



## Emerging Financial Crisis & Economic Capital

Asociación Mexicana de Instituciones de Seguros (AMIS)

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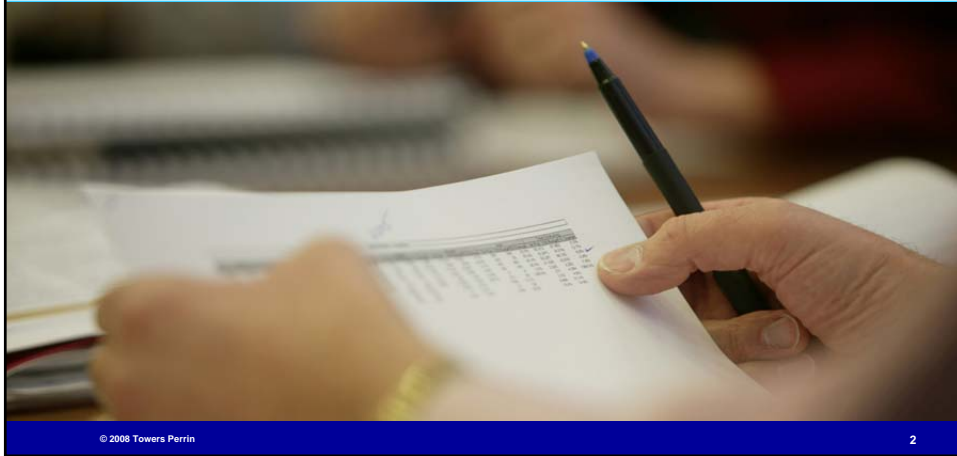
### Agenda

- Emerging Financial Crisis: Impact and Implications
- Economic Capital (EC) Frameworks in Practice
- Two Main Approaches to EC
- ERM Survey Results on EC Methodology
- Other Risk Capital Frameworks
- Case Studies
- FastTrack and FastTrack+

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1

## Emerging Financial Crisis: Impact and Implications



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2

### EMERGING FINANCIAL CRISIS: IMPACT AND IMPLICATIONS

The Subprime Crisis has rapidly evolved into the largest financial crisis since the Great Depression

**Lehman Files for Bankruptcy,  
Battles to Avert Liquidation**

*AFP 15 September 2008*

**Fed in Fresh \$37.8bn Lifeline for AIG**

*F.T. 9 October 2008*

**Iceland Nationalises Banks and  
Russia Provides Pounds 3bn Loan**

*DT 8 October 2008*

**Bush Signs \$700 billion  
Bailout Bill**

*AP 3 October 2008*

**Fortis Thrown €1bn Lifeline  
by Governments**

*AP28 September 2008*

**UK Unveils 875 billion  
Dollar Bank Rescue**

*AFP 8 October 2008*

**Aegon to Book \$573M  
for Bad Credit**

*AP 9 October 2008*

**Yamato Life Becomes 1st  
Japan Financial Firm to Fail  
on Subprime Crisis**

*Kyodo News 10 October 2008*

**Fed to Lend up to \$85B to AIG; Rescue  
Heads Off a Bankruptcy Filing**

*17 September 2008*

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3

EMERGING FINANCIAL CRISIS: IMPACT AND IMPLICATIONS

### Quick review of what's happened

<p>Sep 7: Fannie Mae &amp; Freddie Mac rescued by U.S. government</p> <p>Sep 15: Lehman Brothers files for Chapter 11 bankruptcy</p> <p>Sep 15: Merrill Lynch taken over by Bank of America for \$50bn</p> <p>Sep 16: U.S. Federal Reserve announces an \$85bn rescue of AIG</p> <p>Sep 17: HBOS taken over by Lloyds TSB in a £12bn deal</p> <p>Sep 25: Washington Mutual sold to JPMorgan</p> <p>Sep 28: Fortis partly nationalized to ensure its survival</p> <p>Sep 29: Bradford &amp; Bingley nationalize</p> <p>Sep 29: Icelandic government takes over Glitner (3rd largest bank)</p> <p>Wachovia plans to be bought by rival Citigroup</p> <p>Sep 30: Belgium's Dexia becomes latest European bank bailed out</p>	<p>Oct 3: The U.S. House of Representatives passes a \$700bn government rescue plan for the U.S. financial sector</p> <p>U.K.'s FSA raises limit on guaranteed deposits</p> <p>Oct 6: Germany announces \$68bn (£394bn) plan to save Hypo RE</p> <p>BNP Paribas agrees to take over Fortis from Belgian government for €14.5bn</p> <p>Iceland starts to nationalize banks</p> <p>Oct 8: AIG will get up to \$37.8 billion of fresh liquidity</p> <p>Oct 10: Japan's Yamato Life Ins. Co. collapses with \$2.7bn in debt</p> <p>Oct 13: UK banks' £37bn bailout unveiled</p> <p>Oct 14: US banks' \$250bn bailout unveiled</p>
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EMERGING FINANCIAL CRISIS: IMPACT AND IMPLICATIONS

### Implications of the global financial crisis and recession for the overall insurance industry

- Insurance industry is strong, but suffering losses
  - Credit guarantees against loan defaults
  - Declines in credit-related asset values
  - Securities lending activities
  - Unrealized losses on stock portfolios
  - Losses on cross-investments in failed institutions
  - Shareholder lawsuits
  - Loss of revenue on separate account assets
  - Higher cost for guarantees (including capital)
- Impact on insurers varies by sector and company
  - Life insurers harder hit than P/C insurers
- Consolidation likely, pending available capital

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Implications for life insurers

- Companies are impacted in a number of ways:
  - Traditional business/general account portfolio
  - Separate account business
  - Capital levels and solvency ratios
- Negative industry outlook by major rating agencies
  - Selected downgrades have accelerated capital demands for several large players
- Increased demand for reinsurance vs. reduced capacity
- Diminished access to capital markets / less liquidity
- Sale of AIG's life business offers a rare opportunity for those strong enough to finance a major acquisition to get more scale
  - Sales of life businesses for other insurers are likely
- The Hartford, Lincoln and Genworth have recently acquired banks to allow them access to TARP (the U.S. Treasury's Troubled Asset Relief Program)
  - The acquisition makes them eligible to raise significant funding from the U.S. government's bank bailout plan (but also would place them under the corresponding federal regulation)
  - A few other life insurers owning banks may also access TARP

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EMERGING FINANCIAL CRISIS: IMPACT AND IMPLICATIONS

Despite widespread write-offs, life/health insurers' diversified portfolios will likely protect them from insolvency

Estimated Asset Write-Offs Due to Failures (\$Millions) for selected Life/Health insurers

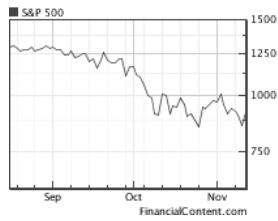
Companies By Asset Size	AIG	WaMu	Lehman	Fannie & Freddie	Total Exposure	% Inv. Assets	% SH Equity
Hartford	\$252	\$146	\$332	\$511	\$1,241	0.8%	7.0%
Sun Life	\$315	\$270	\$349	--	\$934	1.0%	5.3%
MetLife	\$380	\$100	\$375	--	\$855	0.3%	2.6%
Manulife	\$374	\$41	\$395	--	\$810	0.5%	3.4%
Genworth	\$222	\$125	\$123	\$72	\$542	0.8%	4.2%
Lincoln	\$215	\$84	\$121	--	\$420	0.6%	3.7%
Prudential	\$190	\$18	\$197	--	\$405	0.2%	2.0%
Principal	\$200	\$64	\$110	--	\$374	0.5%	5.2%
Ameriprise	\$118	\$65	\$157	--	\$340	1.2%	4.3%
AFLAC	\$39	\$5	\$256	--	\$300	0.5%	3.8%
Protective	\$97	N/A	\$99	--	\$196	0.7%	7.6%
Unum	\$80	--	\$53	--	\$133	0.3%	1.7%
RGA	\$62	\$24	\$32	--	\$118	0.5%	n/a
<b>Total</b>					<b>\$6,668</b>		
<b>Median</b>					<b>\$405</b>	<b>0.5%</b>	<b>3.8%</b>

