



Economic Capital (EC) – The Market Perspective

ERM Symposium

Chicago

March 28-30, 2007

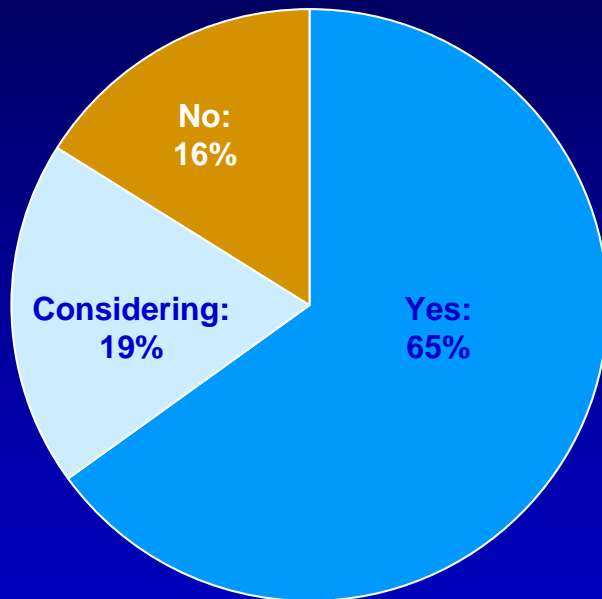
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EC Overview and Recent Trends



Application of EC is on the rise globally

Global Survey Results on Use of EC



Source: Tillinghast 2006 ERM Survey.

- **65%** calculating EC in 2006
 - ... up from 53% in 2004

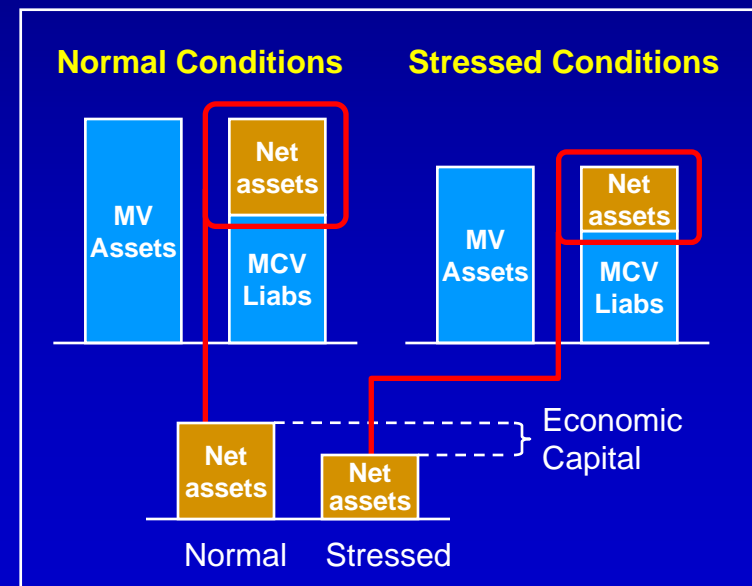
- Planning to calculate EC
 - U.K. 90%
 - Bermuda 89%
 - Asia-Pacific 72%
 - **U.S. 49%**

- Likelihood of calculating EC
 - Reinsurers 80%
 - Multi-line 72%
 - P/C insurers 69%
 - Life insurers 55%
 - **No. America 45%**
 - EU 61%

Market-consistent balance sheet approach is becoming most common method to calculate EC

Economic Capital is...

- Measured as the difference in “market-consistent net assets” between normal conditions and stressed conditions
 - A set of stress tests are applied for each risk, calibrated to a probability level over a one-year time horizon, consistent with the company’s financial strength rating
- Separate stresses are applied to cover a variety of market, credit and insurance risks that might occur over the projected one-year time horizon
- Results are aggregated using a correlation matrix



➔ Commonly used in Europe, increasingly used in North America

EC globally: Solvency II also suggests stress testing approach

- Based on European CFO Forum guidance, EC is calculated using the 99.5th percentile in a stress-testing methodology
 - Requirements are specified for use of internal models
- Consistent standard applied for all EU countries
- Assets and liabilities are on a “fair value” basis
- Capital requirements set for timely intervention
- Approach similar to bank “3 Pillars” approach to EC
 1. Technical valuation rules for assets/liabilities solvency margins
 2. Enhanced supervisory review process
 3. Private and public disclosures
- Capital for op risk typically set as a percentage of total capital

"Best estimate" liability is still the predominant approach used to calculate EC in North America

Economic Capital is determined as...

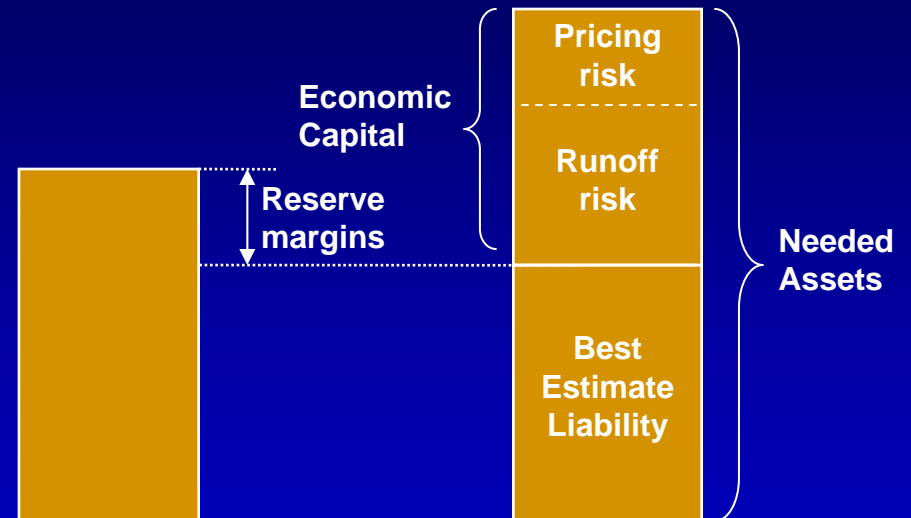
- The level of assets, in addition to the Best Estimate Liability, required to pay future policyholder benefits at the chosen Security Factor
- Economic Capital covers the volatility in:
 - The runoff of existing business
 - The future business ("pricing risk")

Best Estimate Liability is...

- The best estimate projection of non-investment cash flows
- Discounted at the asset returns under the best estimate economic scenario

Security Factor is...

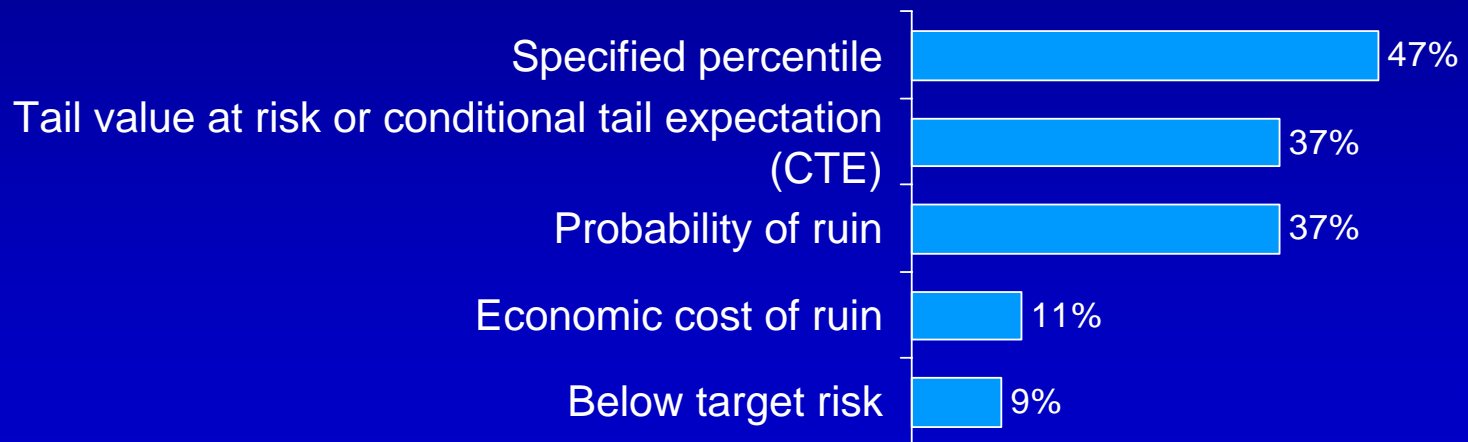
- Based on a risk of ruin level that is consistent with the company's financial strength rating



