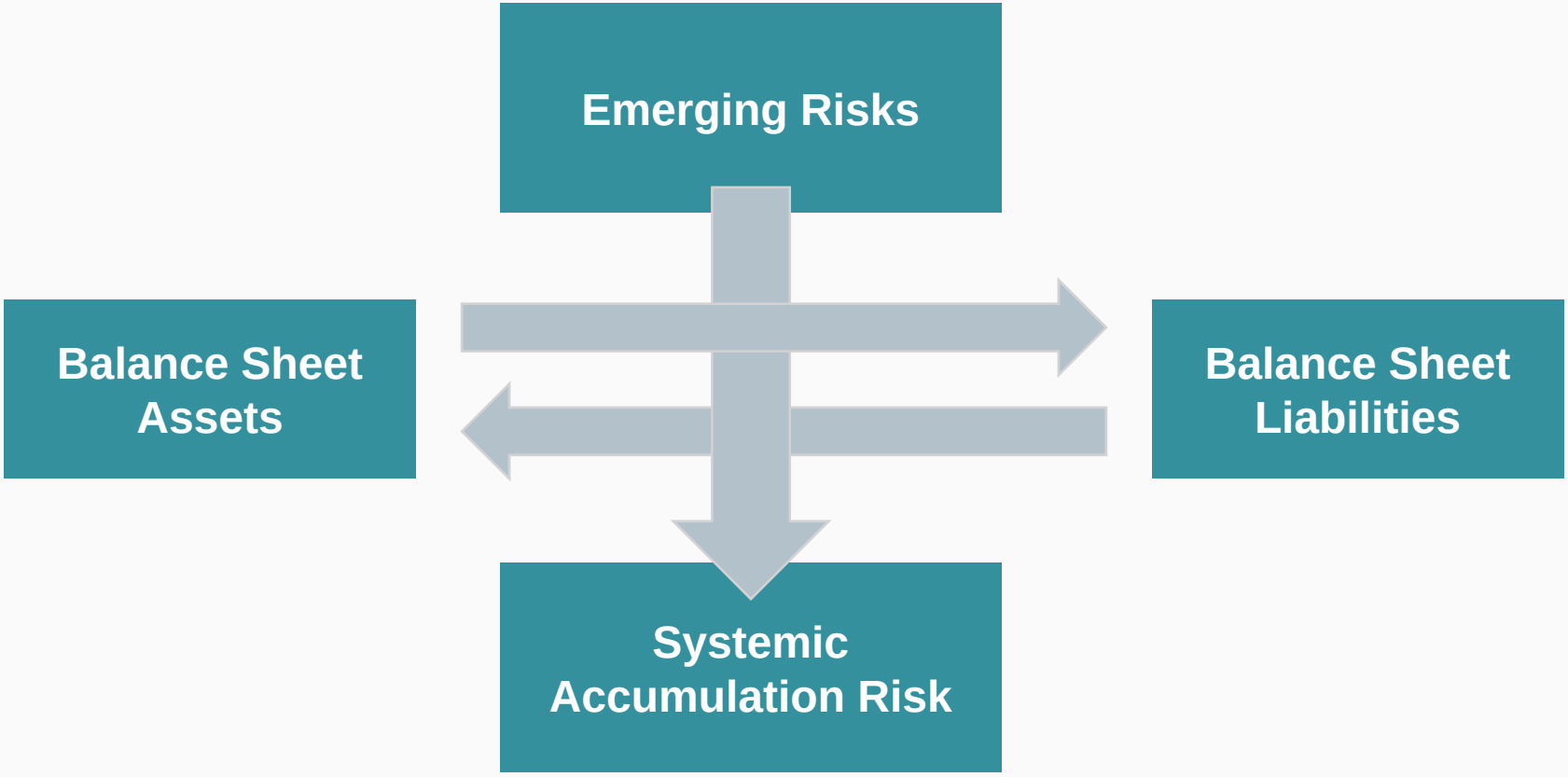
Clients Expect Coverage

Our business is assuming and financing risk.

We need to be experts in both known & emerging risks.

