

Economic Capital for Insurance Risk – Implementation of Solvency II

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Agenda

- Insurance Risk
- Internal Models
- Correlation and Diversification
- Regulatory Capital under Solvency II
- Way forward

Insurance Risk

Risk Management at Insurance

External Factors & Business Environment

Economic Cycle, Competition, Catastrophe, changes in environment and demography

Internal Factors

Internal Controls

Governance

Management

Operational Risk

Failed Processes

Failed People

Failed Systems

External Events

Financial Risk

Credit and Counterparty Risk

Market Risk

Liquidity Risk

Investment Risk and ALM

Insurance Risk

Technical Provision and Reserves

Underwriting

Catastrophe, Claims, Lapse and Expenses

Reinsurance

Insurance risk deals with the risk on the liabilities emanating from the insurance contracts. Assets side is exposed to financial and operational risk similar to any banking institution with the exception that insurance firms have longer term assets as compared to banks. Operational risk arising out of insurance business is not incorporated in the insurance risk and dealt with separately in the manner similar to banks

Insurance Risk

Liabilities/ Product/ Insurance contracts	Underwriting Including Claims and Catastrophe	Correlation / Diversification
	Risk Mitigation through Reinsurance	
	Technical Provisioning/ Reserves	
	Investment Risk & ALM	
Assets		

1. *Insurance* risk refers to fluctuations in the timing, frequency and severity of insured events, relative to the expectations of the firm at the time of underwriting.
2. Insurance risk can also refer to fluctuations in the timing and amount of claim settlements.
3. For general insurance business insurance risk include variations in the amount or frequency of claims or the unexpected occurrence of multiple claims arising from a single cause.
4. Insurance risk also means variations in the mortality and persistency rates of policyholders, or the possibility that guarantees could acquire a value that adversely affects the finances of a firm.
5. Insurance risk includes the potential for expense overruns relative to pricing or provisioning assumptions.”

Risk Sensitivity of Insurance firms

- The existing regulatory frameworks in insurance sector to a large extent do not differentiate between the quantum of insurance risks. The regulatory capital required is still largely fixed or minimum.
- Some sensitivity has been incorporated in the past decade in some regulatory regimes.
- This has opened up regulatory capital arbitrage across the financial intermediaries, especially since banking sector has now come under more risk sensitive Basel II regime.
- Since insurance regulatory regimes do not ask for risk sensitivity, the existing actuarial models stop short of measuring risks and actuarial standards have not incorporated risk sensitivity in their standards, tools and methodologies.
- With the advent of Solvency II type of regimes, the regulatory capital have started becoming risk sensitive. actuarial estimates have started moving towards the “best estimate” and liability valuations towards “market value of liabilities”, assets towards fair value principles and both values topped up with market value margins.
- Insurance companies continue to be biggest investors in the credit markets due to regulatory capital prescription and regulatory capital arbitrage available.

Insurance Risk vs. Actuarial Models

- Actuarial methods are used to assess risks, determine the adequacy of premiums (tariffs) and establish technical provisions for both life and non-life insurance.
- These methods include a detailed understanding of the probabilities of insurance risks (e.g. mortality, morbidity, claims frequencies and severities), the use of statistical methods, the use of discounted cash flows, understanding and assessing the use of risk mitigation techniques and an understanding of volatility and adverse deviation.
- Insurance risk deals with the risk on the liabilities emanating from the insurance contracts. Assets side is exposed to financial and operational risk similar to any banking institution with the exception that insurance firms have longer term assets as compared to banks.
- Operational risk arising out of insurance business is not incorporated in the insurance risk and dealt with separately in the manner similar to banks.
- The linkage between the actuarial model and the risk management function, is through 'use test', and should be ensured by the risk models.