Source: Towers Perrin Analysis

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In the U.S., the variable annuity (VA) business is being hit the hardest by the current market crisis

- Lower asset values leading to lower earnings
  - Higher cost of guarantees
  - Lower (asset-based) revenues
  - Increased utilization of living benefits
  - Lower profitability
  - Unlocking of DAC (3Q08/4Q08)
  - Reduced scale
- Higher market volatility resulting in hedge breakage
  - Higher cost for hedging guarantees
  - More basis risk
  - Reduced hedge effectiveness
  - Increased breakage of VA hedging programs
- Increase in VA risk-based capital (C-3 Phase II)
  - Expecting significant increases in VA RBC at year-end 2008



**We are expecting further consolidation in this market**

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EMERGING FINANCIAL CRISIS: IMPACT AND IMPLICATIONS

Regulation, accounting and oversight implications

- Regulatory changes likely, but too soon to tell extent
  - Federal regulation more likely
- Rating analysis of structured securities was inadequate
  - Unclear what will take its place
- Fair Value is a good principle; the issue is the methodology used and the lack of standards
  - On October 10, FASB has issued FAS157-3 ("*Determining the Fair Value of a Financial Asset When the Market for That Asset is Not Active*") to clarify application of FAS157 ("*Fair Value Measurements*") when markets are distressed
- Mark to market is imperfect, but it's still the best option
- Need for greater disclosure and transparency on securities

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EMERGING FINANCIAL CRISIS: IMPACT AND IMPLICATIONS

### Risk management implications

- Risk management is an imperative; recent events were failure *in* risk management, not *of* risk management
- Strong case exists for bringing actuarial principles into risk exposure management
  - Concentration of risk
  - Single loss limit
  - Maximum probable loss vs. maximum possible loss
  - Prudence in leveraging risk-bearing capital
  - Risk leverage should be a dashboard item
  - Independence of asset valuation professional
- Operational risk management needs to change
- Role of the CRO should be strengthened

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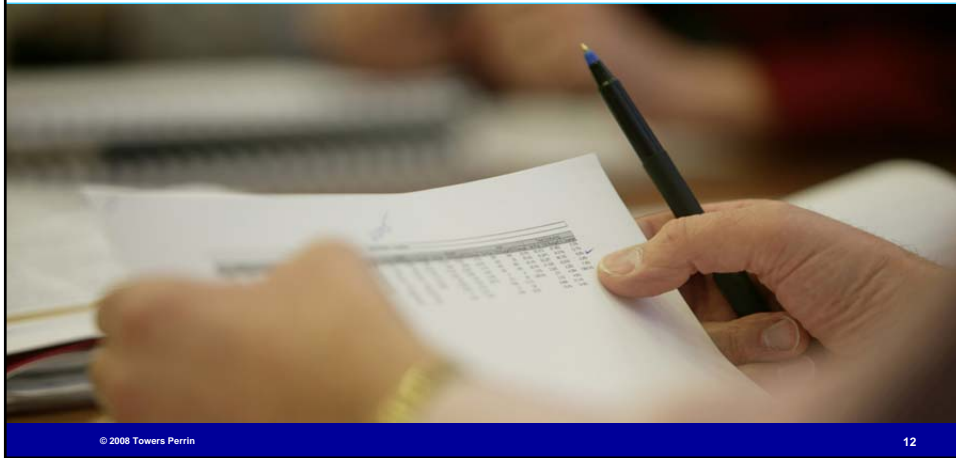
EMERGING FINANCIAL CRISIS: IMPACT AND IMPLICATIONS

### A lesson from AIG: fungibility stress testing is critical

The diagram illustrates fungibility stress testing. It features four blue cylindrical containers representing legal entities. In the center is the 'Parent Company'. To its left is 'Legal Entity 1', to its right is 'Legal Entity 3', and below it is 'Legal Entity 2'. Arrows point from the Parent Company to each of the three Legal Entities, indicating the flow of capital or assets. Additionally, double-headed arrows connect Legal Entity 1 to Legal Entity 3, and Legal Entity 1 to Legal Entity 2, representing the fungibility or inter-relationship between these entities.

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## EC Frameworks in Practice



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12

### EC FRAMEWORKS IN PRACTICE

#### Economic capital: crucial risk management tool particularly in times of market turbulence

- EC has become the key metric for assessing and quantifying risk within an Enterprise Risk Management (ERM) framework
  - EC is increasingly being used as an essential building block
  - Seen as a key part of strategic risk management when rating agencies assess an insurer's ERM capabilities
  - Provides long-term strategic insights
  - Provides quick practical insights
  - Allows for risk-based decision making
- Particularly in these times of financial distress, EC can facilitate credible decision-making and communication
  - Internally to management
  - Externally to investment analysts, rating agencies and regulators
  - But EC also under increased scrutiny given current financial failures

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13

EC FRAMEWORKS IN PRACTICE

### The various ways in which capital influences shareholder value combine to drive the capital the insurer ultimately holds

- Capital held by an insurer represents the excess of value of assets over the value of liabilities
  - Different definitions arise from different accounting conventions such as
    - inclusion of specific assets and liabilities (e.g., exclusion of intangible assets),
    - application of different methodologies (e.g., book vs market value, inclusion of prudent margins in liabilities).
- Important that capital required to support the business (required capital) and capital available to meet this requirement (available capital) are defined and measured consistently
  - Economic capital typically refers to the required capital where assets and liabilities are determined using economic principles
- Shareholders will seek to minimize the level of capital held, subject to being able to attract and retain an ongoing stream of policyholders.
  - Holding additional capital attracts more risk averse policyholders and reduces costs of financial distress, thus increasing franchise value.
  - However, more capital attracts frictional costs, relating to tax, investment costs and agency effects.

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14

EC FRAMEWORKS IN PRACTICE

### Towers Perrin's 2008 insurance ERM Survey produced six key findings

1. **Embedding ERM is proving to be a significant challenge.** Although companies have made progress in integrating ERM into their business, challenges remain. 55% of insurers believe that significant work is required in utilizing EC in decision making and 60% in utilizing EC in performance management
2. **Size matters.** Larger insurers are significantly more advanced in most aspects of ERM implementation and are increasingly looking to realize their competitive advantage. 40% of large companies are already using EC in product design and pricing decisions, with another 42% planning to do so within two years
3. **European insurers are better positioned.** North American insurers are trailing their European counterparts in key aspects, such as EC implementation and its use in decision making. Under Solvency II, these capabilities are expected to lead to lower capital requirements and therefore competitive advantage
4. **ERM is influencing decisions.** In spite of the challenges of embedding ERM, significant numbers of respondents indicate that their ERM program has resulted in key business changes, including such aspects as risk strategy or appetite (36%), asset strategies (35%) and product pricing (31%)
5. **Economic capital standards are emerging.** EC methodology is moving toward a one-year VaR approach, with the majority (56%) using a market-consistent terminal balance sheet
6. **Operational risk remains a weak spot.** Just 7% of participants believe they have an appropriate capability in place, and 37% indicate that significant work is required. Operational risk also lags behind other risks in terms of setting risk limits and EC calculation methodology

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15

EC FRAMEWORKS IN PRACTICE

### Key Finding #5: Economic capital standards are emerging

- EC methodology is moving toward a one-year VaR approach, with the majority (56%) using a market-consistent terminal balance sheet
  - There has been a substantial global shift toward calculating EC base risk over a one-year risk assessment period, from 32% of participants in 2004, to 56% in 2006 and 68% in 2008
  - Even in North America, where this approach is less common, the percentage has increased from 43% in 2006 to 57% in 2008
  - While 85% of larger insurers apply a one-year risk assessment period, a significant percentage of medium-size (35%) and smaller (39%) companies continue to use alternative methods, including a two- to five-year time horizon and the runoff of the portfolio
  - The use of VaR or Risk of Ruin as the primary measure of risk tolerance used to calculate EC has increased from 52% in 2004 to 67% in 2008. During the same period, the use of TVaR or CTE has fallen from 31% to 21%
  - The growing popularity of VaR is consistent across the industry with only marginal differences observed among smaller (61%), medium-size (69%) and larger (75%) firms
  - VaR is most often adopted as a risk measure among multilines (81% of respondents), whereas TVaR is most commonly used among reinsurers (33%) and life insurers (28%)
  - Although the use of a market-consistent terminal balance sheet is common among multilines (85%) and life (67%) companies, just 37% of P/C insurers adopt this approach

