TOWERS PERRIN
TILLINGHAST

Solvency II: Implications for Loss Reserving

John Charles
Doug Collins

CLRS: 12 September 2006

Agenda

- Solvency II Introduction
- Pre-emptive adopters
- Solvency II concepts
- Quantitative Impact Studies
- Internal models
- Conclusions

History of EU solvency regime

Current regime is based on:

- First Non-Life Directive 1973 (subsequently amended)
- First Life Directive 1979 (subsequently amended)
- Reinsurance Directive 2005
- Insurance Groups Directive 1998
- Financial Conglomerates Directive 2002

History of EU solvency regime

- Original regime established a simple, formula based, solvency margin for direct insurers – to accompany freedom of establishment
- Some harmonisation of mathematical reserves and technical provisions added in 1990s – to accompany freedom of services
- Little harmonisation of asset valuations – historical/amortised cost and market value both permitted

EU solvency regime – recent developments

- Solvency I made limited changes to solvency margin to make regime more risk focused
- Clarified that member states could set higher solvency margins if desired
- Recognised need for a major overhaul
- Parent company solvency test for insurance groups and financial conglomerates
- Pure reinsurance companies added to solvency regime in 2005

Solvency II - aims

- Establish solvency standard to match risks
- Encourage risk control in line with IAIS principles
- Harmonise across EU
- Assets and liabilities on fair value basis consistent with IASB if possible
- Set higher solvency standard than currently to permit timely intervention
- 3 Pillar approach broadly consistent with Basel II

Solvency II – Three Pillars

Pillar 1 – technical rules for valuation of assets, liabilities and solvency margin (both SCR and MCR)

Pillar 2 – supervisory review process including individual capital adjustments having regard to effectiveness of risk management and corporate governance arrangements

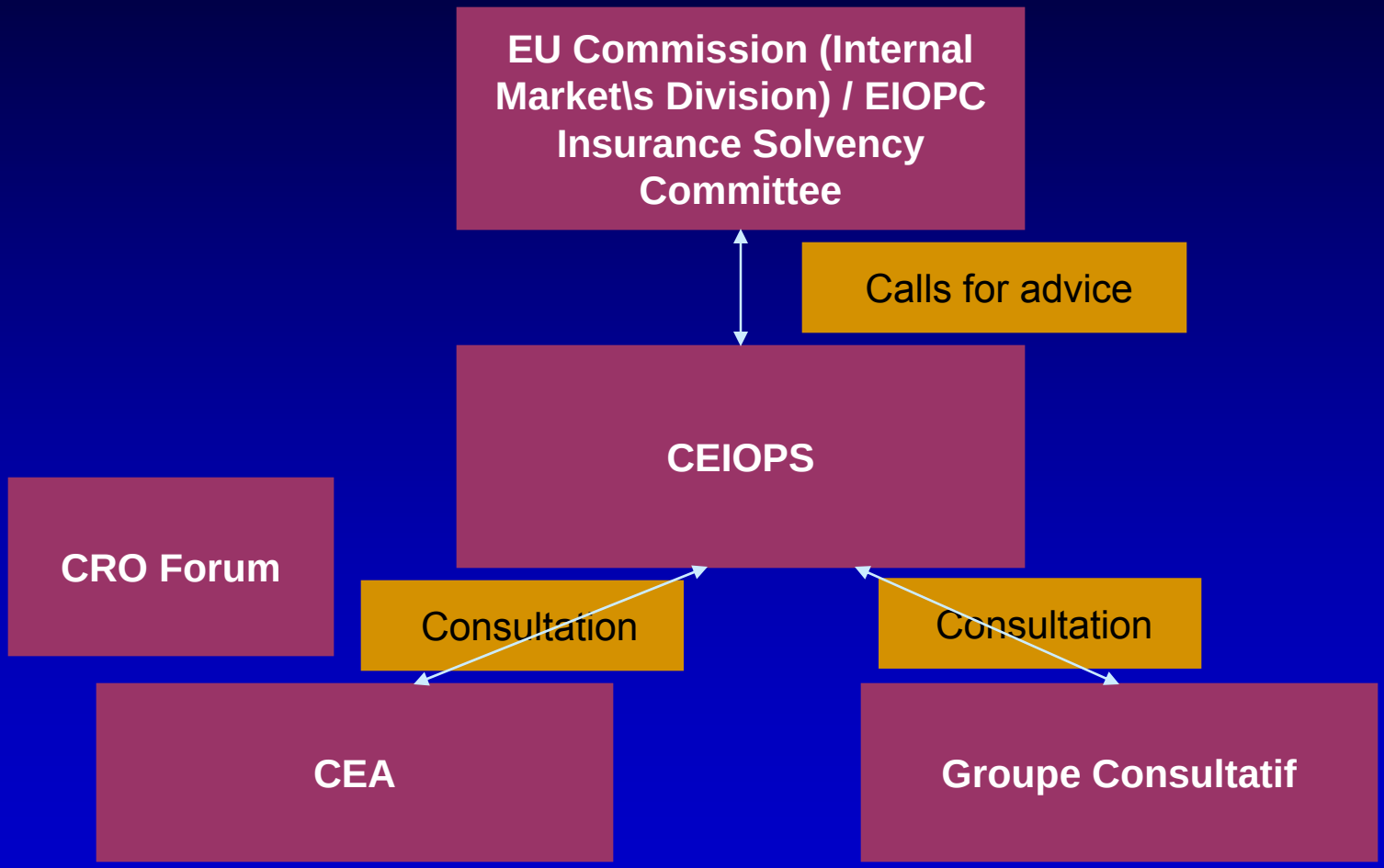
Pillar 3 – public and private disclosures to the regulator

