

Enterprise Risk Management

Southeastern Actuaries Conference

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Agenda

- **Defining ERM**
- Economic Capital
- Adding value through ERM
- Tillinghast Survey
- ERM tools and techniques
- The CRO function

Material risks require management attention

Management must constantly assess exposure to a variety of risks, for example:

- Life threatening risks:
 - Poor governance, rogue trading, large liability claim
 - Change of accounting/rating agency treatment:
 - Pensions liability, stock options, new standards
 - Change of corporate strategy:
 - Mergers & acquisitions, hedging and insurance
- ... and determine which risks provide opportunities for excess returns and which do not**

But it is not easy – organizational inertia!!

- How can we ever capture all the risks that a firm faces?
- We can't get good data on all the risks, so why bother?
- Why don't we just focus on the few risks that we can quantify and manage?
- If not well defined, ERM is challenged by organizational inertia
- It can be viewed as impractical, over-reaching and expensive

Why is ERM important?

- Required to do it — regulations
- Have always been doing it
 - Now we can do it more systematically
- Reflects quality of management
 - Do the basics — hedge and insure appropriately
 - Anticipate and prepare for surprises
- Objective: To increase sustainable firm value

Risk management myths

- It is your job, not mine:
 - Risk management is the risk manager's job
- I know my risks:
 - I don't need to know anyone else's risks in the firm
- I can manage my risks:
 - But I don't have a systematic process to do so
- I buy required insurance and hedge my financial risks:
 - I don't need to spend a lot more time on that

Risk management truths . . .

- Everyone is a risk manager
 - Every action increases or decreases risk exposure
- Every unit can have a material impact on a firm's risks
 - The firm is a connected system
- Risk management is not an ad-hoc activity
 - Need the right resources focused on risk
- Managers need to think strategically about their risks
 - There is more to risk management than loss avoidance

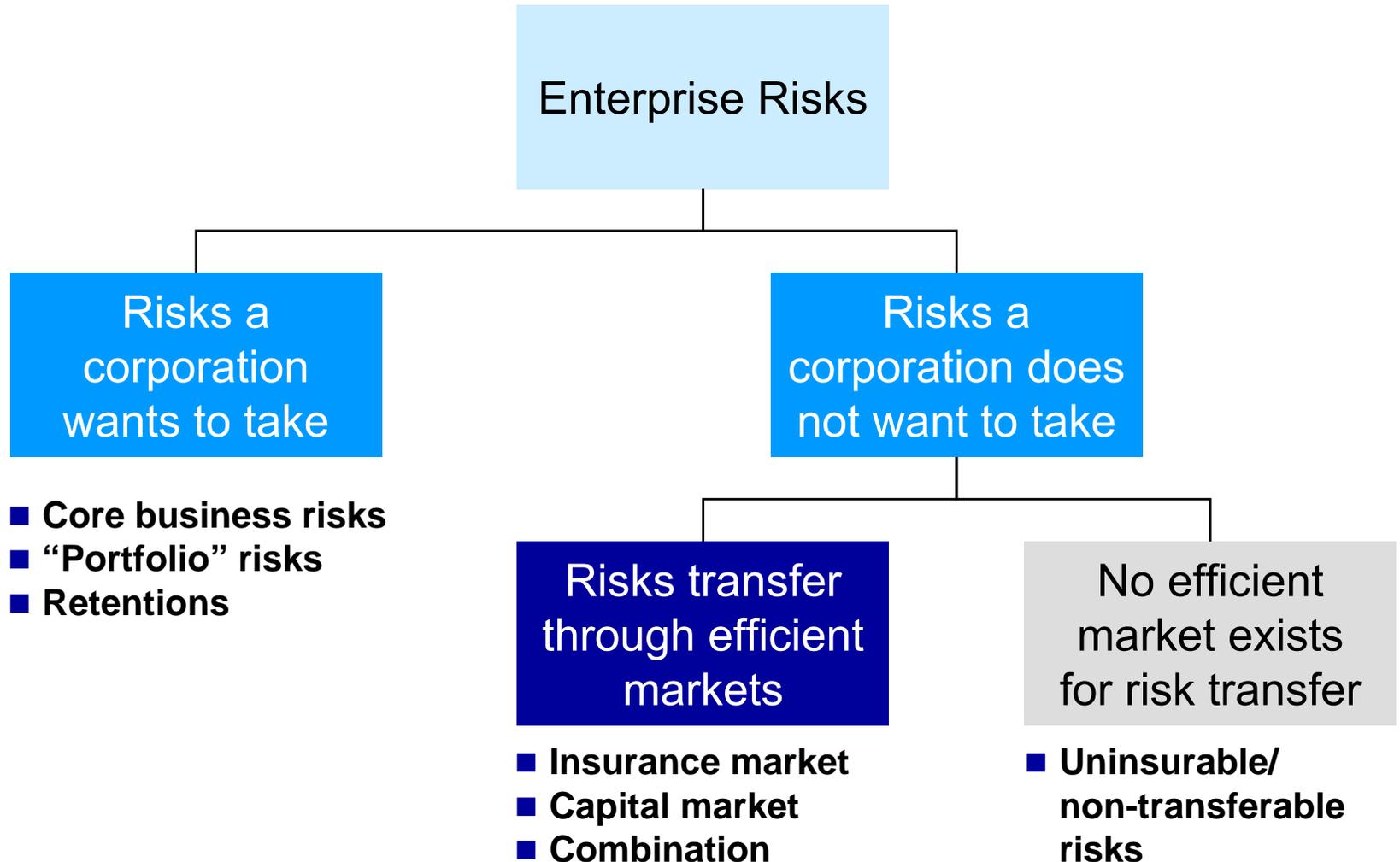
. . . lead to a new corporate finance approach

- The capital structure of the firm is a response to the risks that the firm undertakes
- Risk management instruments are capital resources
- Risk management and capital management are two sides of the same coin

Enterprise Risk Management considers the whole firm



... and must decide which risks to take



Each risk has an impact on the financials

Insurable risks

- Property
- Casualty
- Residual Value

Market risks

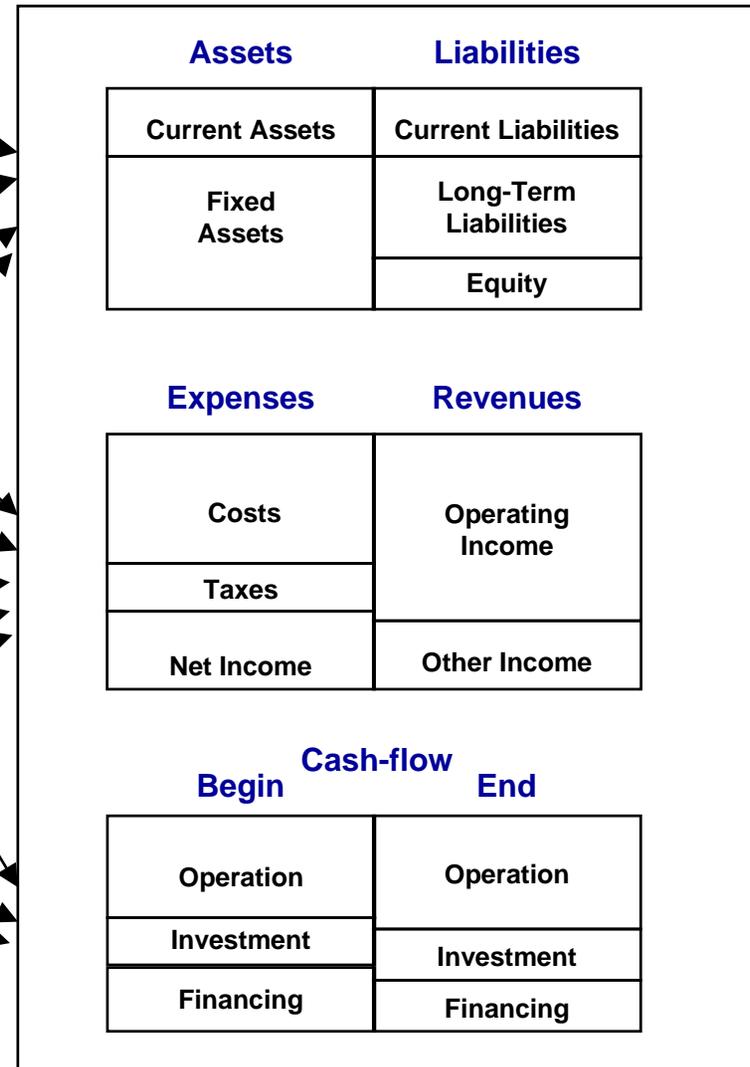
- Foreign exchange
- Interest rate
- Fuel price
- Other

Credit risks

Operational Risks

Business Risks

- Business interruption
- Corporate image, brands
- Economic cycles



The risk management continuum...

**Individual
Risks**



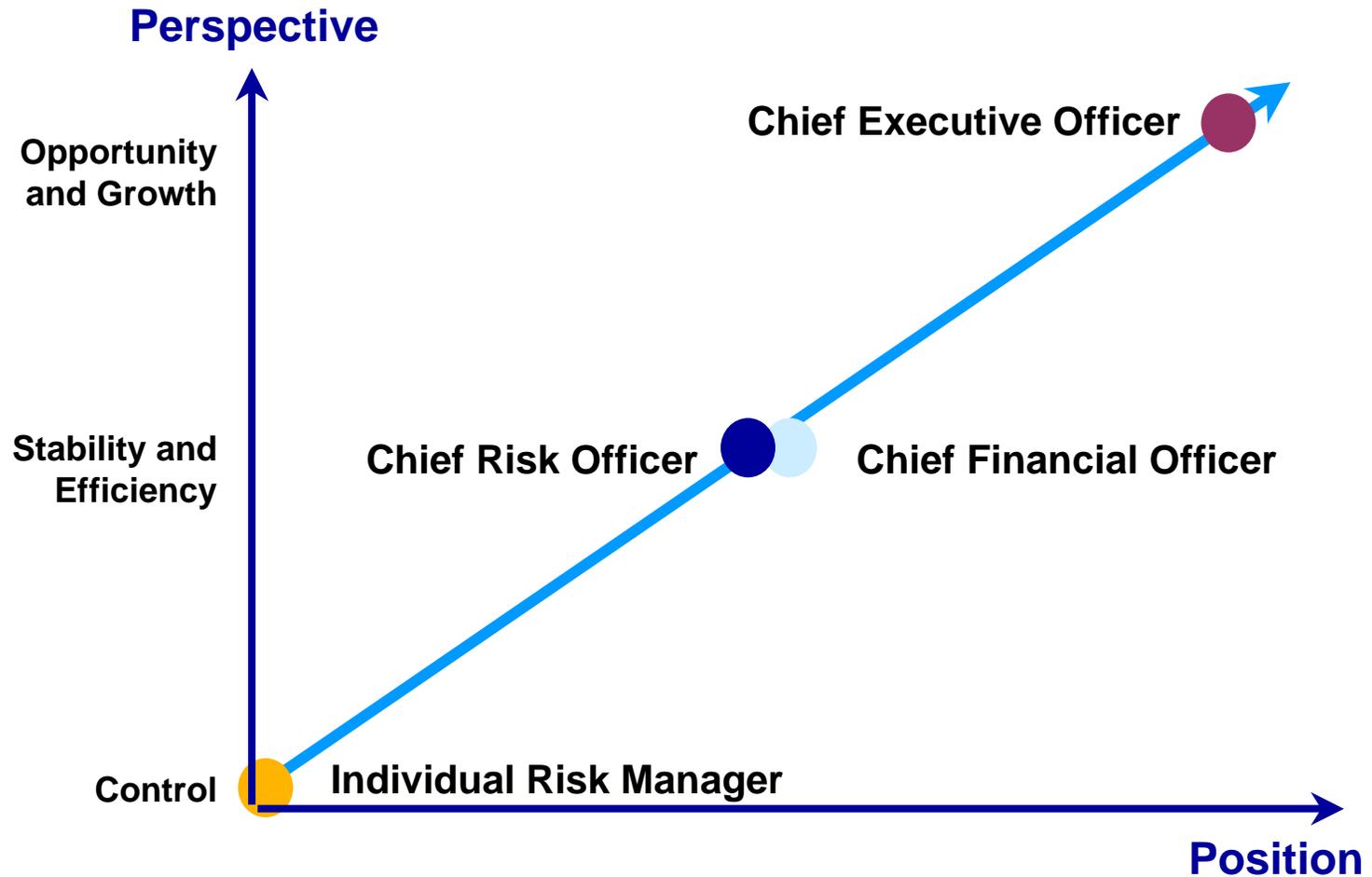
**Volatility
of
Earnings
and
Cashflow**



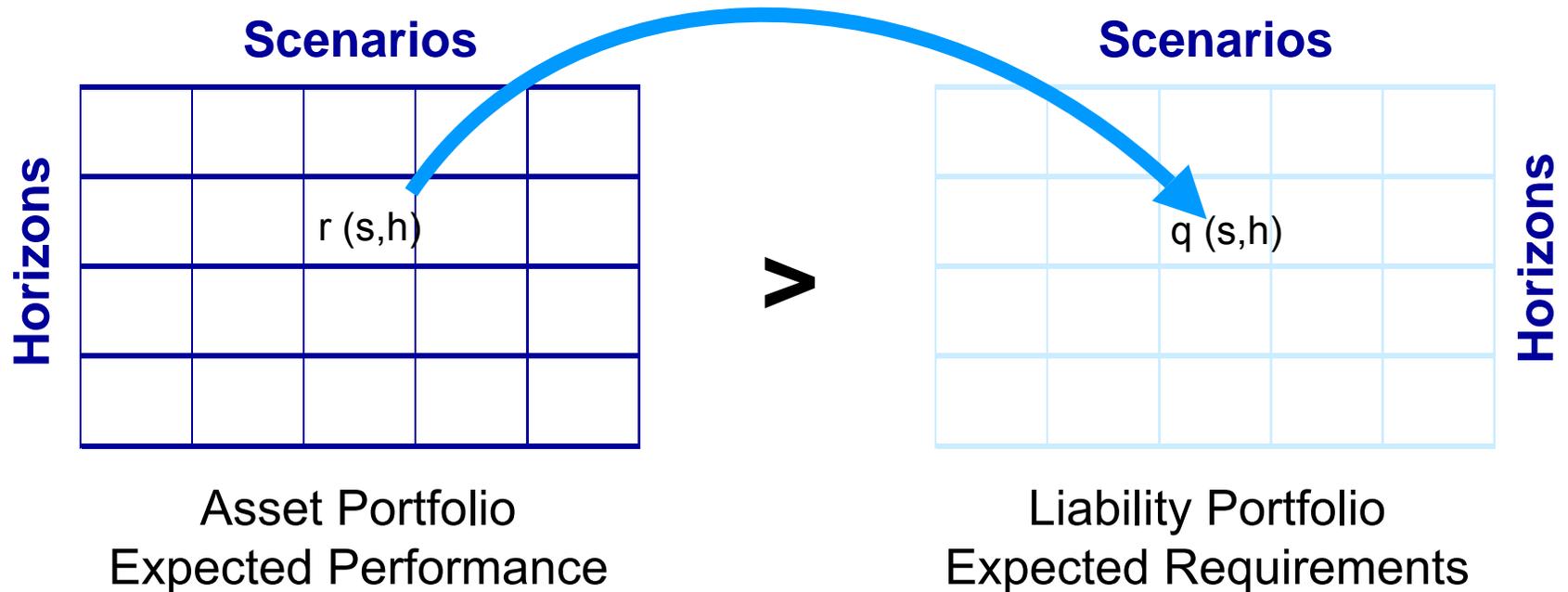
Any event that adversely affects the organization's reputation, customers, employees, shareholders, business opportunities or financial assets



...makes everyone a risk manager



Managing risk — The ALM view



So where's the risk?

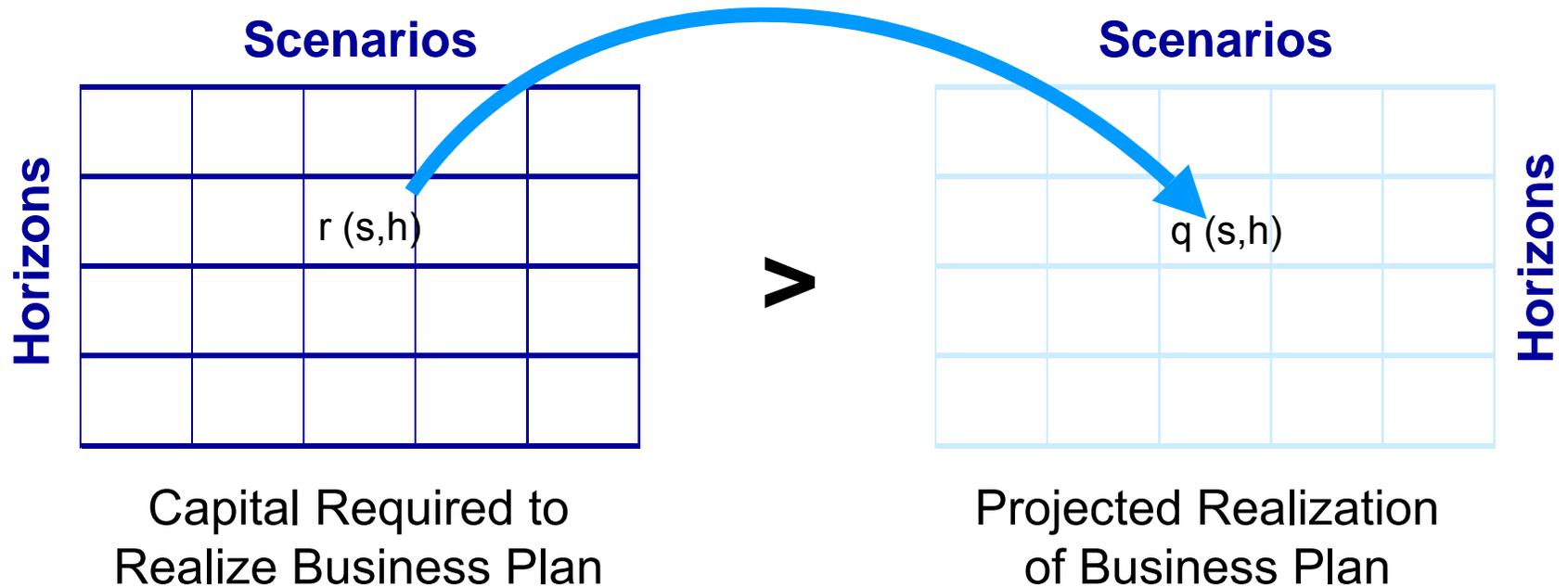
Who bears the risk of getting it wrong?

- Fixed liability: Pay \$100 for 10 years on Christmas
- Funding strategies:
 1. Keep cash equal to sum of payouts, \$1,000, in bank vault
 2. Cash match liability with 10 US Treasury zeros paying on Christmas eve, say for \$900
 3. Buy securities portfolio (bonds, equities) with PV of assets equal to PV of liabilities under current yield curve and spreads, say for \$800
- Risk profiles:
 - Each of these strategies has a different risk profile
 - Who bears the risk?

Who bears the risk?

