



The Role of ALM in Prudential Supervision – Overview of International Developments

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Today's Topics

- Introduction
- International Developments (Insurance Core Principles)
- EU developments / Solvency II
- US developments
- Hong Kong developments

Introduction

ALM Defined:

Management Perspective

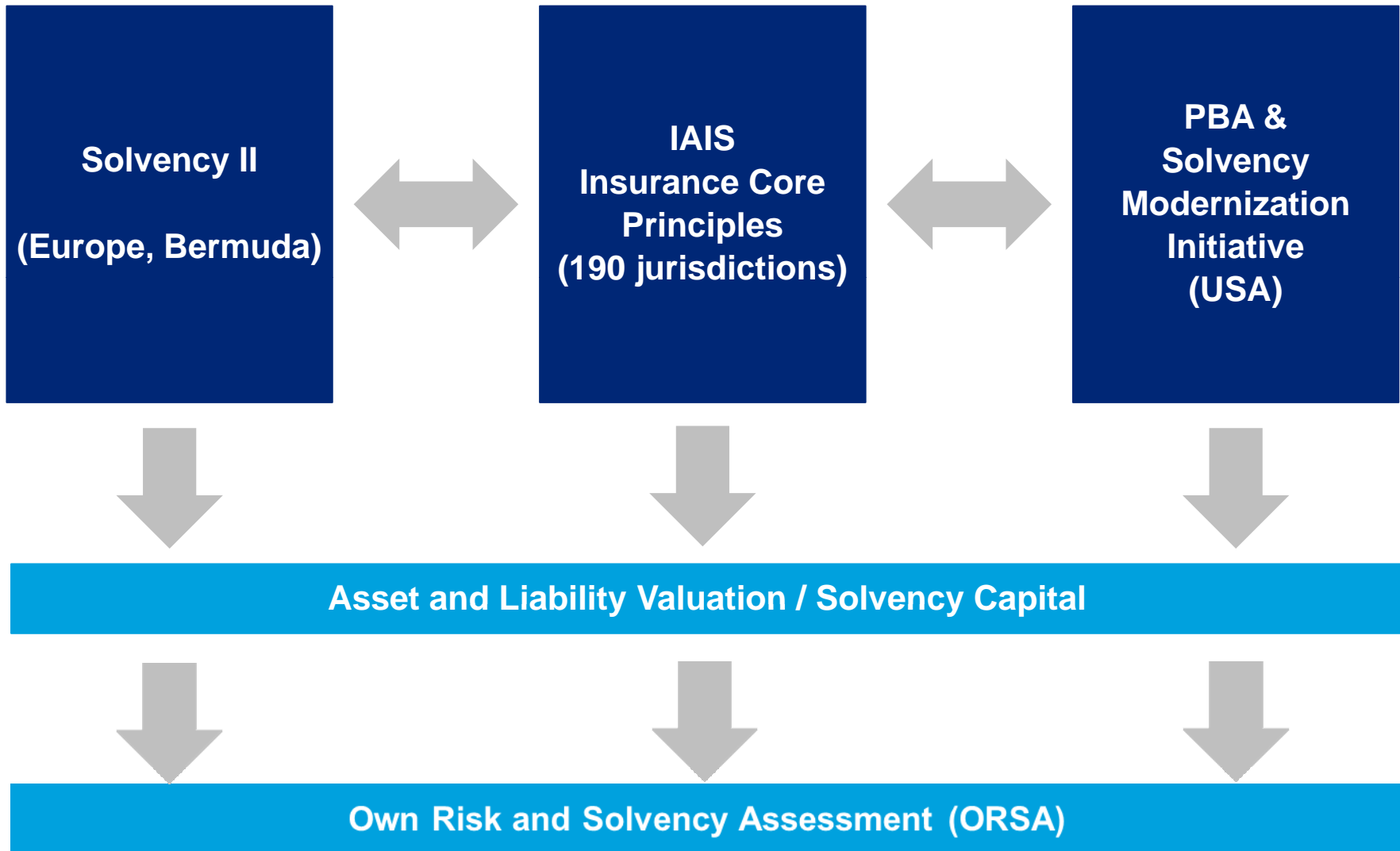
- “ALM is the practice of managing a business so that decisions and actions taken with respect to assets and liabilities are coordinated”. (IAIS)
- Fundamentally, insurers sell liabilities. Those liabilities are designed primarily with customer needs in mind.
- ALM then can be thought of as selecting and managing assets to meet the liabilities. Objectives might include:
 - Matching MV assets with current value (“MV”) of liabilities
 - Duration matching, dollar duration matching
 - Cash flow matching, possibly over the “near term”
 - Hedging against various risks including interest rate movements, equity price changes, currency movements, etc.
- A key aspect of ALM is measuring the risk that the assets might not be able to meet the liabilities. This can be done in various ways, including
 - Projections under current assumptions
 - Stress testing
 - Stochastic projections / analysis

ALM Defined:

Regulatory Perspective

- The regulator is responsible for safeguarding company solvency for the protection of policyholders.
- The regulator therefore has a legitimate interest in assuring that assets are sufficient to meet liabilities, not only under current conditions, but under a range of reasonably possible potential future situations as well.
- Originally, this was done through regulator-specified scenarios.
 - New York Regulation 126 (1987) specified that assets and liabilities must be projected under seven specified scenarios with regard to interest rates (“NY 7”).
 - Taiwan currently requires projection under NY 7 type scenarios as well as 1,000 regulator specified scenarios.
- More recent approaches focus on the insurers own assessment of risk, and especially the Own Risk and Solvency Assessment (“ORSA”)
- Assets and liability measurement approaches are also being updated.