Solvency II – legislative structure

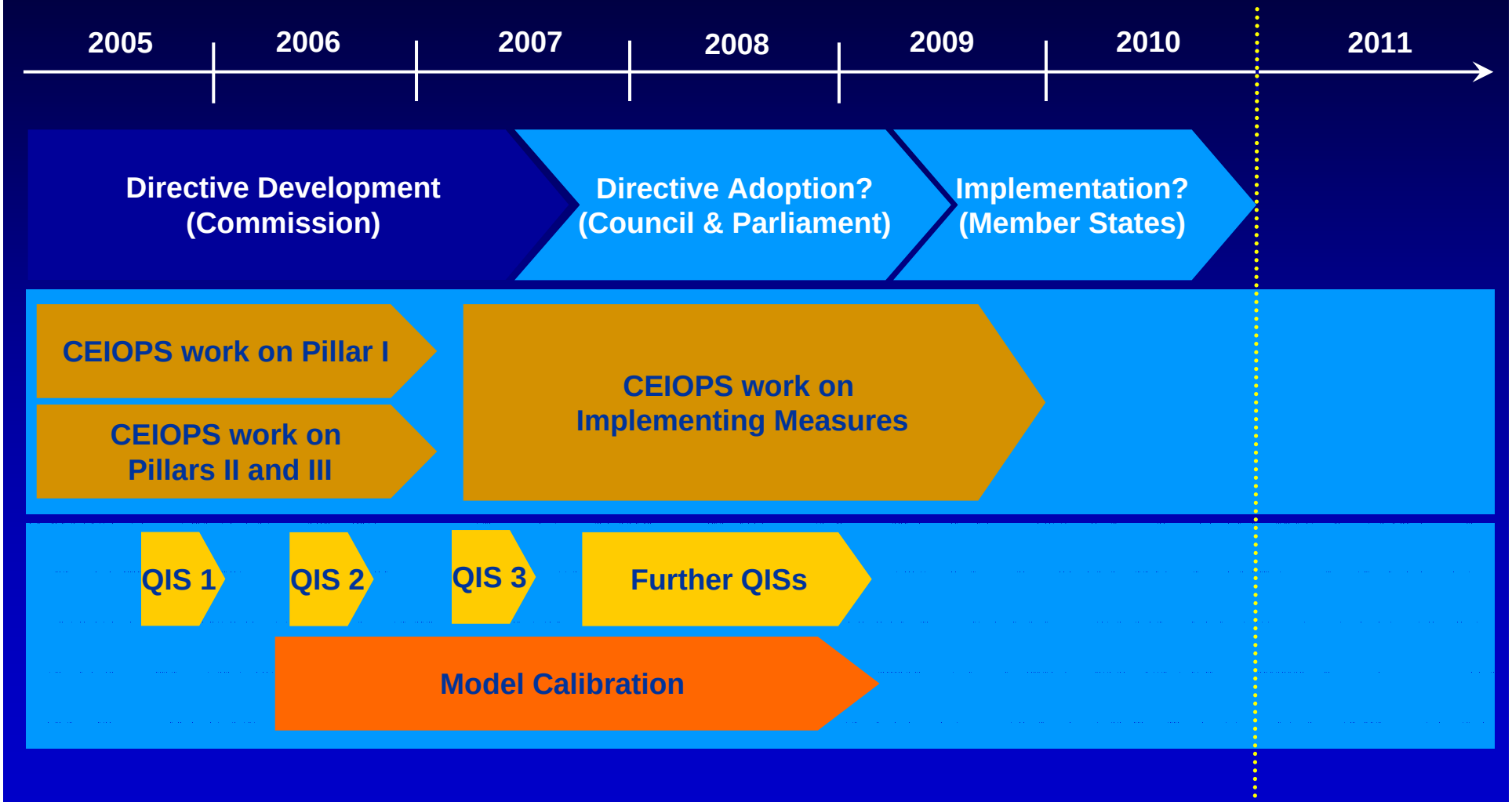
- Solvency II to be completed under Lamfalussy structure

Level 1	European Commission (Internal Markets Division)
Level 2	European Insurance and Occupational Pensions Committee (EIOPC)
Level 3	Committee of European Insurance and Occupational Pensions Supervisors (CEIOPS)
Level 4	European Commission review of member state implementation

Solvency II – structure of project - advice



Where does Solvency II stand?



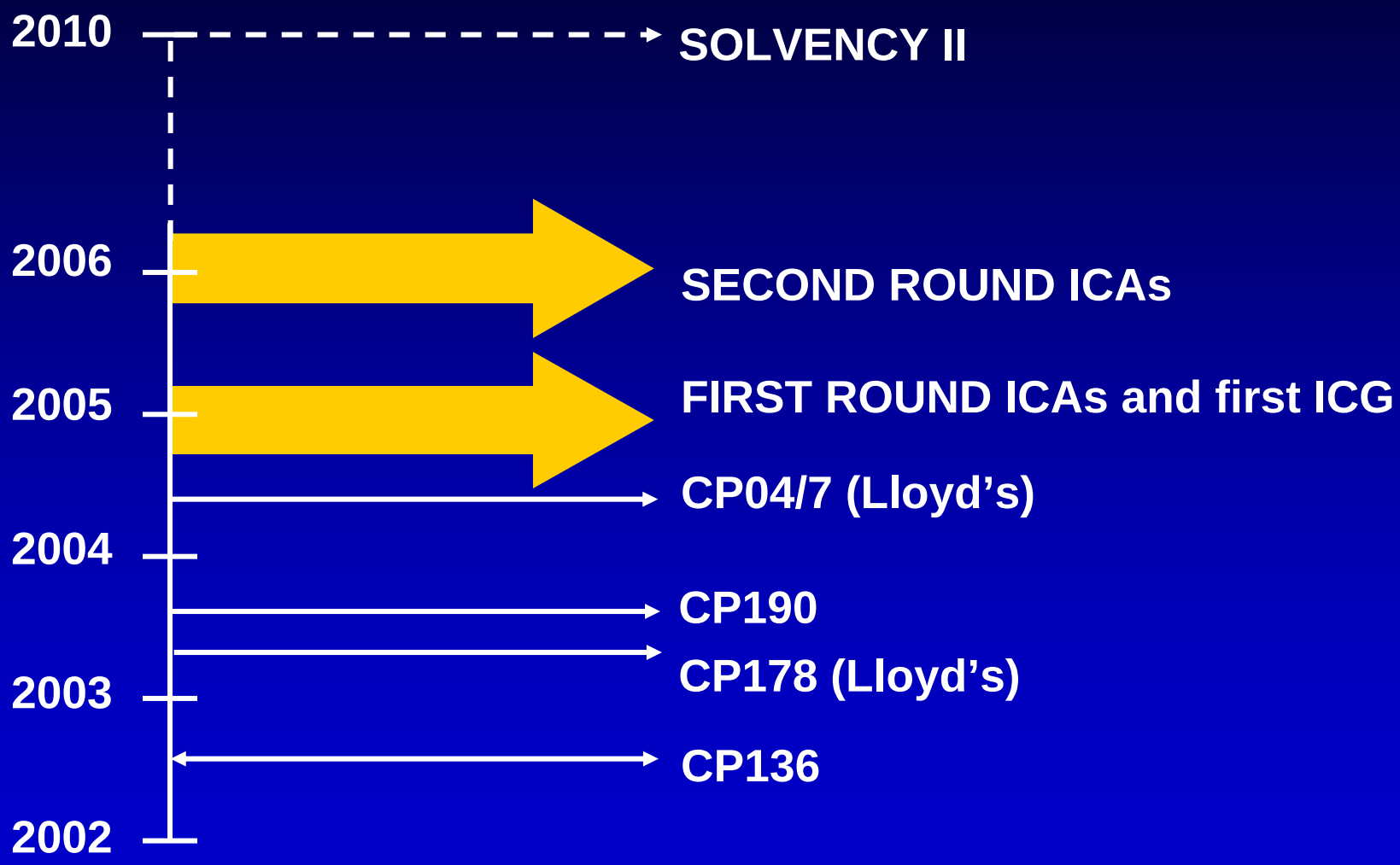
Agenda

- Solvency II Introduction
- Pre-emptive adopters
- Solvency II concepts
- Quantitative Impact Studies
- Internal models
- Conclusions

Pre-emptive adopters

- Some national supervisors have already taken steps to make their local prudential regulation meet the aims set for Solvency II.
- The most advanced regulations are in:
  - United Kingdom
  - Switzerland
  - Sweden (life insurance only).
- In all cases the new regulation is based on marking assets and liabilities to market and capital requirements based on scenario tests or economic modelling.