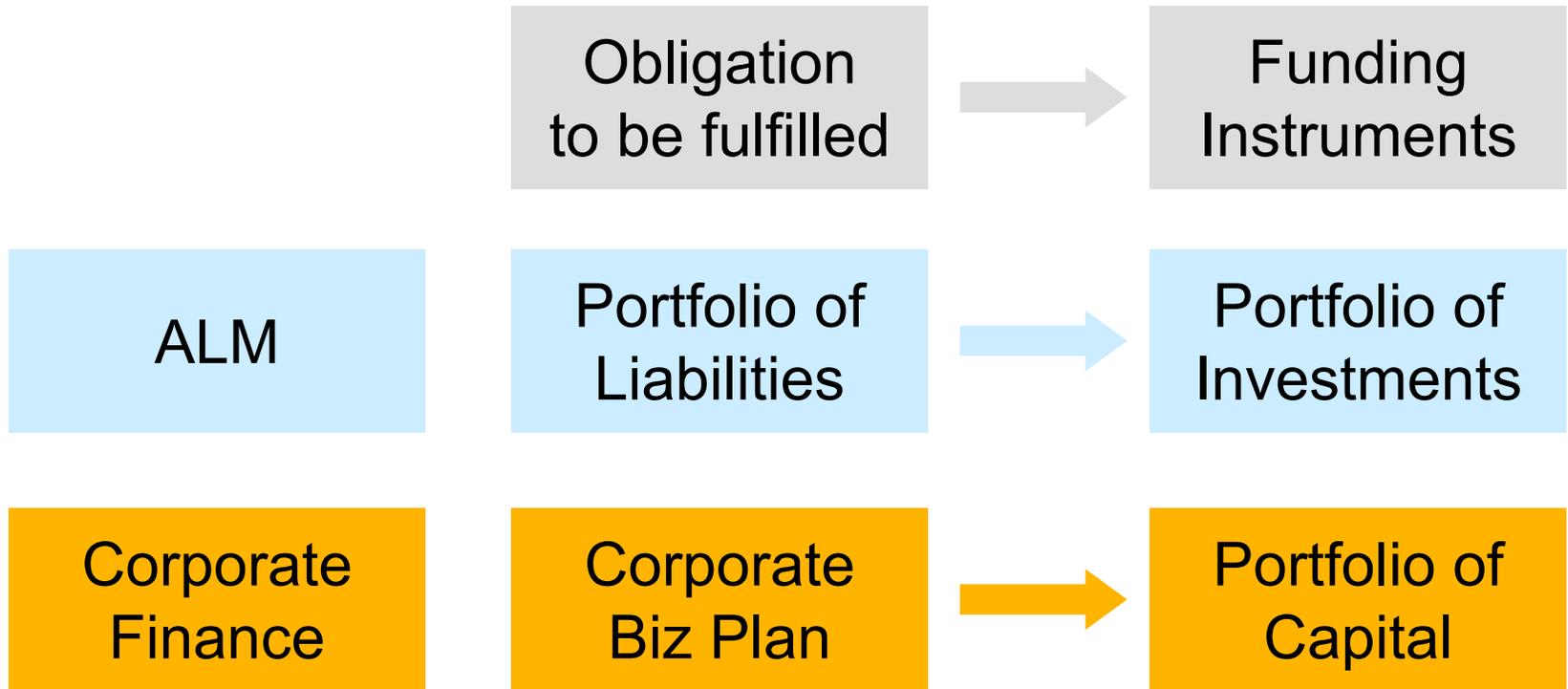
Strategy to Fund Liabilities	Cost	Financial Risk to Receiver	Financial Risk to Shareholder
1. Cash in vault	\$1000	None	Most expensive solution, so low ROE on business
2. Cash flow matched portfolio of US Treasuries	\$900	None	Least expensive solution to assure no asset shortfall
3. Portfolio of bonds and equities of equal value to liabilities	\$800	Credit worthiness of payer to make up shortfall	Shortfall in assets to be met from other sources, leading ultimately to low ROE

Managing risk — The corporate finance view

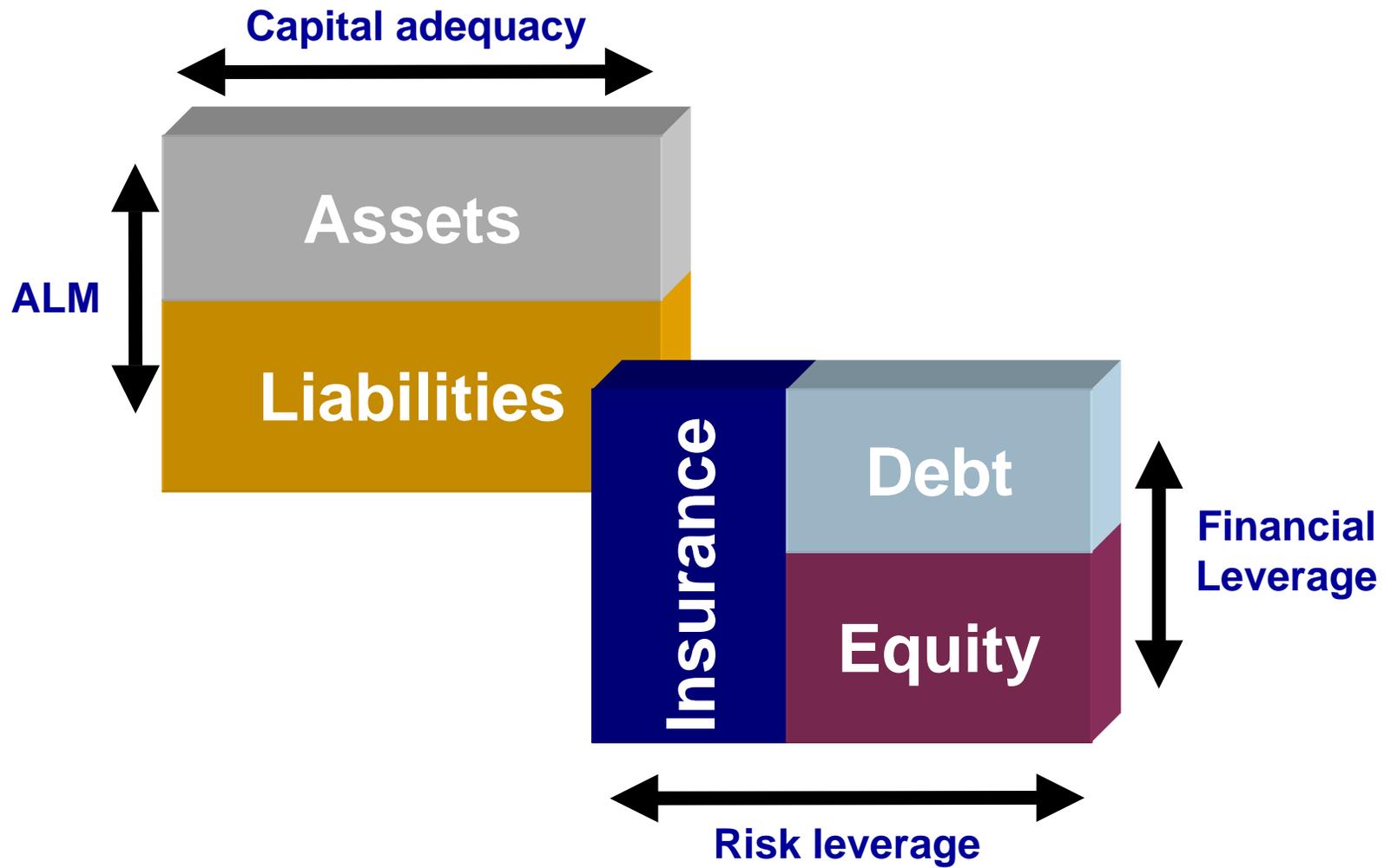


How does this relate to corporate finance?

An ALM perspective on corporate finance



From ALM to corporate finance



Corporate finance objectives

1. Capital adequacy

- Does the firm have enough capital to achieve its corporate finance objectives?
- Does it have proper management of its assets and liabilities?

2. Financial leverage

- Does it have an appropriate mix of debt and equity?
- Is that capital achieving sufficient return?

3. Risk leverage

- Is the company adequately managing its risks?
- Does it consider insurance and hedging in its capital structure?

What is Driving the Growth In ERM?

A wide range of global factors have played a significant role in increasing the focus on ERM:

Illustrative External Shocks

'97 Asian Economic Crisis	9/11 Disaster	Recent Accounting Scandals	Global Pharma Industry Drug Recalls
<ul style="list-style-type: none">Exposed the risks of investing heavily in equity markets which led insurers to diversify	<ul style="list-style-type: none">Revealed the need to measure and manage risks that affect multiple business areas	<ul style="list-style-type: none">Created need to evaluating and manage risk across client bases	<ul style="list-style-type: none">Many industries facing requirement to help mitigate operational risks

Regulatory Factors

Sarbanes-Oxley Act	Basel II	NYSE Rules	International Regulations
<ul style="list-style-type: none">Legislation that requires public companies to asses the effectiveness of their internal controls	<ul style="list-style-type: none">An international accord on capital standards and financial risk management that requires banks to manage credit and operational risk	<ul style="list-style-type: none">New corporate governance standards that require audit committees to review risk assessment and risk management policies	<ul style="list-style-type: none">A large number of other jurisdictions have advanced risk regulations<ul style="list-style-type: none">– E.g., UK, Canada, South Africa

Corporate Governance Initiatives

- Increased pressure on governance bodies to manage risk centrally as a result of market volatility, growing interdependencies across LOBs, and federal regulations

Which Market Segments are Adopting ERM?



Banks / Financial Institutions

- Compliance-focused ERM services as regulatory requirements such as Basel II require banks to improve current risk management practices
- Basel II compliance is a multi-year process, global banks will spend about \$50M to \$150M on such programs
- Global banks may implement independent audits to coordinate compliance programs between their HQs and foreign branches

Insurance Sector

- Increasing regulatory requirements and disclosure of risk
- Unable to comprehensively identify and address *all* risks
- Looking for approach to improve management / capital efficiency
- CRO growing in importance but limited tools and resources

Corporate Sector

- Increasing corporate governance requirements
- Few companies have the framework, skills and tools to assess financial and operational risks
- Traditional ERM analysis does not focus on critical business risks
- Middle market need to manage insurance expenses
- Alternative risk solutions required for non-insurable risks

Key Issues

Formal definitions of ERM

- Accounting (COSO):
 - ERM is a process, effected by an entity's board of directors, management and other personnel, applied in strategy setting and across the enterprise, designed to identify potential events that may affect the entity, and manage risk to be within its risk appetite, to provide reasonable assurance regarding the achievement of entity objectives
- Control and manage risks
 - Governance and compliance processes

Formal definitions of ERM

- Actuarial (Casualty Actuarial Society, CAS):
 - ERM is the process by which organizations in all industries assess, control, exploit, finance and monitor risks from all sources for the purpose of increasing the organization's short and long term value to its stakeholders
- Optimize value from risk-taking
 - Risk analysis and solution execution

Principles for ERM

- Risk management must be suited to the specific circumstances of the firm
 - An off-the-shelf framework will not work on its own
- Recognize the company's organization and culture
 - Design of risk management framework depends on culture, organization and management style of each company
 - Critical change management issues must be effectively addressed to get consensus and buy-in for the framework
- Three key principles guide development of ERM: identification, quantification and management

Principle 1: Risk management is not an audit

- All businesses must take risks to earn returns. Risk management should therefore optimize the risk/return relationship and not only avoid risk
- Audit examines whether specified procedures and processes are being followed. It does reduce risk, but does not consider the risk/return tradeoff
- Audit is a risk mitigation strategy. What to audit and how much time and effort to invest in audit should be the result of a risk management process

Monitoring vs. supporting decision-making

Audit approach	ERM approach
Starts with a checklist of risks	Articulates strategy and identifies risks to achieving strategic objectives
Defensive: Focuses only on downside risks	Considers unexpected upside scenarios; identifies opportunities for risk taking based on relative ability to manage risks vs. competition
Analyzes risks in silos	Considers interaction of risks to expose areas of concentration and diversification
Supports monitoring and reporting	Supports decision-making

Principle 2: Cause-effect dynamics of risks cross organizational boundaries

- Scope of risks should be broad, including external and internal risks, upstream and downstream businesses, suppliers and distributors
- Coordinate scope of financial, strategic and operational risks with other risk categories to ensure that risks “don’t fall through the cracks”
- The **definition of ERM** for a firm falls out naturally from the objective and scope, for instance
 - An approach to integrated management of risks from all sources that threaten the achievement of strategic objectives and those that represent opportunities to exploit for competitive advantage

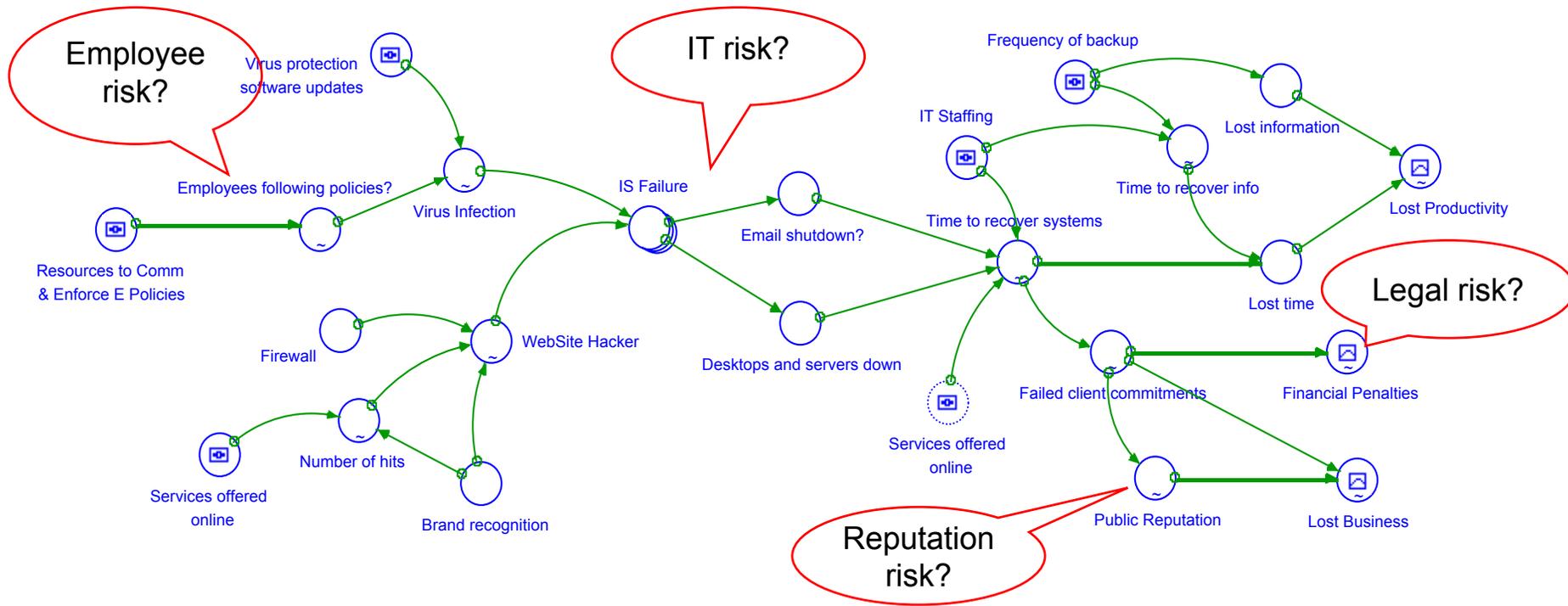
Principle 3: Risk identification processes should capture the anatomy of risk

Causes → Risk Event → Consequences

- Risk events have several key causal factors:
 - Website hacking, software bugs and employees not following e-policies can cause technology failure
 - Poor training, aggressive growth strategy, lack of management checks and balances can cause misrepresentation of product by agents
- Risk events can result in many financial consequences:
 - Technology failure can result in lost customers, lost new sales and lost productivity
 - Sales misrepresentation can result in regulatory fines, restitution and lost sales due to loss in reputation

How should this risk dynamic be classified?

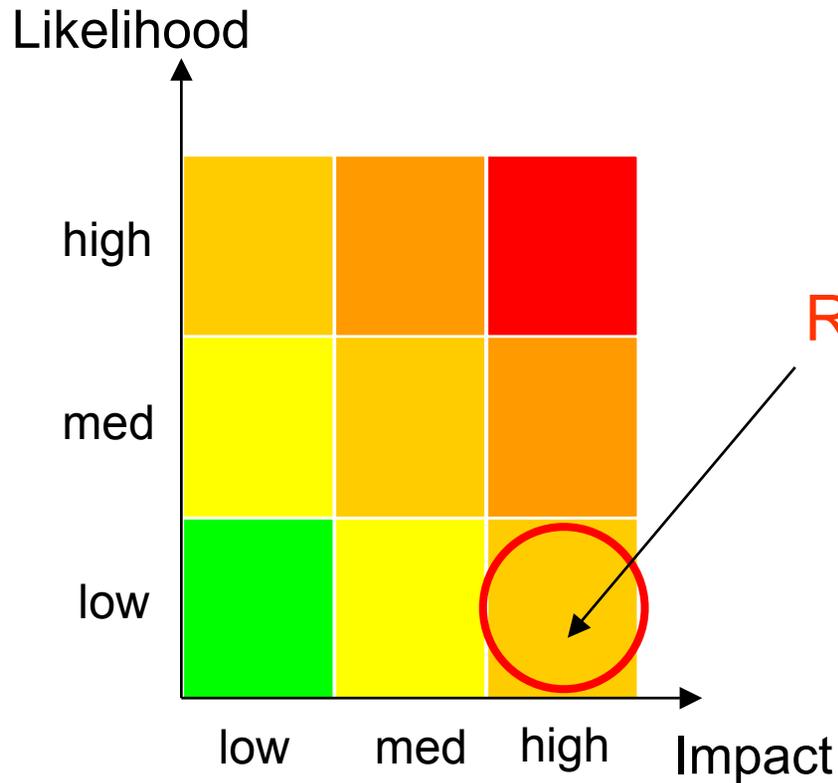
Causes **Risk Event** **Consequences**



Ⓜ Operational Decisions
 ○ Intermediate causal variables
 Ⓜ Output Distributions

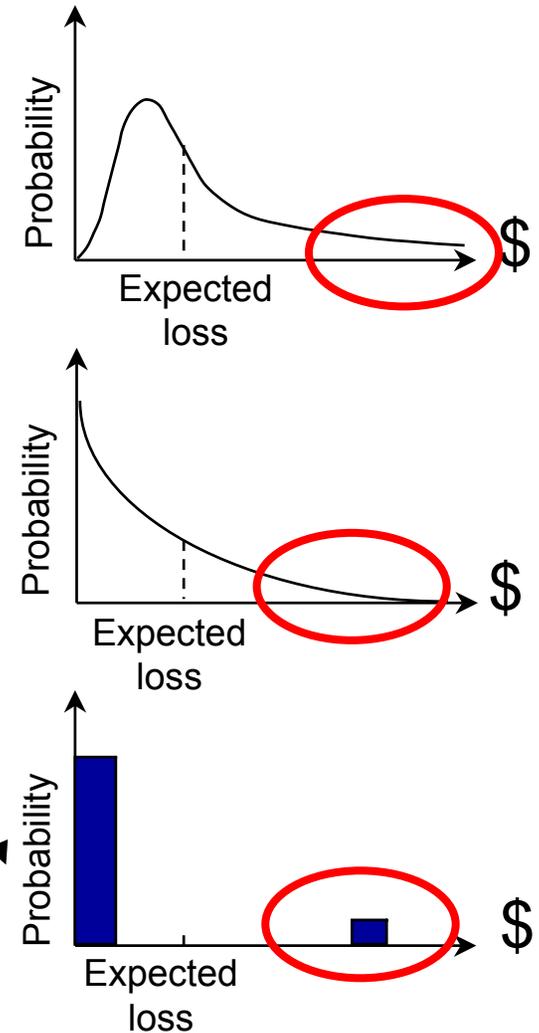
Look beyond the usual HML grid to capture the underlying risk characteristics

Usual Way to Quantify Risks



Risks

Alternatives



Benefits of recognizing the anatomy of risk

- Provides greater clarity of causes, effects and impact, thereby giving reliability in assessing potential losses
- Mitigation plans and controls can be developed using cause-effect relationships
- Avoids double or triple counting of risks that can result from coding the same cause-effect chain as separate risks

There are 4 stages of ERM, corresponding to management issues

Enterprise Risks

- Financial
- Operational
- Regulatory
- Legal liability
- Human assets
- Hazard
- Insurance
- Political
- Market
- etc

ERM Framework and Processes

Compliance and Governance

Diagnostics and Analytics

Solution Analysis and Review

Risk Mitigation/
Transaction Execution

Management Issue

What are my risks?