Internal Models

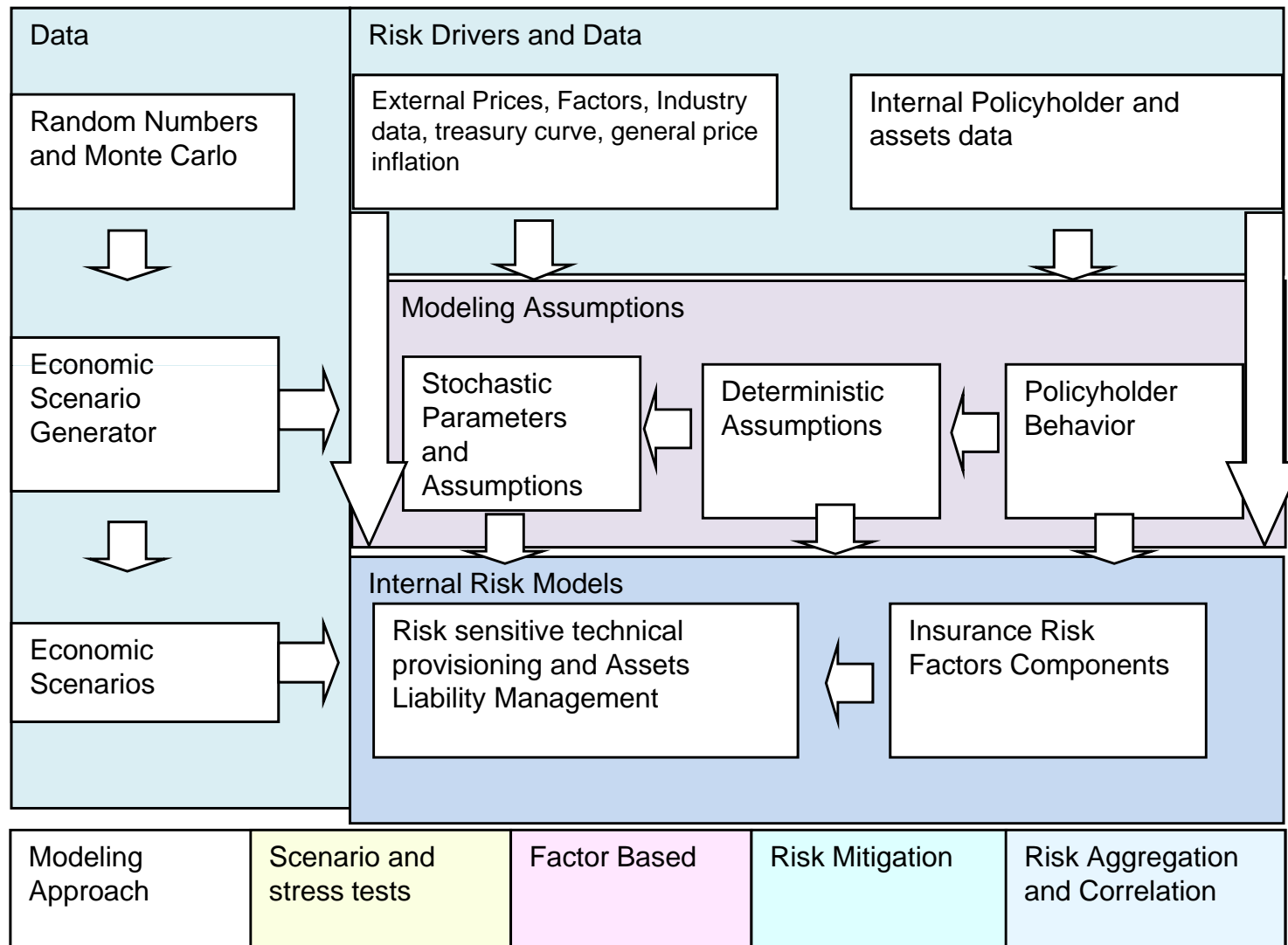
Internal Models for Economic Capital for Insurance Risk