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EC FRAMEWORKS IN PRACTICE

### While many ERM components are largely in place, significant work is required to make effective use of Economic Capital

- European respondents are more comfortable with their EC calculation capabilities (71%) compared to respondents in North America (47%) and Asia/Pacific (49%)
- Companies are significantly less comfortable with managing operational risk exposures compared to insurance, credit and market risk exposures
- Despite the ongoing credit crisis, most companies are fairly comfortable with their capabilities around management of credit risk exposures

Area	Appropriate capability fully in place	Reasonable capability in place; some gaps	Limited capability in place; significant work required	Capability not required
Managing insurance risk exposure	35%	55%	9%	1%
Managing credit risk exposure	32%	54%	11%	3%
Managing market risk exposure	29%	52%	16%	3%
Risk management organization/governance	27%	58%	15%	
Risk limits and controls	19%	58%	23%	
Risk monitoring and reporting	16%	57%	27%	
Risk appetite and tolerances	15%	52%	32%	1%
Economic capital (EC) calculations	10%	45%	37%	8%
Managing operational risk exposure	7%	55%	37%	1%
Use of EC in performance management	6%	15%	60%	19%
Use of EC in decision-making processes	5%	28%	55%	12%

Base: Total Respondents for Q.3 How would you assess your current risk management capabilities in each of the following areas? Please select one level of capability for each area.

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EC FRAMEWORKS IN PRACTICE

### The proportion of respondents calculating EC has changed relatively little since our 2006 survey

- A change in the size profile of companies (this year's survey includes more smaller companies) has resulted in a small shift from "currently calculating" to "considering or planning"
- 57% of respondents are already calculating EC:
  - Companies in the U.K. (87%), Bermuda (73%) and continental Europe (70%) have embraced calculating EC more than those in the U.S. (44%) and Canada (37%). Asia/Pacific (59%) lies between these extremes
  - Almost 85% of large companies and nearly 70% of medium-size companies calculate EC, whereas less than 40% of small companies do so
  - Multiline insurers (67%) and reinsurers (79%) are more likely to calculate EC compared to just over 50% of life and P/C companies

Base: Total Respondents for Q.16 Does your organization calculate economic capital (EC) (i.e., a measure of the amount of capital needed based on the risks in the business)? Please select one response.

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EC FRAMEWORKS IN PRACTICE

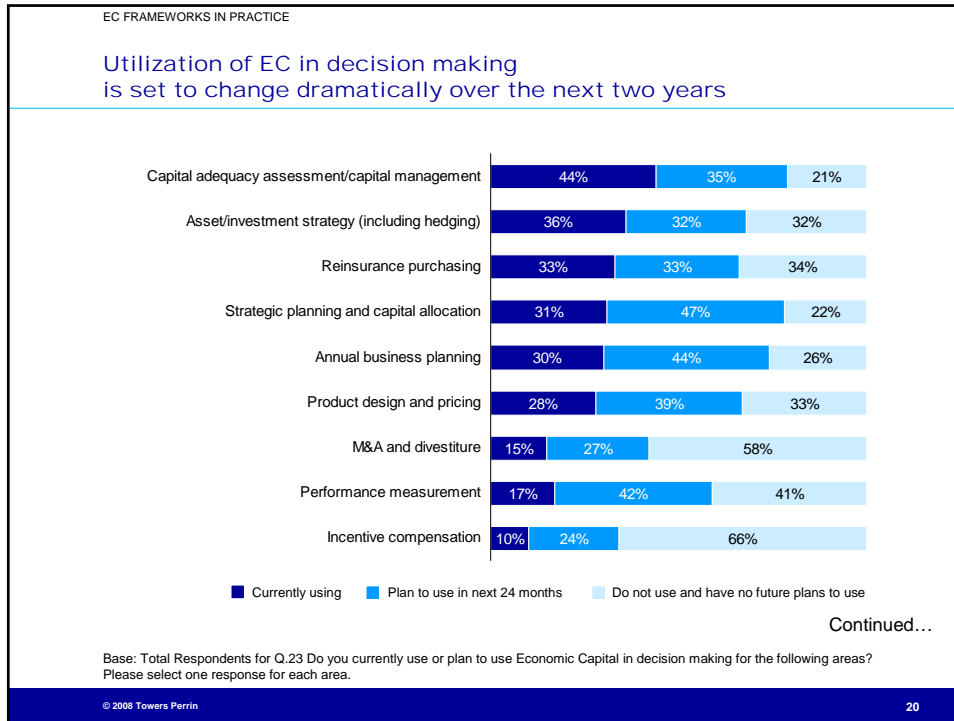
### Planned EC model improvements remain focused on core factors — individual risk modeling, data quality and completeness of risk coverage

Base: Those companies that calculate EC giving a valid answer (percentages exclude none) n=205 for Q.22 What are your objectives for future improvements, if any, to the EC calculations or framework? Please select up to three items.

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Data quality is a particular focus in Europe (56%) but less so in A/P (40%) and North America (37%). It is also a particular focus for reinsurers and P/C companies (50%+)

Over 30% of life offices and multilines identified a desire to improve the timeliness of EC results, compared to less than 20% of P/C companies



EC FRAMEWORKS IN PRACTICE

### Utilization of EC in decision making is set to change dramatically over the next two years

- Use of EC in performance measurement is currently relatively low among all insurers. However, 84% of larger insurers plan to address this in the next 24 months
- Among all insurers, 66% have no plans to use EC within incentive compensation plans; this reduces to 37% for larger insurers
- Current and planned utilization is generally significantly higher:
  - In larger companies than in smaller companies
  - In Europe than in North America and Asia/Pacific
- For many aspects, 30 – 40% of smaller companies globally and of all companies in North America have no plans to use EC

Base: Total Respondents for Q.23 Do you currently use or plan to use Economic Capital in decision making for the following areas? Please select one response for each area.

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EC FRAMEWORKS IN PRACTICE

Successful EC implementation depends on several other factors

- Governance and achieving buy-in
  - Centralized vs. decentralized
- Resources
  - Human resources
  - System resources
- Timeframes and budgets
- Modeling considerations
  - Stochastic processing limitations
  - Model testing: including back testing

Beyond implementation, ongoing requirements and constraints are as important

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EC FRAMEWORKS IN PRACTICE

Implementation of EC will only add value if it is used effectively within the business operations of an insurer

- Capital adequacy
- Risk monitoring and control
- Performance measurement and management
- Risk-based decision making
- Risk-based pricing
- Business and strategic planning
- Mergers and acquisitions

To obtain maximum benefit EC requires both internal utilization and external recognition