What is their financial impact?

How can I manage them?

How do I execute?

ERM today and tomorrow

- Today:
 - Emphasis on compliance
 - Financial institutions — evolutionary change
 - Nonfinancial firms — revolutionary change
 - Tools, what tools?
- Tomorrow:
 - Emphasis on value
 - Financial institutions — tougher standards
 - Nonfinancial institutions — clear leaders emerge
 - More science brought to the art

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- **Economic Capital**
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- Tillinghast Survey
- ERM tools and techniques
- The CRO function

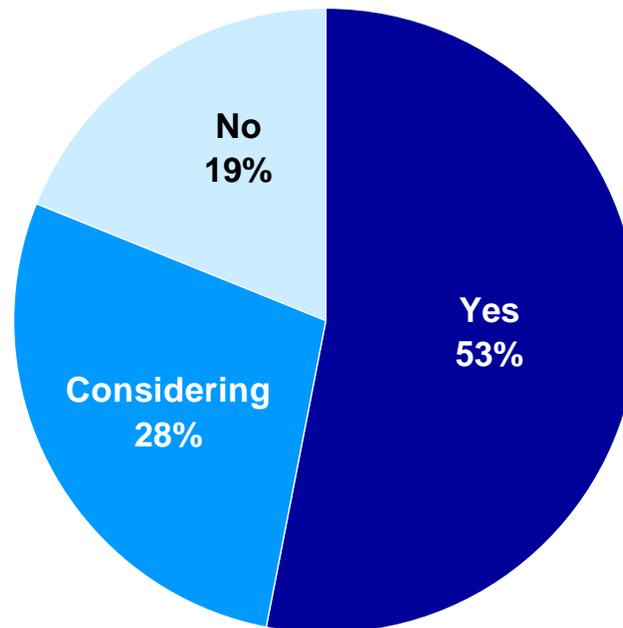
The concept of EC was developed in the banking sector

- Basel I requires holding appropriate levels of capital for different financial risks
 - S&P AAA-rating requires banks to hold capital at the 99.90% level
- Basel II expands the concept to operational risks
 - Quarterly reporting of operational risk exposure
- Insurance companies have picked up the EC concept only in the last several years
 - Rating agencies are starting to give credit for internal models
 - Regulatory changes are accelerating pace of change
 - Larger companies are setting up proprietary stochastic models
- The European CRO Forum is in the process of recommending standards for the acceptance of internal models for compliance with the new Solvency II capital regulation

We will focus our comments on EC as used in the insurance sector

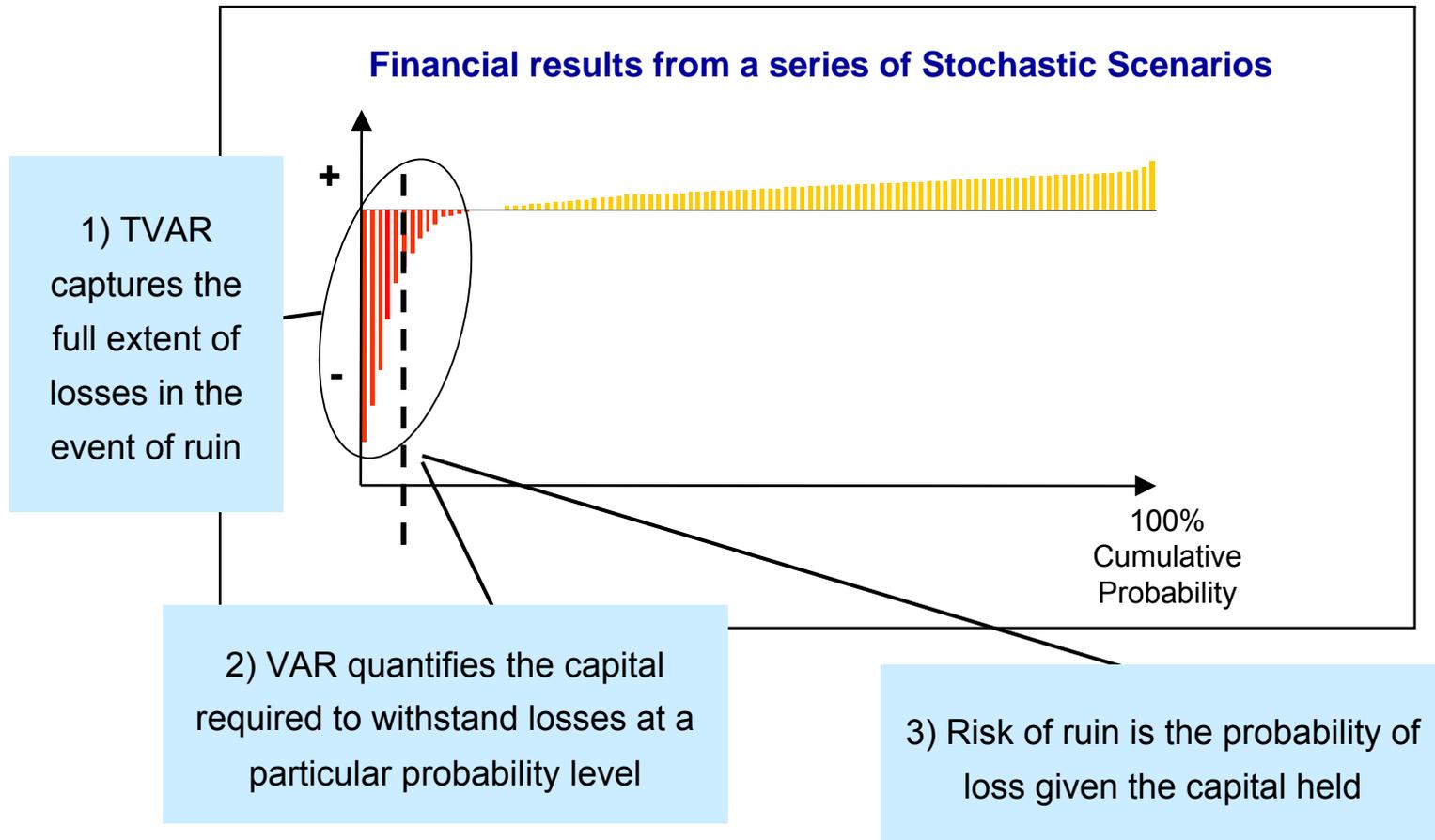
EC calculations are becoming mainstream in the insurance world

- Just over half (53%) of 150 respondents to a recent global Tillinghast Risk and Capital Management Survey currently calculate EC, and a further 28% are considering calculating it
 - P/C businesses and reinsurers have a slightly higher use of EC (60% and 56% respectively) than life insurers
 - Only about one-fifth of respondents (19%) have no plans to calculate EC



Source: 2004 Tillinghast Risk and Capital Management Survey

When calculating EC, three alternative approaches can be used to measure risk: Risk of ruin, VAR and TVAR



Required Economic Capital (REC) = “sufficient surplus capital to cover potential losses, at a given risk tolerance level”

A range of different confidence levels are used by insurance companies and regulators

- Most insurers use expected shortfall risk (TVAR) or risk of ruin
- Most banks use VAR
- Choice of confidence level and implied rating:
 - Most European insurers are using one-year confidence levels between 99.5% and 99.99%
 - European regulators appear to be converging on a one-year 99.5% confidence level for Solvency II
 - Confidence levels are typically linked to a target risk appetite and credit rating
 - Where longer time horizons are used, a lower multi-year confidence level can be justified (e.g. AA over 5 years vs. AA over one year)

Definitions of EC: 'Best estimate' liability approach

Economic Capital is

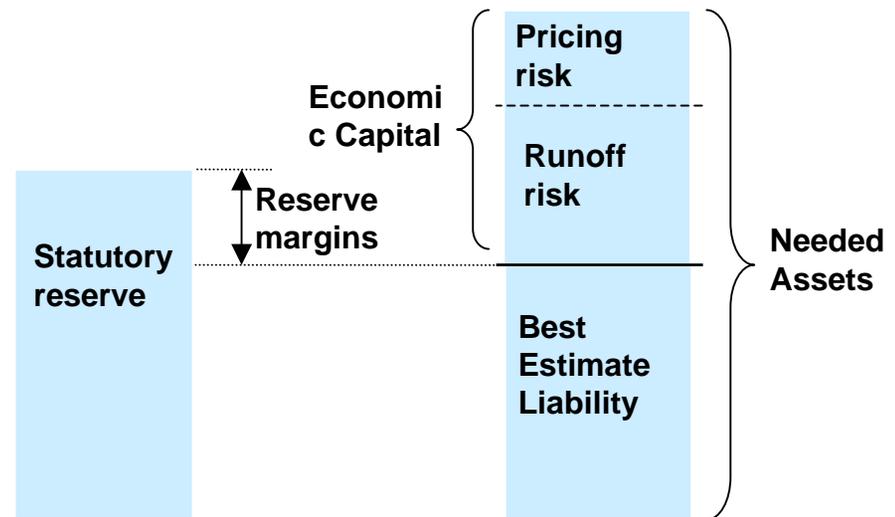
- The level of assets, in addition to the Best Estimate Liability, required to pay future policyholder benefits at the chosen Security Factor
- Economic Capital covers the volatility in:
 - The runoff of existing business
 - The future business (“pricing risk”)

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

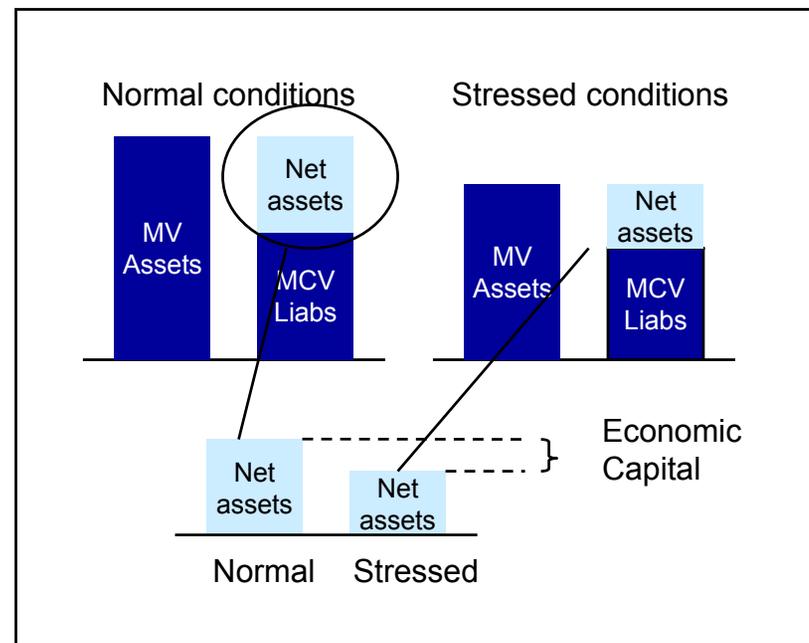
- Based on a risk of ruin level which is consistent with the company's financial strength rating



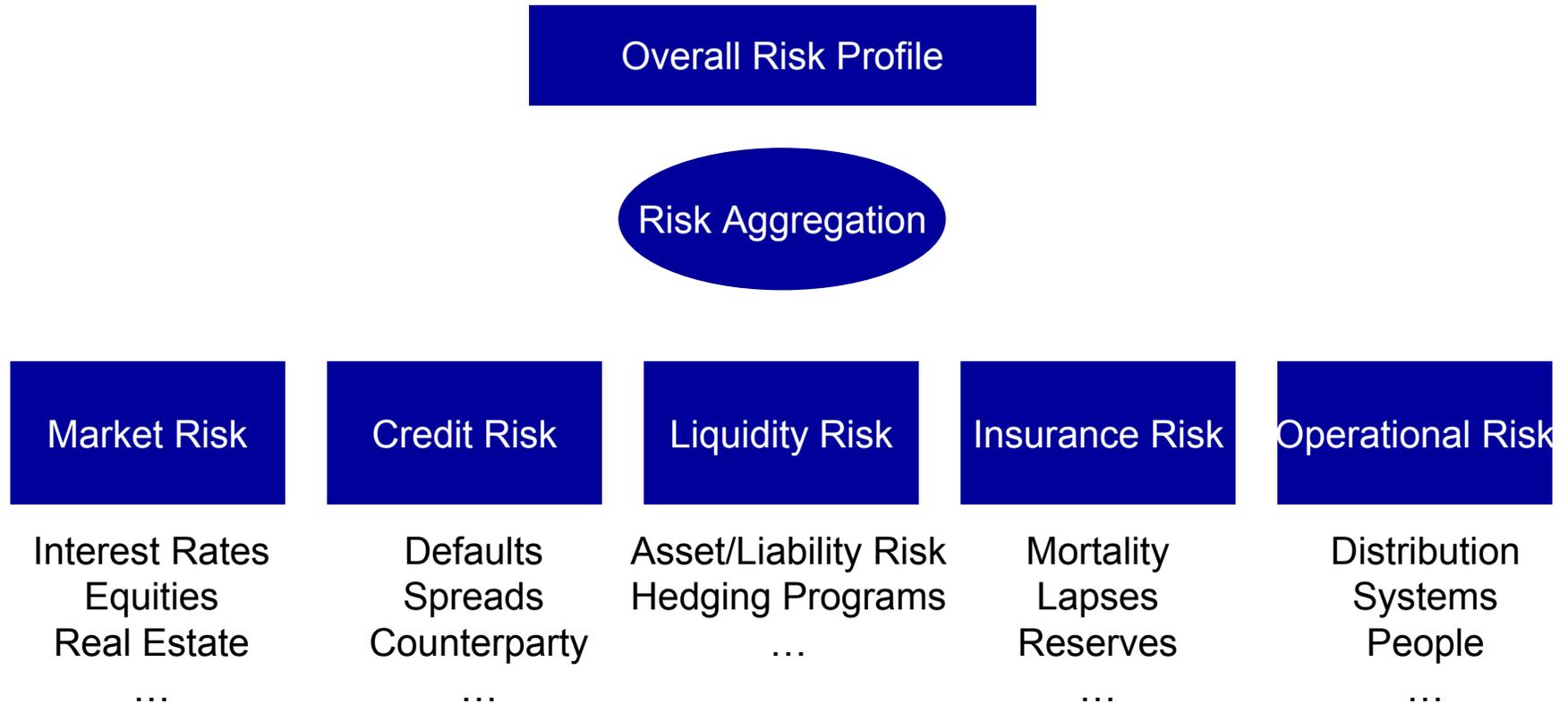
Definitions of EC: Market-consistent balance sheet approach

Economic capital is

- Measured as the difference in “market consistent net assets” between normal conditions and stressed conditions
 - The stress tests applied are each 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 which might occur over the projected time horizon
- Results are aggregated using a correlation matrix approach



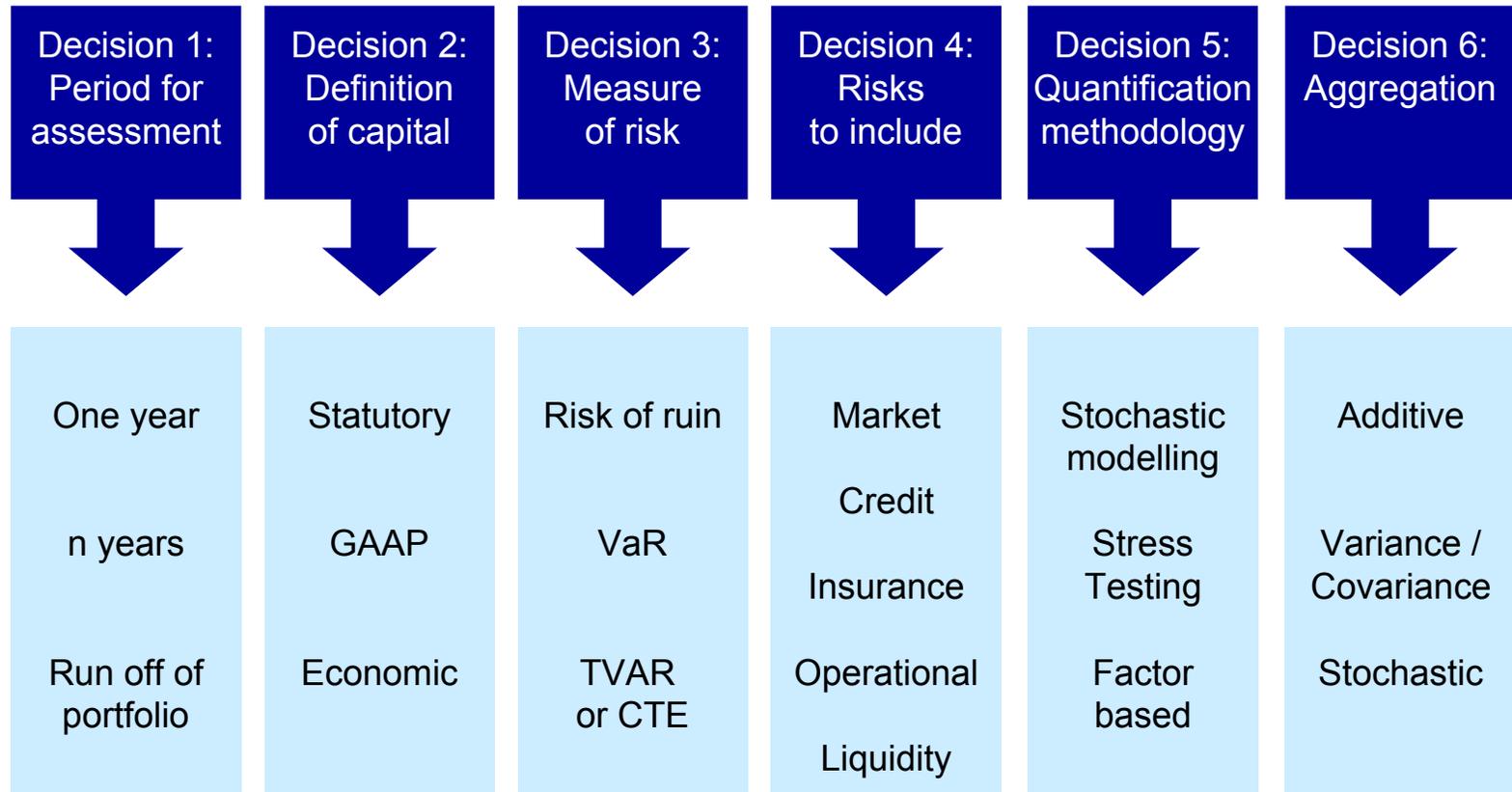
The calculation of EC should include all material risks