International developments in solvency regulation



International Developments: Insurance Core Principles

Insurance Core Principles (“ICP’s”)

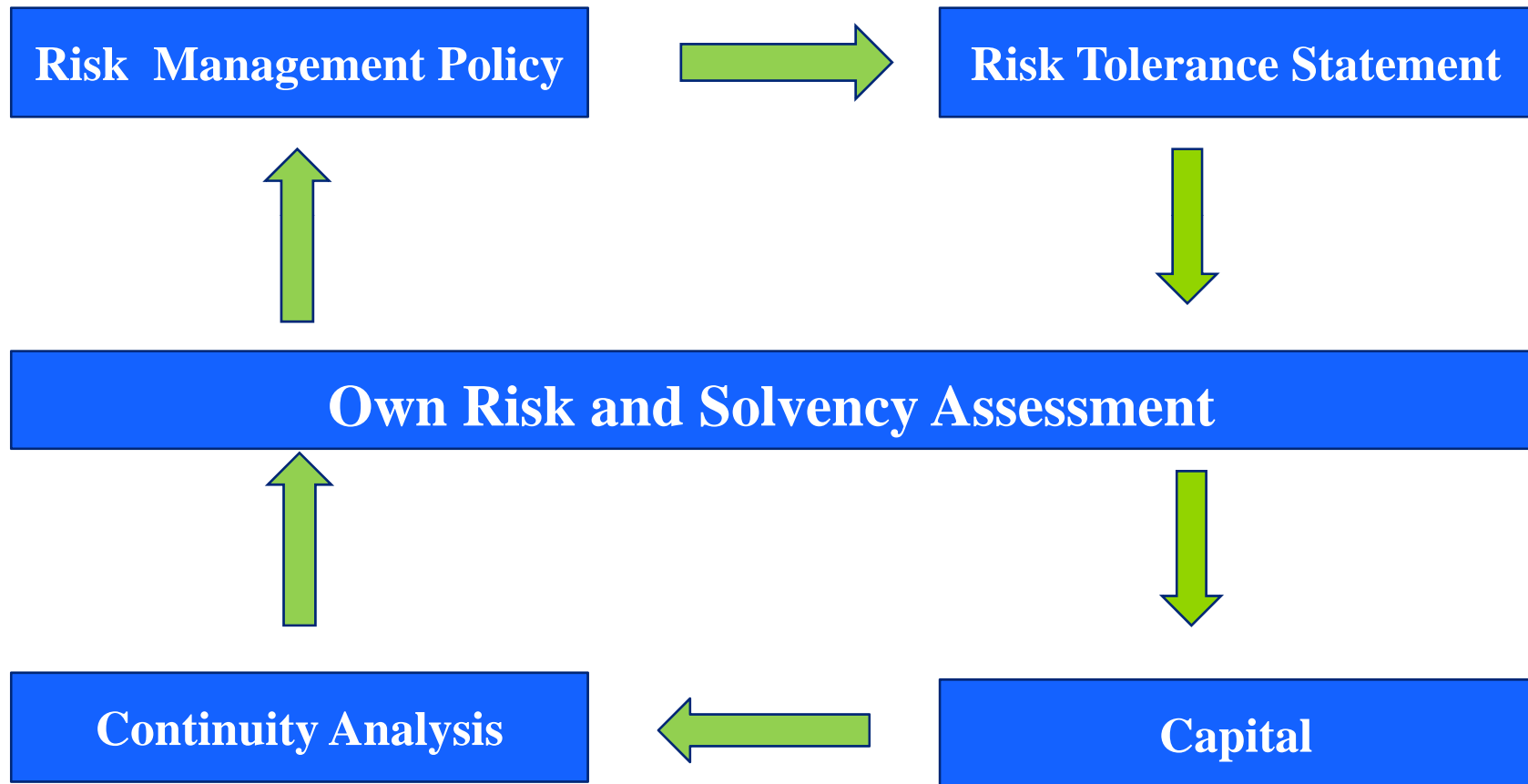
- Developed and issued by the International Association of Insurance Supervisors (“IAIS”). Latest version 12 October 2012
- They set out principles of insurance supervision. There are 26 ICP’s covering all aspects of insurance supervision. Relevant for today’s discussion are:
 - ICP 14: Valuation
 - ICP 16: Enterprise Risk Management for Solvency Purposes
 - ICP 17: Capital Adequacy

ICP 14 - Valuation and ICP 17 - Capital Adequacy

- Requires a **consistent** approach to valuing assets and liabilities (and required solvency capital) – a “total balance sheet approach”.
- Consistent means that “differences in values of assets and liabilities can be explained in terms of the differences in the nature of the cash flows including their timing, amount and inherent uncertainty, rather than differences in methodology or assumptions”. Total balance sheet means all assets and liabilities are considered.
- Both market consistent and amortized cost approaches are permissible.
- The valuation should be “economic”, i.e. financial position is not obscured by hidden or inherent conservatism or optimism in the valuation.
- Options and guarantees should be valued appropriately, but no guidance is given as to how.
- Requires that capital standards be set at a level to absorb “significant unforeseen losses”.

ICP 16 – ERM for Solvency Purposes

Conceptual framework



ICP 16 – ERM for Solvency Purposes

ALM Policy

- Insurers must have a risk management policy which includes an explicit asset-liability management (ALM) policy
 - The ALM policy specifies the nature, role and extent of ALM activities and their relationship with product development, pricing functions and investment management.
- The policy should discuss how the liability cash flows will be met by the cash inflows and how the economic valuation of assets and liabilities will change under an appropriate range of different scenarios. The policy is developed by management. The role of the regulator is to review its robustness.
- Particular attention should be paid to situations where liabilities are longer than available assets. Reinvestment risk should be quantified. The insurer should hold adequate capital or have other risk mitigation policies in place.
- In addition there must be an explicit investment policy. The policy could specify asset allocation strategies and how these are related to the ALM policy

