27th International Congress of Actuaries

ICA CANCUN 2002

IAA Solvency Project
Report of Working Party

Harry Panjer, Canada – Session 54

Stuart Wason, Canada - Session 93

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A New Challenge for Actuaries

Working Party Members

- Allan Brender (Canada)
- Henk van Broekhoven (Netherlands) – Vice-chairperson
- Jan Dhaene (Belgium)
- Marc Goovaerts (Belgium)
- Teus Mourik (Netherlands)
- Glenn Meyers (U.S.)
- Harry Panjer (Canada)
- Dave Sandberg (U.S.)
- Harvey Sherman (U.S.)
- Simon van Vuure (Netherlands)
- Stuart Wason (Canada) - Chairperson
- Hans Waszink (Netherlands)

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Strategy of the Working Party

- **Main themes to be considered by WP**
  - ✓ Identify the types of risk to which insurers are subject
  - ✓ Identify the approaches used to model, and the data resulting from such modelling, of each of the types of risk
  - ✓ Identify the approaches used to model, and the data resulting from such modelling, to determine the interaction/correlation between risks
- **WP review of modelling approaches to focus on,**
  - ✓ Techniques for analyzing the tail of the distribution
  - ✓ Time horizon to be used in the modelling
  - ✓ Techniques for determining the “catastrophic” portion of the distribution
  - ✓ Practical guidance on modelling the interaction between risks
  - ✓ Identify the implications for regulatory capital measurement

Executive Summary

- Assessing risk in an insurance company is an extremely complex topic. The actuary is in a unique position to provide advice to the insurer as well as the regulator.
- There is currently no single internationally agreed upon scheme for classifying insurer risks. This report suggests a scheme.
- WP believes the “three pillar” approach to banking supervision (i.e., minimum capital requirements, a supervisory review process, measures to foster market discipline) is also useful approach for supervision of insurers.

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Executive Summary

- Report provides an overview of some aspects of the risk assessment process that can be used by actuaries to model and manage the risks of insurers.
  - ✓ Actuaries use a variety of powerful tools to model risk
  - ✓ Actuaries pay special attention to the key components of risk for each peril, notably their volatility risk, uncertainty risk and extreme event risk.
  - ✓ A longer time horizon than that commonly used for the banks, is needed to assess potentially serious threats to the insurer's solvency.
  - ✓ An assessment of insurer risks must recognize the variety of techniques used to manage those risks.
  - ✓ There can be significant difference between gross effect of insurer's risks and the combined net effect of all its risks.
  - ✓ The use of internal models within the first pillar may therefore be more important for the solvency assessment of insurers than for banks.

Classification of Insurance Company Risks

- No single generally accepted classification system of insurance company risks
- Insurance supervisory groups have developed a variety of classification schemes
- Banking authorities have similarly developed classification schemes for bank risks (e.g. Bank for International Settlements)
- The different schemes have common elements but also tend to use different terminology
- Insurers take on significant risks not reflected in the schemes designed for banks