➡ Mostly used in North America, but with declining frequency

The measures of risk tolerance used in calculating EC are fairly evenly divided

- The most common responses among participants were tail value at risk or conditional tail expectation (37%), probability of ruin (37%) and a specified percentile (47%)
 - TVaR or CTE is more commonly used in North America (49%) and in continental Europe (48%)
 - The probability of ruin is used more frequently by participants in Bermuda (75%) and the U.K. (59%)

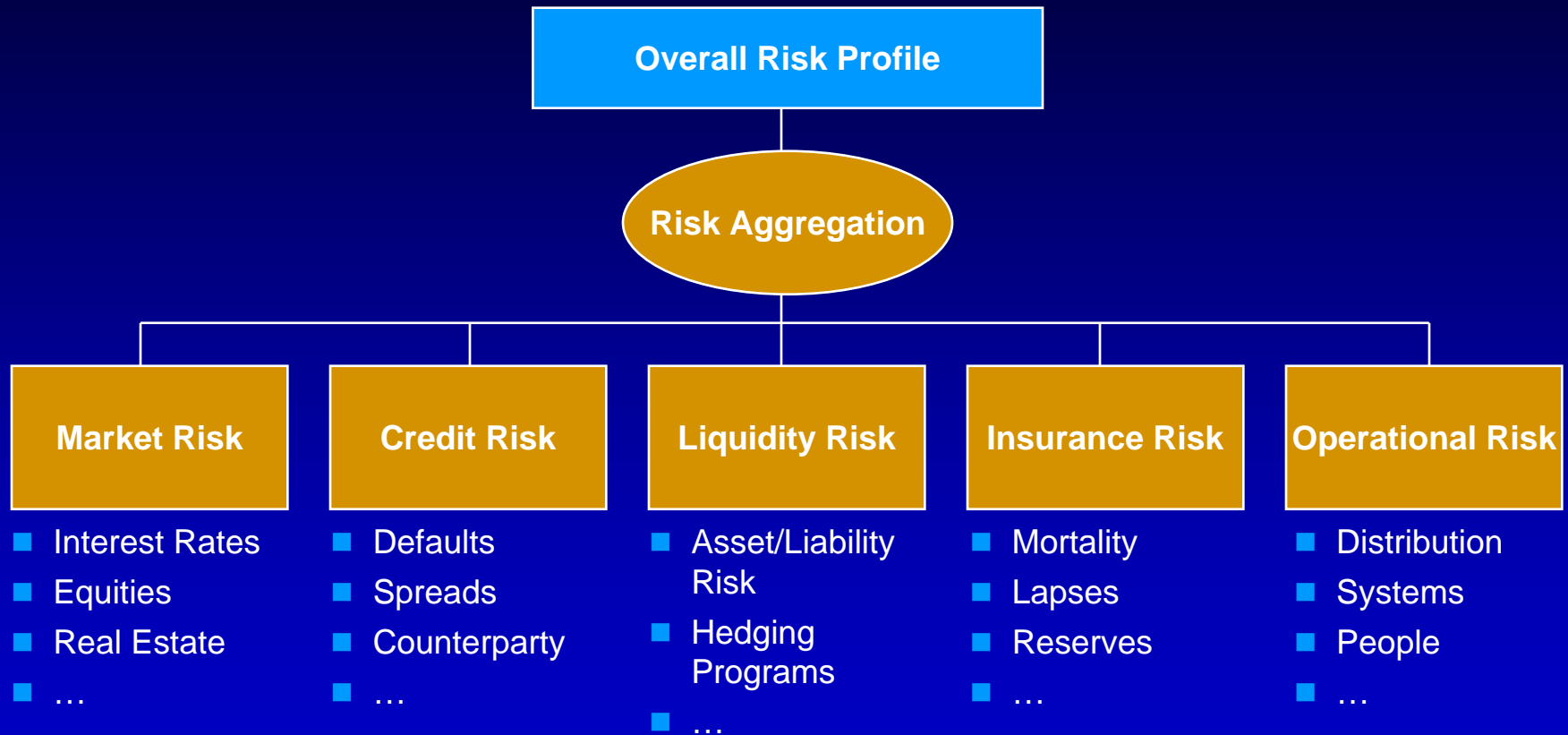


Base: Those that calculate economic capital n = 133 Q.12 What measures of risk tolerance do you use? (Select all that apply.)
Source: Tillinghast 2006 ERM Survey.

Insurance companies and regulators use a range of different confidence levels

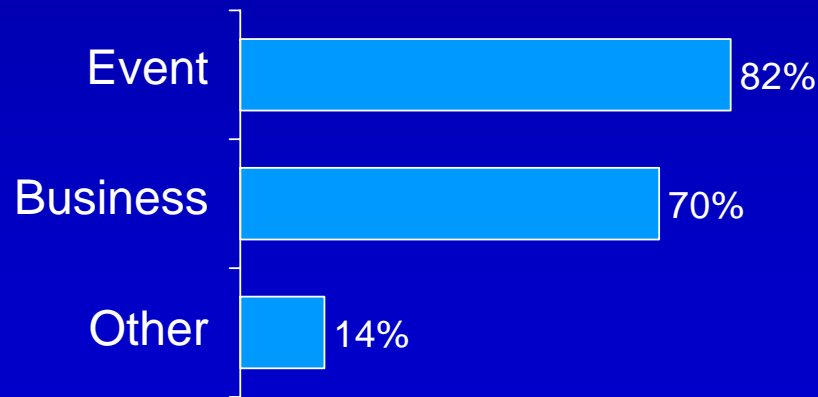
- Choice of confidence level and implied rating:
 - Most European insurers are using one-year confidence levels ranging from 99.5% to 99.99%
 - European regulators and CRO Forum are advocating a one-year 99.5% confidence level for Solvency II
 - Confidence levels are typically linked to a target risk appetite and financial strength rating
 - Rating agencies are evaluating tail risk like bond default risk, using CTE or percentile criteria
 - Where longer time horizons are used, a lower multi-year confidence level can be justified (e.g., AA over five years vs. AA over one year)