There are a variety of approaches in use for measuring EC

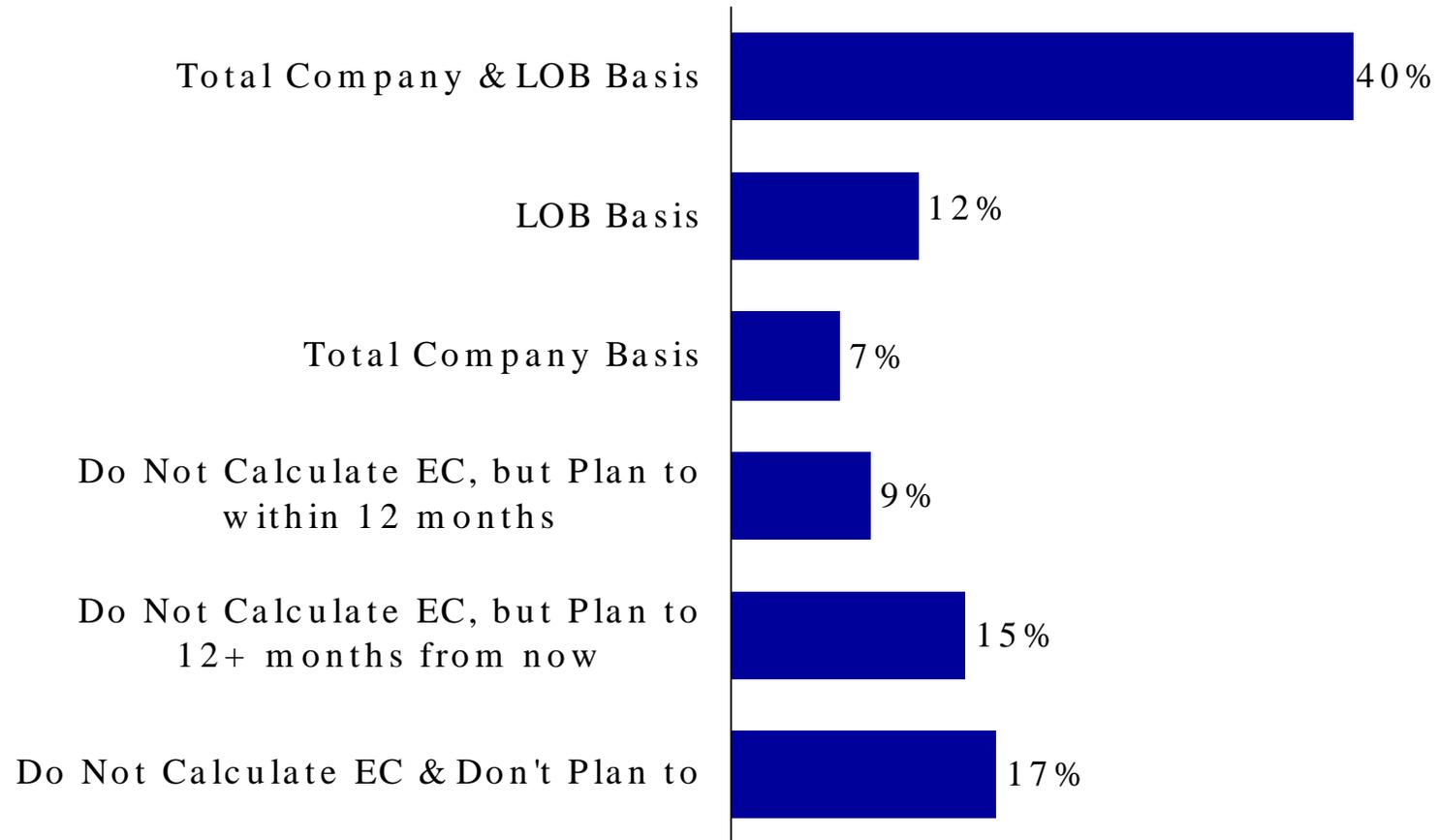
- Methodologies for measuring expected shortfall
 - Economic scenarios
 - Stress testing
 - Factor tables
 - Stochastic models
 - Mean-Variance-Covariance models
 - Credit risk methods
 - Option pricing using analytic forms of distribution (Black – Scholes)
- Analysis increasingly includes operational risk
- Typically, EC is based on the probability of ruin, i.e. economic value of assets < economic value of liabilities
 - $P(\text{ruin}) \leq \text{target level}$ is typically measured over horizons ranging from 1 to 20 years
 - Banks typically use VaR, while insurers increasingly use TailVaR (CTE)
 - Preferred method by rating agencies, using percentiles consistent with desired financial strength ratings

There is no 'right' or 'wrong' approach to building an economic capital model ...



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

Many companies calculate EC on both a total company and a LOB basis

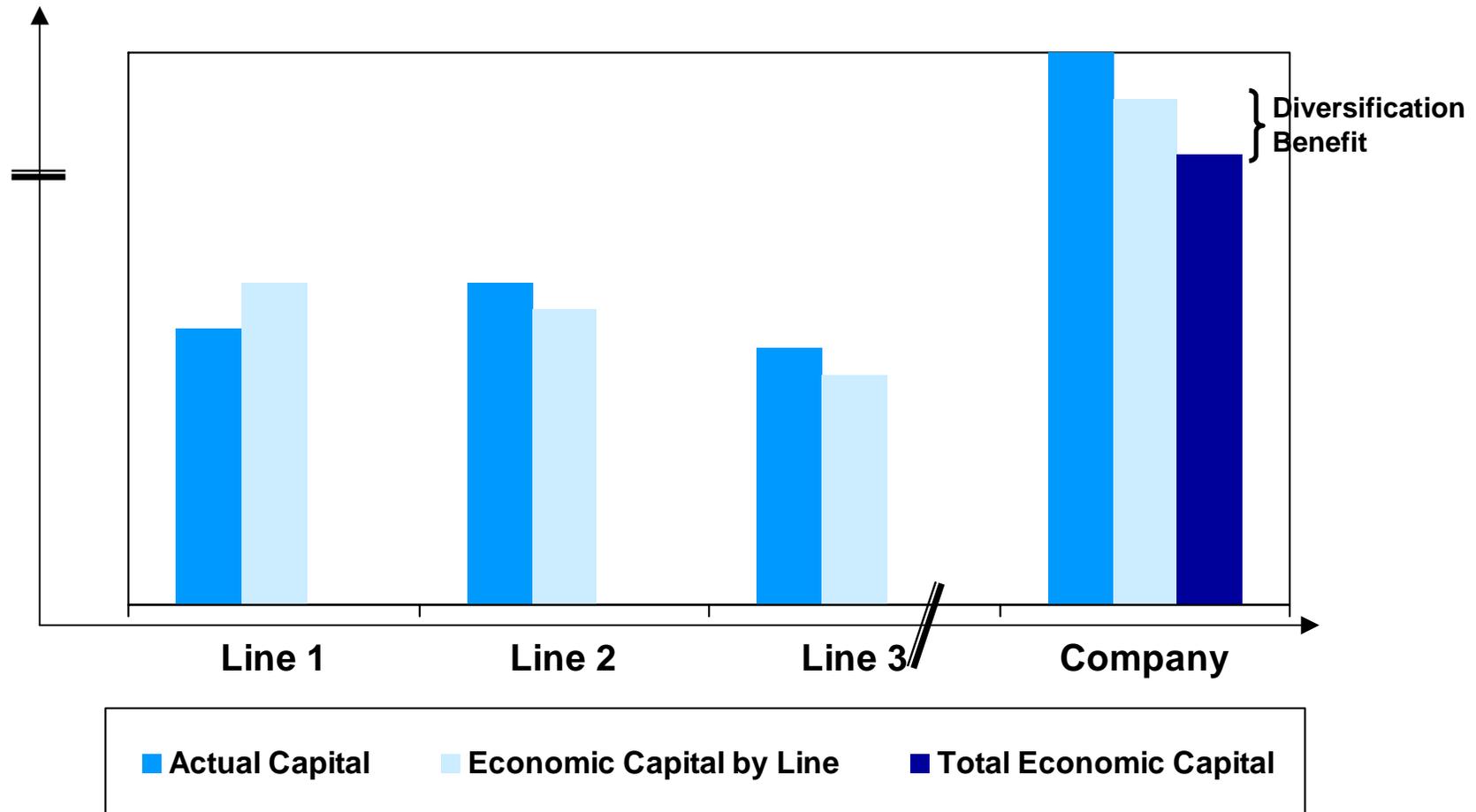


Source: SOA/Tillinghast Risk & Capital Management Seminar (March 2004)

Various methods are in use for allocating EC

- Allocating EC at the enterprise level
 - Diversification benefit goes to corporate segment
- Allocating EC to business segments
 - Diversification benefit stays at LOB level
- Allocating EC for pricing purposes
 - Generally, simplified formulas are used
- Allocating EC for Embedded Value (EV) publications
 - Typically based upon rating agency formulas, or internal capital models
 - Cost of capital in a market-consistent world is based on taxes on investment income for assets backing capital

Typically, the diversification benefit resides at the corporate level



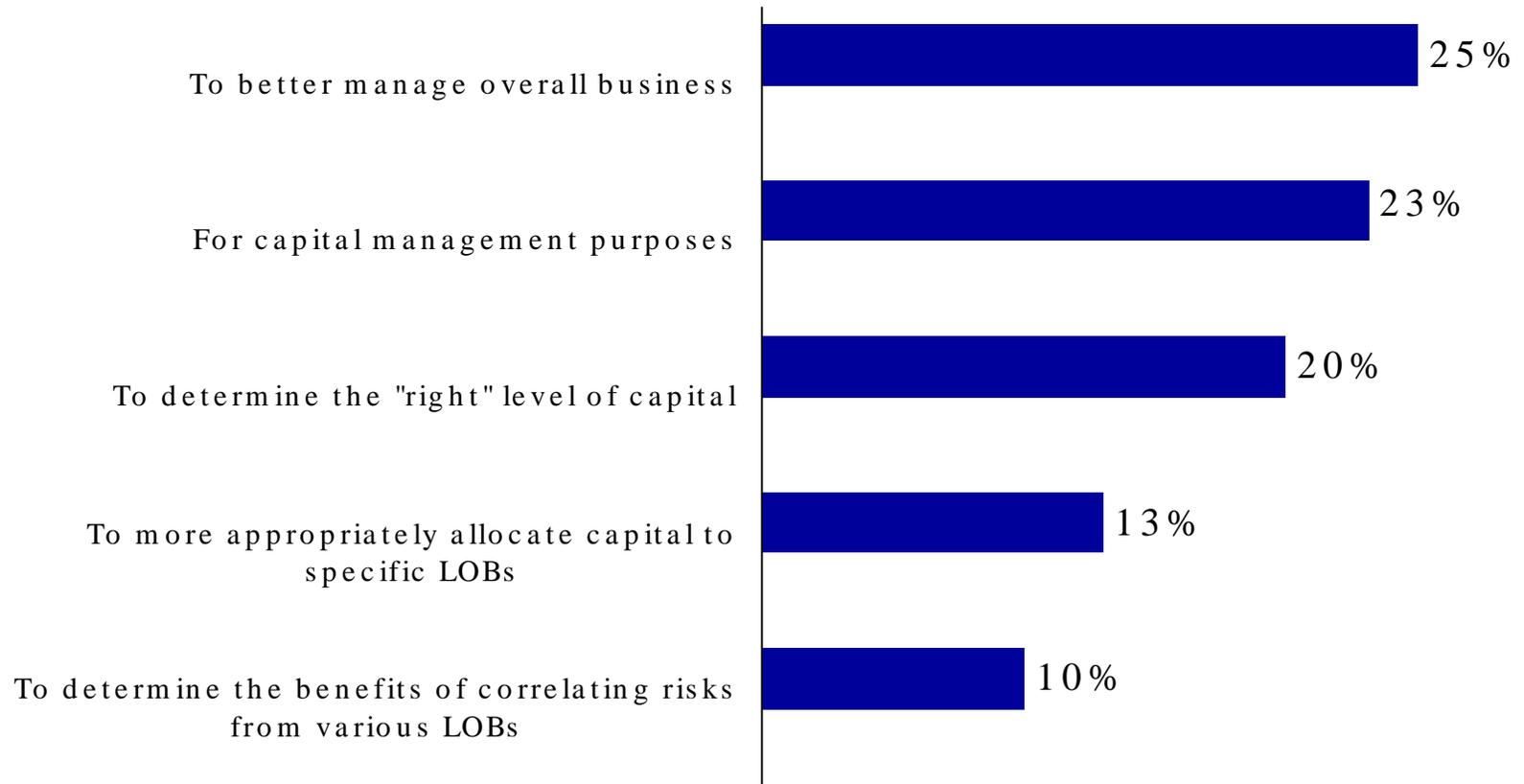
Best practices for determining and using EC

- Using EC to manage to the right level of capital
 - Including both financial and non-financial risks
- Allowing for diversification benefit ($\text{Risk}(x+y) \leq \text{Risk}(x) + \text{Risk}(y)$)
 - Marginal attribution to products/businesses
 - Consolidation across the enterprise
- Determining available EC as the difference between required assets and MV of liabilities (or Embedded Value)
 - Basing required EC calculation on Expected Shortfall or Expected Tail Loss – a coherent risk measure*
- For pricing, required capital should be held at EC level
 - Excess of regulatory capital over EC (if any) could be leveraged through the use of reinsurance or LOC, typically at a lower cost

* See Artzner, Delbaen, Ebner and Heath (1999)

Many companies use EC to determine and manage the "right" level of capital

Uses of EC - Top 5 Answers



Source: SOA/Tillinghast Risk & Capital Management Seminar, March 2004

Recent developments encouraging the use of EC

- Basel II
- Solvency II / European CRO Forum
- OSFI regulation for segregated funds (CAN)
- C-3 Phase II: RBC for variable annuities (VA) – US
- Proposed stochastic reserves for VAs and UL products – US
- GAAP SOP 03-1: explicit reserves for guarantees – US
- General need to develop risk profiles and perform hedging analysis
- Measuring Economic Value / Market Consistent Embedded Value (MCEV)
- Measuring exposure to catastrophic events
- Demands and increasing scrutiny by rating agencies / regulators

**Calculating EC is becoming an important tool for insurers
in guiding risk-based decision making**

Basel II

- International accord on capital standards and financial risk management for banks
 - Expected to be implemented in 2008
 - A multi-year process
- Mandates EC be held for operational risks
 - Level varies by severity (12% – 18% of total EC)
- Greater pressure to implement stronger risk management practices
- Scope for national discretion
- Has accelerated insurers' development of EC methodologies
 - Many European multinationals own both banks and insurers
 - No big impact felt in the US at the company level, given the lack of bankassurance
 - However, accounting bodies are keen on applying the EC concepts tried and tested in banking to insurers (e.g., COSO framework for Enterprise Risk Management (“ERM”) in the US)

Solvency II

- Three-pillar approach to supervision of insurers worldwide, driven mainly by European and Canadian regulators
 - Pillar I: Capital requirements
 - Pillar II: Regulatory supervision
 - Pillar III: Disclosure / best practices
- All types of risks are to be included
- Total balance sheet approach
- Requires use of appropriate risk measures, and an appropriate time horizon
- Need to allow for risk management
- Company-specific approaches recommended
- Capital requirements should be market-efficient
 - Encouragement of best practices
- Expected to be effective by 2010

The European CRO Forum is establishing guidelines for admissibility of internal EC models for Solvency I

- Principles for Regulatory Admissibility of European Chief Risk Officer Forum is establishing guidelines for calculation of EC and diversification of risk
 - “Principles for Regulatory Admissibility of Internal Models” (June 2005)
 - Solvency Capital should be set to ensure a standardized likelihood of economic loss to policyholders
 - Internal models should be based on adverse movement in Economic Value of (Assets – Liabilities), calibrated to a target annual level of 99.5% probability of solvency
 - All material risks affecting the balance sheet should be modeled
 - Internal risk models should be fully implemented inside the company, and reviewed (at least) annually
 - The CRO Forum advocates the admissibility of diversification benefits

EC vs. Regulatory / Rating Agency Capital

- Companies' internal EC models are designed to reflect proprietary risks
 - Company-specific, tailored to risks
 - Using prospective methods
- Regulatory capital (RBC) has historically been based on industry factors
 - Using industry data, not company-specific or risk-specific
 - Formulaic method, retrospective
 - This is changing now (US, Canada, Europe)
- Reconciliation through rating agencies
 - Historically, a retrospective view
 - Current trend towards evaluating capital requirements based on proprietary models
 - All major US rating agencies are developing or enhancing their capital adequacy models

All major US rating agencies are developing or enhancing their capital adequacy models

- Standard & Poor's (S&P) is working on reforming its capital adequacy model to reflect changes brought about by the proposed CTE 90 capital methodology
 - These would be used once the new regulation goes into effect (year-end 2005)
- Essentially, S&P would use the annual default rate for a bond that has a financial strength rating equivalent to that of the company in determining the percentile at which the capital level should be based on:

New versus Old S&P Benchmarks		
S&P Rating	New Factor	Old Factor
BBB	96.5 th percentile	100% CAR
A	99 th percentile	125% CAR
AA	99.5 th percentile	150% CAR
AAA	99.9 th percentile	175% CAR

Source: Standard & Poor's

- Fitch is revising their VA capital adequacy model to incorporate CTE methodology:
 - AA – Fitch rating will require capital based on CTE(98.22) level
- AM Best and Moody's are in the process of enhancing their capital adequacy models as well

We expect EC to become the preferred tool for determining the appropriate level of capital going forward

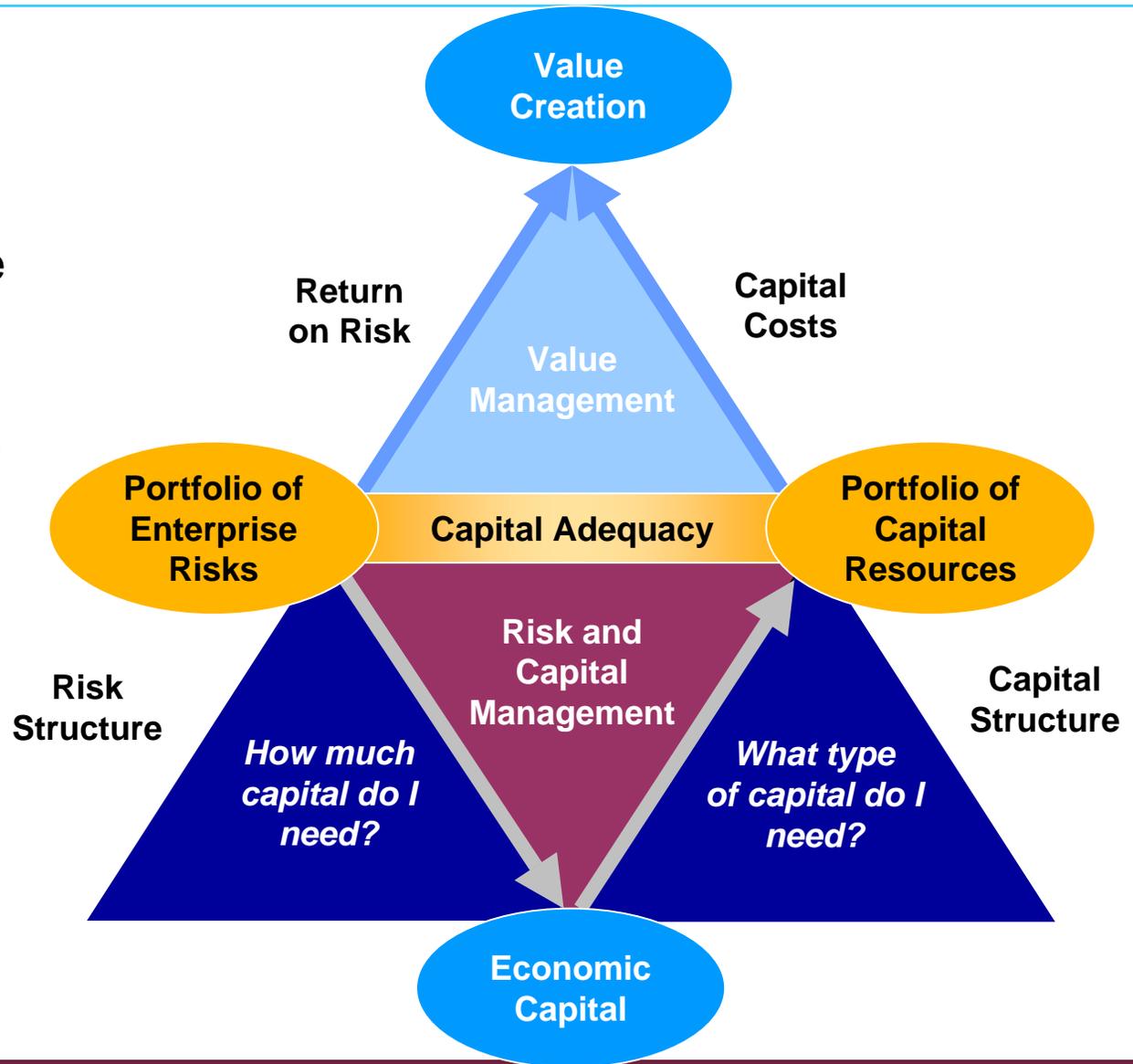
- Increased sophistication of risk management
- Failure of factor-based approaches to detect major emerging risks
- Provides quantitative recognition of sound risk management practices
- Increased acceptance by regulators and rating agencies
- Pressure on companies to optimize their capital structure in light of increasing demands on capital

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Risk-Capital-Value Framework

Maximize value by relating a firm's decisions on the **risks it takes** to the decisions on the **capital it uses** to finance its business



Linking Risk Structure and Capital Structure

- It is conventionally OK to discuss risk structure and capital structure as two distinct topics
- However if we define:
 - Capital management delivers the optimal capital resources (both paid-up and contingent) sufficient to support the needs of a firm and, in particular, to cover the risk exposures that the firm faces
 - Risk management ensures that the firm's operational and financial exposures are controlled or structured in such a way that they are supportable by its capital resources
- Then, not only are they tightly related topics, *they are the same thing!!!*

Risk structure is a measure of the firm's risk

- Defining the risk structure is a way of articulating its risk exposures and analyzing the potential impact of those exposures on future financial performance
- A risk map is a good starting point as a way to capture and describe the set of risks that the firm faces
- A dynamic financial model then converts the statistical analysis of risk exposures into a financial analysis of the enterprise

How much capital? What type of capital?