UK ICAS Regime



New Approach to UK Supervision

- All firms required to assess the capital they need (individual capital assessment ICA) to meet liabilities as they fall due at a defined level of confidence
- Formula-based calculation of ECR specifies benchmark capital requirement
- Stress and scenario testing or economic capital modelling may be used to by each firm
- Risk management review integral to ICA assessment
- Supervisor may add capital to the ICA and set a higher capital target (ICG)

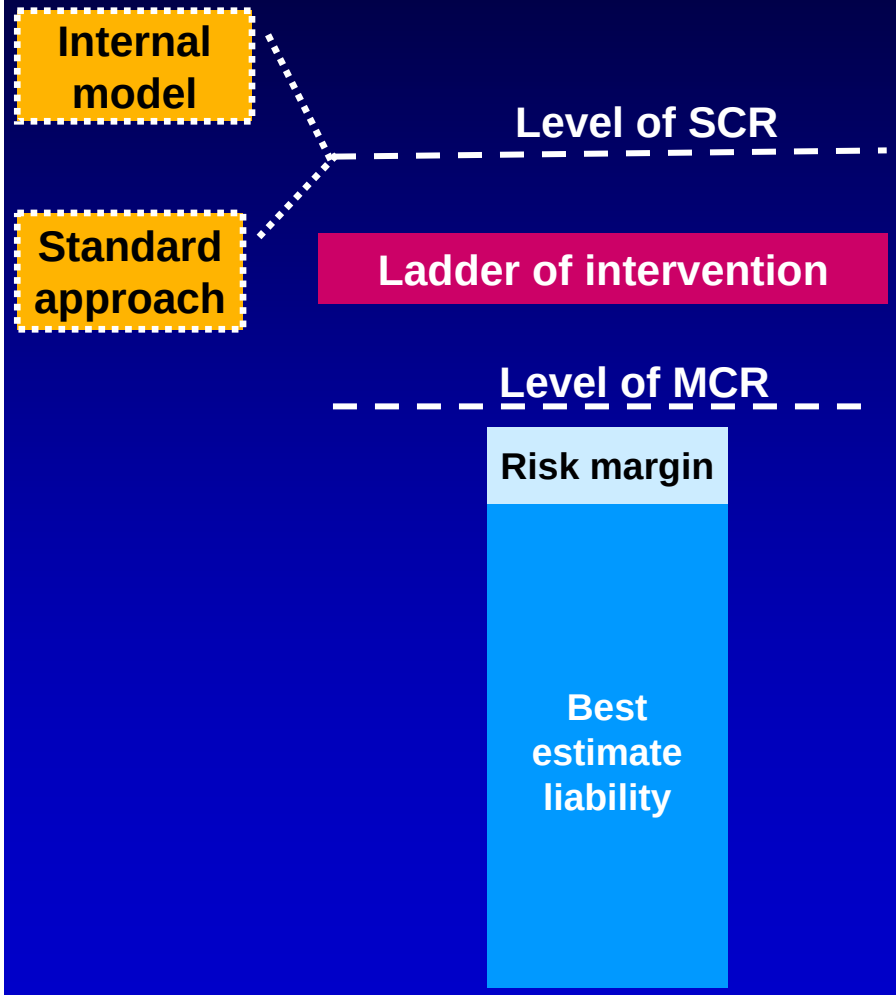
New Swiss approach to supervision

- SST will apply from 2008, but full compliance not mandatory until 2011
- Assets and liabilities marked to market
- A cost of capital approach is used to set market value margins for non-hedgeable risks.
- Target capital defined as level of confidence that the insurer will have adequate capital over the next year

Agenda

- Solvency II Introduction
- Pre-emptive adopters
- Solvency II concepts
- Quantitative Impact Studies
- Internal models
- Conclusions

The major components of the framework ...



- Technical Provisions – amounts set aside in order for an insurer to fulfil its obligations towards policyholders and other beneficiaries; includes a risk margin
- Solvency Capital Requirement (SCR) – level of capital that enables an institution to absorb significant unforeseen losses and gives reasonable assurance to policyholders and beneficiaries
- Minimum Capital Requirement (MCR) – a safety net that reflects a level of capital below which ultimate supervisory action would be triggered
- Ladder of intervention as available capital falls from SCR towards MCR

Solvency II – features

- Assets at market value
- Technical provisions on a fair value basis
- Solvency Capital Requirement (SCR) – target capital from combination of internal model/stress test/formula
- Minimum Capital Requirement (MCR) – floor for capital cover, breach of which invokes ultimate supervisory sanctions

Technical provisions: Best estimate liability

Proposed valuation approach

- For technical provisions, start with discounted value of the best estimate cash-flows
- Use of market-consistent assumptions for financial elements of the basis
  - yield curves for discounting
- Accruals basis

Technical provisions – allowing for risk

- Hedgeable risk (largely financial): market price or market-consistent basis

- Non-hedgeable risk (most insurance risk):
  - Percentile approach – ability to run off liabilities at given confidence level; subject to minimum risk margin of one-half standard deviation
  - Cost of capital approach (as applied in the Swiss Solvency Test)

SCR and MCR Concept

- Solvency Capital Requirement (SCR)
  - Target level of capital
  - Capital to meet technical provisions with 99.5% certainty after one-year stress events
- Minimum Capital Requirement (MCR)
  - Regulatory intervention floor
  - Alternatives under consideration
  - Similar approach to SCR
  - Solvency I for transition period

Time horizons: Definitions

- Solvency assessment period (SAP) – the period of time for which a business is modelled as an ongoing entity for the solvency test. The SAP is one year under Solvency II.
- Risk assessment period (RAP) – the period over which variability in the underlying risks are considered in the valuation model.
- We could consider the following alternative interpretations of the RAP in the context of a large claim contingent on the outcome of litigation:
  - Narrow view of the RAP considers only potential changes in view of the outcome over the upcoming year.
  - Wide view of the RAP considers the potential deterioration in future years based on the potential outcome of the case.

Time horizons: Solvency assessment period

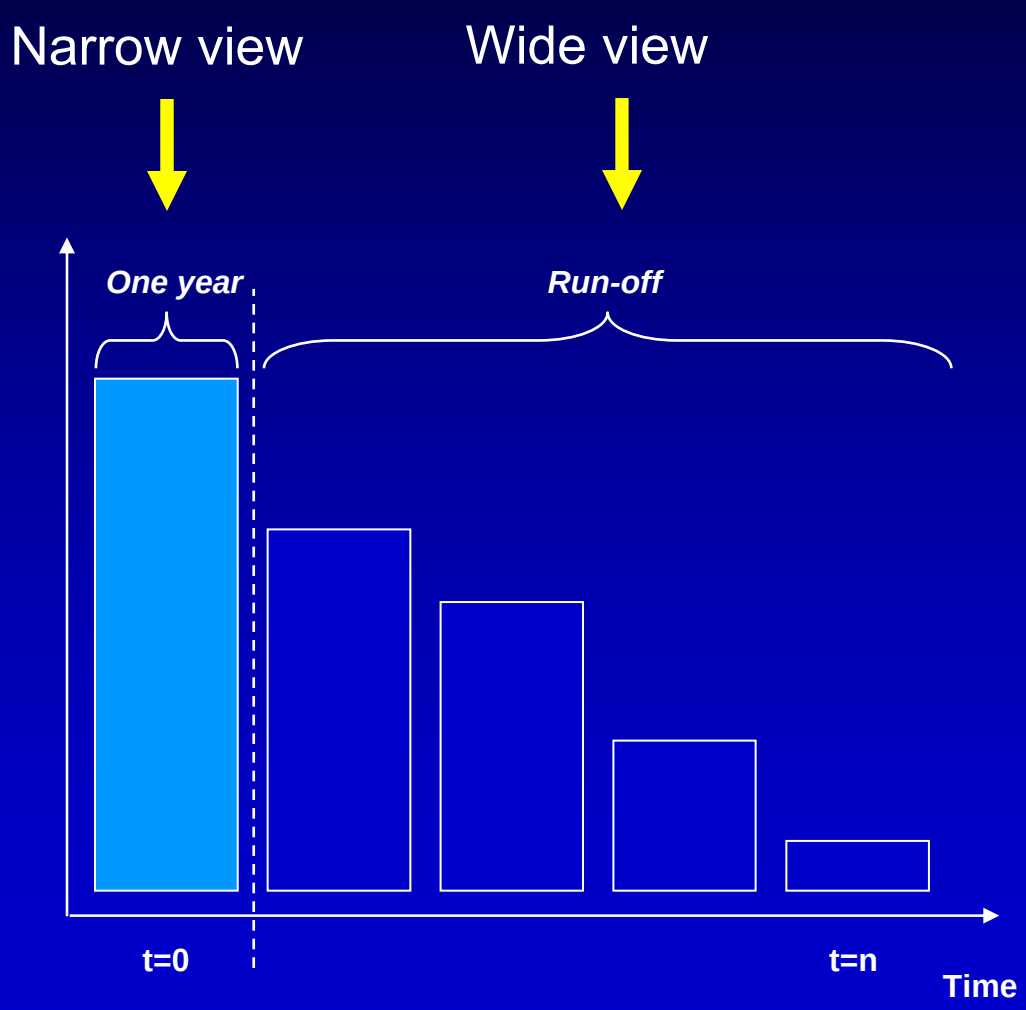
- Under UK ICAS implementation firms were given a choice of different solvency assessment periods (1,3 and 5 year periods) with different levels of confidence (99.5%, 98.5% and 97.5%)
- UK Firms expected to give reasons why longer time horizons were not considered if a one-year approach was adopted
- Some potential for inconsistency in considering the risk assessment periods for run-off