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## Two Main Methods for EC



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24

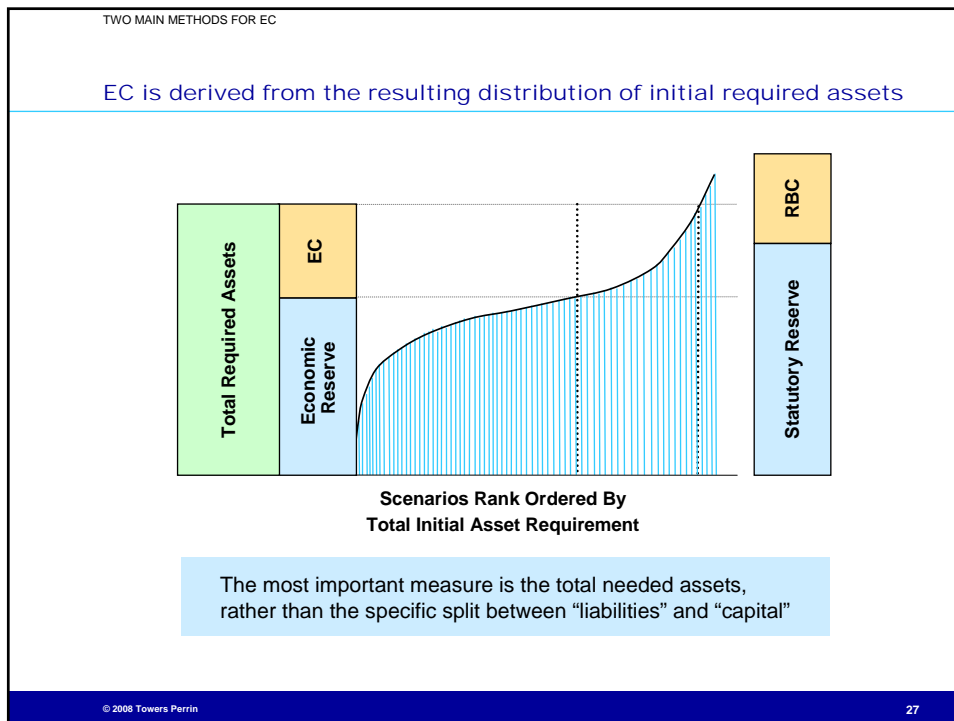
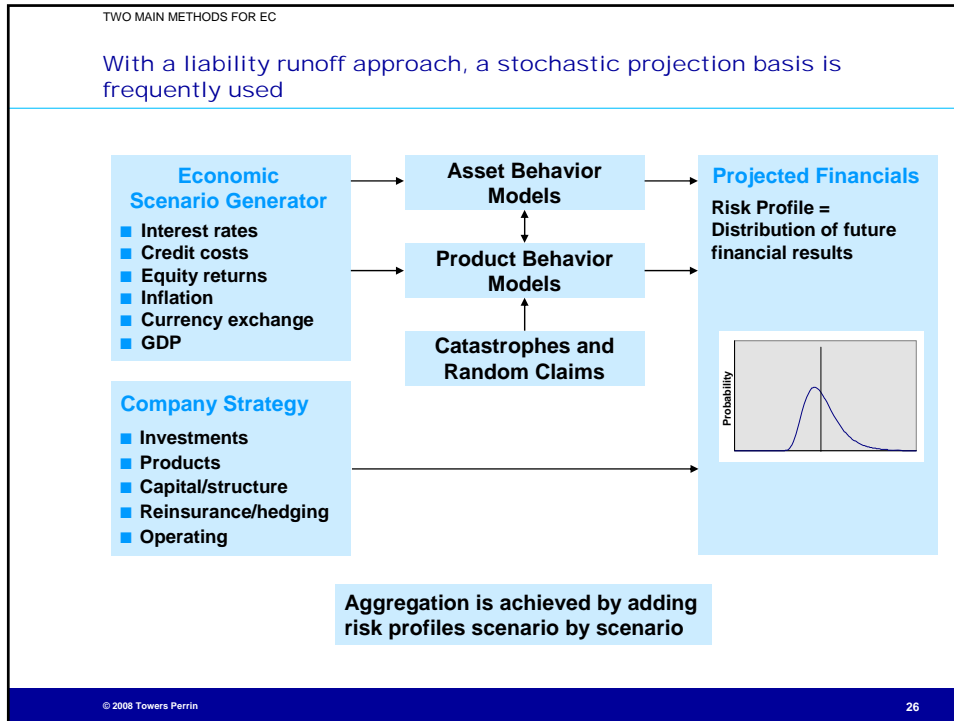
### TWO MAIN METHODS FOR EC

There are a number of different ways in which to define EC

- Economic capital (EC) is an internal calculation of the capital required, based on the company's view of risk, with calculations based on economic principles.
- In deciding on a definition of EC to use, insurers need to make a number of key decisions
  - E.g., time horizon, measures of risk and level of confidence
- There are also a number of implementation decisions to be made — consequently, there are a large number of possible ways in which EC can be defined
- In practice, two methods have emerged as the most common:
  - **A liability runoff approach**
    - The level of total initial assets, less some measure of reserves for liabilities, required to pay all future policyholder benefits at the chosen confidence level
  - **A one-year mark-to-market approach**
    - The level of assets, in addition to the market value of liabilities, needed to cover a fall in the market value of net assets over a one-year time horizon at the chosen confidence level

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25



TWO MAIN METHODS FOR EC

One-year mark-to-market approach is frequently implemented using stress testing

- EC is based on the amount of assets needed to remain solvent over a one-year time horizon at a required confidence level, measured on a mark-to-market basis
- In practice, stochastic and stress testing implementation approaches are used
- Assets are measured at market value; liabilities are measured on a best estimate basis, i.e., all prudence is removed
- Separate stresses are applied to cover a variety of market, credit and insurance risks
- The stress tests applied are each calibrated to a probability level over a one-year time horizon, consistent with the target financial strength rating
- Results are aggregated using a correlation matrix approach

Leading edge companies are developing more sophisticated implementations where risks are modeled on a stochastic integrated basis

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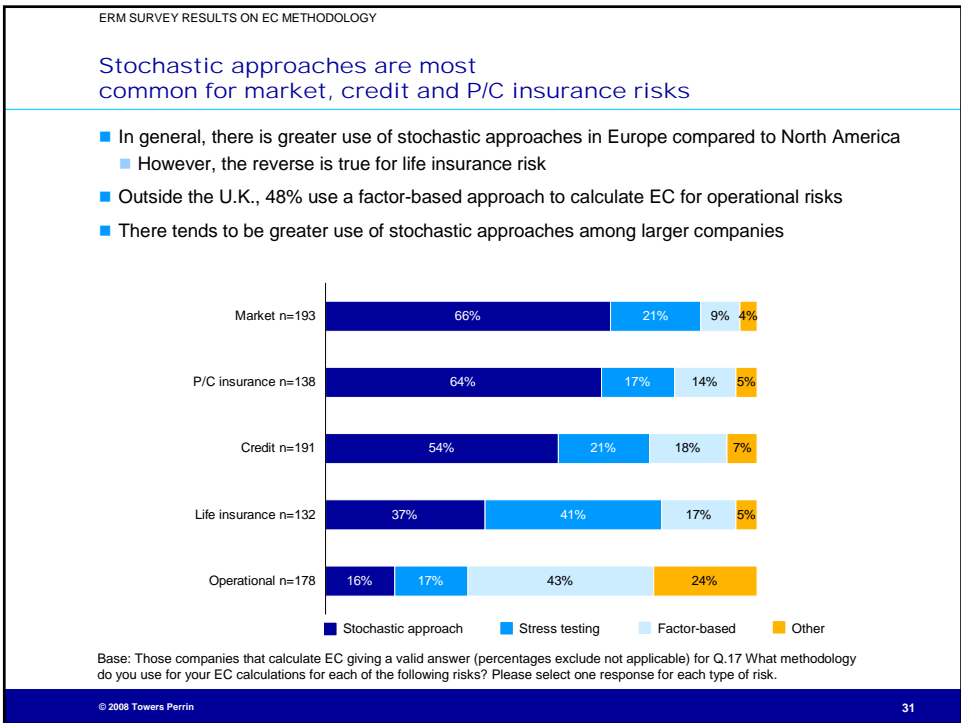
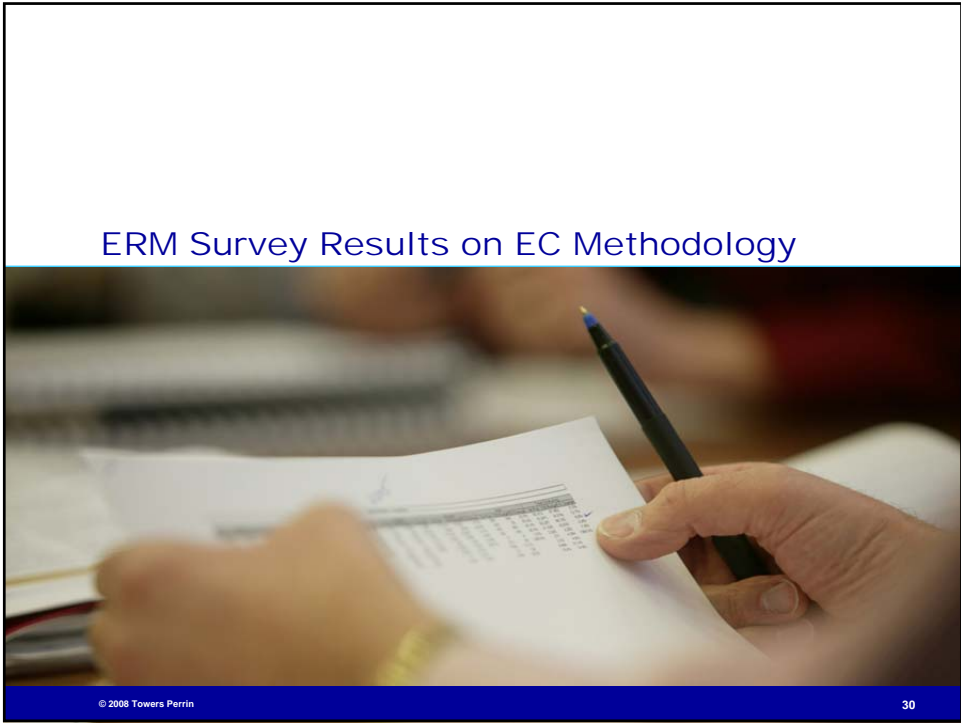
TWO MAIN METHODS FOR EC