Emerging Exposures = Systemic Reserve Risk

Emerging Exposures = Systemic Risk



Challenges / Opportunities

Decisions, Decisions

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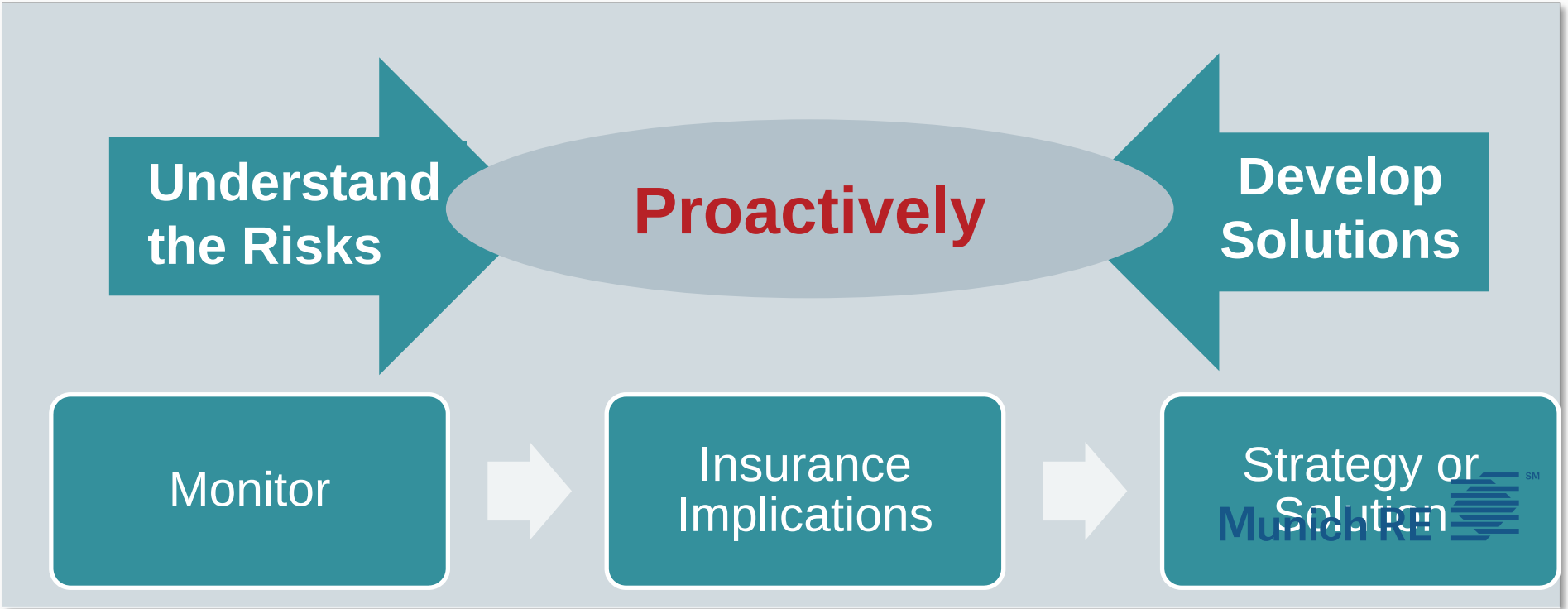