The calculation of EC should include all material risks



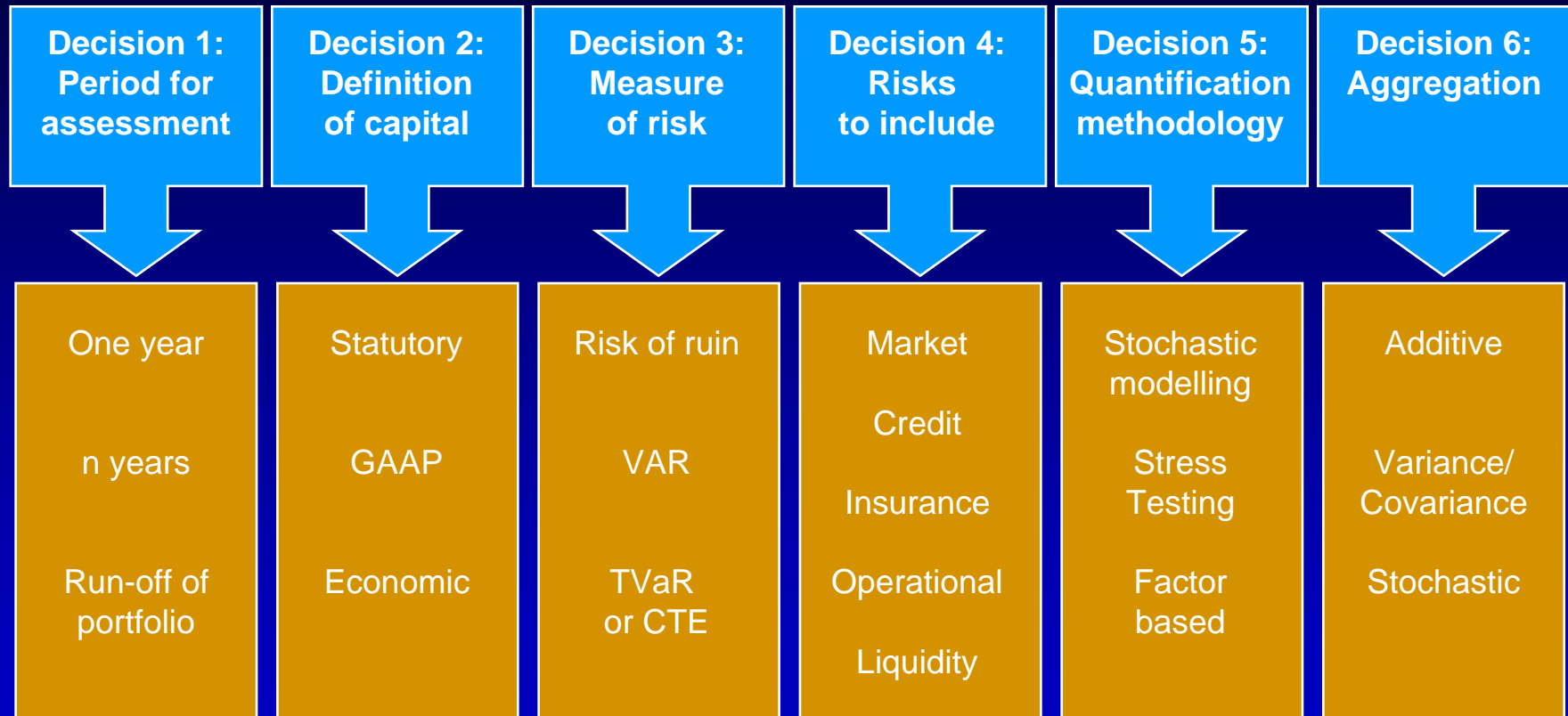
The majority of firms are now including event and business operational risks in their EC calculations

- The vast majority of the respondents that calculate EC use event risks (82%) and business risks (70%) in their EC calculations for operational risks
 - In 2004, less than half of the respondents included event and business risk
 - Multi-line companies on a global basis more frequently included event risk in their EC calculations (91%); this statistic increases to 94% of the multi-line companies in Europe
 - Almost all of the U.K. insurers (96%) include event risk in their calculations
 - Life insurers (81%) and multi-line companies (87%) were more likely to include business risks than P/C insurers (48%) on a global basis



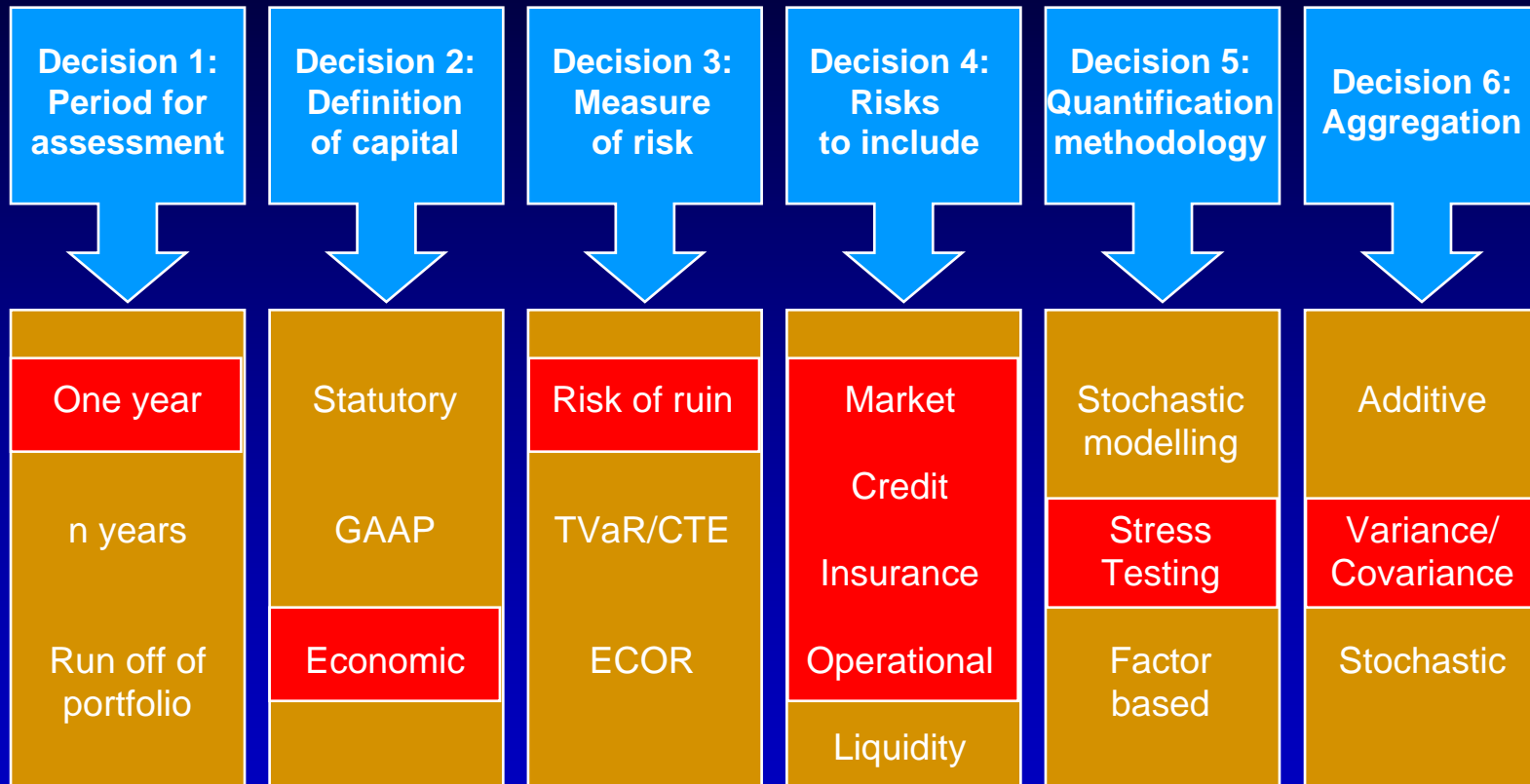
Source: Tillinghast 2006 ERM Survey.