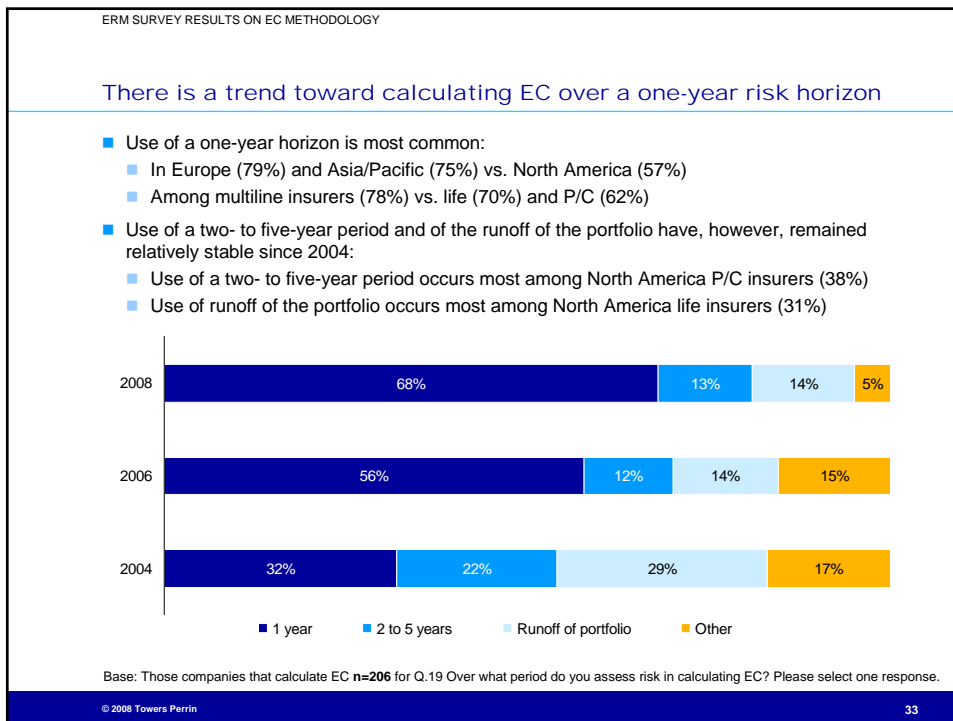
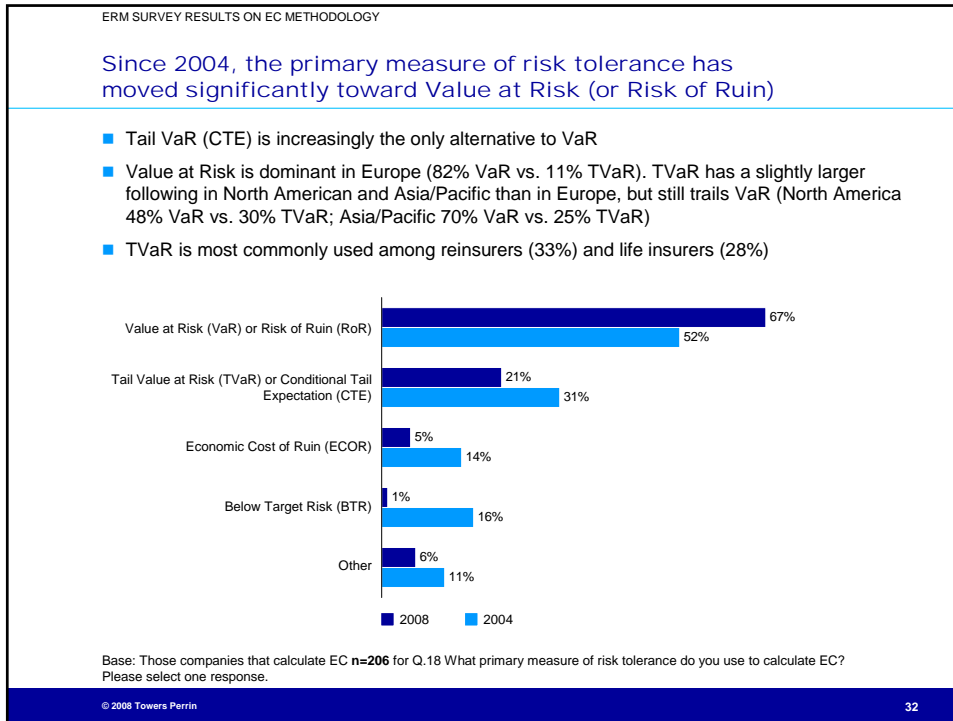
Ultimately, in deciding on an EC approach, an insurer needs to consider a number of factors