ICP 16 – ERM for Solvency Purposes

Risk Tolerance Statements

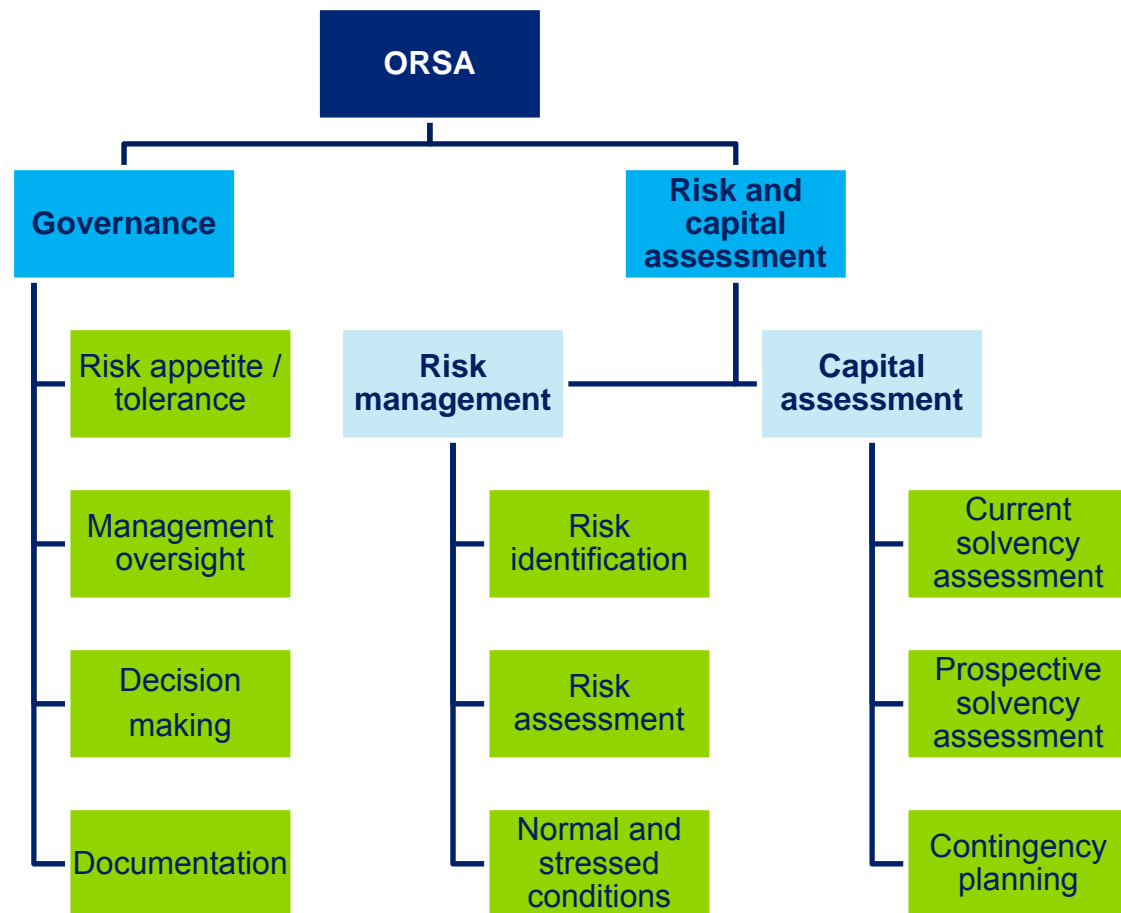
- A risk tolerance statement sets out quantitative and qualitative risk tolerance levels and defines risk tolerance limits.
- Quantitative risk tolerance statement examples:
 - “*Surplus will not decrease by more than X even if interest rates should move by Y basis points*”
 - “*Surplus will not decrease by more than X even if equity prices drop by Y%*”
- Qualitative risk tolerance statement example:
 - “*We have no tolerance for below investment grade investments*”
- Risk tolerance statements must be translatable into clear guidance to operational management.

ICP 16 – ERM for Solvency Purposes

Own Risk and Solvency Assessment (“ORSA”)

- The ORSA is management’s assessment of its own risk management system and the company’s current and likely future solvency position.
 - It is an *process* that results in a written *report*
 - Primary responsibility rests with senior management and the Board
- The ORSA must address all relevant risks, including underwriting, credit, market, operational and liquidity risk.
- The ORSA has a prospective focus – impact of future changes in economic conditions or other external factors must be considered
 - Requires sophisticated financial projection capabilities
 - Actual scenarios are not specified in the ICP. Management makes the estimates.
- The ORSA is both a process and a report.

Common structure of the ORSAs



Key Points

- Business and risk strategies are aligned
- Owned by the Board of Directors / Executive Management
- Time horizon is the duration of the business plan

ORSA report – Content overview

Based on our experience, an ORSA report should cover the following topics:

Executive Summary

Risk management system

Overview of ORSA methodology and process

ORSA process and methodology for quantified risks

ORSA process and methodology for other material risks

ORSA results

Actions to meet capital requirements over the period

Independent validation

Review and sign-off

EU Developments / Solvency II

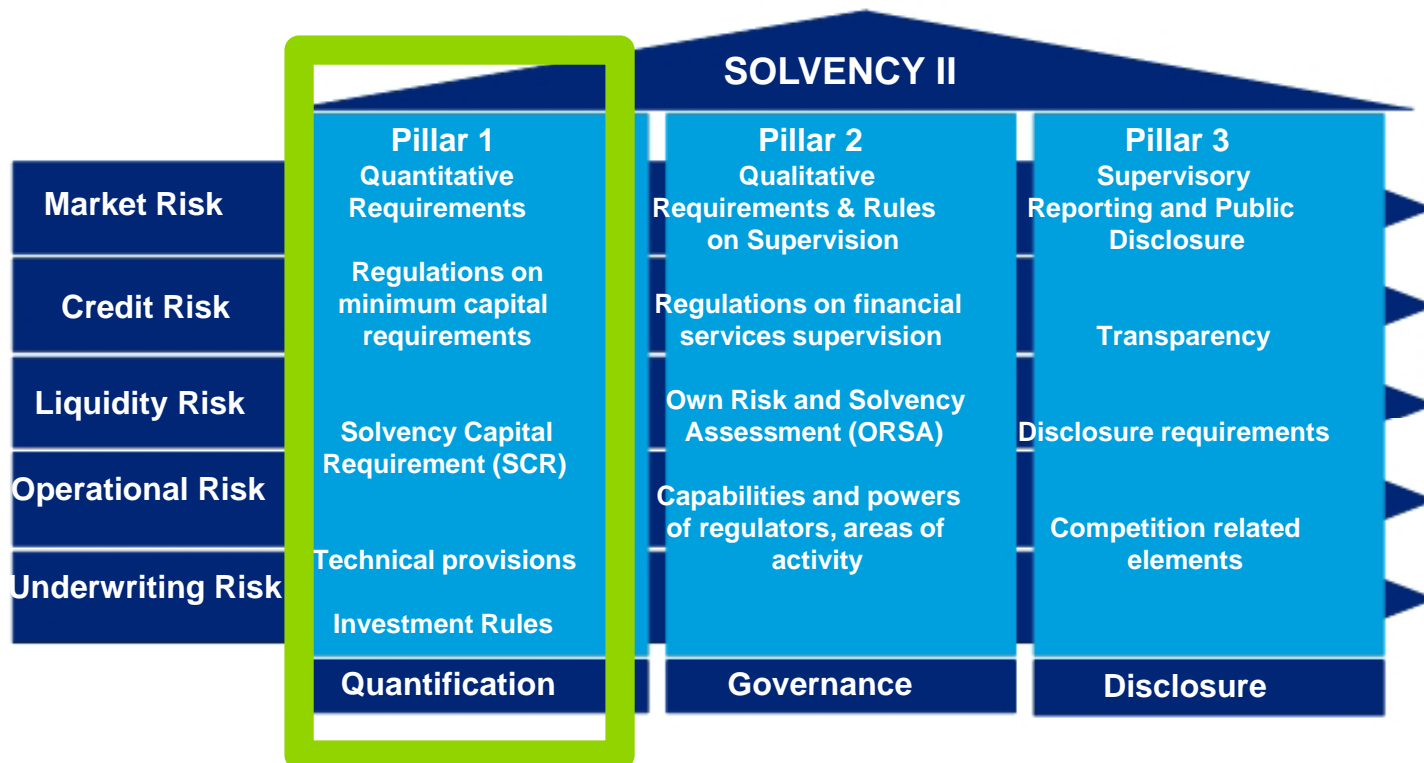
Solvency II

Topics

- Asset and liability valuation
- Solvency Capital Requirement (SCR)
- ORSA (Basically same as ICP 16, but with more detail)

Solvency II Structure

- The Solvency II system is designed to capture both quantitative and qualitative aspects of risk, each pillar focusing on a different regulatory component; minimum capital requirements, risk measurement and management and disclosure



Solvency II

Asset and liability valuation

- All assets are valued at market value (or estimated market value)
- Liabilities are valued by discounting expected future cash flows with a risk margin
 - The risk margin is based on a “cost of capital” approach, assuming a 6% COC for non-hedgeable risks
 - Discounting is done at risk free rates plus a liquidity premium to recognize the illiquid nature of certain liabilities. Liquidity premium concept is being re-thought.
 - Liability cash flows that depend on assets are projected based on assumptions consistent with the discount rates
 - Option and guarantees (e.g. guaranteed minimum credited interest rates) are valued stochastically on a market consistent basis, i.e. using risk-neutral valuation

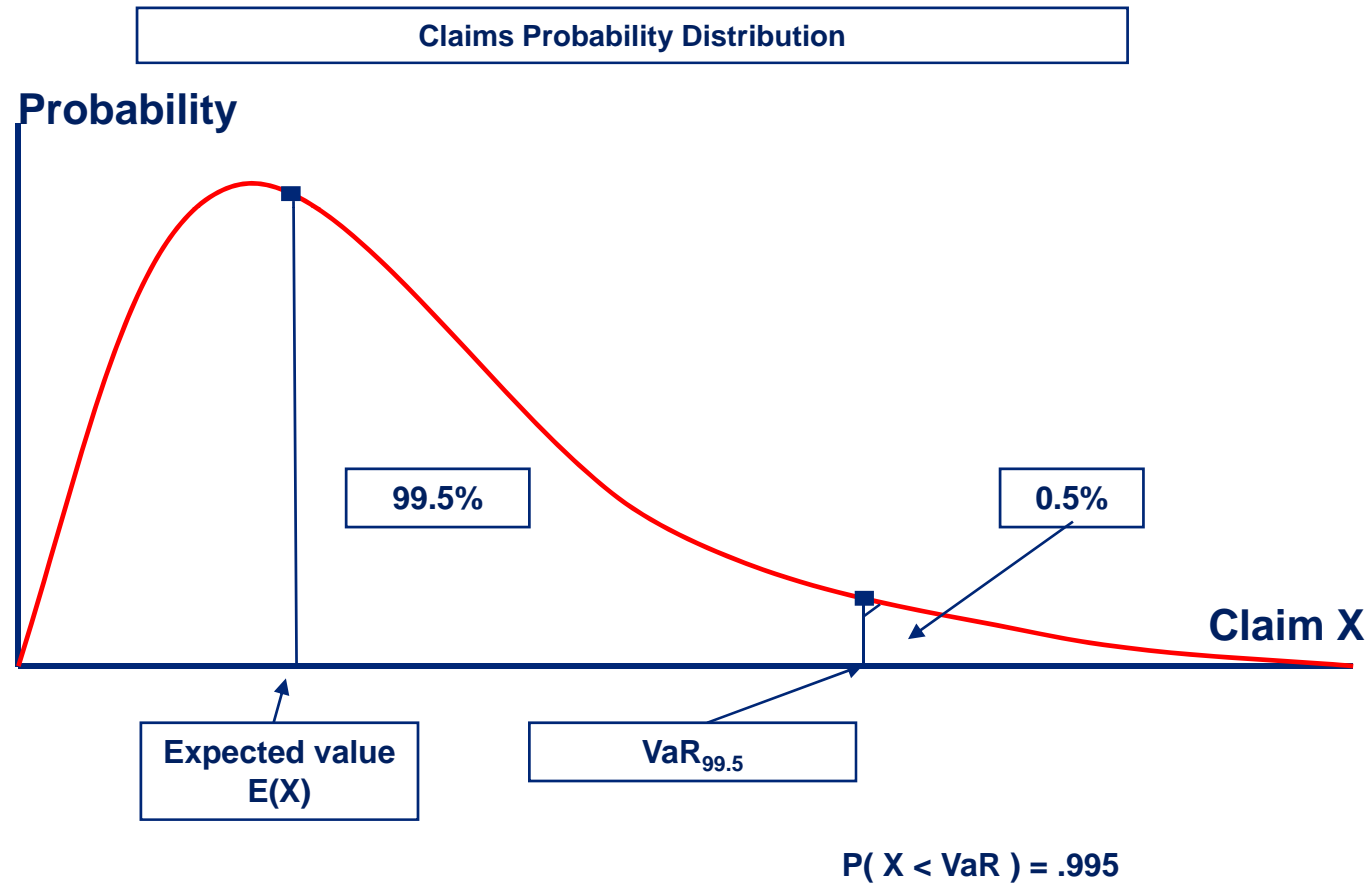
Solvency Capital Requirement

Basic Principles

- Economic value based approach
- Capital requirement over a 1-year time horizon, however includes impact on all future liabilities and therefore represents “fair value”
- Capital calculated to a confidence level of 99.5% (i.e. 1 in 200 year event)
- Accounts for diversification effects across risks and risk mitigation
- VaR is the chosen measure
- Consistency is necessary (horizon / confidence interval / risk measure)