- “A risk management system developed by an insurer to analyze the overall risk position, to quantify risks and to determine the economic capital required to meet those risks”
 - Use test- the process by which the internal model is assessed by the insurer in terms of its application within the undertaking’s risk management process
 - Statistical quality standards- Internal models are calibrated onto losses and risk and their focus is on the tail. Correlation is considered within the model. All material risks should be considered. The model should be broadly consistent with technical provision computation.
 - Calibration standards- wherever feasible, use VaR at 99.5% over 1 year confidence level. Different risk measure/ time horizon are permitted provided policyholders’ protection equivalent to Standard Formula i.e. 99.5% over 1 year, VaR. Approximations are also permitted where firm demonstrates approach provides equivalent protection
 - Validation standards- validation involves both quantitative and qualitative elements. And it should be subjected to the independent review.
 - Profit and Loss Attribution
 - Documentation standards- must provide theory, assumptions, mathematical and empirical basis underlying the model, weakness of the model.

Insurance Products type

Life			Non Life		
With Profit	Investment Risk with Policy Holders	Without Profit	Casualty/ Accident/ Health	Property	Others
Contract with Savings			With workers comp-general	Motor with third party liability	Credit and surety ship
Death protection contracts					
Survivorship Protection Contracts			Worker's comp Annuity	Motor other classes	Legal expenses
Contracts with Disability or Morbidity Risk					
Health Insurance similar to life			Health Insurance - long term	Marine, aviation and transport	Miscellaneous non life
Reinsurance			Health Insurance - short term	Fire and damage to property	Assistance

Internal Models for Insurance Risk



Risk Factors and Risk Components for Insurance Risk

Risk Factors	Trend Level Volatility Catastrophe						
LoBs	Insurance Risk Components						
Life	Mortality	Disability Morbidity	Longevity	Expenses	Lapse	Revision	Catastrophe
Health	Premium	Claims	Accumulati on	Expenses	Standard deviation	Correlation	Catastrophe
Non Life	Premium	Claims	Reserves	Expenses	Standard deviation	Correlation	Catastrophe

Internal Modeling Approach

Modeling Approach Deterministic/ Stochastic	Insurance Risk Components/ Factors
Scenario Based	Non life catastrophe, Health Worker Compensation – mortality, longevity, disability, revision Life- Revision
Scenario Based with risk mitigation	Life- Lapse, Expenses, Disability, Mortality, Longevity, Market Risk – Currency, Property, interest rate, equity
Factors Modeling	Life catastrophe, Health – Accident and Others
Factors Model with risk mitigation	Health- long term expenses Health long term claims Health long term accumulation Concentration risk for market risk Spreads
Factors Model with risk aggregation and correlation	Non-life premium reserve Health- Short term Health workman compensation
Risk Aggregation and Correlation	Non life, Life Health- short term, workman compensation, workman compensation annuity Market risk for ALM
Risk Mitigation, Risk Aggregation and Correlation	Insurance Risk Health, health long term Life Underwriting Risk Market Risk for ALM

Technical Provisioning

Assets	Technical provisioning	Risk Margins
		Best Estimates

Technical Provisions =

Best estimate or probability-weighted average of the present value of future cash-flow scenarios using current assumptions related to the experience of the portfolio.

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Risk Margin to cover for residual or non financial risk and a market value margin (MVM) to reflect the additional cost of transferring the liabilities to a third party.

Issues and challenges to make technical provisioning risk sensitive

- 1. Risk Margin depends upon the size, risk and existing portfolio of the transferee insurance firm. This is being addressed by computing the risk margin with respect to a reference insurance firm which is realistically large and diversified.
- 2. Technical provisions (as prescribed by Solvency II requirements) cover policy obligations and may not include claims handling or other expenses.
- 3. Incorporating risk mitigation through reinsurance into each obligation.
- 4. Treatment of unearned premium- The future cash-flow scenarios relating to claims arising from unearned premiums are analyzed on the same basis as those arising from claims that have already happened.
- 5. Obligations on a portfolio ideally do not depend upon the insurance firm. However, to maintain the brand standing, insurance firm may settle claims at higher than the costs assumed in the obligation valuation. Some other firm may settle at lower costs. This also impact the liability valuation and technical provisions.