Risk Premium:
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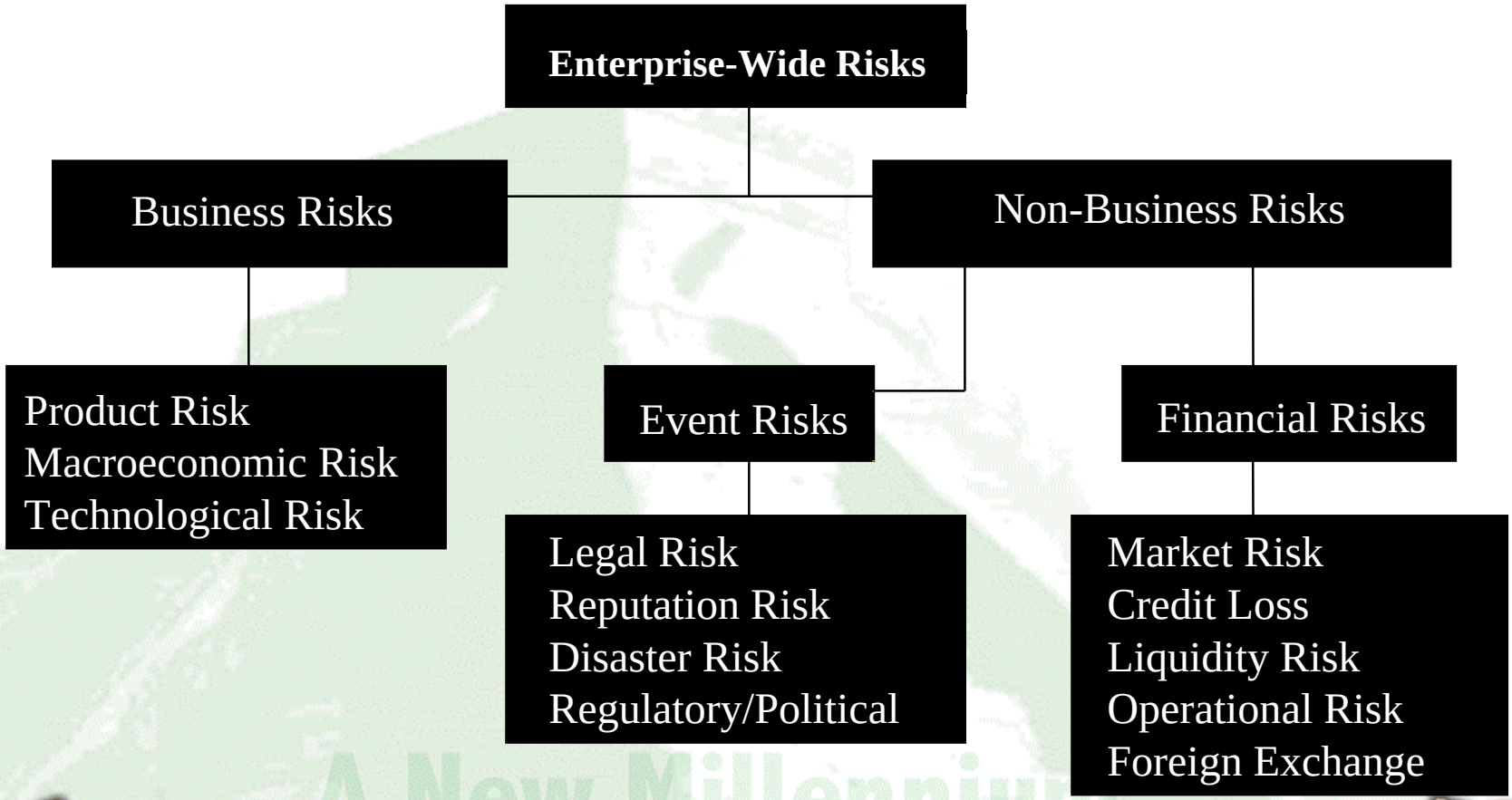
A General View of Enterprise Risks



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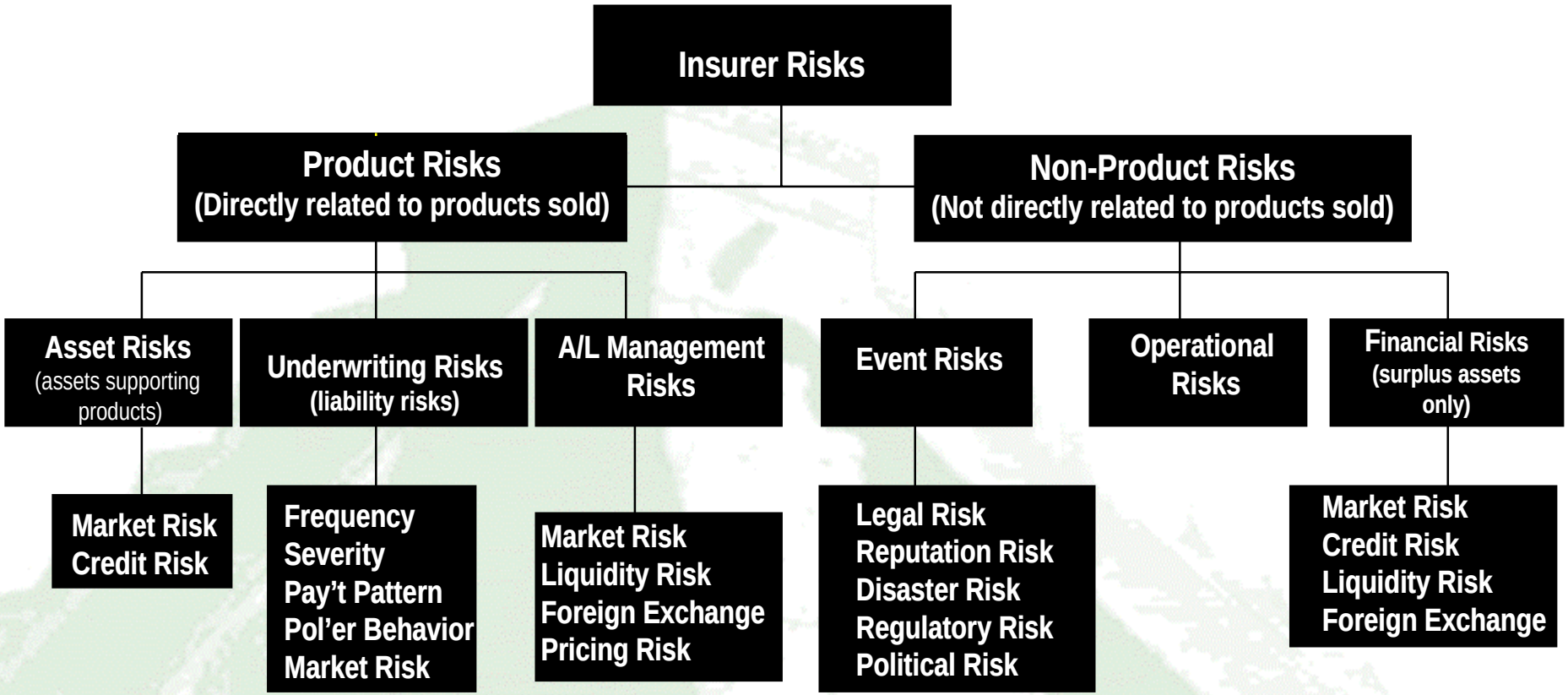
A General View of Insurer Risks