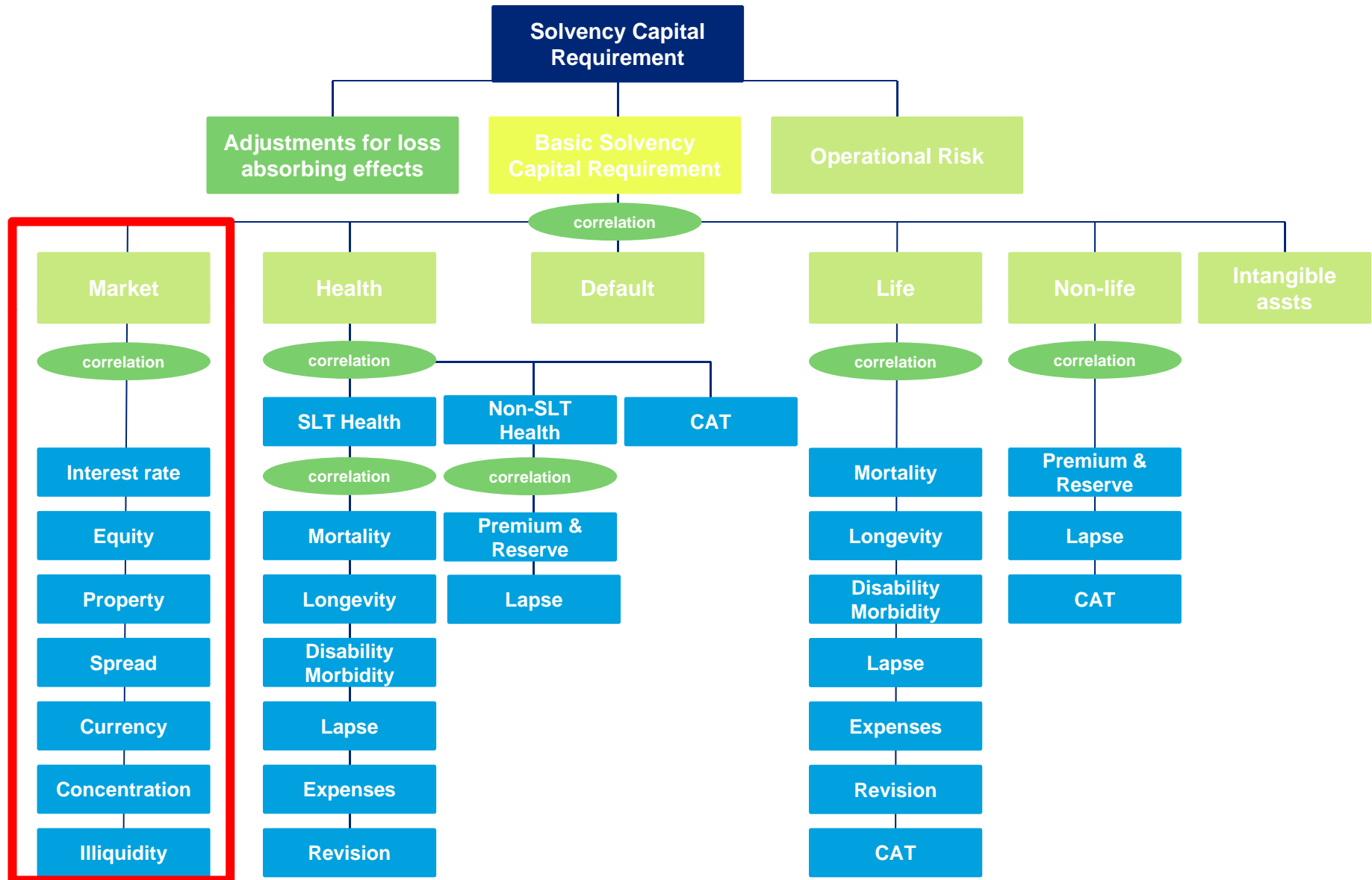
Solvency Capital Requirements (SCR)

Value at Risk



Solvency Capital Requirements

SCR structure standard formula – market risk



Solvency Capital Requirements

Market risk – standard formula

SCR for market risk

The capital charge for each market risk sub module is first calculated and then a correlation matrix is used to determine the overall SCR_{market}

$$SCR_{\text{market}} = \sqrt{\sum_{i,j} Corr_{i,j} \cdot SCR_i \cdot SCR_j}$$

Where SCR_i denotes the sub-module i and SCR_j denotes the sub-module j , and where ' i,j ' means that the sum of the different terms shall cover all possible combinations of i and j . In the calculation SCR_i and SCR_j are replaced by the following:

- $SCR_{\text{interest rate}}$ denotes the interest rate risk sub-module;
- SCR_{equity} denotes the equity risk sub-module;
- SCR_{property} denotes the property risk sub-module;
- SCR_{spread} denotes the spread risk sub-module;
- $SCR_{\text{concentration}}$ denotes the market risk concentrations sub-module;
- SCR_{currency} denotes the currency risk sub-module; and
- $SCR_{\text{illiquidity premium}}$ premium denotes the illiquidity premium risk sub-module.

Solvency Capital Requirements

Market risk – Correlations

SCR market risk correlation matrix

The factor $Corr_{i,j}$ in the SCR_{market} formula denotes the items set out in row i and in column j of the following correlation matrix:

$i \backslash j$	Interest	Equity	Property	Spread	Concentration	Currency	Illiquidity
Interest	1	A	A	A	0	0.25	0
Equity	A	1	0.75	0.75	0	0.25	0
Property	A	0.75	1	0.5	0	0.25	0
Spread	A	0.75	0.5	1	0	0.25	-0.5
Concentration	0	0	0	0	1	0	0
Currency	0.25	0.25	0.25	0.25	0	1	0
Illiquidity	0	0	0	-0.5	0	0	1

The factor A in the above correlation matrix shall be equal to:

- 0 when there is an increase in the term structure of interest rates; and
- 0.5 when there is a decrease in the term structure of interest rates.