Monitoring Emerging Exposures

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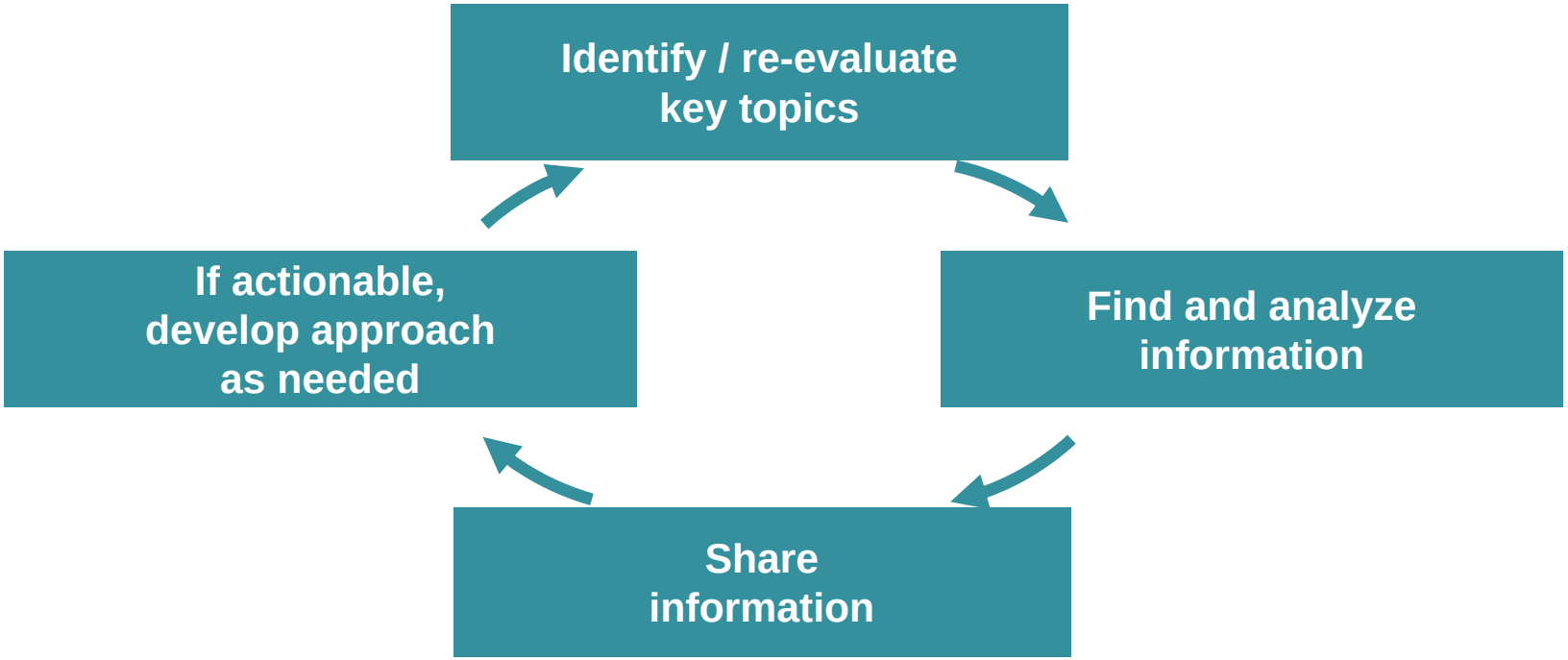
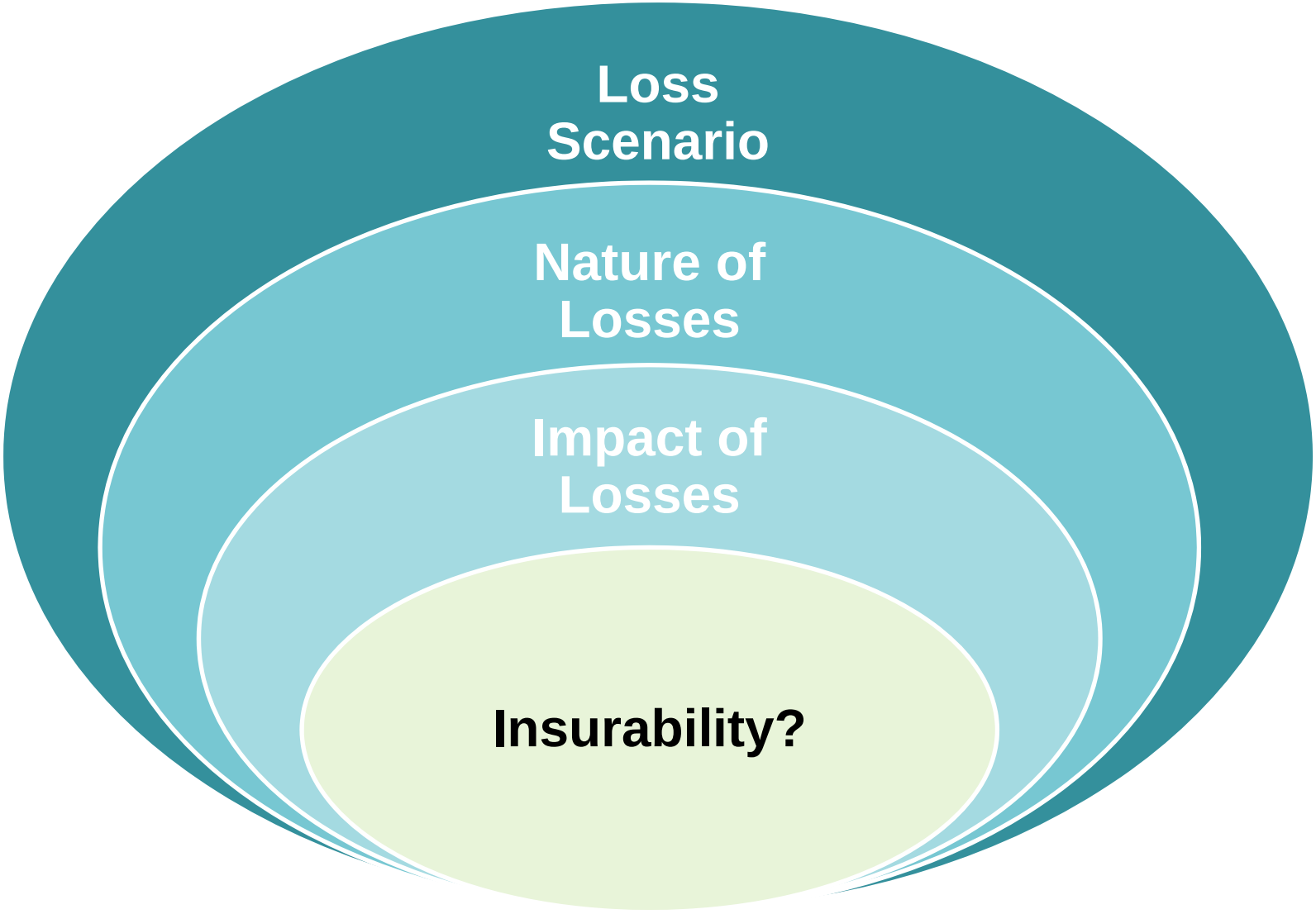
The Issue