Internal Models for Technical Provisioning

- Internal models are recommended whenever there are embedded options and nonlinearity in the policies or exposures.
- Linear exposure liability is equal to unearned premium calculated pro-rata basis on time. This method is allowed if demonstrated to be a reliable estimate. This method is not acceptable in all jurisdictions.
- Non-linear exposure is estimated by current value of the unexpired risk for the remainder of the contract period, less any applicable expected premiums. If expected premiums are not enforceable, the estimation excludes such premium.
- There are various approaches to model cash-flows. One of the recommended approaches is to offset inflow against cash outflow.
- For acquisition costs there are various approaches. It can be either expensed during the beginning of the contract (between first to third year) or recovered through allowance from the future premiums and other revenue.
- Derivatives, guarantees and options should be included in the valuation methodology. Cash-flow should include cash inflows and outflows over the entire lifetime of policies.
- The question which is generally asked is “should the contract inflows (eg. premium) be considered separately from outflows (claims) .
 - The answer is if the inflow and outflows cannot be easily separated, they can be considered together. Uncertainty about the receipt of the premium should be appropriately reflected using probability weighted cash inflow.

Correlation and Diversification

Correlation

- Correlation at the four levels is assumed and modeled for insurance risks. At the most granular level is the correlation across the risk components. The next level of correlation and risk aggregation is across the lines of business. Correlation across the reinsurers is another type of correlation which is generally modeled for P&C risks.

	Assets	Underwriting	Technical Reserves	Claims / Catastrophe	Reinsurance
Assets	1				
Underwriting	Low	1			
Reserves	Low	High	1		
Claims/CAT	Low	High	Low	1	
Reinsurance	High	Medium	Medium	High	1

Correlation Matrix

Insurance firms have built variety of correlation matrix for risk measurement and risk aggregation. Following inputs are considered to build the correlation matrix

- Scenarios and possible ‘cause and effect’ event chains
- Availability of data-specially the market data
- Assumptions underlying economic scenario generator (ESG)
- Correlation assumptions under stressed conditions

Correlation matrix approach has limitation in the non-linear environment. One of the less complex approach firms follow is the “non-linearity scaling adjustment”. This is computed from stressed capital required for a scenario at lower confidence of say 94%. The ratio of stressed capital to the capital required at 94% confidence is called non-linearity scaling adjustment factor

Correlation	Interest	Equity	Property	Spread	Concentration	FX
Interest	100%					
Equity	0%	100%				
Property	50%	75%	100%			
Spread	25%	25%	25%	100%		
Concentration	0%	0%	0%	0%	100%	
FX	25%	25%	25%	25%	0%	100%

Correlation between the risk components for life insurance

	Mortality	Longevity	Disability	Lapse	Expense	Revision	CAT
Mortality	100%						
Longevity	0%	100%					
Disability	50%	0%	100%				
Lapse	0%	25%	0%	100%			
Expense	25%	25%	50%	50%	100%		
Revision	0%	25%	0%	0%	25%	100%	
CAT	0%	0%	0%	0%	0%	0%	100%

Regulatory Capital under Solvency II

Regulatory Capital under Solvency II

Capital computation for Life Insurance according to Solvency II	Capital computation for Non-Life Insurance according to Solvency II
Technical provisions according to current basis	Technical provisions according to current basis
Provision for unearned premium	Provision for unearned premium
Life assurance provision	
Claims provisions	Claims outstanding
Provision for bonuses and rebates	Provision for bonuses and rebates
Other provisions	Equalization provision
Unit linked	Other technical provision Provision for unexpired risk
Total value current bases	Total value current bases
Deferred acquisition costs (-)	Deferred acquisition costs (-)
Best estimate value of the segment of liabilities	Best estimate value of the segment of liabilities
Total	Total
of which Death	of Premium
of which Survivorship	of Claims
of which Disability	
of which Savings	
Optional data	Optional data
of which value of hedgeable risks	of which value of hedgeable risks
of which value of non hedgeable risks	of which value of non hedgeable risks