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Other Classification Schemes

International Association of Insurance Supervisors (IAIS)

- ***Investment Risks*** (Various kinds of asset risks which are directly or indirectly associated with the insurers' asset management)
- ***Technical Risks*** (Various kinds of liability risks which are directly or indirectly associated with the technical or actuarial bases of calculation for premiums and technical provisions in both life and non–life insurance, as well as risks associated with operating expenses and excessive or uncoordinated growth)
- ***Non-Technical Risks*** (Various kinds of risk which cannot in any suitable manner be classified as either technical risks or investment risks)

Other Classification Schemes

Bank for International Settlements - Basel Accord for Banks

- ***Credit Risk*** is the risk of default and change in the credit quality of issuers of securities, counter-parties and intermediaries, to whom the company has an exposure.
- ***Market Risk*** arises from the level or volatility of market prices of assets. Market risk involves the exposure to movements in the level of financial variables such as stock prices, interest rates, exchange rates or commodity prices.
- ***Operational Risk*** is the risk of direct and indirect losses resulting from the failure of processes, systems or people.

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Working Party Proposal

- ***Underwriting Risk***
- ***Credit Risk***
- ***Market Risk***
- ***Operational Risk***
- ***Liquidity Risk***
- ***Event Risk***

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Examples of risks within each category

- ***1. Underwriting Risk***
  - ✓ Underwriting process risk
  - ✓ Pricing risk
  - ✓ Product design risk
  - ✓ Claims risk (for each peril)
  - ✓ Economic environment risk
  - ✓ Net retention risk
  - ✓ Policyholder behavior risk
- ***2. Credit Risk***
  - ✓ Business credit risk
  - ✓ Invested asset credit risk
  - ✓ Political risk
  - ✓ Reinsurer risk
  - ✓ Sovereign risk

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Examples of risks within each category

- ***3. Market Risk***
  - ✓ Interest rate risk
  - ✓ Equity and property risk
  - ✓ Currency risk
  - ✓ Basis risk
  - ✓ Reinvestment risk
  - ✓ Concentration risk
  - ✓ ALM risk
  - ✓ Off-balance sheet risk
- ***4. Operational Risk***
  - ✓ Human capital risk
  - ✓ Management control risk
  - ✓ System risks
  - ✓ Strategic risks

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Examples of risks within each category

- ***5. Liquidity Risk***
  - ✓ Liquidation value risk
  - ✓ Affiliated company risk
  - ✓ Capital market risk
- ***6. Event Risk***
  - ✓ Legal risk
  - ✓ Reputation risk
  - ✓ Disaster risk
  - ✓ Regulatory risk
  - ✓ Political risk