The UK position could change to align with Solvency II (or vice-versa).

Time horizons: Contrasting approaches

- In previous advice to the European Commission, CEIOPS have stated that the capital assessment should be made over a 1-year horizon.
- The time horizon applies both to risks and the period of assessment.
- While the UK's FSA have not produced definitive guidance, in a first draft of a principles and guidance document for ICAs, there is a recommendation that risks be considered to ultimate.
- The two approaches are inconsistent.

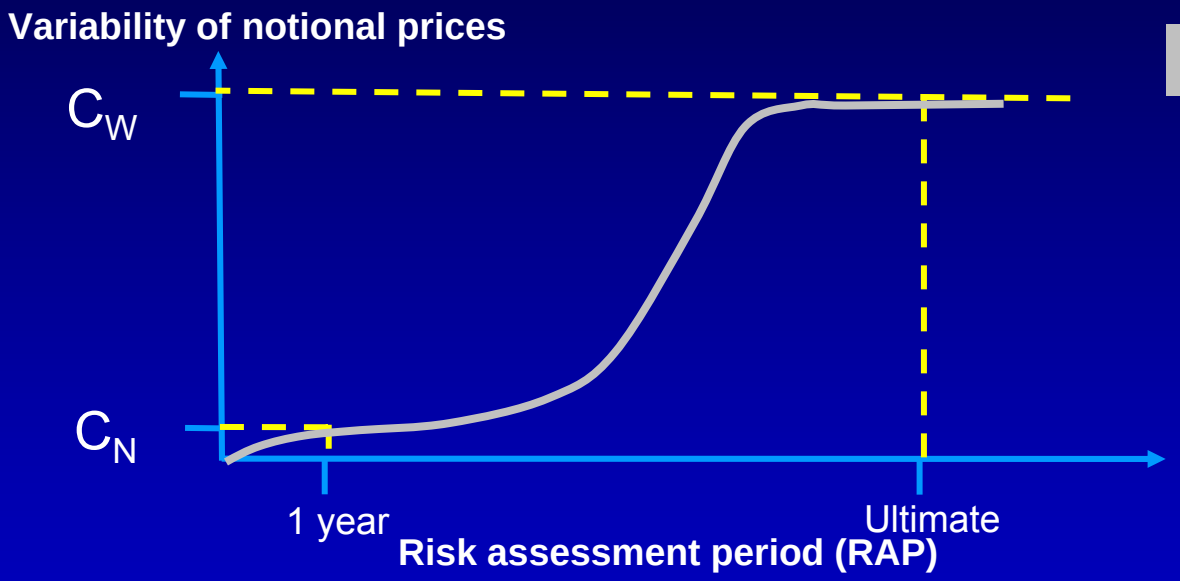
Time horizons: Risk assessment periods



- The narrow view bases capital on what is likely to be recognized over a single year
- The wide view considers potential trends and their development to ultimate on a reasonably foreseeable basis

Illustrative example of risk assessment periods

- C_N and C_W represent capital requirements with a narrow and wide RAP assuming in both cases a SAP of one year



- Using C_N could underestimate potential variation as C_N could be close to zero although C_W is non-trivial

Time horizons: Conclusions

- We believe that the wide risk assessment approach is consistent with consideration of underlying variability from the viewpoint of an external third party who would purchase the risk after an adverse scenario.
- This requires consideration of underlying variability of the ultimate outcome of potential losses.
- Under this approach, the capital assessment would be higher than under the narrow risk assessment approach for the same percentile level of confidence.

Loss reserve implications

- Risk focus means need to consider variability and calculation of risk margins
- Reserving central to risk management
- Wide approach fits with conventional stochastic methods
- Aggregation approaches needed to allow for diversification benefits
- Narrow risk assessment approach requires ad-hoc methodology to consider calendar year variability
- Narrow approach demands consistent technical provisions across companies

Agenda

- Solvency II Introduction
- Pre-emptive adopters
- Solvency II concepts
- Quantitative Impact Studies
- Internal models
- Conclusions

Quantitative Impact Studies

- Companies asked to provide data confidentially that simulate proposals under consideration
- Companies also provide feedback and alternative proposals
- Output is used for Impact assessment of the Directive
- Results will influence calibration of Solvency regime by regulators

The form of the QIS requests illustrate CEIOPS current thinking

Quantitative Impact Study (QIS 1)