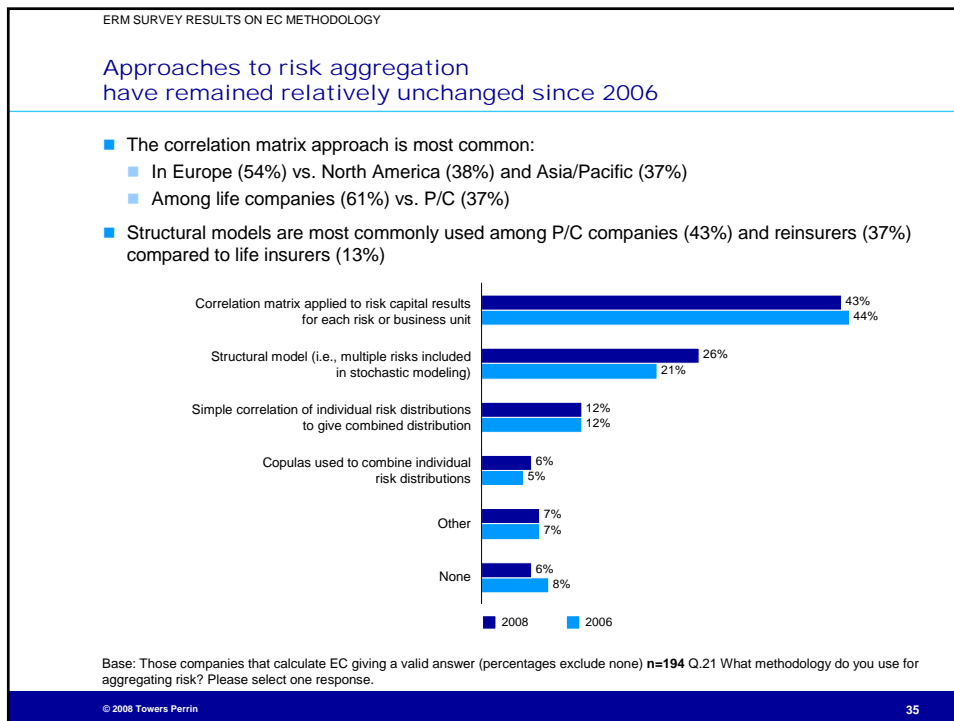
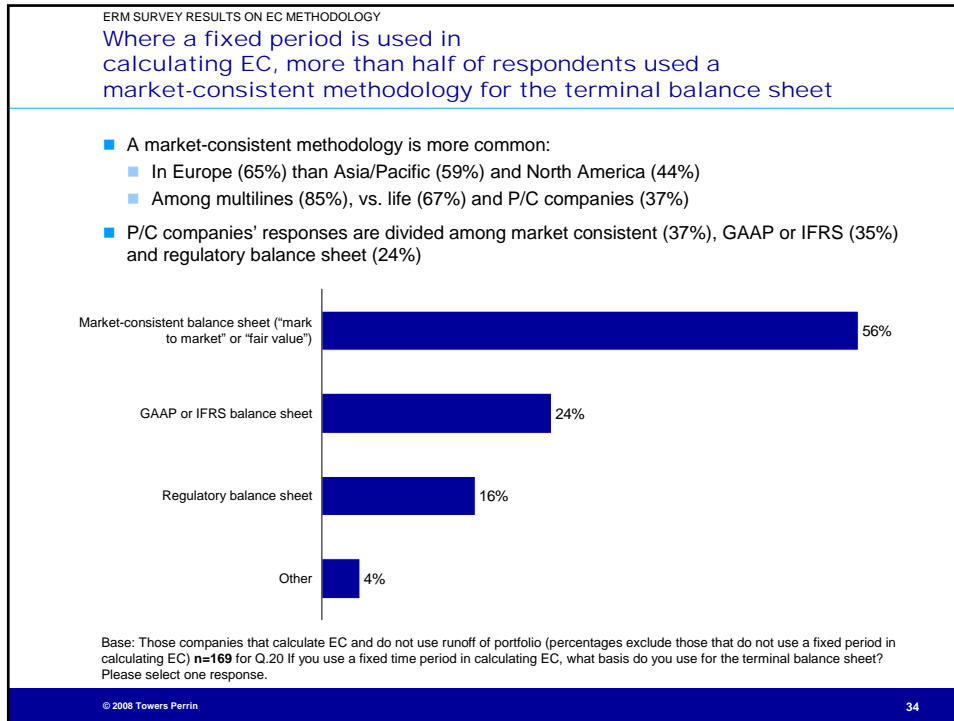
- Objectives and intended applications of EC framework
  - Capital adequacy
  - Risk monitoring and control
  - Performance measurement and management
  - Risk-based decision making
  - Risk-based pricing
- Constraints (in implementation and ongoing)
  - Budget
  - Time
  - System
  - Human resource
- Type of business

Decisions need to strike balance between simplicity, reliability and practicality

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## Other Risk Capital Frameworks



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36

### OTHER RISK CAPITAL FRAMEWORKS

Globally, there are many other existing or developing solvency and risk capital frameworks

- Regulatory and rating agency capital frameworks currently in use or in development include:
  - Basel II
  - Solvency II (Draft Framework Directive — July 2007)
  - U.S. NAIC RBC: Factor approach
  - U.S. NAIC RBC: Principles-based approach
  - Regulators of a number of other countries
    - U.K. ICA and general capital requirements, Swiss Solvency Test: SST, Canada OSFI: MCCSR, Australia: Required Capital
  - Rating agencies
    - S&P's New RBC Insurance Capital Model and S&P's New Internal EC models acceptability criteria, Moody's General EC principles, Fitch Prism EC Model, A.M. Best EC principles
- These frameworks can differ in a number of areas:
  - Risks covered
  - Approaches used: standard formulas, models and scenarios
  - Assessment period, risk metrics and confidence level
  - Correlation, hedging
- Overall, the above frameworks show strong similarities in a number of areas, but also some significant differences in resulting capital, modeling requirements and methodology

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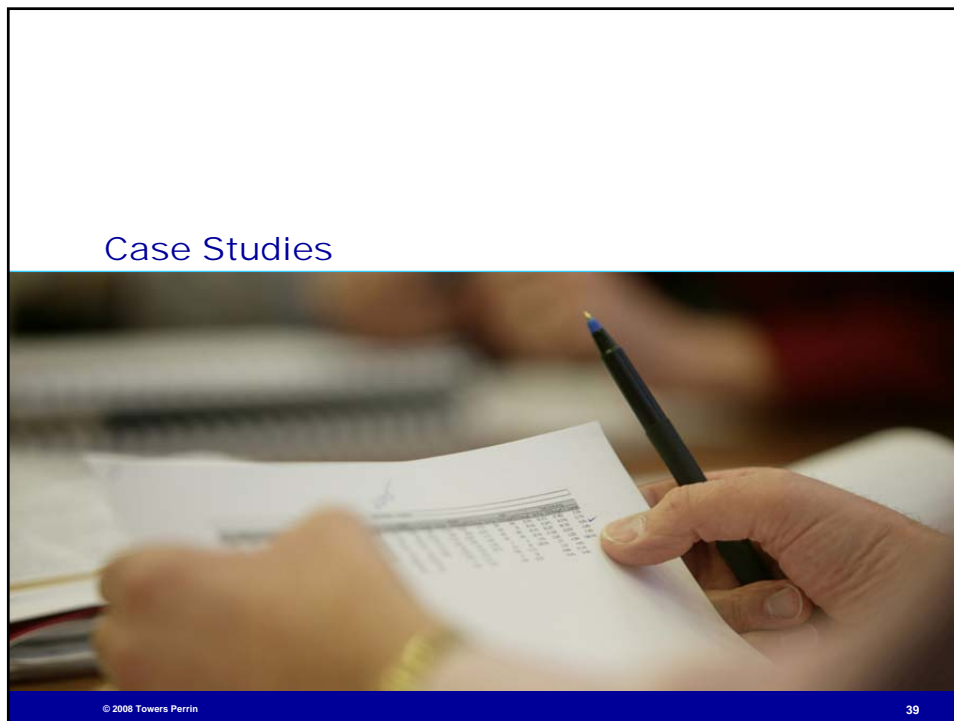
37

OTHER RISK CAPITAL FRAMEWORKS

Solvency II will use a one-year mark-to-market method, whereas U.S. principles-based approach moves to a liability runoff method

Framework	Overall Observations
U.S. NAIC RBC: Factor approach	<ul style="list-style-type: none"> <li>■ Factor-based approach</li> <li>■ Covers all insurance and asset risks (C-1, C-2, C-3 risks) and some operational risk via the C-4 component</li> <li>■ Assessment period is the runoff of the business</li> <li>■ Confidence level of factors is implicit (approximately 90% VaR or CTE 95)</li> <li>■ Aggregation formula allows for correlation between C-1 and C-3 risks</li> <li>■ Basis is U.S. statutory balance sheet</li> </ul>
U.S. NAIC RBC: Principles-based approach	<ul style="list-style-type: none"> <li>■ C-3 Phase III for life and C-3 Phase IV for fixed annuities: Subject to criteria for setting prudent assumptions and margins</li> <li>■ Stochastic modeling for market risks, with prudent estimates for other risks</li> <li>■ Assessment period is the runoff of the business</li> <li>■ Confidence level of CTE 90</li> <li>■ Correlations between products, but not across risks or across segments</li> <li>■ Basis is U.S. statutory balance sheet</li> </ul>
Solvency II — Draft framework directive — July 2007 (solvency capital requirements)	<ul style="list-style-type: none"> <li>■ Risks covered are underwriting, market, credit, liquidity, operational, legal</li> <li>■ Uses standard approach or approved internal models</li> <li>■ Assessment period is one year</li> <li>■ Confidence level of 99.5% VaR</li> <li>■ Correlation approach is prescribed for the standard approach, other aggregation techniques for internal models subject to approval</li> <li>■ Total balance sheet approach based on market-consistent valuation</li> </ul>

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CASE STUDY 1: DEVELOPMENT AND IMPLEMENTATION OF HOLISTIC EC MODEL

### Case Study 1: Development of sophisticated EC model for large multinational with single approach across geographies and Life and P&C business