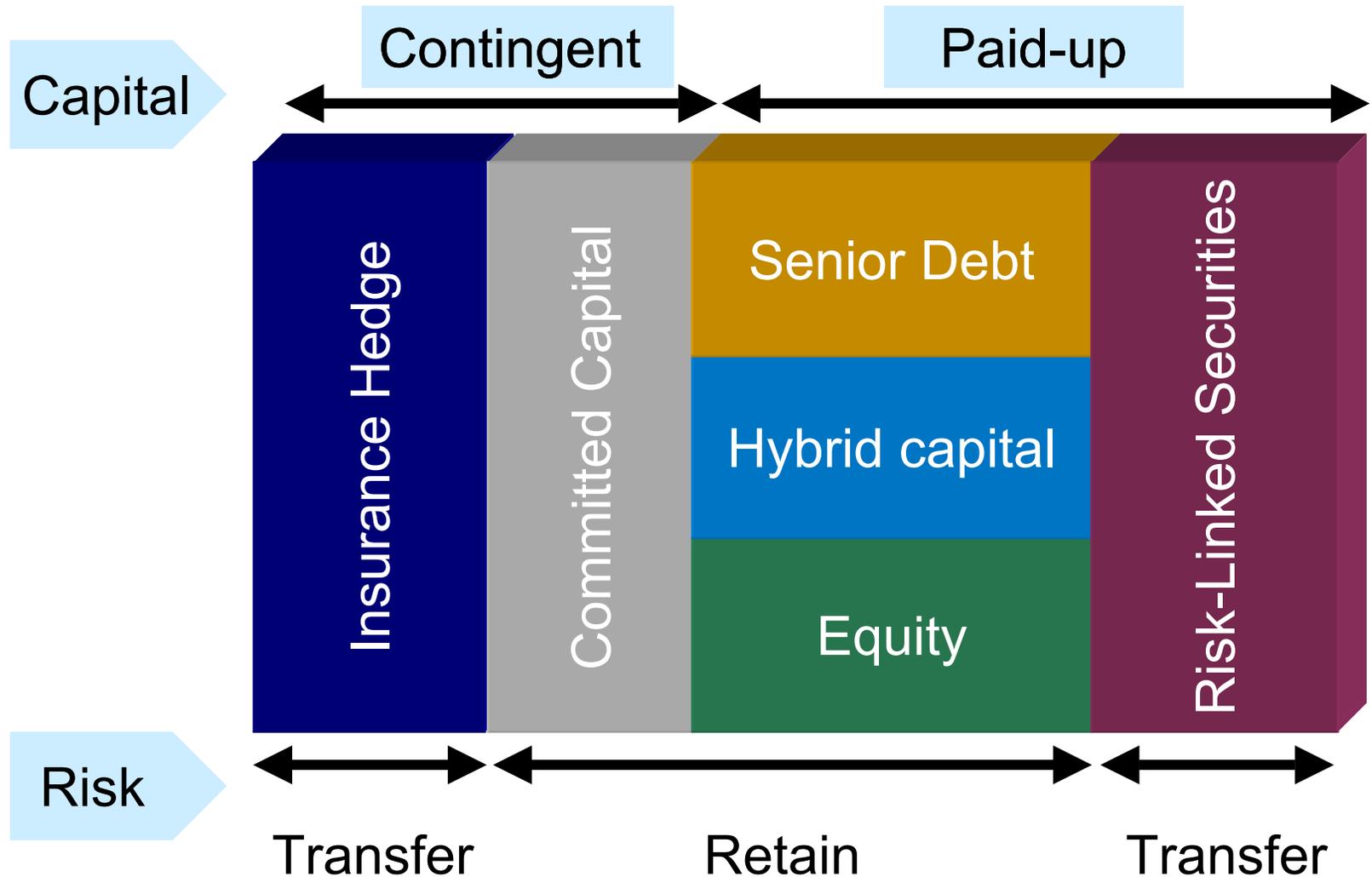
- Company takes on risks to generate returns
- Capital is needed for 3 primary reasons
 - **Operational capital** to fund operations
 - **Risk capital** to cushion adverse financial results
 - **Signaling capital** to indicate financial soundness
- Standard corporate finance theory recognizes paid-up capital
- Basic forms of capital are equity and debt
- Recent developments have introduced hybrids that have features of both equity and debt
- What about off-balance sheet capital?
- Are insurance and derivatives also forms of capital?

Capital & Risk

- Capital Required
= Operational Capital + Risk Capital + Signaling Capital
- Firm Risk
= Retained Risk + Transferred Risk
- Firm Capital
= Paid-up Capital + Off-balance-sheet Capital

$$\mathbf{Firm\ Capital = f(Firm\ Risk)}$$

A portfolio of capital instruments to meet firm risk



Risk and capital management can create value in three ways

- Increase future profits (make better business decisions)
- Reduce the amount of capital employed
 - Convince regulators/rating agencies to acknowledge the validity of the lower economic capital results
- Reduce the cost of capital
 - Convince shareholders that management is doing a good job
 - Convince rating agencies of lower effective risk profile

Creating maximum value requires the integration of economic capital measures into business decision-making

- Capital is a scarce resource
 - Need to select business opportunities that generate maximum value for the available capital
- Projection of profit alone is inadequate
 - There is a need to allow for cost of capital to make sound decisions
- Pricing should reflect volatility and not just expectation
 - Credit card lending — high expected loss, low volatility, hence low capital requirement
 - High layer catastrophe business — low expected loss, high volatility, high capital requirement

Integrating economic capital into decision making

- Can be used to make better informed decisions affecting performance:
 - Strategic planning process
 - Annual business planning
 - Product pricing
 - Product and business mix
 - Product design
 - Reinsurance purchasing

Integrating economic capital into decision making

- Modeling gives additional insights into capital requirements:
 - How risks interact (diversification effects, natural hedges, risk correlations)
 - Impact of alternative business strategies
 - Capital implications of each strategy can be assessed alongside its relative cost (e.g., reinsurance purchasing strategy)

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- Economic Capital
- Adding value through ERM
- **Tillinghast Survey**
- ERM tools and techniques
- The CRO function

Tillinghast's third biennial survey of risk and capital management

- In 1999 and 2002, the Tillinghast business of Towers Perrin conducted global benchmarking surveys of insurance companies to document the approaches and the status of activity regarding enterprise risk management (ERM)
 - Organizations found this information to be valuable in benchmarking their risk management activities against their competitors and against best practices
- Risk and capital management has become a strong driver of success in the insurance industry, causing a reassessment of the role of the risk management function in many organizations
 - Tillinghast conducted a quantitative market research effort in 2004 to provide an ERM update on the global insurance industry
- The goal of this research effort was to address the following areas of risk and capital management:
 - Risk management objectives
 - Roles and responsibilities
 - Risk measurement
 - Economic capital
 - Risk and reporting practices
 - Decision making

Continued...

Tillinghast's third biennial survey of risk and capital management

- Chief Risk Officers, Chief Actuaries and Chief Financial Officers in large insurance organizations around the world were invited to participate in the survey
- A total of 150 executives responded, headquartered in the following regions:
 - 47% North America
 - 39% Europe
 - 10% Asia/Pacific
 - 4% South America
- The businesses in which the respondents have a significant presence include:
 - 72% property/casualty insurance
 - 69% life/health insurance
 - 39% reinsurance
 - 26% other financial services such as banking and mutual funds

Our survey of risk and capital management among insurers around the globe identifies five key findings

- 1. Enterprise Risk Management has come of age.** Insurers are giving enterprise-level risk management increasing attention, high level accountability and clear responsibilities, befitting a legitimate strategic function
- 2. ERM is ultimately about creating shareholder value.** Insurers see the principal objectives for ERM as helping them create and improve shareholder value through better risk-based decision making and capital allocation
- 3. Economic capital is a key tool that is on the fast track.** Economic capital (EC) is becoming an important tool for insurers in guiding risk-based decision making at all levels in their organization, although the method for calculating EC is still evolving
- 4. Risk and economic capital management are already making a difference.** Enhanced risk and capital management approaches have already affected business decisions made by insurers, and they are likely to do so more frequently as their use increases in a wide variety of areas
- 5. We're not done yet.** Despite the progress insurers have made since we began these surveys, both risk management approaches and economic capital calculations are still very much works in progress, with major gaps that the industry will need to fill

Risk management efforts are focusing on improving basic risk processes

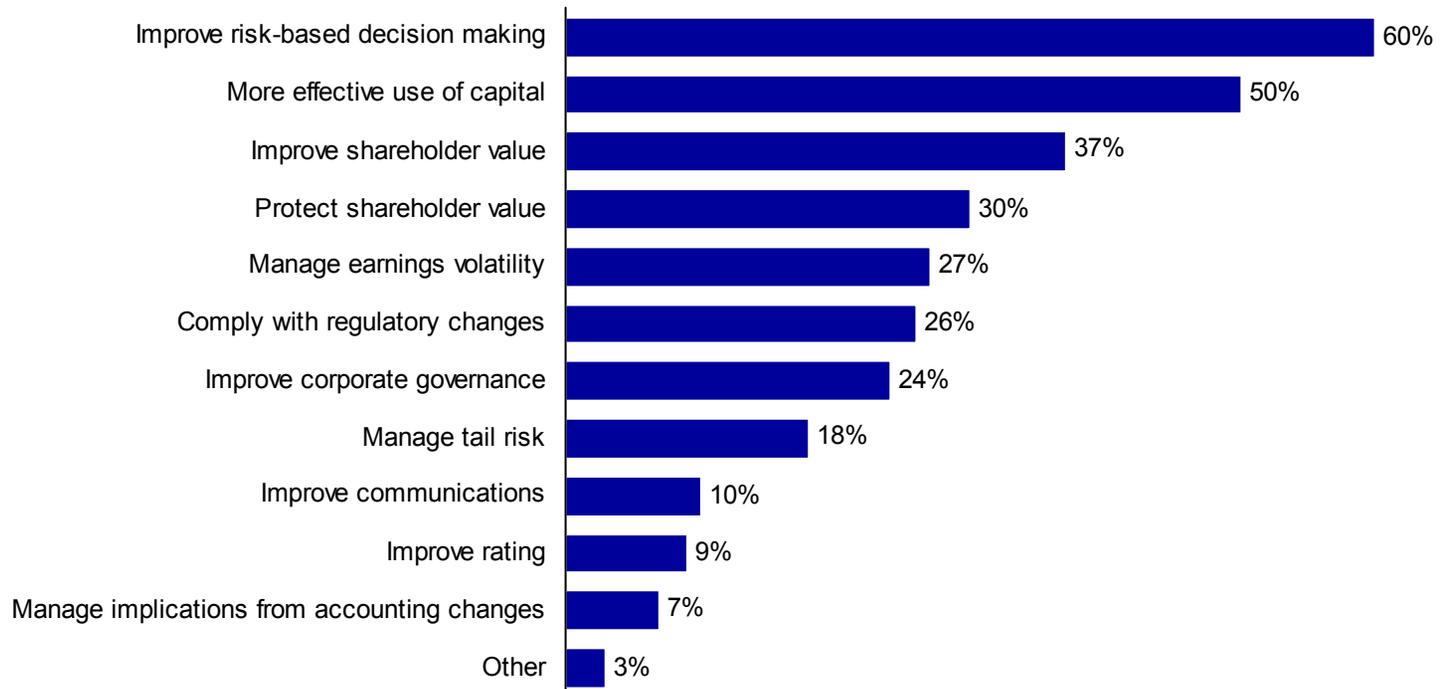
- Approximately two thirds of respondents are currently focusing their risk management efforts on improving internal risk reporting processes (67%), improving the measurement and quantification of insurance risks (66%) and improving risk identification and prioritization processes (63%)
- Only 7% are incorporating risk into incentive compensation — indicating a gap, as the link is not already there



Base: All Respondents Q.2 Where are your risk management efforts now being focused?

Key objectives for improving risk management include improved risk-based decision-making and more effective capital allocation

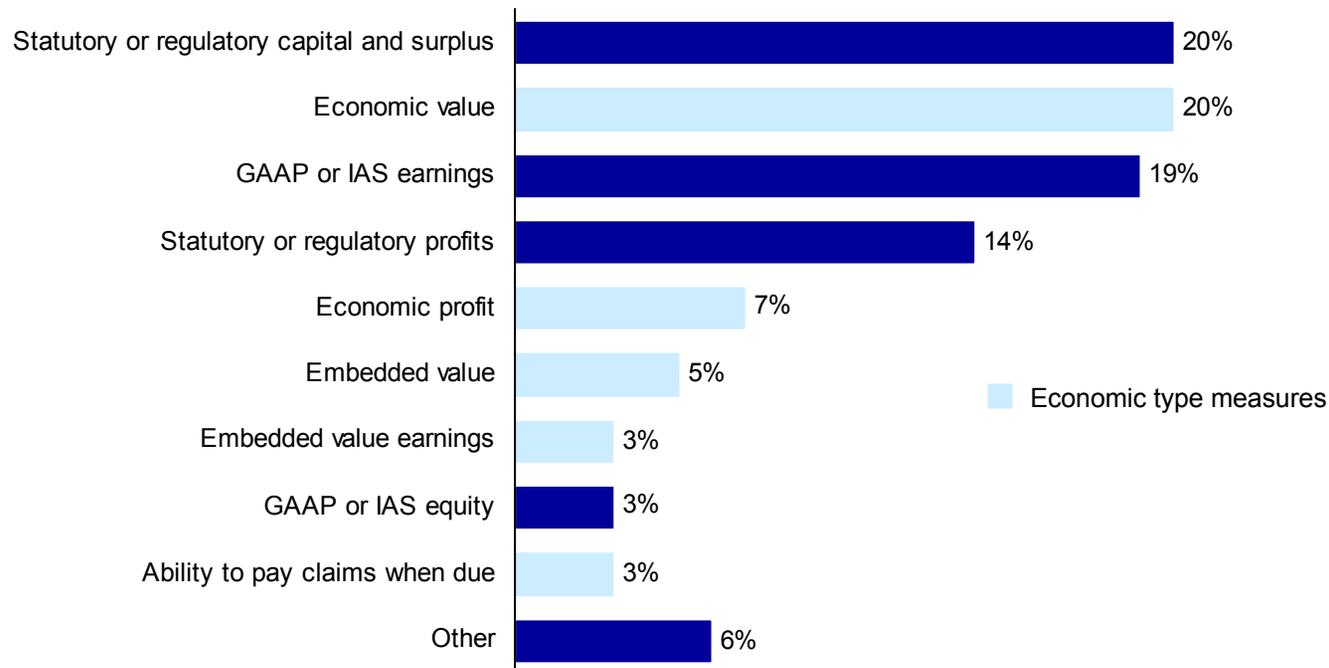
- When asked for the three top objectives for improving risk management, the most frequently mentioned objective was to improve risk-based decision making (60%).
 - Half of respondents cite more effective use of capital as a top objective for improving risk management
 - European companies are more likely to cite complying with regulatory changes (48%)
 - More than one third (37%) would like to improve shareholder value



Base: All Respondents Q.3 What are your top three objectives for improving risk management?

Statutory/regulatory and GAAP/IAS measures sit alongside more “economic” measures of risk

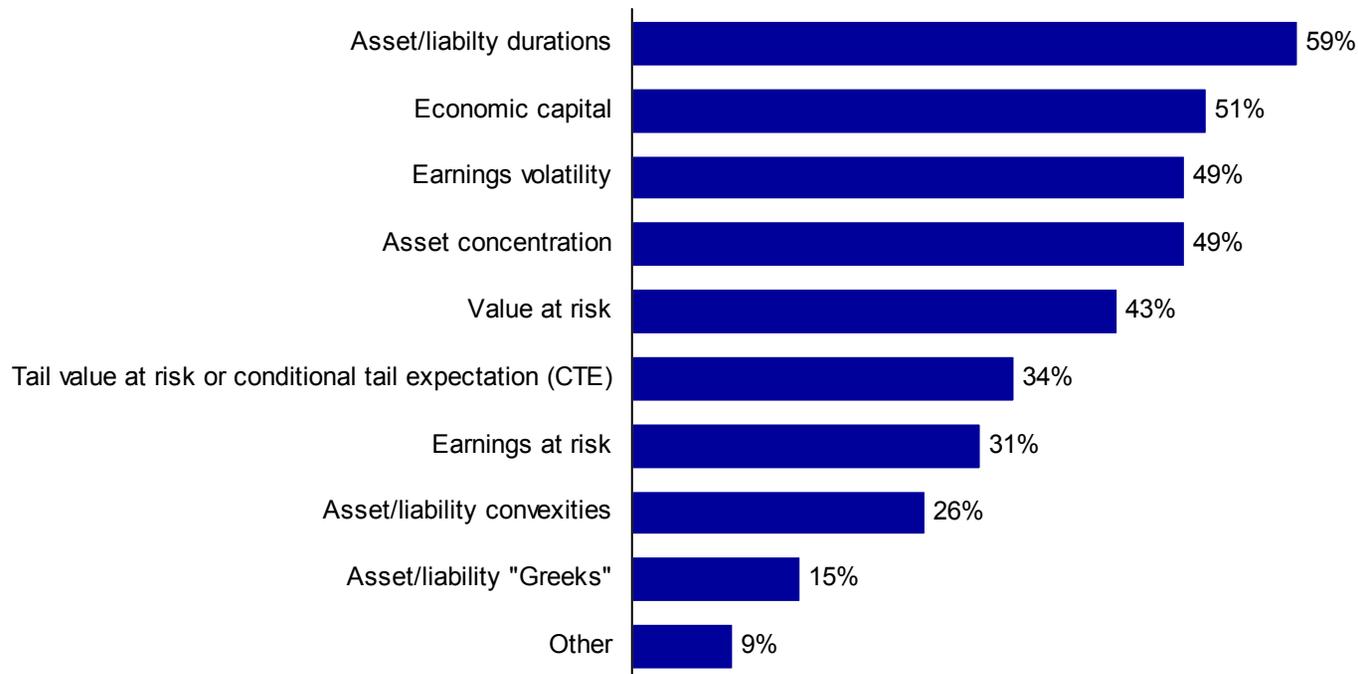
- The use of statutory or regulatory measures (34%) shows a focus on regulatory compliance and policyholder protection
- Adoption of GAAP or IAS measures (22%) indicates an accounting view for shareholders
- “Economic” measures (38%) eliminate the potential distortion of specific regulatory or accounting regimes, giving a pure view of risk



Base: All Respondents Q.8 When measuring risk, what is the primary factor you measure the impact on?