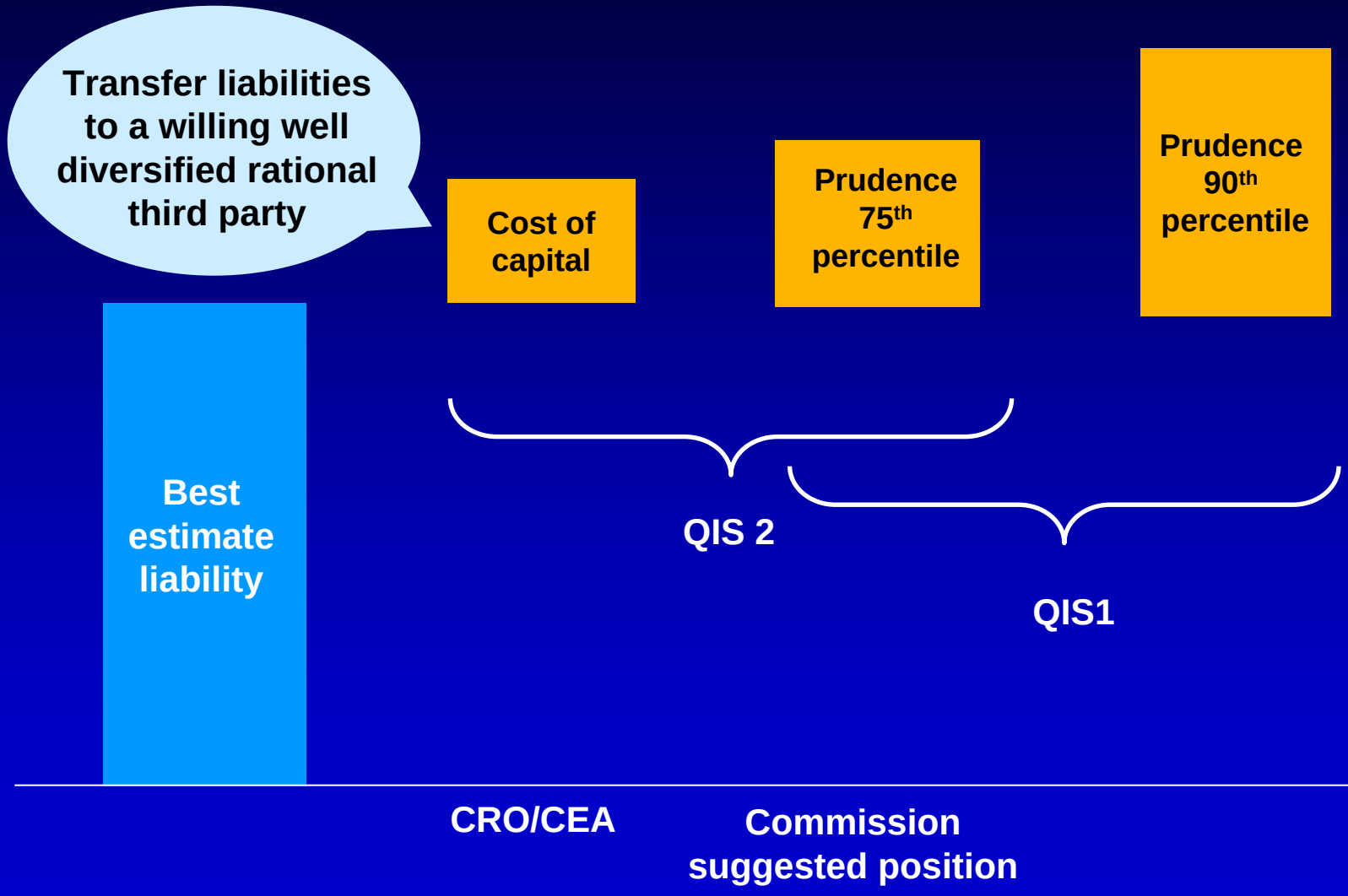
- Ran from 1 October 2005 – 31 December 2005
- Focused on technical provisions
  - 75th and 90th percentile risk margins
  - optional margins based on the 60th percentile or an undefined cost of capital approach
  - No allowance for “own credit risk”
  - Discount rates specified by reference to swap yields

Quantitative Impact Study 2 (QIS 2)

- QIS 2 ran from 1 May 2006 to 31 July 2006
- QIS 2 covers:
  - Technical Provisions – proposed economic bases
  - Other Liabilities – on local basis
  - Asset Values – market values
  - The SCR – on a formulaic basis
  - The MCR – on alternative bases
- Feedback elicited on design and structure of proposals

We use the structure in QIS 2 to illustrate current proposals for the SCR standard approach

Percentile or cost of capital approach?



Technical provisions: Cost of capital approach

- Proposal is based on Swiss Solvency Test (SST)
- Allocated capital based on regulatory requirements excluding capital for hedgeable risk
- Allocated capital reduces as risk runs-off
- A cost of capital would have to be specified - SST assumes 6% pa (pre tax) in excess of risk free rate
- Cost then discounted back at valuation rate

Technical provisions: Percentile risk margins

- Treatment of reinsurance not straightforward under percentile approach
- Should percentile estimates allow for:
  - Process uncertainty
  - Parameter uncertainty
  - Model uncertainty
- No commonly accepted methods
  - Actuarial profession is actively considering these issues

Technical provisions: Other issues

- What is the risk free rate? Government bonds or swap yields? Allowance for liquidity premium?
- Risk margins are not additive
  - Allowance for diversification
  - Unit of account

The option of centrally calibrated factors to determine the risk margin should be available to companies.

QIS 1 – Findings (Technical provisions)

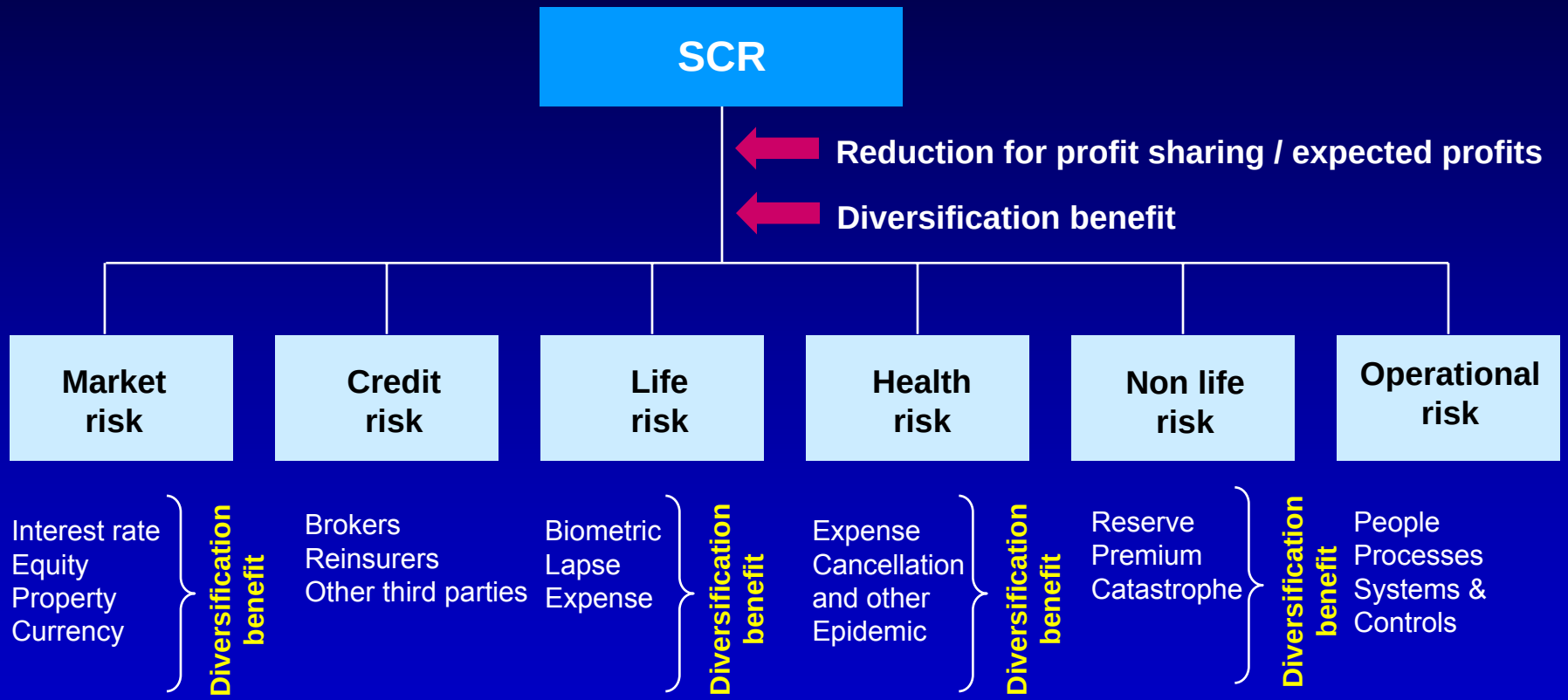
- Impact of 75% confidence risk margins on provisions:
  - Life: 1%-3%
  - Non-life: 2%-7% apart from UK 14%
- Non-life discounted best estimates (excluding equalisation provisions) plus 75% confidence risk margins well below current overall provisions
- Many life companies could not model options and guarantees on a market-consistent basis
- Differences in treatment of life discretionary liabilities