- Multinational has developed two internal EC methodologies:
  - Long-term stochastic run off holistic
  - One-year, mark-to-market stress and scenario testing
- Multinational wanted to develop and implement a single approach across the group, forming the basis for the 'internal model' approach under Solvency II
- The new EC approach must be able to meet all expected future requirements for EC...
  - Be usable in day-to-day decision making
  - Meet current and expected regulatory requirements
  - Be of comparable quality (or better) to peer group EC models
  - Be updatable and auditable within reporting timescales
  - Allow comparability across different business units ("BU")
- ...and be implementable across the Group by end 2008
  - Build upon existing EC models and approaches
  - Reflect existing constraints, e.g. actuarial software, computing power
  - Reflect very different sizes, complexities and risks of its business units
- In addition
  - Insurer wanted a strong ERM rating from S&P
  - CRO made strong public statements regarding the introduction of EC as a key metric in assessing/guiding the business

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40

CASE STUDY 1: DEVELOPMENT AND IMPLEMENTATION OF HOLISTIC EC MODEL

### Project scope

- **Project 1: EC Methodology**
  - Develop single EC methodology to fulfil group objectives
  - Systems understanding important for successful methodology
- **Project 2: EC implementation**
  - Work with insurer to implement proposed methodology
  - Large and complex undertaking from implementation and governance perspective
  - Key project components
    - Proof of concept spreadsheet model
    - Detailed methodology/calibration development and documentation
    - Prototype model – for end 2008 local regulator calculation
    - Project management
  - Planned future activities by the insurer
    - EC process development
    - EC utilisation in decision-making
    - BU modelling review/processes

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41

CASE STUDY 2: PROVIDE GUIDANCE ON EC METHODOLOGY & IMPLEMENTATION

### Case Study 2: As a next step in its ERM program, the midsize insurer made a decision to develop and implement EC

- The insurer recognizes EC as a key metric for quantifying risk, and ultimately aims to embed the use of EC within the organization. It will be an integral tool within the firm's ERM framework which will
  - Improve management insights
  - Support decision-making at all levels across the firm
  - Optimize risk adjusted returns
- The decision to implement EC was also influenced by S&P's views on EC as part of their ERM rating process
  - In 2008 the insurer received an ERM rating of "Strong" from "Adequate" (following an earlier Towers Perrin engagement)
  - Internal EC model increasingly a requirement for "Strong" or "Excellent" ERM rating
  - "Strong" or "Excellent" ERM rating is a requirement for internal EC models to be considered for a ratings upgrade
- The insurer engaged Towers Perrin to provide guidance on EC methodology and implementation
- Recognizing that achieving the above goals can take time, the insurer decided to implement EC using a phased approach, with specific objectives for 2008
  - Initial EC implementation
  - Key priorities and plans for future enhancements

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42

CASE STUDY 2: PROVIDE GUIDANCE ON EC METHODOLOGY & IMPLEMENTATION

### Initial implementation approach used stress testing approach

- Framework uses a one-year mark-to-market definition of EC, implemented using a stress testing approach
  - Risk is assessed over a one-year horizon
  - Required EC is calculated separately for each risk
  - Aggregate EC is determined using a correlation matrix
- Firmwide EC results by November 2008
  - By major risk type
  - By major line of business
  - Understanding of key risks driving capital needs
  - Understanding of diversification benefits created by aggregation
- With guidance from Towers Perrin, the insurer has now established a solid foundation from which a more robust solution can be developed
  - Ultimately enable more sophisticated risk and reward decision making
  - Processes and tools to produce EC for each risk and in aggregate
  - A more refined plan for longer term EC developments

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43

## CASE STUDY 2: PROVIDE GUIDANCE ON EC METHODOLOGY &amp; IMPLEMENTATION

## Towers Perrin provided guidance on all key areas of the implementation

- Towers Perrin was involved in many of the detailed aspects of the work as well as having senior level influence on the overall project governance
  - Involvement was focused on providing guidance on methodology issues as well as interpretation of results
  - All modeling done internally by insurer in-house
  - Stochastic scenarios provided by Towers Perrin (from MoSes ESG)
  - Active roles on Steering Committee and Working Group
- Key deliverables included methodology documents and supporting analysis covering a number of topics
  - EC framework and economic balance sheet
  - Market-consistent modeling issues
  - Stresses (Interest rate, Equity, Credit spread, Counterparty default, Mortality, Morbidity, Lapse)
  - Aggregation and correlation
  - Sample results presentation

## CASE STUDY 3: INDEPENDENT EC REVIEW

## Case Study 3: Following the implementation of an EC framework in 2007, a large US life insurer sought an independent review

- The insurer's approach to EC is based on Solvency II framework i.e., one-year mark-to-market approach
- Insurer wanted a fairly comprehensive review, but with a particular focus on market risk
- Desire for independent review of EC calculations and results driven in part by goal to publish results but have seen relatively volatile movement in EC results between quarters
- Why Towers Perrin was hired
  - Recognized expertise and experience in EC methodology and implementation issues
  - Strong credentials in US and Europe (especially Solvency II)
  - Global MCEV review experience
  - Good existing relationship with client

CASE STUDY 3: INDEPENDENT EC REVIEW

The detailed review examined four aspects of the EC framework

- The high level scope of the work included:
  - In depth EC model review and validation of market risk
  - High level EC model review and validation of credit, operational and insurance risk
  - High level benchmarking against leading best practices for calculating and reporting EC (including the correlation matrix)
  - Work with internal audit who were conducting a parallel review of the controls and validations around the EC calculations
- Review based on:
  - Many detailed interview meetings
  - Methodology documentation
  - Analysis performed in support of stressed assumptions
  - Calculation, results and aggregation spreadsheets
- Regular interaction with the corporate risk management team, including weekly status meetings and meeting with CRO with interim deliverable
- Main deliverable from the project was a detailed report discussing our findings and recommendations to be presented and discussed with the CRO
  - Highlighted positives and negatives with their current framework and calculations
  - Well received by the client

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FastTrack and FastTrack+

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FASTTRACK AND FASTTRACK+

FastTrack EC uses a one year mark-to-market definition of EC and a stress testing approach to implementation

**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

Implemented by many multinational insurers and adopted/proposed for:

- UK ICA regime
- Swiss Solvency Test
- EU Solvency II standard approach

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FASTTRACK AND FASTTRACK+

FastTrack+ EC aims to meet the high standards for regulatory/rating agency recognition of EC results – which are requiring a re-think of how EC results are calculated

Historic

- Slow
- Aggregate
- Approximate
- Inflexible

→

Future

- Timely
- Granular (allocated)
- Robust (justifiable)
- Flexible
- Controlled

**Key requirements**

- EC results must be used in business decision-making
  - This must go beyond capital adequacy assessment
- Parameterisation of risk distributions and interactions must be justified
  - In particular, tail distributions and tail dependencies
  - Sensitivities to be considered where data is insufficient to back assumptions
- Impact of risk on portfolios must be accurately assessed
  - In particular, non-linearity of risk interactions
- Processes/controls must pass “audit-level” scrutiny

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FASTTRACK AND FASTTRACK+

Current modelling systems present a number of challenges

**ALM/DFA models**

- Provide detailed stochastic insight into loss distributions
  - But often only for a subset of risks
  - And typically with very long run-times (calculate much more than one year mark-to-market losses)
- For other risks and for less material business units, stress testing typically used (again often building from ALM/DFA model output)
- PC DFA models typically not designed for one year mark-to-market approach
- For groups, typically multiple models in multiple locations, combinations of stochastic and stress testing approaches

**Economic Scenario Generators (Real World)**

- Calibrations often focused on long term reasonableness
- Deficiencies in short term tail distributions (fat tails) and alternative calibrations often difficult to test

**Aggregation**

- Implicit assumptions underlying “sum of squares” approach are difficult to justify