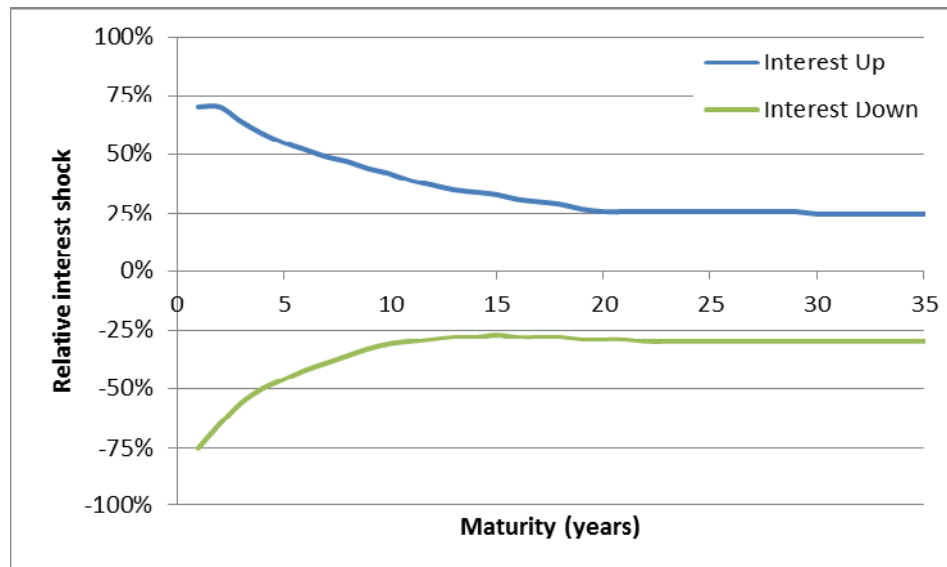
Solvency Capital Requirements

Market risk: interest rate risk

Interest rate risk

- Applies to all assets and liabilities (e.g. discounted value of future liability cash-flows) for which the net asset value is sensitive to changes in the term structure of interest rates or interest rate volatility
- The values of both assets and liabilities are recalculated under two sets of stressed conditions - up and down. The larger decrease in surplus is the SCR requirement. Management actions can be taken into account.

Level of interest rates



The term structures should be altered by multiplying the current spot rate curve by $(1+\text{stress})$

Solvency Capital Requirements

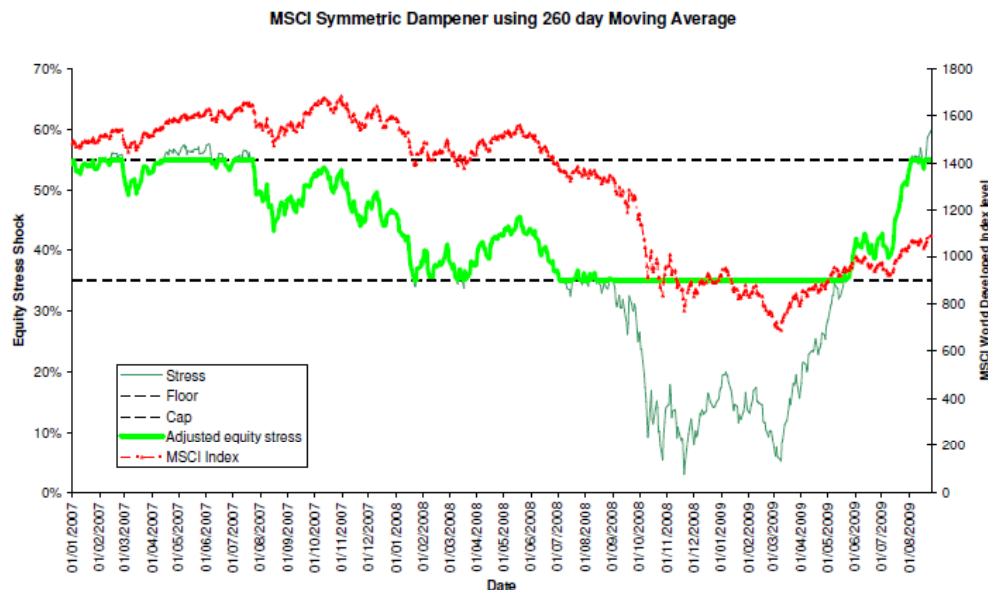
Market risk: equity price risk

Equity price risk

- Applies to all assets and liabilities that are sensitive to changes in equity prices

Level

- The standard equity shock is 39% for type 1 and 49% for type 2 equities. Correlation of 0.75 between global and other.
- Type 1 equity is listed in regulated markets in the countries which are members of the EEA or the OECD
- Type 2 includes other equity e.g. non-listed and non-EEA or OECD, hedge funds, commodity, other alternative investments



Symmetric adjustment mechanism: Anti-cyclical adaption of the standard shock based on averages of the last 3 years limited by a band of 10% on either side of the standard stress

This led to the following adjustments:

QIS5
(31-12-2009)

-9%

Solvency Capital Requirements

Market risk: property risk

Property risk

- Immediate effect of a fall in real estate benchmarks taking all individual direct and indirect exposures into account
- The following investments should be treated as property
 - Lands, buildings and immovable-property rights
 - Direct or indirect participations in real estate companies (for investment purposes)
 - Property investment for the own use of the insurance undertaking

Calculation

- The shock is 25% fall in real estate benchmarks
- Calibrated on 'UK Investment Property Databank Total Return Indices', monthly 1987 tot 2008
- No breakdown in property classes (Office, City offices, Retail, Commercial) as they do not diverge much

$$SCR_{property} = \Delta NAV | \text{property shock}$$

Solvency Capital Requirements

Market risk: currency risk

Calculation

The shock is 25% change (rise and fall) in value of all other currencies against the local currency in which the undertaking prepares its local regulatory accounts

Solvency Capital Requirements

Market risk: spread risk (1/2)

Scope

- **This module captures the risk of a change in value of net assets due to a move of the credit curve relative to the risk-free term structure (both level and volatility). It also is meant to capture the risk of default.**

Government bonds or guaranteed assets

- **No capital charge for government bonds or assets guaranteed by national government of an EEA state.**