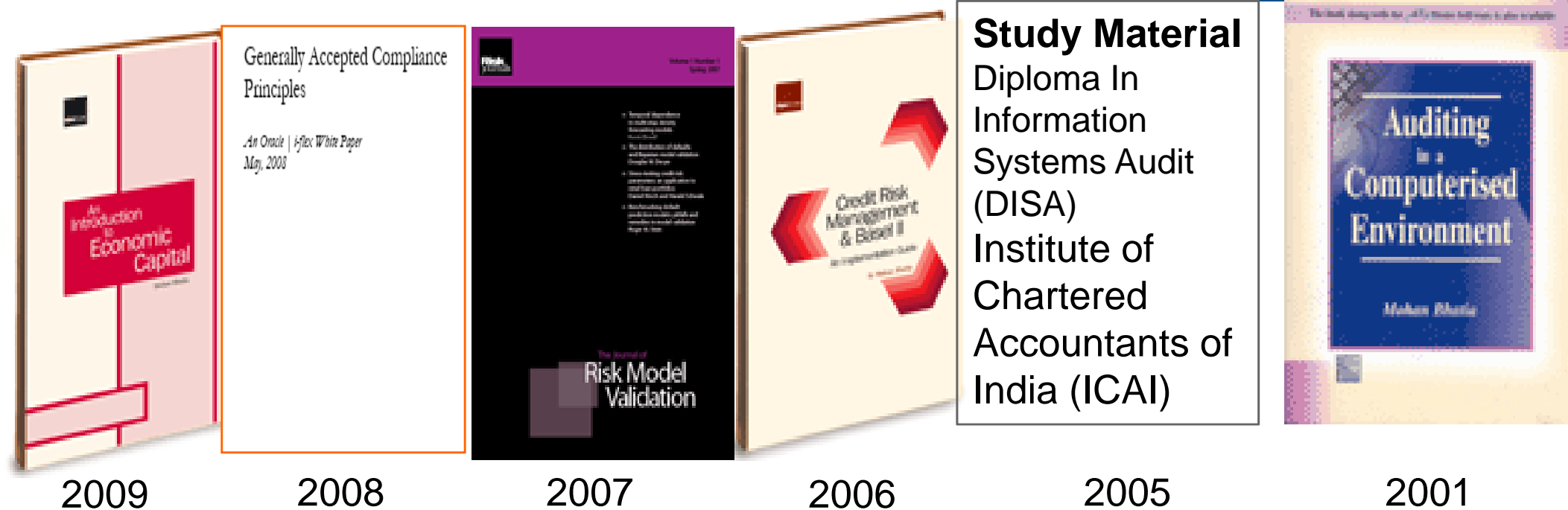
Way forward

Way forward

- Insurance business has traditionally been using actuarial standards, tools and methodologies for their business decisioning.
- Quantitative and data based decisioning has been prevalent in the insurance business for more than a century now.
- However, there are differences between the actuarial and the risk view of insurance and between the risk management approach in banking sector and insurance sector. Insurance risk emanates not only from the insurance liabilities but also from the assets.
- There are various ways to model insurance risk. The modeling methods for non-life and life insurance business vary a lot.
- Experts have identified 8 risk components for life business and non life business is modeled broadly through premium and claims.
- Risk experts have started modeling correlation for insurance risk though the level of granularity is still not fine.
- Insurance risk can be modeled and measured using stress testing and scenarios to start with and by incorporating correlation at sufficient level of granularity.
- Solvency II and regulatory initiatives have started the risk management regimes for insurance risk.

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Riskbooks



2009

2008

2007

2006

2005

2001

- Mohan is trainer, consultant, risk and compliance expert and business strategist.
- Mohan is Vice President and Managing Principal of Risk and Compliance Practice at Oracle Financial Services Software Consulting. Mohan manages a team of more than 60 risk management domain experts providing consulting to BFSI. Mohan is expert in Solvency II and Basel II implementation and Risk Model Validation.
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- Mohan is published by Risk Books London.