There is no "right" or "wrong" approach to building an EC model



Six key decisions need to be made, and the approach taken should reflect the nature of the company and management's objectives

Towers Perrin's FastTrack EC approach follows a well researched and thoroughly tested path



Implemented by a majority of multinational insurers and adopted/proposed for: UK ICA regime, Swiss Solvency Test, EU Solvency II

There are four stages to implementing the FastTrack EC approach

Step 1

Develop an economic view of the business

Economic assessment of assets and liabilities

Step 2

Identify key risks and determine levels of stress to be applied

List of stress events to quantify key risks

Step 3

Apply stresses to the economic balance sheet

EC requirement for each key risk

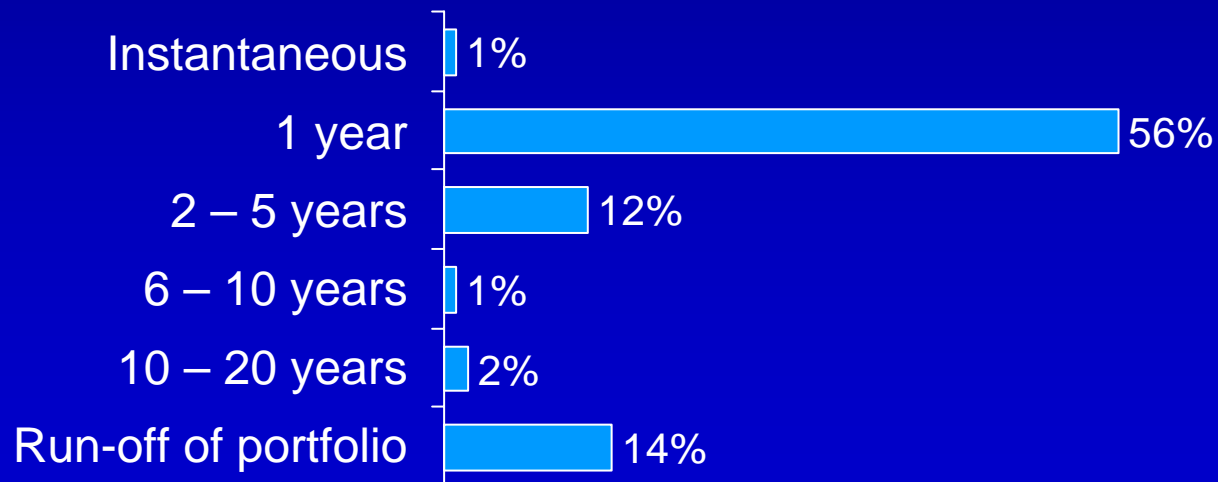
Step 4

Aggregate individual risk capital results, allowing for correlation effects

Total EC requirement for your business

One year has become the most frequent risk assessment period

- More than half (56%) of respondents assess risk over a one-year period
 - This is a sharp increase from 2004, when only 32% of the respondents indicated they assessed risk over a one-year period
 - Assessing risk over a two- to five-year period has decreased from 22% to 12% and the run-off of portfolio from 29% to 14% since 2004
 - Respondents based in continental Europe (84%) were more likely to use a one-year period than their counterparts in the U.K. (48%)
- This is based on the widespread use of the Solvency II methodology worldwide

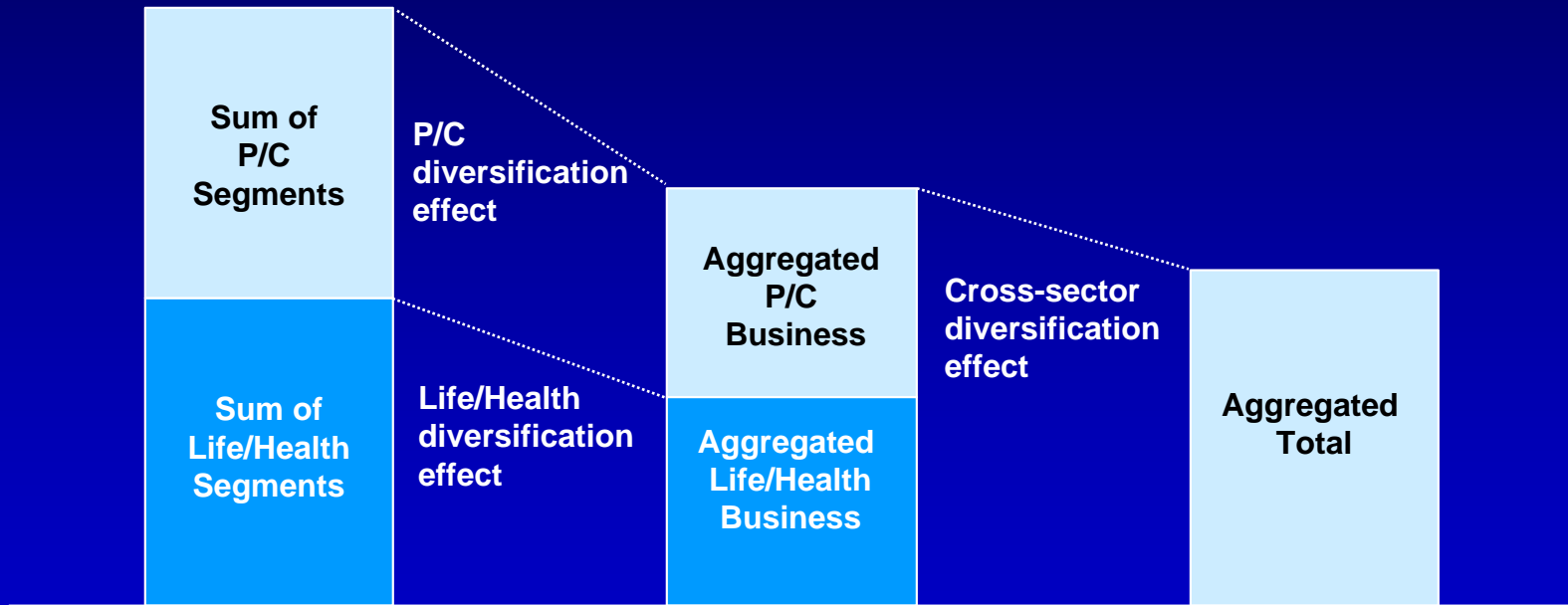


Source: Tillinghast 2006 ERM Survey.

By combining models, insurance companies are able to measure diversification benefits

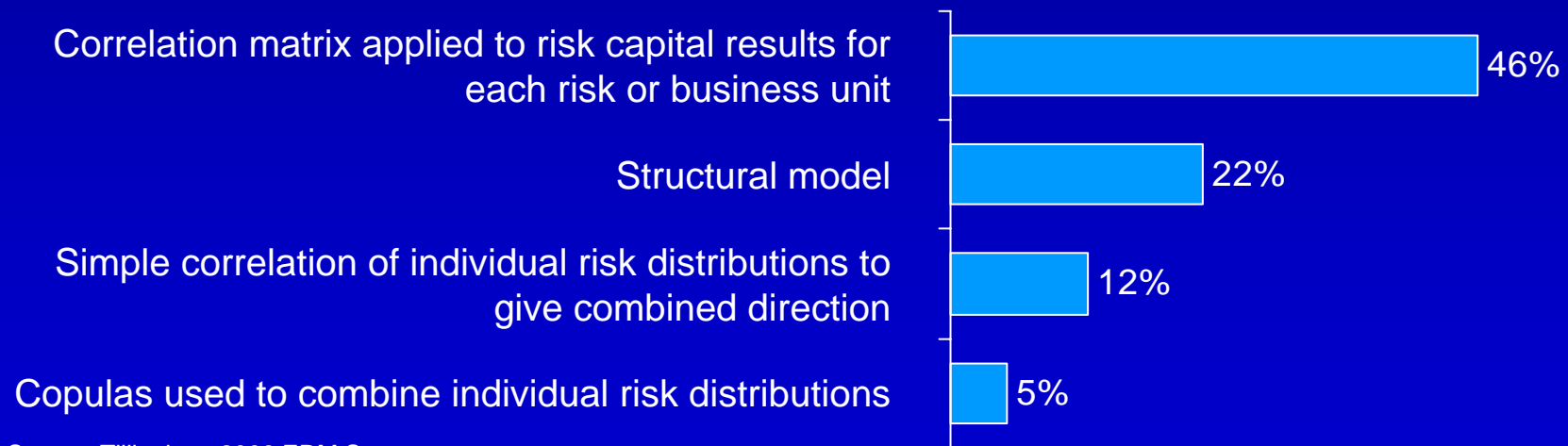
Enterprise Diversification Benefit

Economic Capital



Almost half of our ERM Survey respondents use a correlation matrix for aggregating risk