QIS 1 – Findings (Technical provisions)

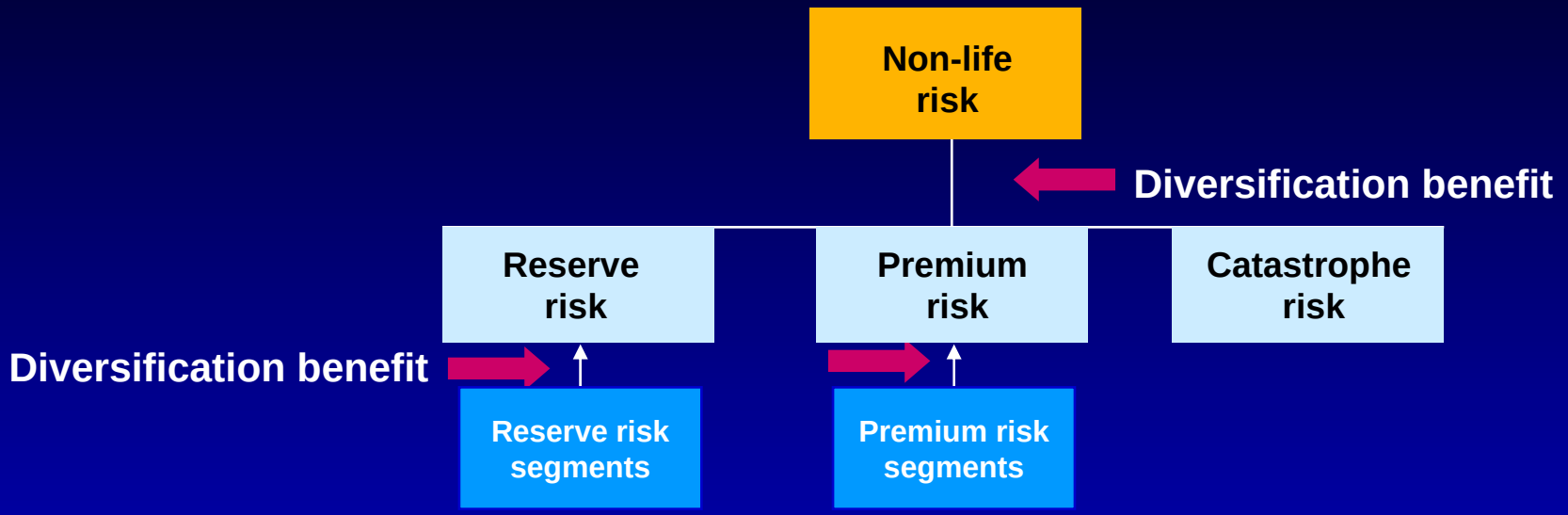
- Problem areas noted by participants were:
  - Lack of resources, time and experience
  - Lack of data and choosing actuarial assumptions
  - Derivation of risk margins
  - Treatment of reinsurance
- Wide range of methods used by companies to produce results
- Participation skewed to larger companies and smaller companies under-represented

These findings support our conclusion that much is still undefined

QIS 2: Design and structure of SCR framework



QIS 2: Non-life insurance risk



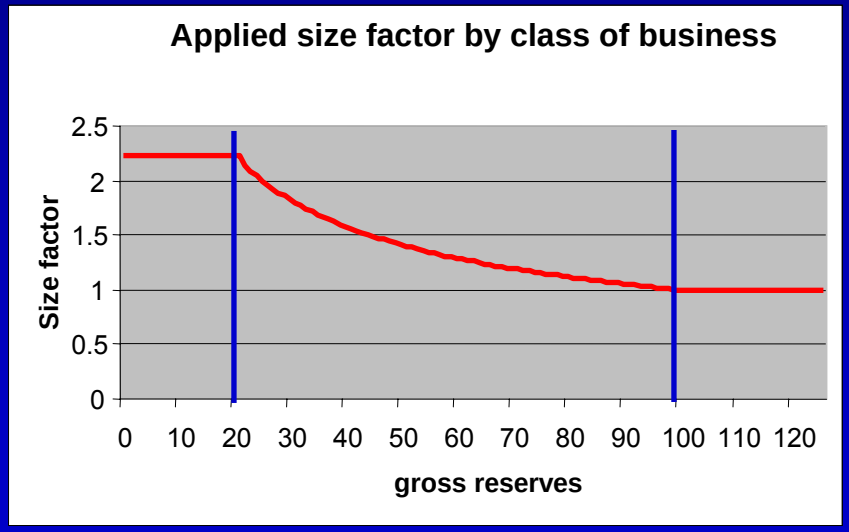
+/-	Product class segmentation consistent with Council Directive
+	Structure of framework: ■ Risk types separately assessed ■ Allowance for diversification
-	Framework and spreadsheet relatively complex - unattractive for smaller companies?

QIS2: reserve risk

Capital charge = factor x claims provisions

Standard factors

Size factors



Size factor =1

if GWP ≥€ 100mln

Size factor =2.236

if GWP ≤ € 20mln

The size factors apply to each line of business

QIS 2: Reserve risk

Capital charge = factor x claims provisions

Standard factors

Size factors

-	Reserve risk could be significant for many non-life insurers. No additional company-specific information is taken account of.
??	Calibration of factors. These seem very high. (40% to 60% for larger companies and 80% to 120% for smaller companies)

QIS 2: Premium risk

Capital charge = factor x net earned premium next year

Standard factors

Size factors

In addition: Company specific based on mechanical calculation of volatility of historical combined ratios

+	Company specific information may be used
-	Due to mechanical calculation, changes in strategy (e.g. reinsurance, pricing not captured adequately)
-	Information is on an accounting year basis
??	Calibration of factors. These seem very high (40% to 60% for larger companies and 80% to 120% for smaller companies)

QIS 2: Catastrophe risk – possible approaches

- Scenario-based approach
- Market share approach
  - Events specified by the national regulator
  - Reinsurance taken into account

+	Company specific stresses may be used
+	Reinsurance taken into account
+/-	Market loss approach may be used for those companies who cannot develop their own catastrophe models. This approach is inappropriate for international writers

QIS 2: Expected profits/losses

- Expected profits/losses are part of the SCR
  - Expected profits are subtracted from SCR (but expected losses are added)
  - Two equally volatile companies can have a different SCR

Expected Profits
= Earned premium next year x (100% - expected combined ratio)
+ Expected run-off result next year

Expected (discounted) combined ratio based on average combined ratio previous 3-5 years

+	Allowance for expected profits/losses next year
-	Due to mechanical calculation, prospective changes (e.g. reinsurance, pricing, underwriting cycle) not captured adequately

QIS 2: Credit risk – factor approach

SCR credit risk = MV of exposure * duration * factor

Rating	CEIOPS rating bucket	Factor
AAA	I – Extremely strong	0.008%
AA	II – Very strong	0.056%
A	III - strong	0.66%
BBB	IV - adequate	1.312%
BB	V - speculative	2.032%
B	VI – very speculative	4.446%
CCC or lower	VII – extremely speculative	6.95%
Unrated	VIII - unrated	1.6%

QIS 2: Market Risk – factors and scenario

	Factor	Scenario
Equity risk	-40% * Non linked equities	Change in NAV following 40% equity shock
Property risk	-20% * Property	Change in NAV following 20% property shock
Interest rate risk	Bucket approach up and down	Change in NAV for up and down scenarios
Currency risk	0.25 * net foreign exchange position	Change in NAV following 25% foreign exchange shock