A variety of metrics are used for measuring and quantifying risk

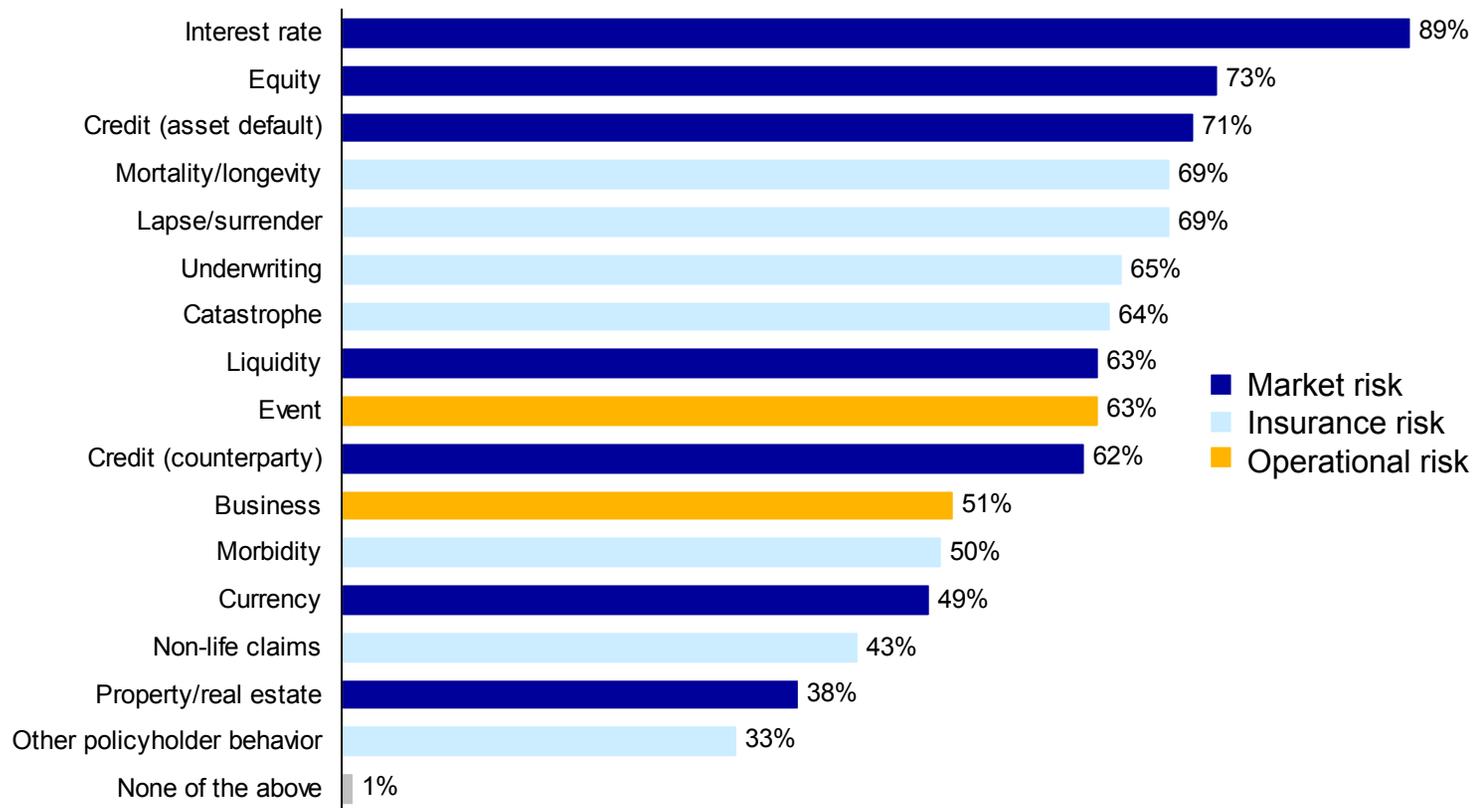
- For asset-liability risk, the more detailed metrics such as convexity and “Greeks” are used less often than simple duration analyses
- Some metrics are driven by regulatory requirements, such as tail value at risk (CTE) in North America
- Other popular metrics include economic capital, earnings volatility and asset concentration
- European companies use Value at Risk more than North Americans



Base: All Respondents Q.9 What metrics does your organization use for measuring and quantifying risk?

Risk management now includes a wide variety of risks, with market risks most frequently covered

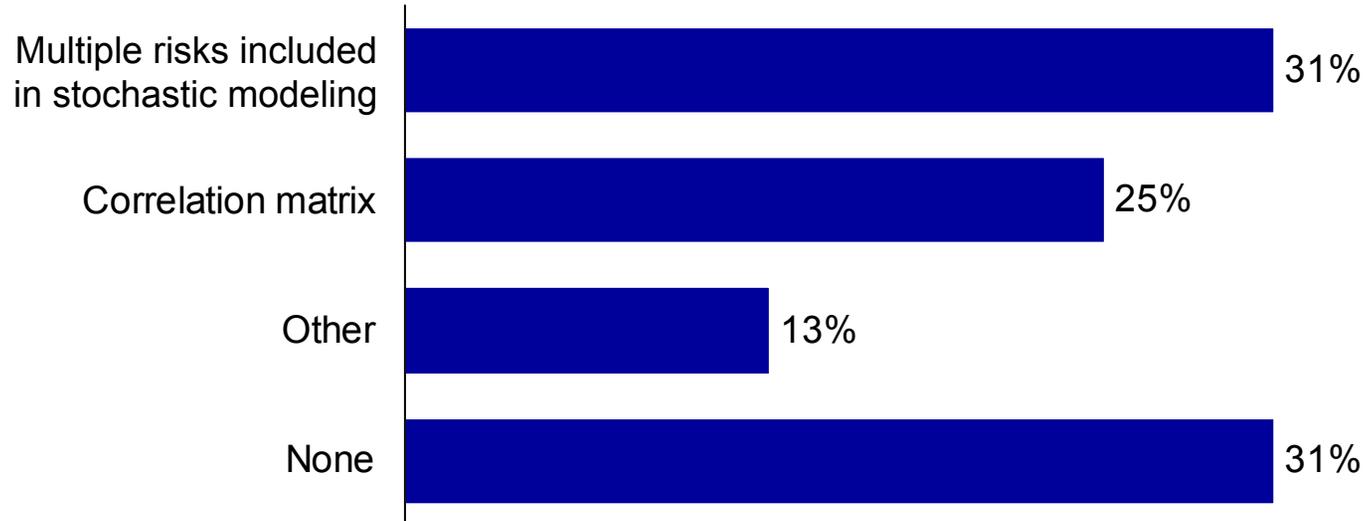
- Most respondents actively manage market risks such as interest rate, equity and asset default
 - European companies tend to focus more on market risks than other regions
- More than 60% of respondents include select insurance risks in their risk management processes — mortality/longevity, lapse/surrender, underwriting and catastrophe



Base: All Respondents Q.10 From the list of risks below, please select the risks that are actively included in your risk management processes.

Two thirds of respondents are aggregating risk, although there is not one dominant methodology for doing so

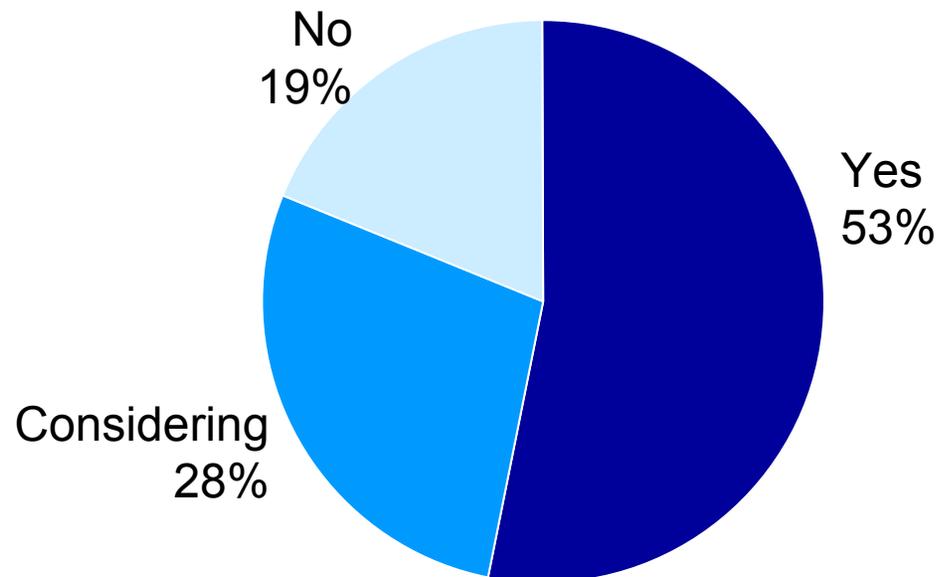
- Almost one third of respondents (31%) aggregate risks by including multiple risks within their stochastic modeling
- However, an equal number of respondents do not aggregate risk



Base: All Respondents Q.13 What methodology do you use for aggregating risk?

Economic capital calculations are becoming mainstream

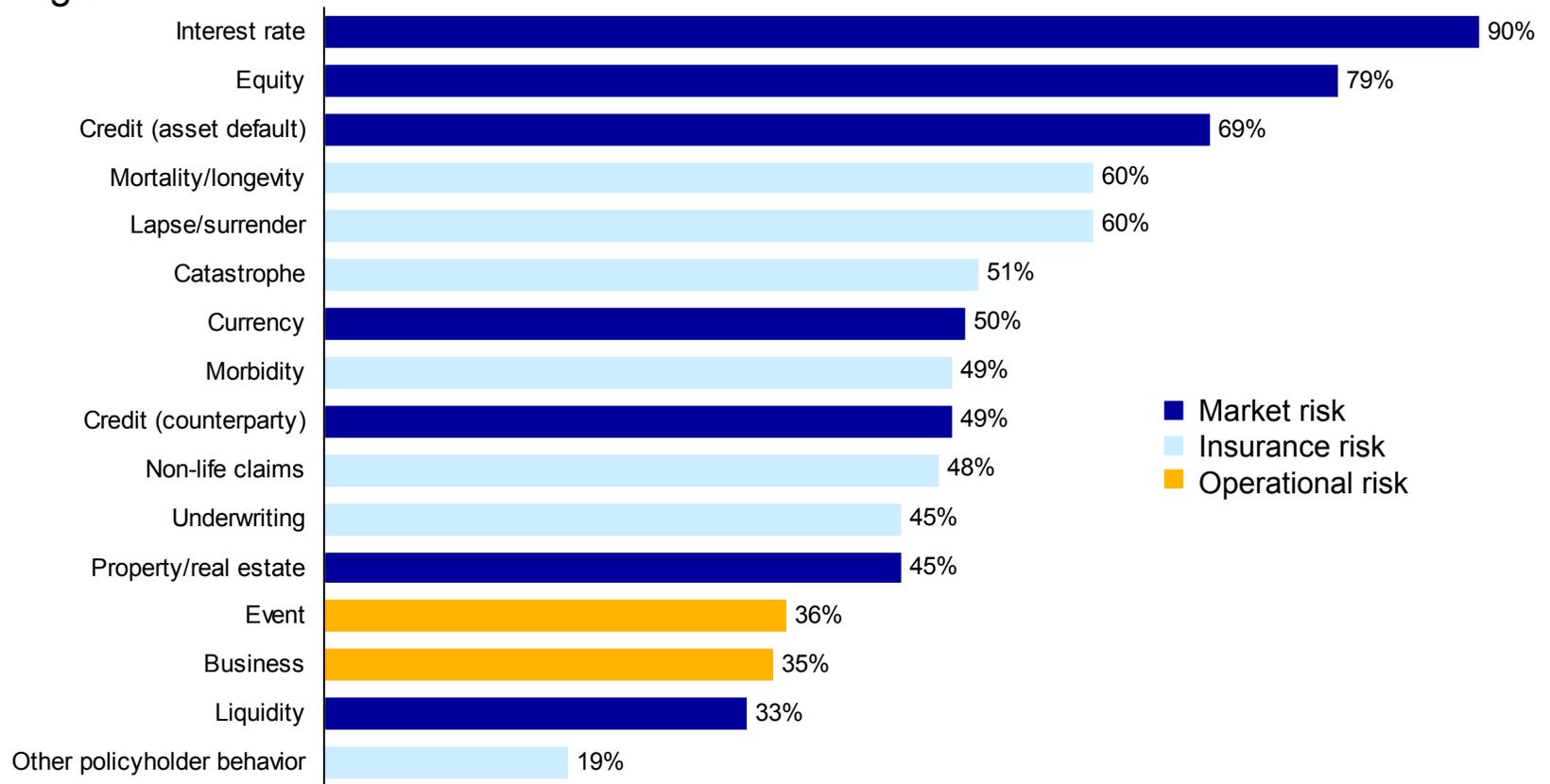
- Just over half of respondents (53%) calculate economic capital and a further 28% are considering calculating it
 - PC businesses and reinsurers have a slightly higher use of economic capital (59% and 56% respectively)
 - Only about one fifth (19%) of all respondents have no plans to calculate economic capital



Base: All Respondents Q.14 Does your organization calculate economic capital (EC) (e.g., measure the amount of capital needed based on the risk of the business)?

Market risks are most often captured in economic capital calculations; operational risk least often

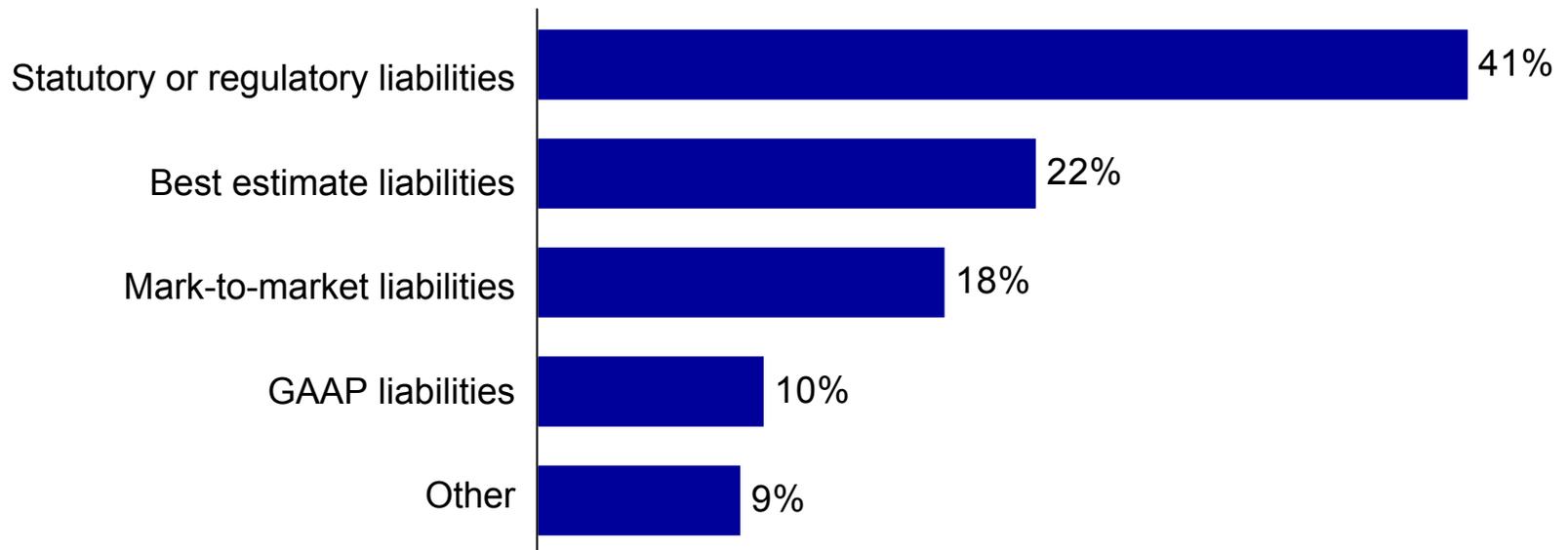
- Of those that calculate economic capital, market risks are used in calculations by most respondents
- European companies have greater coverage of risks than companies in other regions



Base: Those that calculate economic capital n = 80 Q.15 Of the risks that are included in your risk processes, please select the risks that are included in your economic capital calculations.

Statutory or regulatory liabilities are the most used definition of liabilities in economic capital calculations

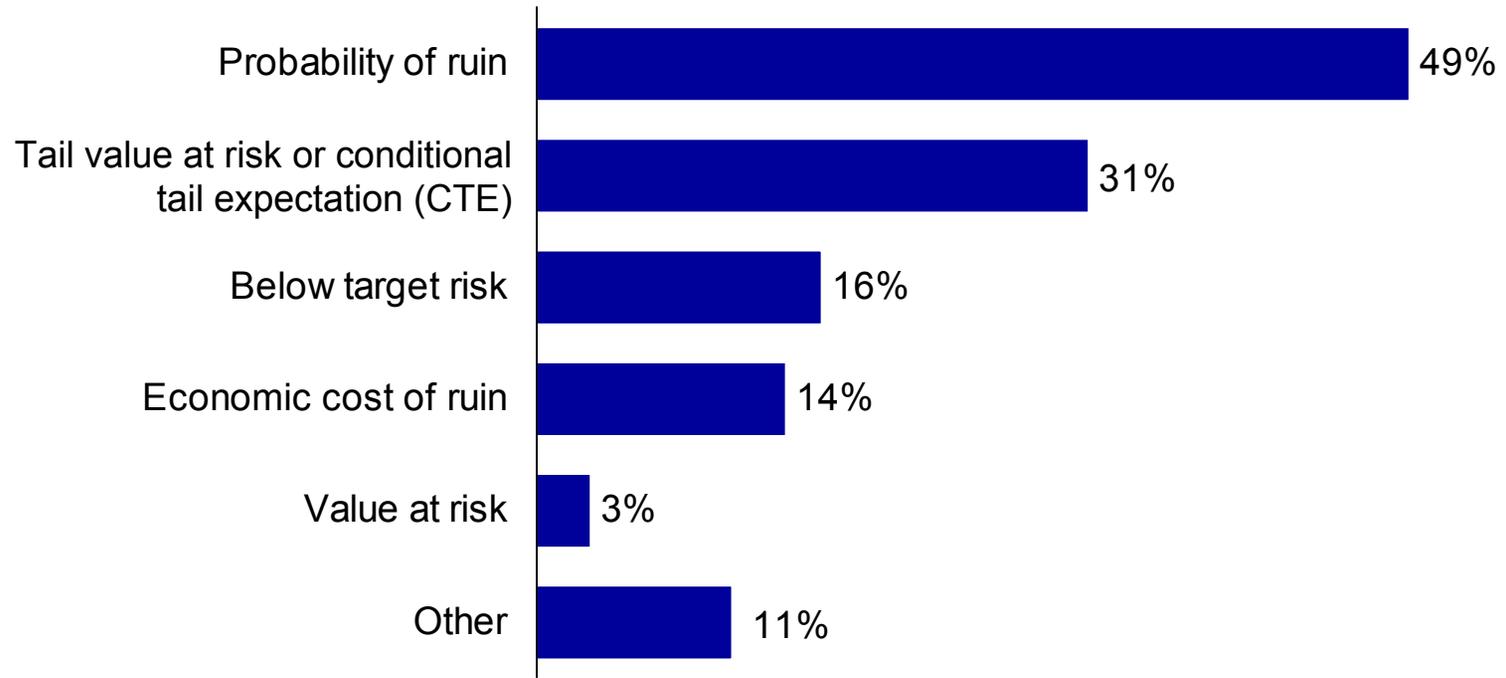
- Forty-one percent (41%) of respondents define economic capital as an amount in excess of statutory or regulatory liabilities
 - 55% of North American companies adopt this definition
- However, European and Asian respondents are more likely to use “economic” measures, e.g., mark-to-market or best estimate liabilities (52% and 55% respectively), as are PC businesses in general



Base: Those that calculate economic capital n = 80 Q.16 Economic capital is normally defined as the assets in excess of liabilities required to cover losses at a certain risk tolerance level. For this purpose what definition of liabilities do you use?