- The methodology most frequently used for aggregating risk is a correlation matrix applied to risk capital results for each risk or business unit (46%)
 - Globally, multi-line companies (57%) and life insurers (52%) make more use of correlation matrices than P/C insurers (16%)
 - Correlation matrices are used more frequently in Europe (60%) than in North America (32%)
- Structural models are utilized more frequently by P/C insurers globally (48%) than multi-line companies (14%) or life insurers (13%) to aggregate risk
 - Structural models are used even more by P/C insurers in North America (58%)
- Only 8% of the respondents do not use a set methodology for aggregating risk

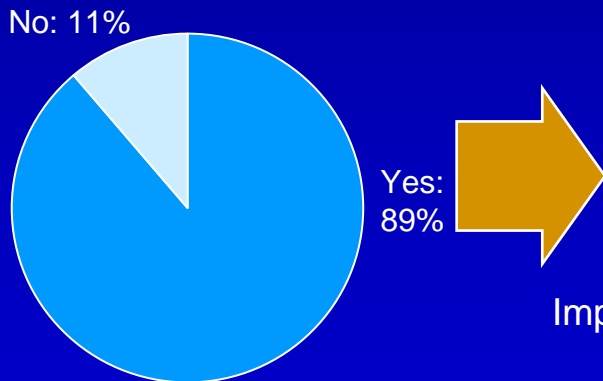


Source: Tillinghast 2006 ERM Survey.

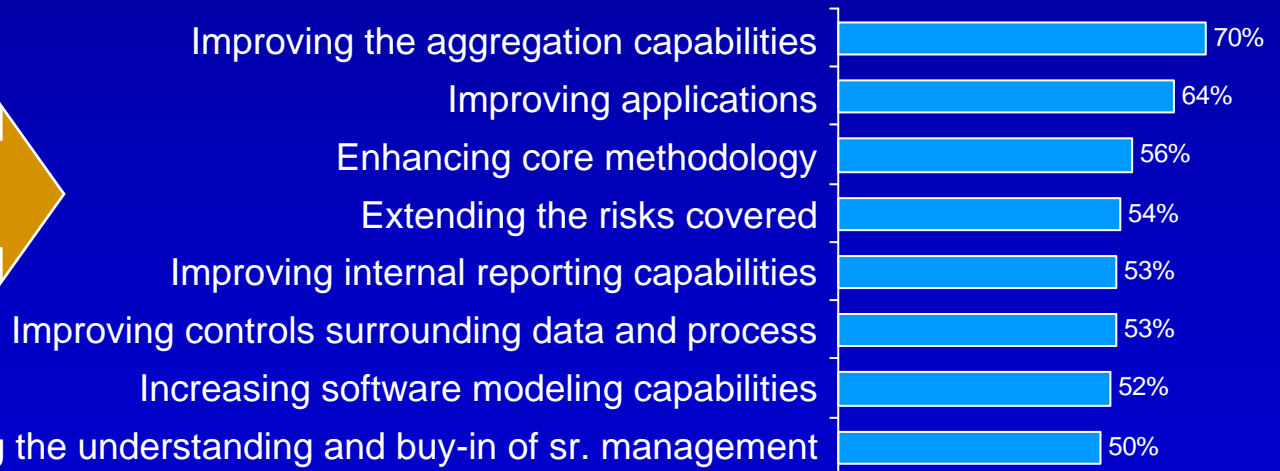
Almost all of the respondents that calculate EC are planning to make further improvements

- 89% of the survey participants that calculate EC are planning to make further improvements or enhancements to their EC calculations or framework
 - This is a particular focus of the participants in Asia Pacific (96%) and Canada (100%)
 - North American life insurers (93%) indicate an even higher propensity for wanting to improve their EC calculations or framework, as did 95% of the multi-line companies in Europe
- Of those planning improvement, the most frequently cited goal is to improve aggregation capabilities (70%), followed by improving applications (64%)

Plans for Further Improvements



Goals of Planned Improvements

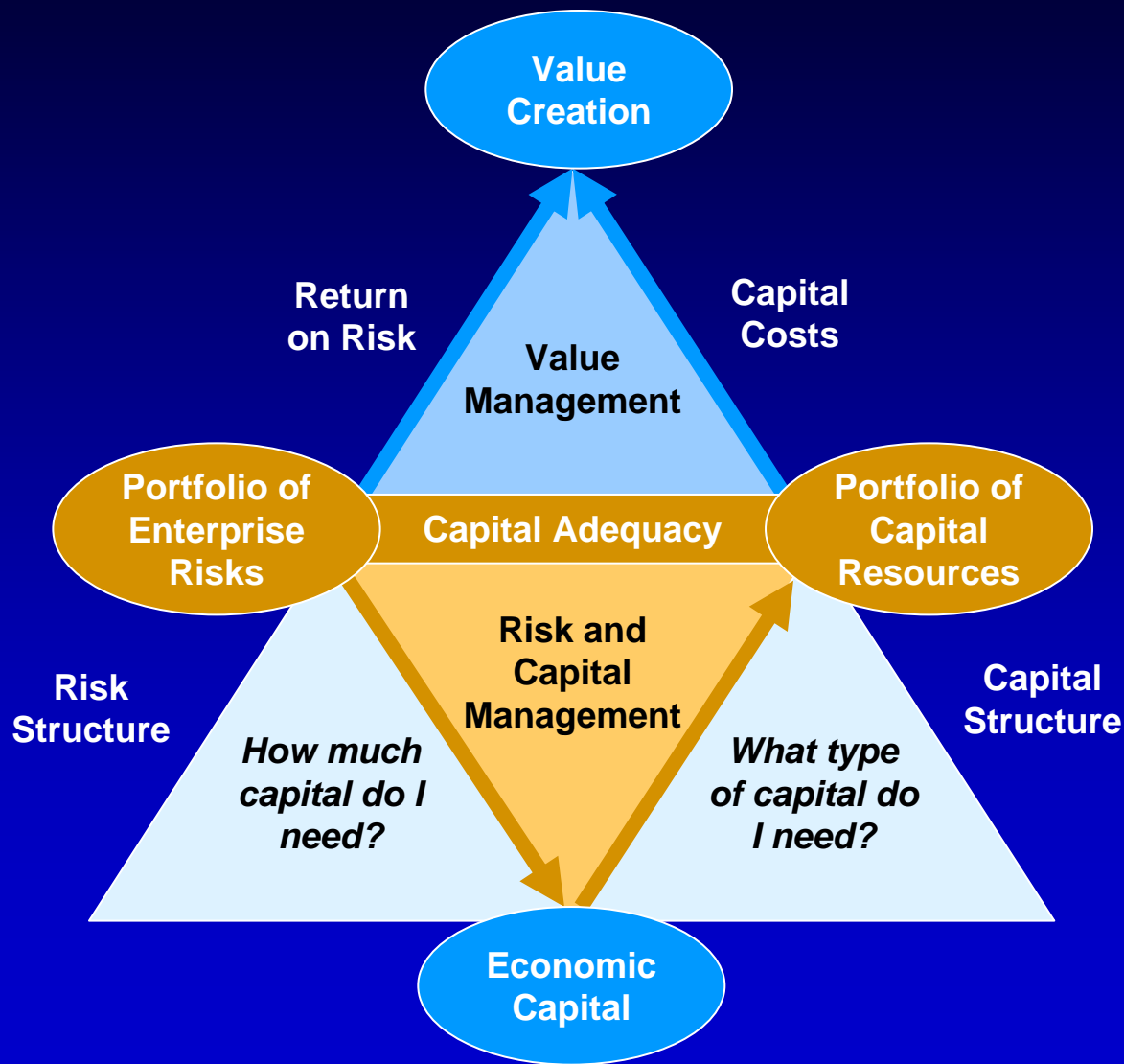


Source: Tillinghast 2006 ERM Survey.