	Equity	Property	Interest rate	Currency
Equity	1			
Property	1	1		
Interest rate	0.75	0.75	1	
Currency	0.25	0.25	0.25	1

CORRELATIONS AMONG MARKET RISK FACTORS

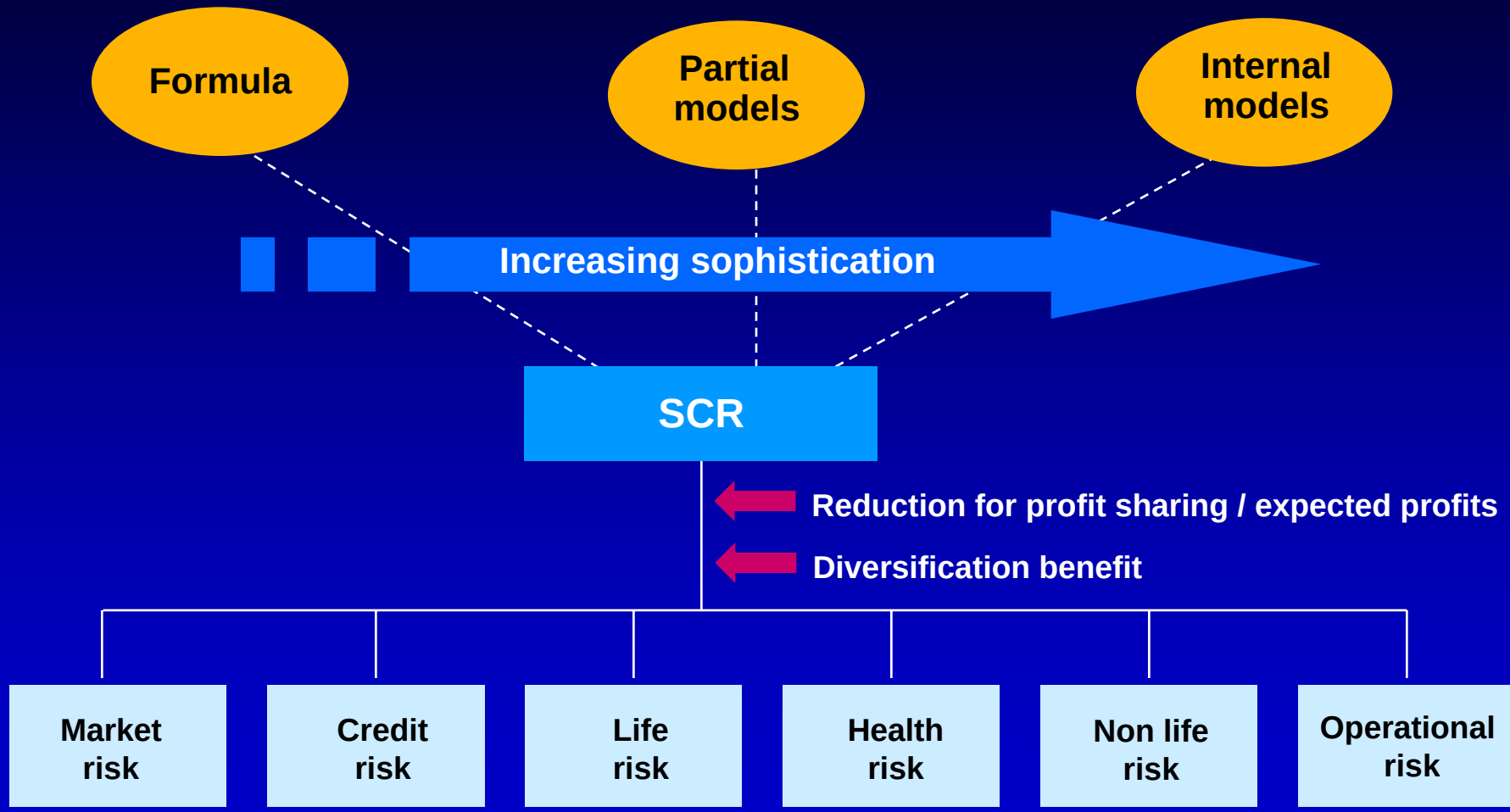
QIS 2: Operational risk

- Operational risk component = max (A, B) where
  - A = .06 * Life earned premium + .03 * non-life earned premium + .03 * health earned premium
  - B = .006 * Life technical provisions + .003 * non-life technical provisions + .003 * health technical provisions
  - Where factors are reduced to one tenth for linked business
- Large one off premiums could be a problem

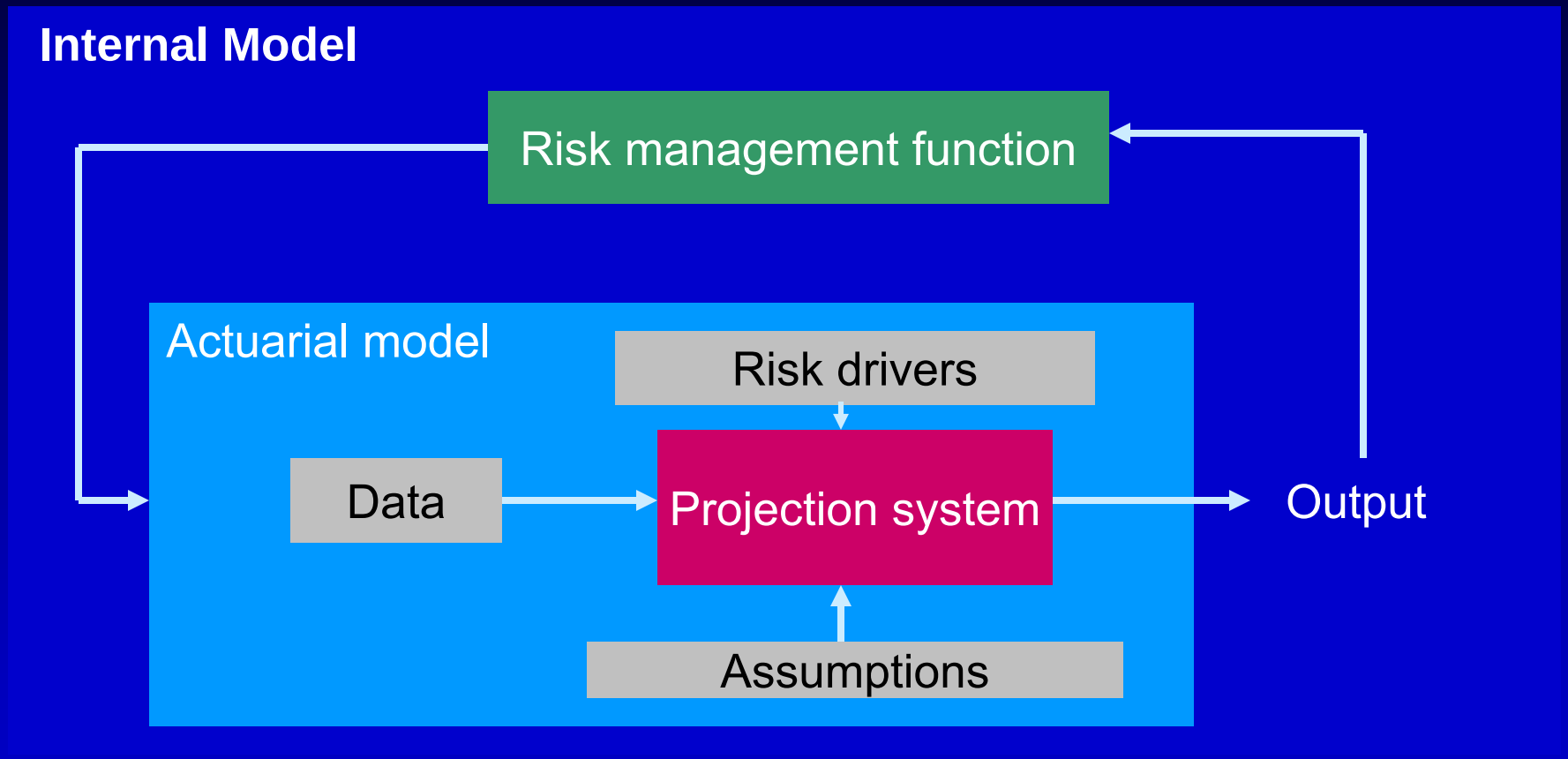
Agenda

- Solvency II Introduction
- Pre-emptive adopters
- Solvency II concepts
- Quantitative Impact Studies
- Internal models
- Conclusions

Calculating the Capital requirements



Definition of an Internal Model



An internal model is more than an actuarial model.