- Previously – Not enough timely information (Pollution; Asbestos)
- Currently – Too much information – Need to manage it

The Process



Loss Scenarios for Emerging Exposures



Munich RE SM

THANK YOU FOR YOUR ATTENTION

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Munich RE

The Future of CARE

David Ingram, CERA, FRM, PRM

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November 2010

ORSA – Own Risk and Solvency Assessment

- Insurers would be required to:
- regularly perform its own risk and solvency assessment (ORSA) to provide the board and senior management with an assessment of the adequacy of its risk management and current, and likely future, solvency position.
  - the insurer's board to be responsible for the ORSA.
- encompass all reasonably foreseeable

Objectives of ORSA

- identify the relationship between risk management and the level and quality of financial resources needed and available.
- determine the overall financial resources it needs to manage its business given its own risk tolerance and business plans, and to demonstrate that supervisory requirements are met.
- base its risk management actions on consideration of its economic capital, regulatory capital requirements and financial resources.
- analyze its ability to continue in business, and the risk management and financial resources required to do so over a longer time horizon than typically used to determine regulatory capital requirements.

ORSA – the future of Solvency Regulation?

- IAIS – moving to require ORSA in all regulatory jurisdictions
  - Or considered “substandard” regulators
- Solvency 2 / CIEOPS
  - May require to achieve equivalence
- NAIC
  - Consultation on ORSA August 2010
  - Does not ask the question

    “Should we adopt ORSA?”

CARE & ORSA

- Minimum Standards for ORSA might be satisfied by Stress Tests
- Notice that nowhere in the definition of ORSA does it restrict the considerations to any single view of risk
  - As the Solvency standards are usually restricted
- CARE defines a Comprehensive view of risk
  - This is fundamentally required for ORSA