Adding Value from EC



Leading-edge companies maximize value by relating decisions on the risks they take to decisions on the capital they use



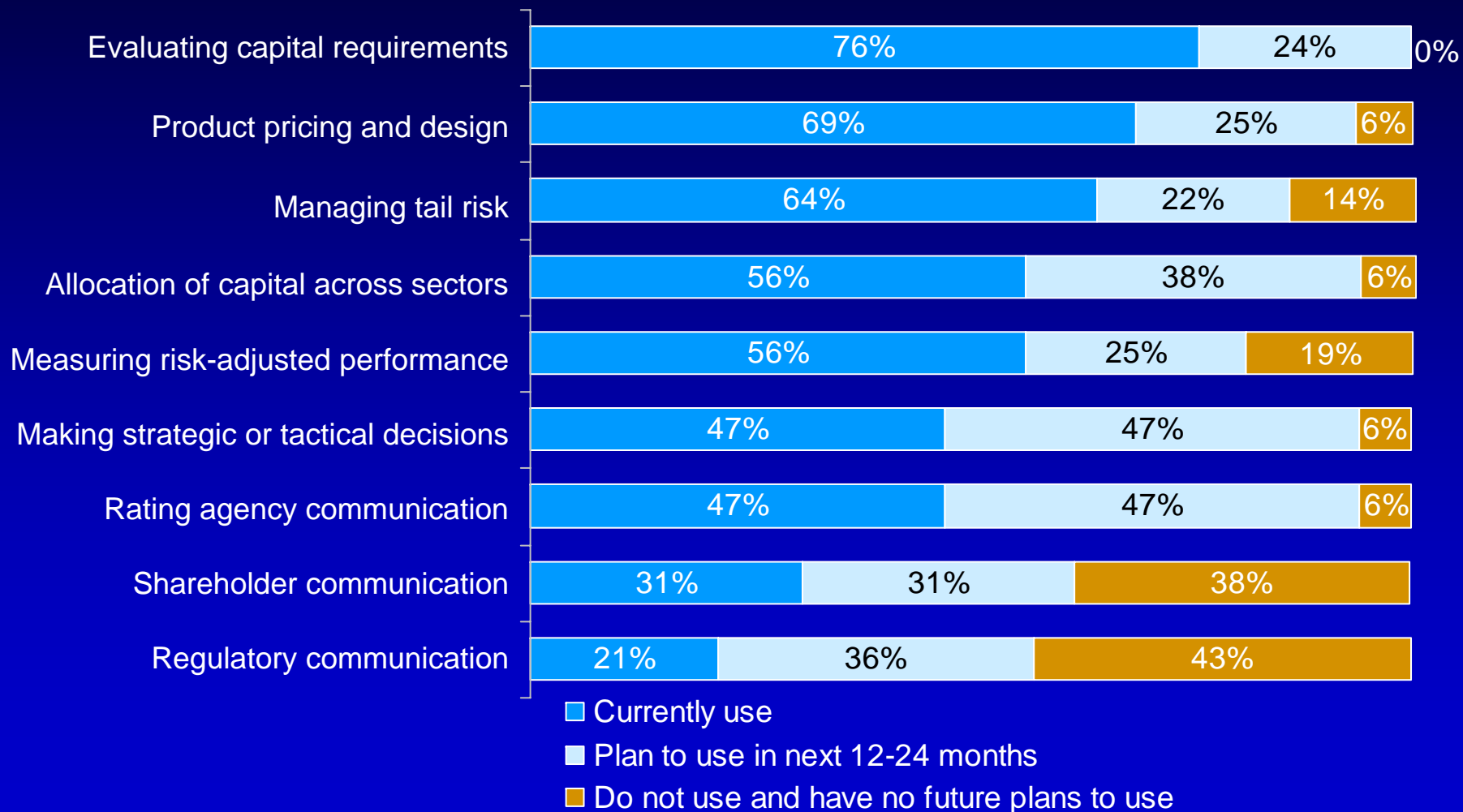
Adding value from EC

- Increased focus on allocation of capital for performance management purposes
 - EC as required capital for EEV/MCEV calculations
 - Use of EC as a metric for short-term/long-term incentive plans
- Use of EC for business planning
 - Requires projection of future new business
- Use of EC in pricing
 - Principles-based regulation requires projection of EC at annual intervals
 - In practice, factor-based shortcuts are typically used
- EC is seen as a key component of ERM framework
 - Increasing scrutiny by regulators/rating agencies
 - Typically, stress testing approach is used

Leading-edge companies are leveraging EC to connect risk and value

EC is increasingly used for product pricing and design

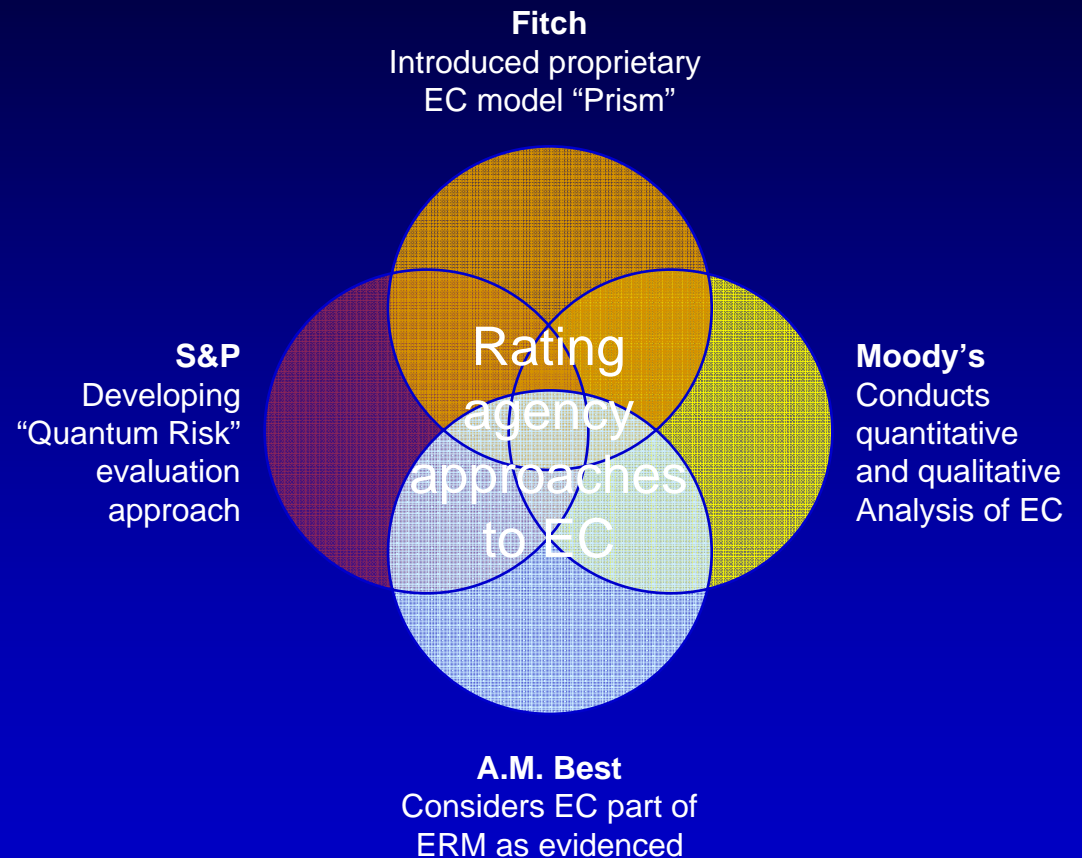
Current and Planned Uses of EC Calculations



Source: Tillinghast CFO Survey 2006.