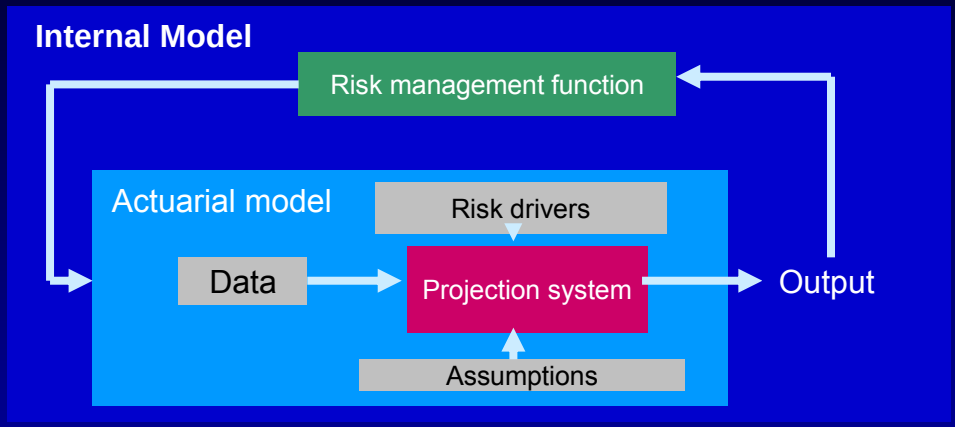
Internal models and the standard approach

Advantages of internal models

- Can be customised to an individual company's risk profile and risk management processes
- Provides information about distribution of outcomes and not single reference point
- Automatically allows for correlations among risk factors used in the stochastic model
- Difficult to allow for group level diversification without such a model

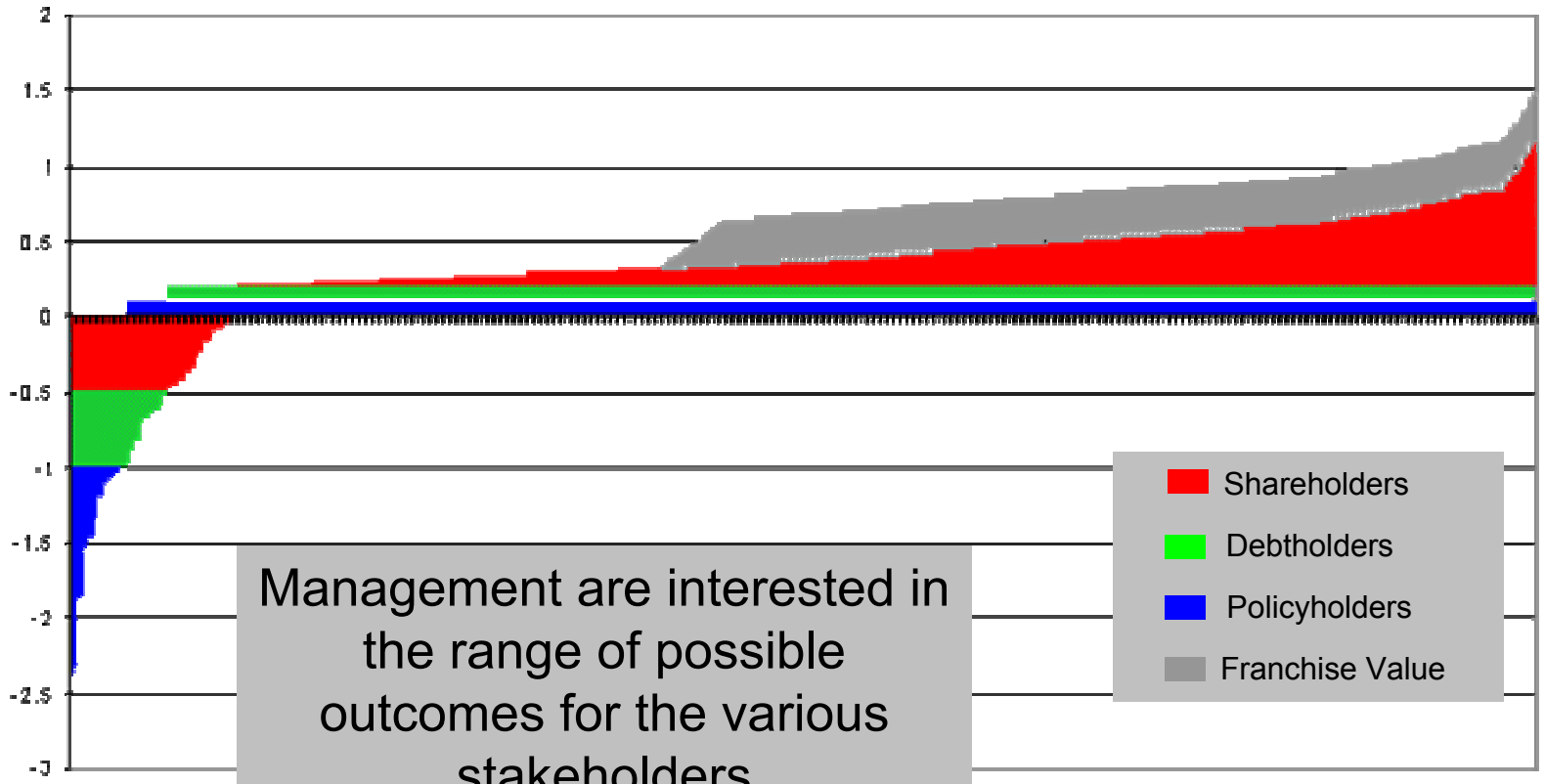
Validation criteria for internal models

- Internal model
  - Statistical quality test
  - Calibration test
  - Use test
- Actuarial model
  - Input/output of the model
  - Underlying logic for the risk components
  - Aggregation of the individual components
  - Use of the actuarial model to facilitate business decisions



Internal models - more than policyholder view

Distribution of Outcomes



Management are interested in the range of possible outcomes for the various stakeholders

Agenda

- Solvency II Introduction
- Pre-emptive adopters
- Solvency II concepts
- Quantitative Impact Studies
- Internal models
- Conclusions

Solvency II: Conclusions

Focus on loss volatility and not just best estimate

Reserving core to overall actuarial model for capital

Increased financial reporting complexity

Framework is still not finalised and significant unresolved issues remain

TOWERS PERRIN
TILLINGHAST

Solvency II: Implications for Loss Reserving

John Charles
Doug Collins

CLRS: 12 September 2006