Solvency Capital Requirements

Market risk: spread risk (2/2)

Bonds

The capital charge for bonds is determined as follows:

$$SCR_{bonds} = \sum_i MV_i \cdot Duration_i \cdot F^{up}(rating_i)$$

Rating	AAA	AA	A	BBB	BB	<BB	NR
F ^{up}	0.9%	1.1%	1.4%	2.5%	4.5%	7.5%	3.0%
Max Dur.	36	29	23	13	10	8	12

Solvency Capital Requirements

Market risk: concentration risk (1/2)

Scope

- Assets considered in equity, interest rate, spread and property modules
- Aimed at counter party concentration risk, not geographical area or industry

Financial Investments

The capital requirement for market risk concentration:

$$SCR_{conc} = \sqrt{\sum_i Conc_i^2}$$

- E_i denotes the net exposure at default to the counterparty i ;
- XS_i is the excess exposure %: $XS_i = \max\left(0; \frac{E_i}{Assets} - CT_i\right)$

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Solvency Capital Requirements

Market risk: concentration risk (2/2)

$$SCR_{conc} = \sqrt{\sum_i Conc_i^2} \text{ and } Conc_i = E_i \cdot XS_i \cdot g_i$$

Formula Recap

- **E_i** denotes the net exposure at default to the counterparty i ;
- **XS_i** is the excess exposure %: $XS_i = \max\left(0; \frac{E_i}{Assets} - CT_i\right)$
- **Assets** denotes total assets in scope
- **CT_i** is the "concentration threshold %" (next slide)
- **g_i** is the risk factor for market risk concentration. It depends on the credit quality of name i

Factors

Rating	AAA	AA	A	BBB	<BBB
CT_i	3.0%	3.0%	3.0%	1.5%	1.5%
g_i	12%	12%	21%	27%	73%

US Developments / Principle-based Approach

History of Reserves and Capital (U.S.)

Reserve Valuation - Current

- Governed by the Standard Valuation Law (SVL), with supporting regulations and Actuarial Guidelines Net premium reserves reflecting interest and mortality only and with assumptions locked in at issue for most products
- Generally considered that minimum reserve standards have been established to be sufficient to cover future claims 75% - 85% of the time
- Subject to an Actuarial Opinion signed by a qualified actuary, supported by an Asset Adequacy Analysis, which is a principle-based analysis of the reserves in light of the assets.
- Asset Adequacy Analysis is calculated in the aggregate and defines a floor (i.e., only impacts reserve if a deficiency is discovered)

History of Reserves and Capital (U.S.)

Risk-Based Capital (RBC) - Historical

- National Association of Insurance Commissioners (“NAIC”) RBC regime primarily formula-driven, derived from data in published statutory statements
- Calculation delineates four categories of risk (C1-C4):
 - Asset default and subsidiary risk (C1)
 - Pricing inadequacy risk (C2)
 - Interest rate mismatch and equity risk (C3)
 - General business risk (C4)
 - Covariance among risk categories is reflected in determination of total capital requirements
- Calculation emphasizes solvency and the identification of weakly capitalized companies

History of Research and Capital (U.S.)

Risk-Based Capital (RBC) - Current

- Generally, minimum capital requirements are expected to be sufficient to protect insurer solvency 95% of the time.
- RBC Ratio of actual to required capital determines regulatory action
- Formula-based for C-1, C-2 and C-4
- Model-based for C-3 for VAs and certain fixed annuities
 - C-3 Phase I – addressed interest rate risk on certain fixed annuities
 - C-3 Phase II – addressed interest rate and equity risk for VA's
 - The first steps away from a traditional formulaic approach to calculating RBC

The Case For Change

Concerns with the Current Approach

- Consumers are demanding more complicated and varied product benefits and guarantees
- These enhanced benefits require companies to engage in more sophisticated investment strategies, including hedging strategies
- Advances in technology have allowed companies to increase the complexity of product design with more complex guarantees
- The current formulaic approach does not capture the way most insurers operate
- Fundamental problem: a static formula cannot properly capture the risk of these new benefits and guarantees or company risk management techniques

The Case For Change

The Need for a Permanent Solution

- Current valuation system is broken – regulators have been using “band-aid” formulaic modifications with limited success as new products are developed
- Required reserves are too high for some products and too low for other products, as compared to an economic reserve that is more accurate
- Capital requirements and reserves need to take into account the actual risks of the business practices and products issued by individual companies

The Solution – A Principle-Based Approach

The Objectives of PBA

- Place greater emphasis on reflecting risks that materialize in “tail” scenarios, where low probability events can have a large impact. Asset / liability risks are a key aspect
- Reflect underlying economics in statutory financials, providing more information and greater insight to readers of financial statements
- Link statutory requirements to company risk management practices
- Allow optimal product price by “right-sizing” the level of reserves
- Eliminate the practice of designing products “around” the regulations
- Facilitate simpler products, satisfying consumer demands with straight-forward designs

The Solution – A Principle-Based Approach

The Underlying Principles

- Capture all of the identifiable, quantifiable and material risks, benefits, and guarantees associated with the contracts
- Utilize risk analysis and risk management techniques to quantify the risks; this may include stochastic models
- Allow the use of company experience to establish assumptions for risks over which the company has some degree of control or influence
- Use assumptions and methods that are consistent with, but not necessarily identical to, those utilized in the company's overall risk assessment process

The Solution – A Principle-Based Approach

Emphasizes Process Over Prescription

- Identifying risks
- Generating economic scenarios
- Determining assumptions
- Determining margins
- Modeling and measuring risks
- Sensitivity testing of material risks
- Documenting results and processes

PBA Development and Implementation

National Association of Insurance Commissioners (NAIC)

- State Insurance Commissioners are responsible for insurance regulation
- NAIC *facilitates* state-based regulation
 - Develops model laws and regulations for review and adoption by individual states
 - Accredits insurance departments' regulatory processes
 - Provides expertise, uniformity, resources to state insurance departments
- Operates through a vast committee structure including technical task forces:
 - Life & Health Actuarial Task Force (LHATF) develops reserving requirements
 - Capital Adequacy Task Force (CADTF) develops regulatory capital standards
 - Life Risk-Based Capital Working Group (LRBCWG) within CADTF develops technical capital requirements for life and annuities
- Often responds to technical proposals from the American Academy of Actuaries and relies on the Academy and other interested parties for analysis and research