Rating agencies are increasingly considering proprietary EC models when assessing capital adequacy

- Building economic models into their rating process during ERM reviews
- Expecting companies to demonstrate balance between qualitative and quantitative ERM
- Linking capital adequacy requirements directly to ratings



Capital Adequacy Model and Economic Capital: Insurance Ratings Impact

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March 2007

Agenda

A. S&P Insurer Capital Adequacy Model Update

B. ERM – Bridging from Capital Adequacy to ICM

C. Economic Capital and Ratings

Capital Adequacy Model Update

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Why Update the Capital Model Now?

The risk-based capital model is an integral tool to evaluate capital adequacy for life, property & casualty, and health companies.

- First introduced by S&P in the early 1990s**
- Limited changes to the capital factors**
- Insurance products have become more complex and existing factors may not have fully captured the embedded risks**
- Observed volatility in economic parameters (credit, market, underwriting exposures) over the last 15+ years needs to be updated and captured in S&P's analysis of capital**

Framework Changes to the Capital Model

Current:

Formula:

**Total adjusted capital (TAC) less charges for
asset-related and credit-related risks**

**Underwriting/pricing risks + reserve risk (p&c) + asset/liability risk
(interest rate) (life) + business risks not already captured**

Updated:

- **Estimate target capital (within confidence levels) based on insurer's risk profile**
- **Target capital will capture all risks (asset, credit, insurance)**
- **Compare the total adjusted capital to the required target capital**
- **Calculate the redundancy or deficiency of target capital to TAC at each rating level**

Example

XYZ Insurance Company ('AA' FSR) has total adjusted capital (TAC) of \$1.1 billion. Under the current model, capital adequacy ratio is 150% (very strong)

Proposal:

Target Rating	Confidence Level	Required Target Capital (Bn)
AAA	99.9%	\$ 1.5
AA	99.7%	\$ 1.3
A	99.4%	\$ 1.0
BBB	97.2%	\$ 0.8

Conclusion:

- TAC of \$1.1 billion is deficient by 15% or \$200 million to absorb the company's specific risks at the AA rating level**

Asset-Related Risk Factors: Fixed Income Securities

Current:

- **Factors for each credit quality classification (AAA to impairment)**
- **Assumed expected defaults over 10 year less varying recovery rates using a 6% discount rate**

Updated:

- **Factors for each credit quality classification (AAA to impairment) based on tenor and stressed in accordance with target capital levels**

Asset-Related Risk Charges: Common Equities

Current:

Single factor

- **Assumption: A single factor (15%) applied based on 1 standard deviation of the historical annual prices of S&P 500 stock as a proxy for annual equity volatility**

Updated:

Single factor for each target rating category by country

- **Methodology:**

- **Volatility of each country's equity market has been measured and updated**
- **Factors stressed in accordance with target capital levels**

**STANDARD
& POOR'S**

Asset-Related Risk Charges: Reinsurance Recoverables

Current:

- **Assigned credit risk factors according to credit default statistics. Reinsurers under some form of regulatory control are deemed equivalent to a 'CCC' and those that are not rated considered to be a 'B'**

Updated:

- **Used the same cumulative default factors developed for fixed income securities, with the same confidence levels**
- **Assume a single tenor of 10 years for all recoverables**
- **Surcharge of 20% on reinsurance recoverable balances where there is an issue of 'willingness to pay'**

Underwriting Risks: Mortality

Current:

- A factor is applied against four groupings of net amount of risk (in-force less carried reserves)

Updated:

- To factor in credit for higher levels of in-force diversification, expanded the number of net amount of risk groupings:
- < \$1 Bn / \$1 – 5 Bn / \$5 - 10 Bn / \$10 – 50 Bn / \$50 –100 Bn / >\$100Bn

Methodology:

- **Calculated a standard deviation of actual to expected ratios; converted to claim amount volatility and compared that to the net amount at risk.**
- **The same confidence levels as applied to fixed income securities will be used.**

Underwriting Risk Charges: Asset/Liability Matching

Current:

Asset-liability factors developed when products were much less complex. Less sophisticated risk measurement techniques employed

Updated:

Factors are derived by aggregating expected capital needs relating to each of the following sub-categories of risk:

- **Mismatch risk (MV sensitivity difference of assets, hedges, and liabilities)**
- **Systemic spread volatility risk**
- **Basis risk**
- **Liability structural feature risk (embedded options) e.g. elective surrender, death related surrender, benefit responsive withdrawal, minimum guarantees, etc.**

Standard & Poor's published an article that:

- **identifies all updated risk-adjusted factors**
- **provides an explanation behind the development of each factor**
- **highlights risk profiles that are most/least impacted by the updates**

Next Steps

- **Standard & Poor's Received 300+ pages of feedback from insurance companies and other interested market participants on the proposed revisions to the capital model over a three month period**
- **Updated capital model will be finalized in the 1st half 2007**
- **During 2007, both models will be run simultaneously**
- ***As S&P gains more confidence in the revised capital modeling indications, greater reliance will be placed on it for analytical purposes***

S&P Insurer ERM Evaluation Process

Bridging from Capital Adequacy to Internal Capital Models (ICM)

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ERM Evaluation Components



Capacity / Capital Management

- **Many Insurers & Reinsurers practice Capacity / Capital Mgt**
 - Make plans for writing all of the profitable business they can write
 - Then Assess whether they have exceeded their Capacity
 - Based on S&P, AM Best or RBC Capital Target
 - Use Reinsurance to bring retained risk back into line with Capacity

This is not Strategic Risk Management!

- ❑ **S&P, AM Best, RBC Capital formulas are not measures of company specific risks**
- ❑ **Strategic Risk Management uses company specific risk measure**
 - May be Economic Capital or Earnings at Risk or other risk measure

**We are not saying that Capacity / Capital Mgt is bad
- It is just not Strategic Risk Management**

What Can go Wrong with using General Risk Capital models?

- **When new products or investments become major activities**
- **before the NAIC, S&P or others add something to their capital formula...**

- **Two Bad things can happen:**
 - The company can hit a bad spell and experience losses far above their risk tolerances
 - The Regulators / Ratings agencies can decide to set a reasonable level of expected capital requirement or reserves

- **Two Good Things could happen:**
 - Nobody gets wise
 - No loss event happens

Planning for Luck - IS NOT RISK MANAGEMENT!!!