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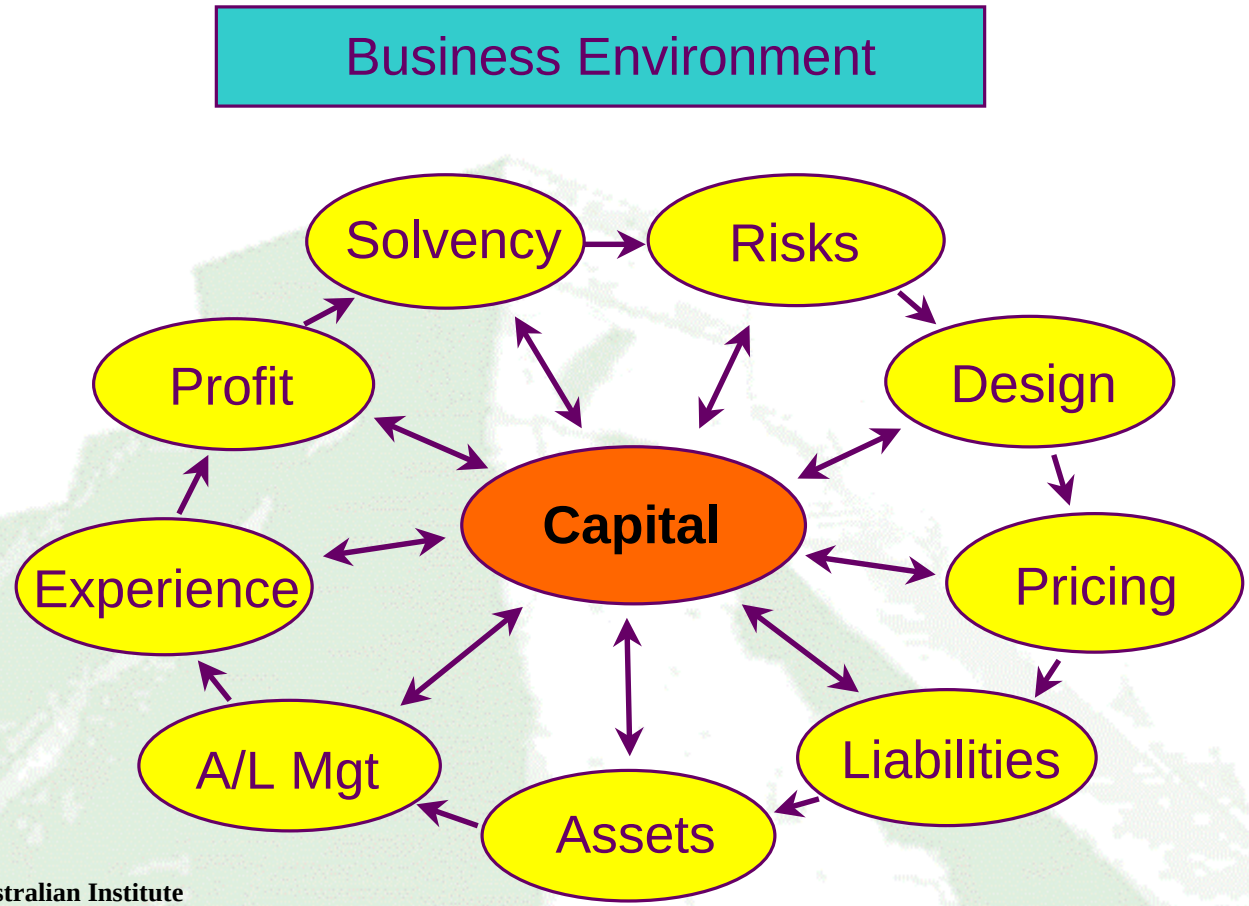
Risk Assessment Process*



* Phrase coined by Australian Institute of Actuaries

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Some Modelling Tools

- ***Collective risk models***
  - Frequency of claims (or credit events)
  - Severity of claims (or credit events)
  - Build aggregate models using these components
- ***Diffusion models and other stochastic processes***
  - Evolution of risk, stock market, or yield rates over time
  - May be in continuous time or in discrete time
- ***Multi-state models***
  - Movement from state to state over time
    - alive to disabled to dead
    - claim occurrence to reported to settled to reopened
    - credit risk movements between rating categories
- ***Cash flow models***
  - Provides framework for valuation and solvency assessment
  - Scenario analysis and stress-testing are key tools

Key Components of Risk Models

- ***Volatility risk***
  - ✓ Process risk
  - ✓ Diversifiable
- ***Uncertainty risk***
  - ✓ Model specification error
  - ✓ Parameter estimation error
  - ✓ Structural risk error
  - ✓ Systematic risk and non-diversifiable
- ***Extreme event risk***
  - ✓ High impact one-time shocks
  - ✓ May be completely unanticipated and not captured in model

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Time horizon to measure risk

- Trading risk using VaR uses 1-10 days typically
- Insurer often has long term liabilities
- Short assessment period may miss key long-term uncertainty risk; e.g. improving mortality
- Long period may introduce excessive long-term uncertainty risk due simply to limited data
- Long time frame needs to also capture management responses to emerging adverse results (feedback loop)