A wide variety of measures of risk tolerance are used

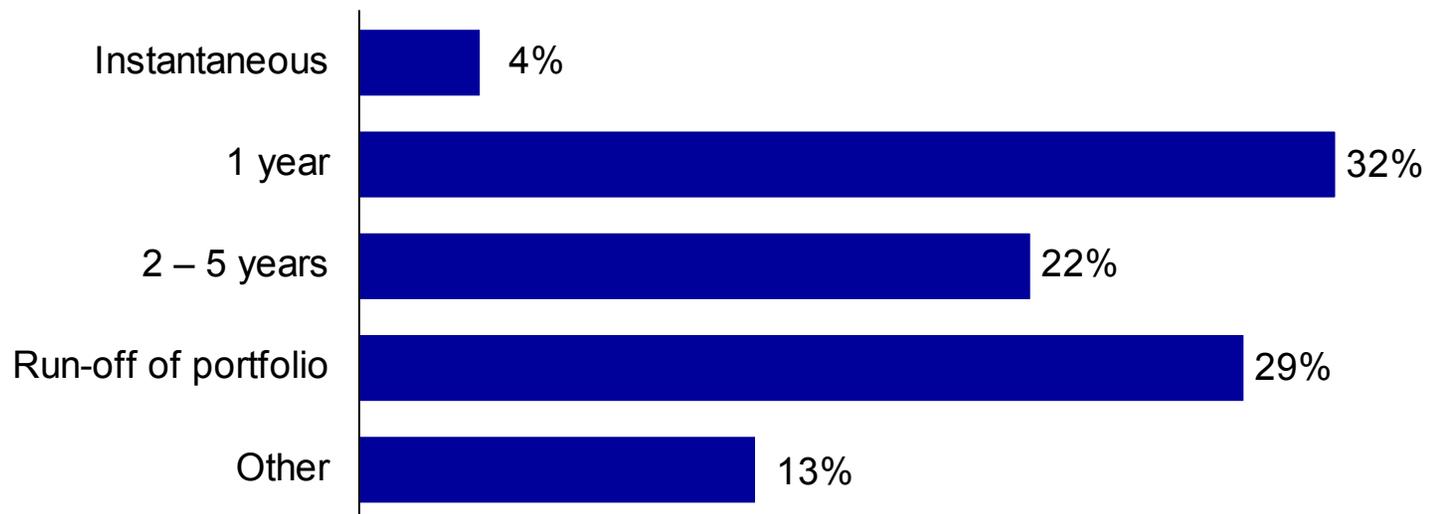
- There are significant differences by region
 - 48% in North America use Tail Value at Risk or CTE as the number one measure
 - 76% in Europe and 44% in Asia use Probability of Ruin as the primary measure



Base: Those that calculate economic capital n = 80 Q.17 What measures of risk tolerance do you use?

The period of risk assessment also varies widely

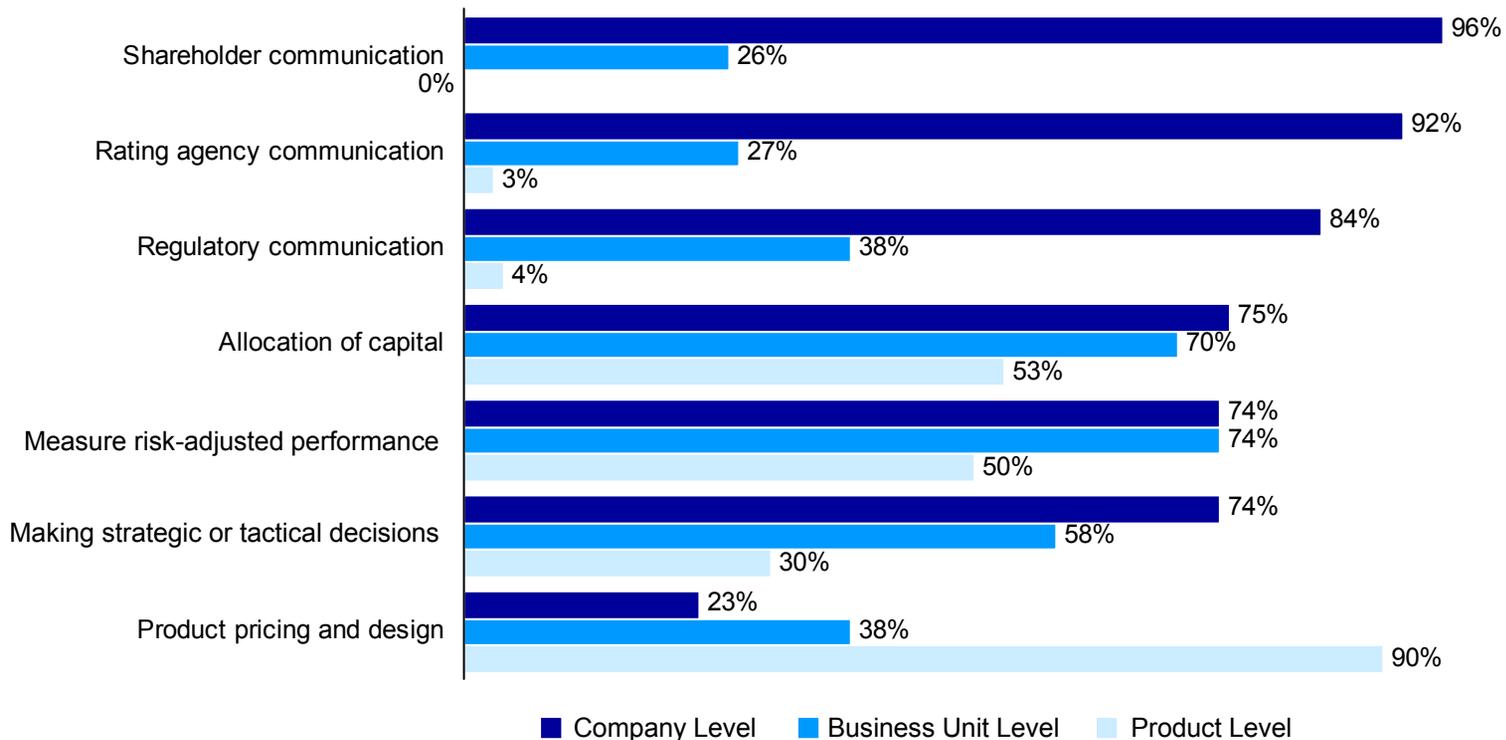
- When asked about the period of risk assessment, almost one third (32%) said they assess risk over a one-year period
 - Asian and European companies are most likely to use one year (56% and 45% respectively)
- Twenty-nine percent (29%) use the duration of the run-off of the portfolio —This number was higher for North American companies (40%)



Base: Those that calculate economic capital n = 80 Q.18 Over what period do you assess risk?

Economic capital is used in key internal decision-making processes as well as in communications to shareholders, rating agencies and regulators

- External communication of economic capital results is widespread, with the focus being on shareholders (96%) and rating agencies (92%) ahead of regulatory (84%)
- Almost three quarters (74%) of respondents use calculations to measure risk-adjusted performance at the business unit level and to make strategic or tactical decisions

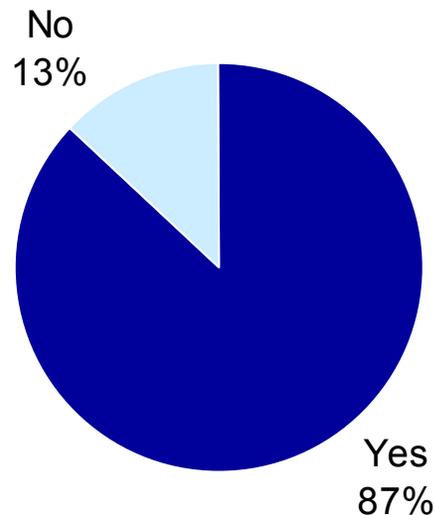


Base: Those that calculate economic capital* n = 80 Q.19 How do you use, or plan to use, these economic capital calculations?
*Percentages exclude not applicable/no answer.

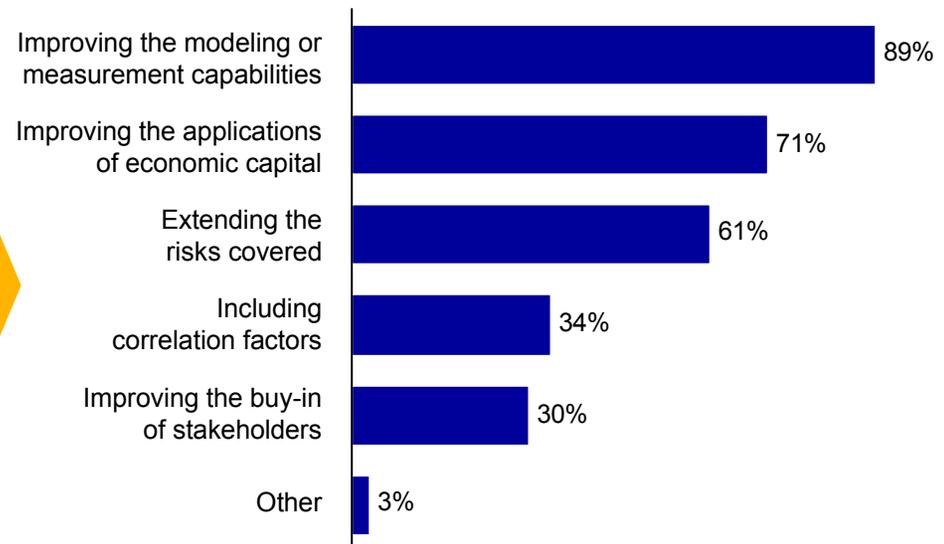
Most respondents plan further improvements to their economic capital calculations

- Of those planning improvements, the most frequently mentioned goals are improving the modeling or measurement capabilities (89%), improving the applications of economic capital (71%) and extending the risks covered (61%)
- Objectives vary depending on where companies are already in the process
 - North Americans plan to extend their risk coverage (72%), while Europeans plan to improve the applications (82%)

Plans for Further Improvements



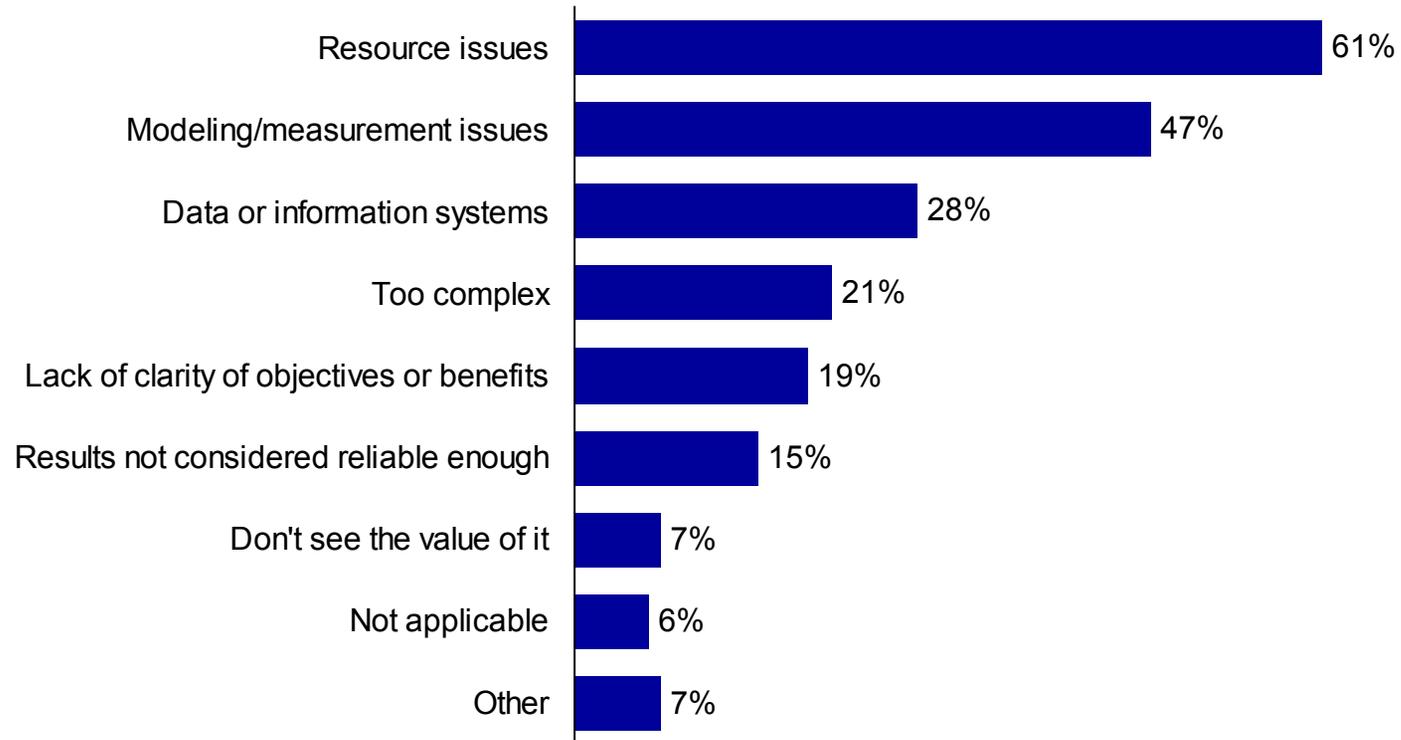
Goals of Planned Improvements



Base: Those that calculate economic capital n = 80 Q.20 Are you planning to make further improvements or enhancements to your economic capital calculations or framework? Base: Those planning further improvements/enhancements to the economic capital calculations n=70 Q.21 What are the goals of the planned or future improvements to the economic capital calculations or framework?

Of the 98% of respondents not using economic capital extensively, the majority cite lack of resources as the reason why

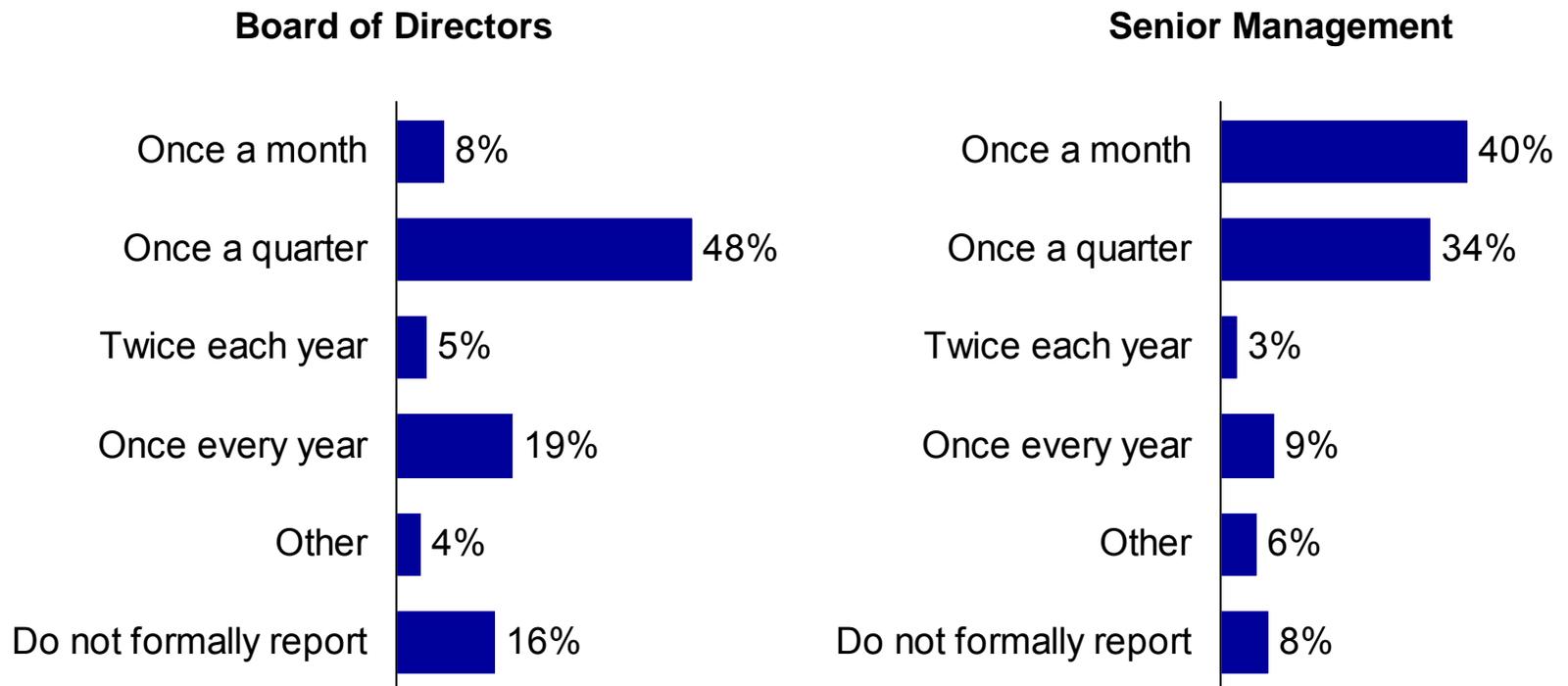
- Resource issues are the greatest barrier to more extensive economic capital use (61%)
 - Almost half of all respondents (47%) indicate that modeling/measurement is a reason for not using economic capital



Base: All Respondents Q.22 What are the main reasons you are not using economic capital or its applications more extensively?

The frequency of risk reporting is very low, given its importance

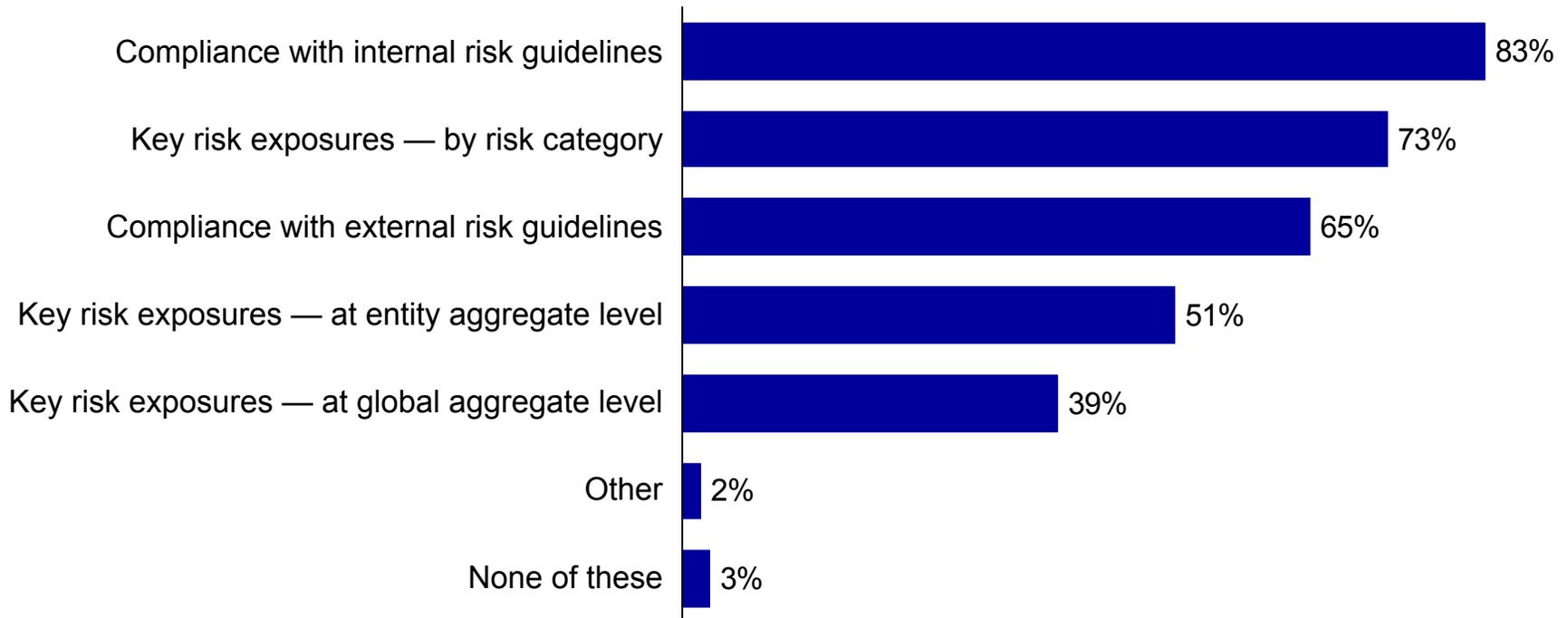
- 92% of respondents report once a quarter or less to the Board
- Only four in ten respondents report on risk to senior management at least once a month
 - European companies report even less frequently to senior management



Base: Total Respondents Q.23 How frequently do you report on risk to these two groups?