Strategic Risk Management (SRM)

- **Why are we making SRM so important?**
- **There are some companies with Superior Risk Management that we will then be judging to be Adequate?!?**
 - Companies with Superior Risk Management (Controls) will have low volatility of earnings and low incidence of losses.
 - Companies with Strong/Excellent ERM will have low volatility of earnings, low incidence of losses AND Steadily improving Returns.
- **Strategic Risk Management is the UPSIDE of Risk Management**

Economic Capital

And the S&P Insurer Rating Process

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Evaluating Economic Capital Models

- **S&P is developing robust processes for evaluating insurers' internal economic capital models**
 - Dynamic approach will enhance our existing and prospective view of capital adequacy
 - To be performed only for companies with effective/coordinated processes for risk control, emerging event management, risk-management culture, and risk models
- **STRONG or EXCELLENT ERM**
- **Evaluations of economic capital will be used in conjunction with existing static, risk-based measures**

Through evaluation of a robust economic capital model, S&P can incorporate benefits of uncorrelated risks (diversification)

Insurers must have effective procedures for maintaining both risks and losses within predictable bounds

Economic Capital Models

Major Review Considerations:

1. Risk Quantum
2. General level of risks
3. Company specific variations in level of risks.
4. Company specific exposures & offsets
5. Diversification effects
6. Model robustness
7. Model execution
8. Model usage – specific
9. Stress Tests

Major ECM Review Considerations

1. Risk Quantum – Definition of EC Value

- Var vs. CTE
- Time Frame
- Confidence level
- Open vs. Closed Fund

2. General Level of Risks

- How risky is the stock market?
- How volatile are interest rates?
- How much Credit risk at each rating level?
- How much tail risk in from insurance & policyholder behavior?
- How large is Operational Risk?

Major ECM Review Considerations

3. Company Specific Variations in level of risks

- Due to specific restrictions
- Due to favorable risk selection
- Due to favorable risk divestiture
- Due to other past or future management actions

4. Company Specific exposures & Offsets

- Detailed Company specific products & product features
- Detailed Company specific investments
- Detailed Company specific customer base
- Company Specific markets and sub-markets

Major ECM Review Considerations

5. Diversification Effects

- Source of Correlation assumptions & methodologies
- Treatment of differences between tail correlation & loss distribution average correlation
- Treatment of risks with low or negative alpha

6. Model Robustness

- Model vs. factor
- Granularity
- Approximations vs. exact
- Scenarios vs. Stress
- May vary by risk and by location
- Materiality considerations
- “State of the Art” considerations

Major ECM Review Considerations

7. Model Execution

- IT infrastructure
- Model development – Internal vs. External
- Custom vs. Standardized
- Support Staff
- Validation & Review Process
- Documentation

8. Model Usage

- Steering – Strategic Risk Management
- Trading – Product Pricing Usage
- Risk Management – ALM, Hedging, etc.

If EC model not used for any of these purposes, how are different models reconciled?

Major ECM Considerations

9. Stress Tests

- Internal Stress tests and assumption sensitivity tests
- Output Review – Summary and detailed
- S&P scenario tests
- S&P sample product tests
- Risk Limit test (MPEC)

Questions?

**Insurance ERM Evaluation Criteria
on the web at
www.erm.standardandpoors.com**

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Regulatory Risk Based Capital



ERM Symposium

Chicago

March 28-30, 2007

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Regulatory RBC

- Purpose
- Overview of Current Structure
- Regulatory Updates

Purpose of Regulatory RBC

- Minimum amount of capital needed to support the overall business operations considering the size and risk profile of the insurance company

Purpose of Regulatory RBC

■ 5 Major Categories of Risk

- C-0 Asset Risk Affiliates
- C-1 Asset Risk – Other
- C-2 Insurance Risk
- C-3 Interest Rate, Market & Health Credit Risk
- C-4 Business Risk

Current RBC Structure

- Regulatory Financial Solvency Measure
 - Compares Total Adjusted Capital (TAC) to
 - Authorized Control Level (ACL) RBC

Current RBC Structure

■ 4 Regulatory Action Triggers

- Company Action Level (TAC 150% - 200% ACL)
- Regulatory Action Level (TAC 100% - 150% ACL)
- Authorized Control Level (TAC 70% - 100% ACL)
- Mandatory Control Level (TAC < 70% ACL)

Current RBC Structure

■ Regulatory Actions By Trigger

- Company Action Level (CFP)
- Regulatory Action Level (CFP + Examination / Analysis)
- Authorized Control Level (Authorizes Regulatory Action)
- Mandatory Control Level (Requires Regulatory Control)

Current RBC Structure

- Authorized Control Level RBC = 50% of RBC after Covariance
- Total Adjusted Capital = Statutory Capital & Surplus (Total Net Worth) + Adjustments
- Examples of Adjustments - Asset Valuation Reserve, Half of Dividend Liability, Non-tabular Discounts, Medical Discounts

Current RBC Structure

■ Life Company RBC after Covariance

$$C0 + C4a + \sqrt{(C1o + C3a)^2 + (C1cs + C3c)^2 + (C2)^2 + (C3b)^2 + (C4b)^2} \text{ where}$$

$C0$ = *Affiliated Insurance Company Assets RBC*

$C1cs$ = Unaffiliated Common Stock/Affiliated Non – Insurance Stock

$C1o$ = All Other Asset Risk

$C2$ = Insurance Risk (NAR, Reserves)

$C3a$ = Interest Rate Risk

$C3b$ = Health Credit Risk

$C3c$ = Market Risk

$C4a$ = Business (Premium Liability Component)

$C4b$ = Business Risk (Health Administrative Expense Component)

$$ACL = \frac{C0 + C4a + \sqrt{(C1o + C3a)^2 + (C1cs + C3c)^2 + (C2)^2 + (C3b)^2 + (C4b)^2}}{2}$$

Regulatory Updates

- Goal: Replace the current factor based approach with a principles-based approach to determining the C-3 component of RBC (PBA = Stochastic Modeling with CTE Statistic)
 - C-3 Phase I – Fixed Annuities and Single Premium Life Insurance
 - C-3 Phase II – Variable Annuity Guaranteed Benefits
 - C-3 Phase III – All Other Life Insurance and Indexed Annuities

Regulatory Updates

■ C-3 Phase I

- January 2006 AAA releases an enhanced C-3 Phase I interest rate generator
- Produces interest rate scenarios based on a specified yield curve using the same model parameters as original generator
- Predetermined scenario sets (12 or 50) no longer provided
- Development of Calibration Criteria for insurers using internal interest rate models

Regulatory Updates

■ C-3 Phase I

- C-3 Phase I testing required for companies with assets exceeding \$ 100 million
- C-3 Phase I testing required for companies with assets less than \$ 100 million if fail significance test, the stress test or elect to do C-3 testing on a continuing basis

Regulatory Updates

■ C-3 Phase II

- CARVM Expense Allowance recovery risk adjusted for liabilities subject to C-3 Phase II testing
- Actuarial Certification instructions clarified
- Added section to require Actuarial Memorandum to be completed
- Standard Scenario equity class changed from two 10% drops to one 20% drop and balanced class changed from two 6% drops to one 12% drop
- C-3 Phase II results subgroup analysis completed in 2006 recommendations to follow

Regulatory Updates

■ C-3 Phase III ???

- AAA Life Capital Adequacy Subcommittee (LCAS) formed:
 - (1) Life Capital working group 2005
 - (2) Annuity Capital working group 2006
- Goal: Single integrated framework for C-3 risk evaluated using a principles-based approach to risk measurement

Regulatory Updates

■ Implications of restructuring

- Consistency in economic scenario generators across product lines
- Consistency in principles underlying risk measurement
- Elimination of reference to phases
 - C-3 Phase I (annuity) and C-3 Phase II covered under ACWG
 - C-3 Phase I (single premium life) covered under LCWG

Regulatory Risk Based Capital

Questions ?