PBA Development and Implementation

Approach & Milestones

- Modify the Standard Valuation Law (SVL) to enable principle-based reserves (PBR)
 - New SVL references a Valuation Manual (VM)
 - VM will be amended as needed by the NAIC; state legislative action is not required
- Develop detailed reserve requirements in the VM
 - PBA will be implemented in phases
 - PBA will only apply to the specific products as provided in VM-00
- Develop principle-based capital requirements
 - Introduce in phases by risk type and product
 - Start with C-3 risk

PBA Development and Implementation

Standard Valuation Law (SVL)

- Enables a state to use minimum reserve requirements in the VM for products issued on or after VM operative date
 - Enables PBR for new business while leaving existing structure in place for business already in force on VM operative date
 - Products include life insurance contracts, annuity and pure endowment contracts, accident & health insurance contracts, and deposit-type contracts for issues on and after VM operative date
 - Both principle-based & non-principle-based reserves
- Authorizes the VM to provide requirements needed for PBR:
 - Minimum reserves
 - Financial reporting
 - Experience reporting
 - Corporate governance

PBA Development and Implementation

Valuation Manual (VM)

- Prescribes uniform reserve requirements and consistency with the Accounting Practices & Procedures Manual (APPM)
- Enables ongoing uniformity of valuation practices across states via VM changes
- Preserves state authority & control
- Provides to all stakeholders the efficiencies of having one set of requirements

PBA Development and Implementation

Efficiencies Desired From VM Approach

- Greater uniformity in state requirements
- Easier implementation of requirements
- Model rule process replaced by model VM requirements
- One rule adoption by reference each year in the Accounting Practices and Procedures Manual is more efficient than separate rule adoption for each reserve change

PBR Reserve Methodology

The Deterministic Component

- Serves as a floor for the stochastic amount
- Is not designed to capture all risks
- Exact calculation form will differ by product

PBR Reserve Methodology

The Stochastic Component

- Closer to a “true” principle-based reserve, since it more adequately captures risks related to the contract
- Multiple economic scenarios are used to capture “tail risk: (risks that could have high impact, but low probability)
- The amounts calculated for each economic scenario are ranked from highest to lowest, and the reserve is determined by taking the average of the highest amounts above a prescribed level, such as 70% (i.e. the average of the highest 30%) also known as “CTE 70” or Conditional Tail Expectation 70

PBR Reserve Methodology

The Assumptions

- Under PBR, valuation assumptions will fall into one of three categories
 - Prescribed Assumptions
 - Stochastically Modeled Assumptions – interest rates and equity prices
 - Prudent Estimate Assumptions – where the company has a measure of control

Capital Methodology

Scope

- The current phase of the principle-based approach for capital involves a review of the interest rate and market risk (C3) component for all life insurance products. C1 factors are also being reviewed, but the approach will not be changed.
- Scope of the work does not include review of C2 or C4 components
- C-3 Phase III (C3P3) is seen as the next step toward a future comprehensive principle-based approach to capital
- C3P3 capital requirements recommended to apply to all life insurance products inforce

Capital Methodology

Calculation Basis For Stochastic Amount

- Based on a Total Asset Requirement (“TAR”) approach
- C-3 component of risk-based capital = $\text{TAR} - \text{statutory value of liabilities included in TAR calculation}$
- TAR
 - Recommended to be set consistent with regulatory capital requirements for variable annuities (CTE90)
 - An after-tax calculation reflecting stochastic interest rate and equity scenarios
 - Calculated as the greatest present value of accumulated deficiencies, same a life PBR methodology

Capital Methodology

Key Differences From PBR Reserve Calculation

- Applies to all inforce individual life insurance policies, not just new business issued after the effective date.
- No dual-track calculation, as in the life PBR “greater of stochastic or deterministic amount”
- After-tax calculation

U.S. vs. EU

U.S. and EU Frameworks (1/2)

- U.S. has taken a bottom-up approach; EU has taken a top-down approach:
 - Concepts are similar; differences arise in implementation
 - Generally, international reform based on a total balance sheet framework
 - U.S. PBA will be implemented one product at a time
- In both cases liability projections are based on best estimates of company experience + margin, **BUT** Solvency II does not recognize credit spreads in liability valuation. PBR does.
 - S II allows negative reserves, PBA has a floor of the cash value.
- In both the U.S. and EU, significant debate has taken place over the technical aspects of the calculations
- U.S. PBA has been developed over several years in cooperation with industry, regulators, and, especially, the actuarial profession

U.S. vs. EU

U.S. and EU Frameworks (2/2)

- Scope
 - International framework encompasses entire balance sheet
 - U.S. framework is more product & risk specific
- Financial Reporting Basis
 - Solvency II is based on mark to market concepts where cash flows are valued based on market consistent risk neutral approach. All assets are at market value.
 - U.S. is book-value based; U.S. PBA standards are based on projected cash flows based on real world economic scenarios and margins based on realistic expectations plus a margin for adverse deviation

Hong Kong Developments: Revised RBC Framework

Hong Kong

Current Framework

- Current system was copied from the UK.
- Assets are valued mostly at market
- Net premium reserves that use conservative mortality, morbidity and interest but don't allow for lapses. Valuation rates refer to government bond rates. Assumptions are updated at each valuation date.
- Solvency capital is based on a Solvency 1 type formula ($\% \text{ reserves} + \% \text{ NAR}$)
- “Dynamic solvency testing” is required by Actuarial Guidance Note 7 (AGN7)
 - Requires projections of solvency position based on the business plan as a base case.
 - Forecast period is three years, five if there is an indication of a problem after three
 - 6 required “simple scenarios” focusing on individual risks, including several that involve specified changes in interest rates and equity prices
 - At least three compound scenarios, chosen by the actuary also required

Hong Kong

Revised RBC Framework

- Objective is to make the HK regulations
 - ICP compliant; and
 - Achieve Solvency II equivalence
- All aspects of the current system will be reviewed
 - Valuation of assets and liabilities
 - Solvency capital requirements
 - Requirements around ERM / ORSA
 - Public disclosure?
- It can be expected that explicit modeling of assets and asset / liability mismatch will be required.

Thank you!

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