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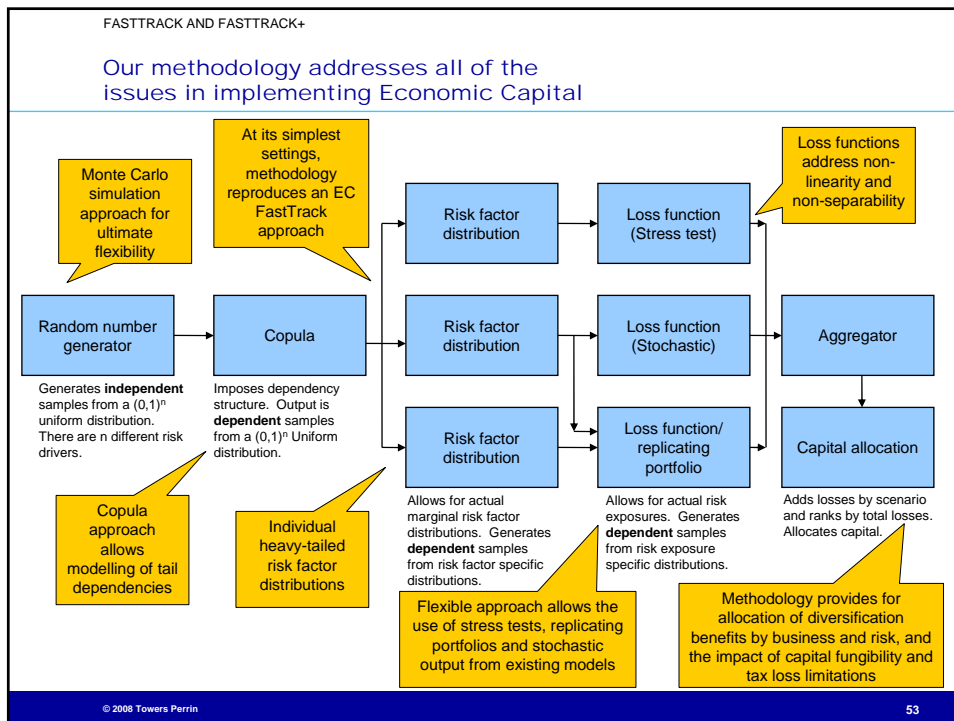
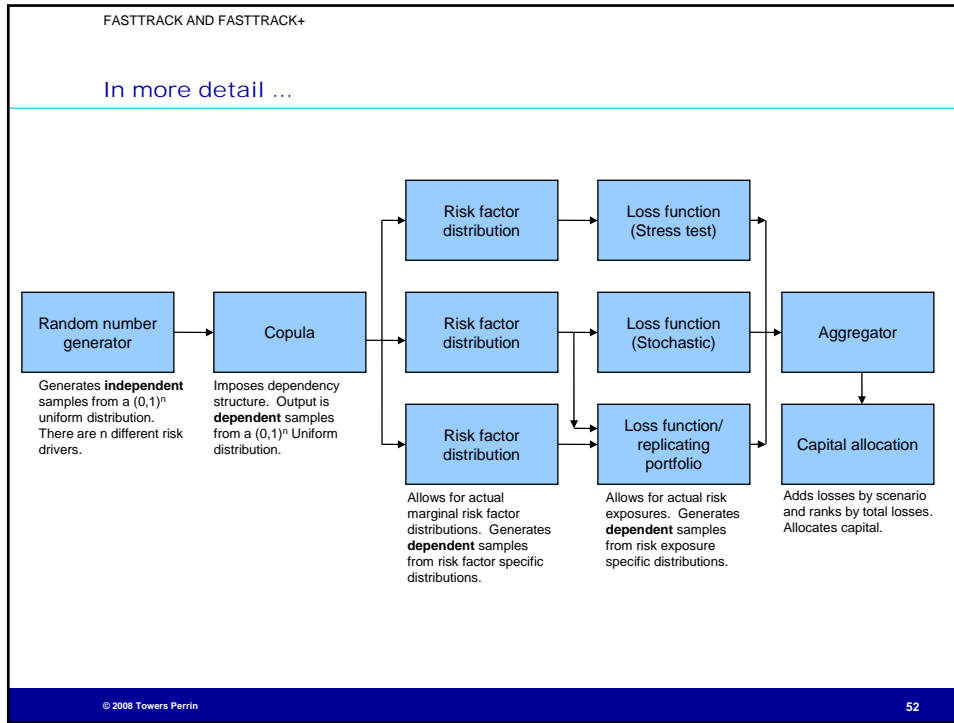
FASTTRACK AND FASTTRACK+

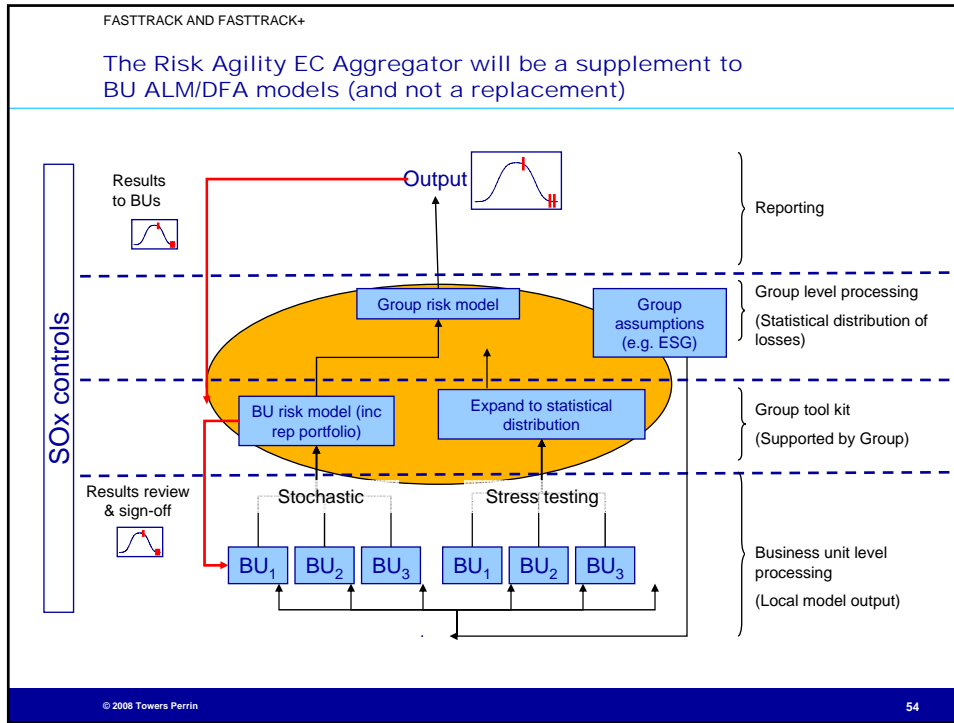
FastTrack+ EC takes a different approach to many current EC calculation systems

<p><b>Step 1: Risk Factors and dependencies</b></p> <ul style="list-style-type: none"> <li>■ Build a powerful, flexible model of one year risk factor distributions and their inter-dependencies</li> <li>■ Focusing on a one year horizon gives speed and allows exploration of alternative tail distributions and dependencies (where there is typically little data available for calibration)</li> </ul>	<p><b>Step 2: Loss distribution development</b></p> <ul style="list-style-type: none"> <li>■ Extract from ALM/DFA models the key information defining the distributions of one year losses                             <ul style="list-style-type: none"> <li>■ Stochastic data for complex distributions</li> <li>■ Stress test data for simpler distributions</li> </ul> </li> <li>■ Develop a fast statistical model to replicate the characteristics of the ALM/DFA one year loss distributions (using replicating portfolios where appropriate)</li> </ul>	<p><b>Step 3: Aggregation and allocation</b></p> <ul style="list-style-type: none"> <li>■ Run large numbers of scenarios (hundreds of thousands) for all risk factors, reducing statistical error</li> <li>■ Capture scenario loss data and risk factor inputs to enable sophisticated output analytics                             <ul style="list-style-type: none"> <li>■ Aggregation at different levels (BU, region, group)</li> <li>■ Capital allocation, allowing for diversification benefits</li> </ul> </li> </ul>
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- **Risk factors** are the drivers of risk
  - For example, interest rate movements, equity market movements, catastrophes
- **Loss functions** describe the impact of risk factors on the portfolio of insurance business (assets and liabilities)

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