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Risk management

- ***Risk reduction***
  - Limiting exposure to certain risks
- ***Risk integration***
  - Managing assets and liabilities in an integrated way - ALM
- ***Risk diversification***
  - Increasing number of policies reduces relative risk
- ***Risk hedging***
  - Offsetting transaction reduces risk
    - ✓Natural mortality hedge between annuities and life insurance
    - ✓Reinsurance
- ***Risk transfer***
  - Sale or securitization
- ***Risk disclosure***
  - Requirements support better risk management

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Approaches to Combining Risks

- ***Aggregated (integrated) risk modelling***
  - Based on “internal model” approach
  - Captures complex relationships; especially economic changes
    - ⇨Solvency measure is applied to the totality of all risks
- ***Separate models for each risk***
  - A model of each risk type is developed (whether internal or factor based)
    - ⇨Specific solvency measure applied to each such risk
  - Solvency measures are combined using formulas or estimated correlations to recognize the interactive effects of risks
    - ⇨e.g. USA RBC formulas that recognize full or no correlation or possibly partial correlation.

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Implications for Solvency Assessment

Role of the Actuarial Profession

- Assessment of risk is key to operations of an insurer
- Through the actuarial control cycle, actuaries are involved in the assessment of risk throughout an insurer's operations
- Insurance business, especially long term business, is complex
- Continuous monitoring allows management to take positive actions
- Actuaries have been doing this complex analysis for some time in some countries
- Actuaries are professionals who are well positioned to assist the regulators in the solvency assessment of insurers

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Implications for Solvency Assessment

Supervisory Approach

- WP is supportive of a “three pillar” insurer supervisory approach.
- WP recognizes that “three pillar” approach is not unlike the prudential framework for insurer supervision in some jurisdictions.
- Insurer risks are sometimes very complex and varied and may be difficult to adequately capture in a common, yet simple, set of RBC formulas.
- WP supports the use of internal models within the first pillar as the ultimate goal with consistent RBC-type formulas as an attainable intermediate step.

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Implications for Solvency Assessment

Supervisory Approach (continued)

- As a long-term goal, internal models will require the development of models which balance individual insurer experience and an industry need for standardization and transparency
- Reasons for developing unified international solvency assessment framework for both banks and insurers are many. Question which WP has not explored is whether banking industry may be more prone to systemic (system-wide) risk than the insurance industry.
- Due to the long term nature of insurance contracts, it is likely that insurers are more prone to systematic risk than banks, and hence, require more detailed, long term modelling.

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Examples included in the paper

Underwriting Risk Examples

- Extremely Large Fire Insurance Losses
- Creditor Insurance Portfolio Mortality Risk
- Catastrophe Hedge Program Effectiveness
- Establishing Capital Requirements for P&C Insurers
- Automobile insurance
- Mortality Risk: An Analytical Approach to Volatility
- Capital Requirements for Annuity Liabilities

Market Risk Examples

- Guaranteed Minimum Value of Investment Funds
- Annuity Portfolio Interest Rate Risk

Operational Risk Examples

- A Parametric Approach
- A Causal Approach

Aggregation of Risk Example

- Combination of Insurance Risks

Status of the Report

- Final Report has been accepted by the IAA Insurance Regulation Committee and is in the process of receiving IAA member association acceptance as well.
- Final Report is available on the IAA web-site.
- Report has been received favourably by the IAIS.
- IAIS has suggested the IAA could be helpful in assisting in the development of a global structure for insurer risk based capital (initially more focused on principles than numbers).

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Further steps by the IAA

*New WP on **RBC Solvency Structure** has been formed to develop a universally applicable framework for RBC.*

- **April 2002:** Finalize terms of reference
- **May 2002:** Assemble information about ongoing related work. Develop first sketch of broad global RBC principles.
- **August 2002:** Have draft report on global RBC principles available for IAA Insurance Regulation Committee. Report will include additional practical content for each principle. Report will identify additional work to be done by the WP.
- **October 2002:** Have received feedback from IAA and IAIS meetings discussing work of WP
- **May 2003:** Issue complete draft report to the IAA Insurance Regulation Committee

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You can participate

- To join as an observer - send an email to Christian Levac at the IAA Secretariat at christian.levac@actuaries.org
- To contact the WP directly, send an email either to
  Stuart Wason at stuart.wason@ca.wmmercer.com or
  Henk van Broekhoven at Henk.v.Broekhoven@mail.ing.nl

Thank you

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