While almost three quarters monitor individual key risks, fewer are monitoring aggregate risk exposures

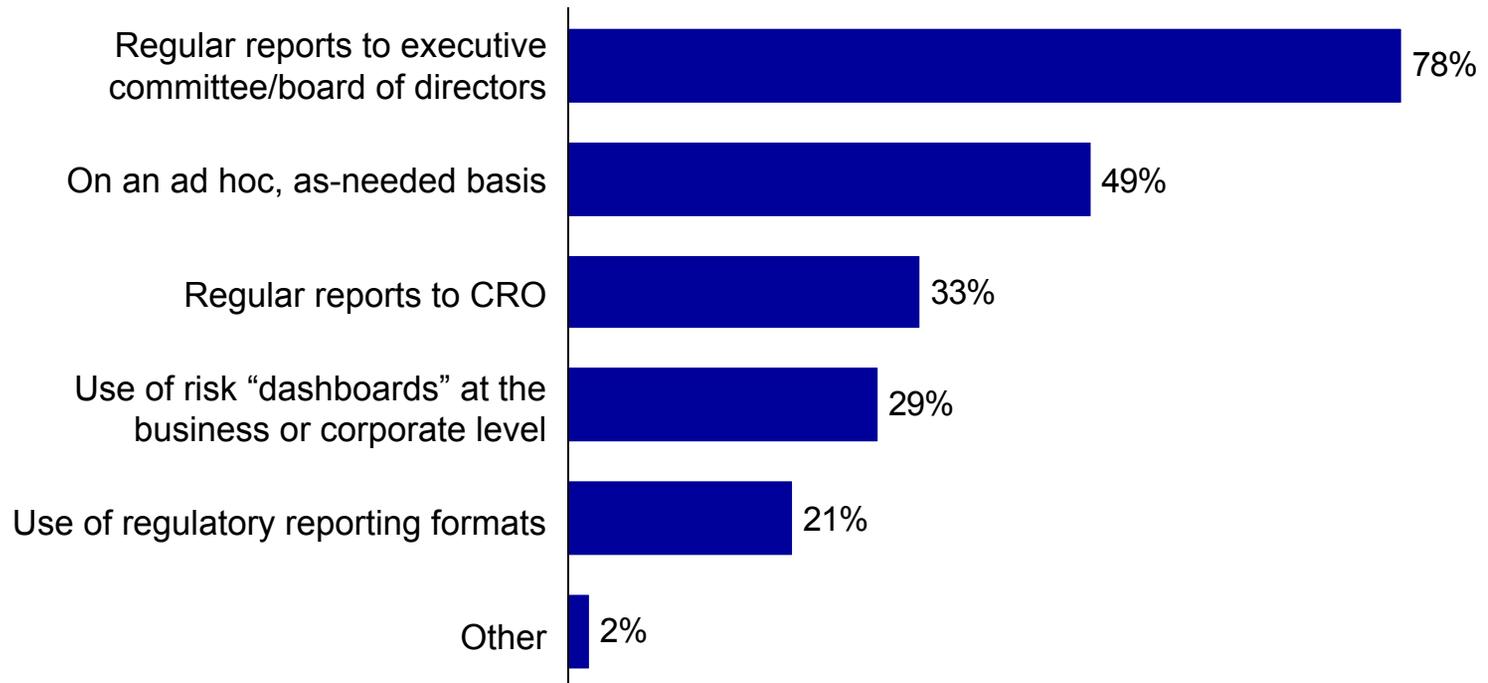
- Compliance with internal risk guidelines is monitored by more than eight in ten respondents (83%) and compliance with external risk guidelines is monitored by almost two thirds of respondents
- Almost three quarters (73%) monitor key risk exposures by risk category.



Base: All Respondents Q.24 Does your organization regularly monitor any of the following?

Regular reporting is common for the internal communication of key risks

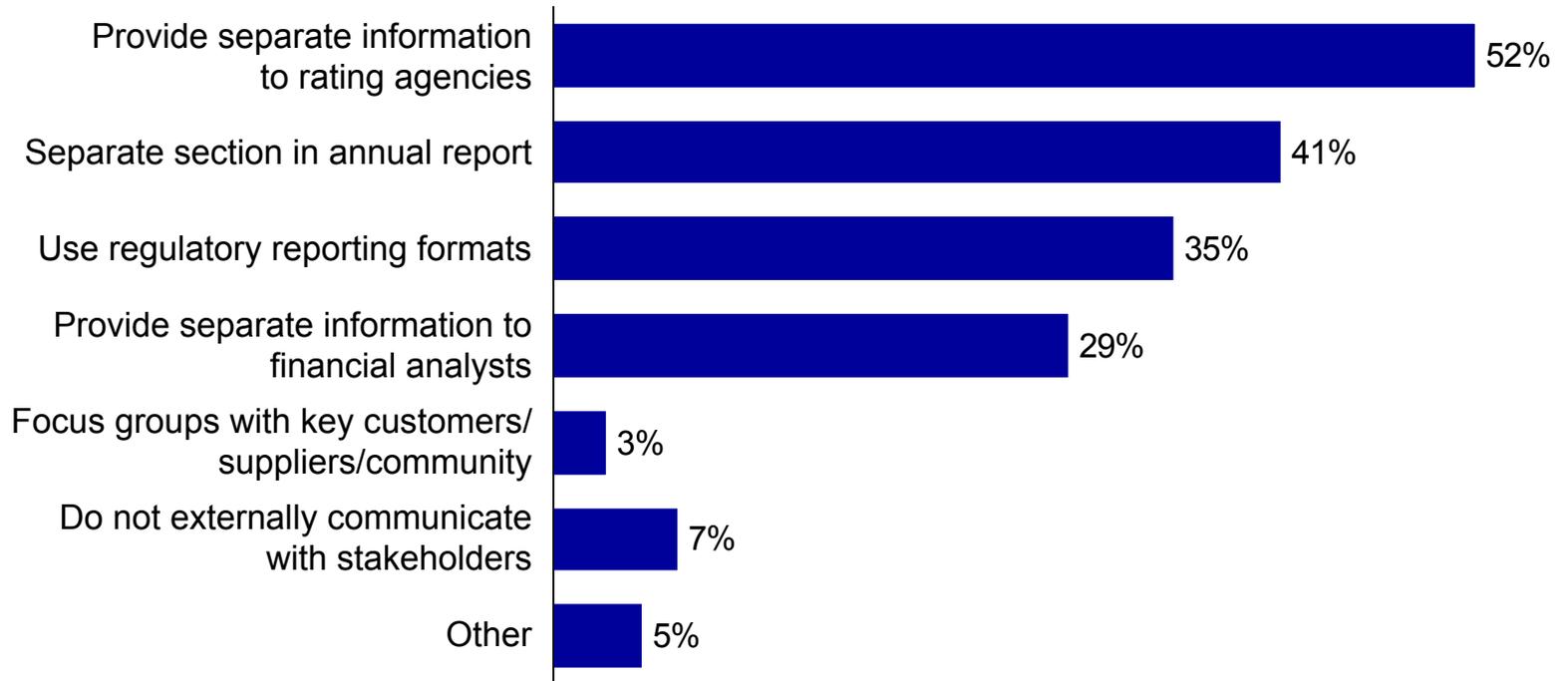
- More than three quarters of respondent organizations (78%) internally communicate key risk exposures and risk management activities via regular reports to their executive committee/board of directors
 - Almost half (49%) communicate key risks on an ad hoc basis



Base: All Respondents Q.25 How does your organization internally communicate its key risk exposures and risk management activities?

Externally communicating key risks and risk management is important for the majority of companies

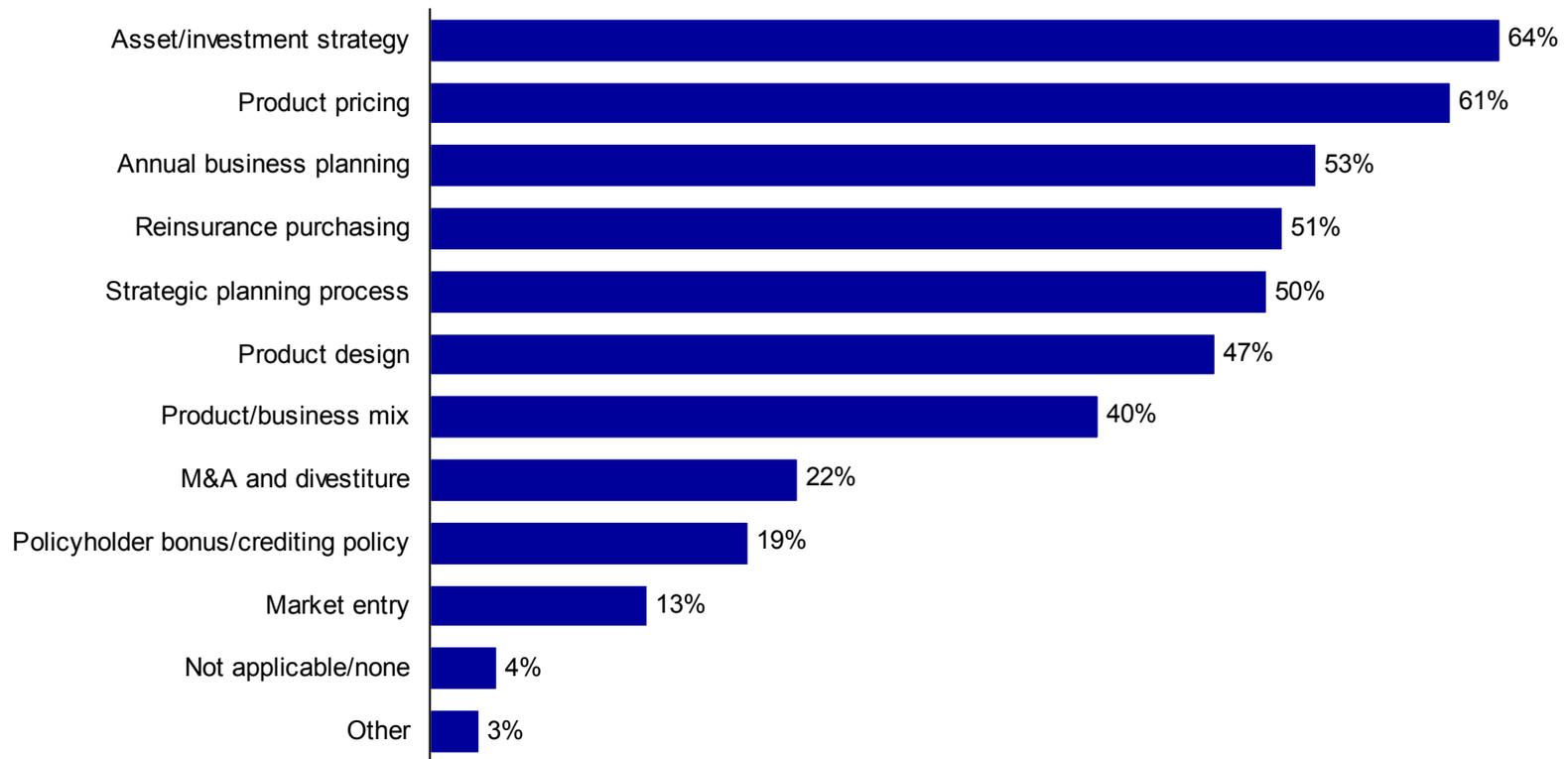
- More than half of respondent organizations (52%) provide separate information to rating agencies as a means of external communication about risks and risk management activities.
- Forty-one percent (41%) have a separate section devoted to risk management in their annual report — more noticeably in Asia (57%) and Europe (50%)



Base: All Respondents Q.26 How does your organization externally communicate with key stakeholders about risks and risk management activities?

Key business decisions are already being affected by risk management considerations

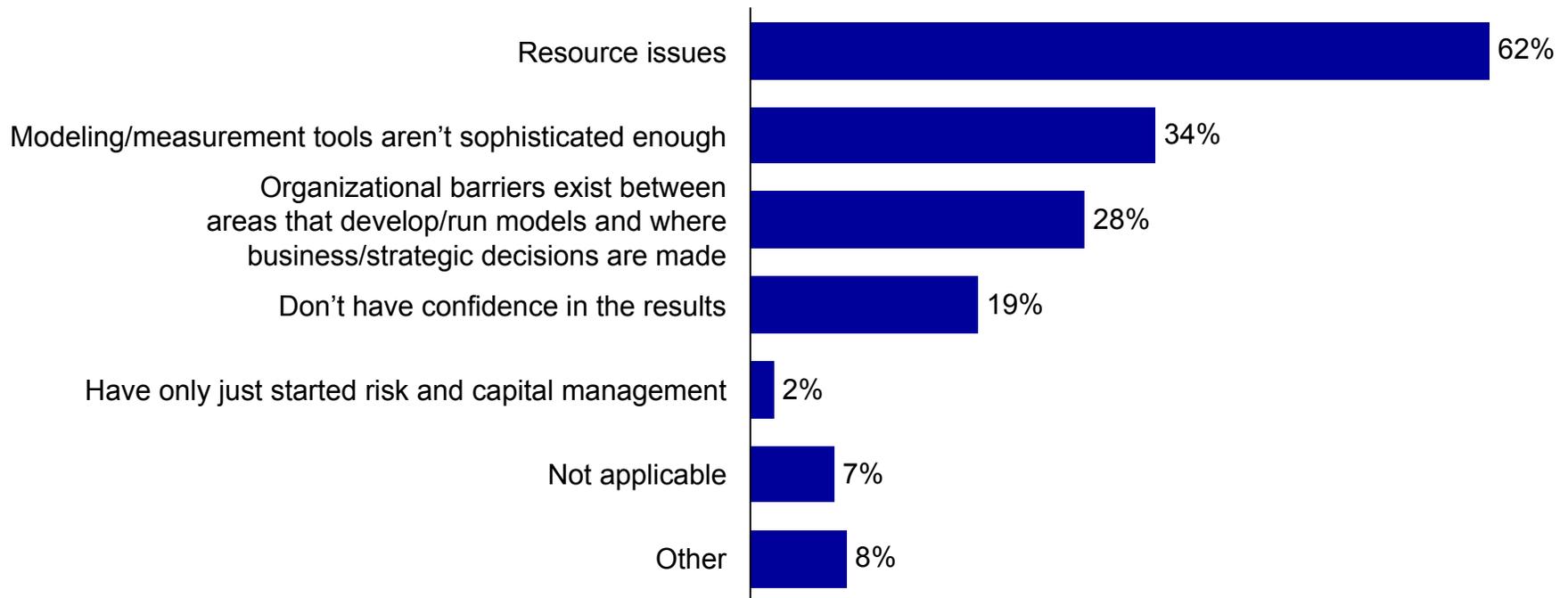
- Risk management considerations have most often resulted in a business decision change in the areas of asset/investment strategy (64%), product pricing (61%), annual business planning (53%), reinsurance purchasing (51%) and strategic planning (50%)



Base: All Respondents Q.28 In which areas have risk management considerations resulted in a change of business decisions?

Resource issues are the primary reason that risk and capital management tools are not used more in decision making

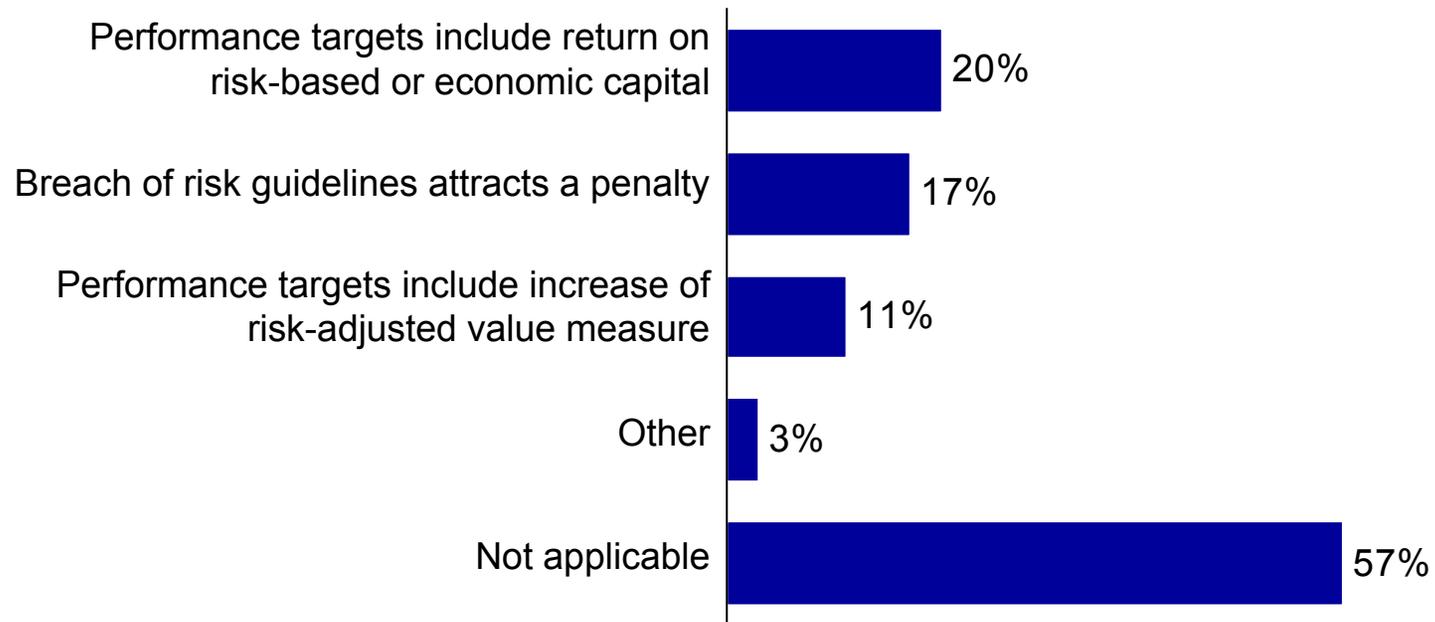
- Resource issues are the most commonly cited reason for not using risk and capital management tools more in decision making (62%)
 - This was also the reason most frequently mentioned for not using economic capital
- Slightly more than one third of respondents (34%) indicate that modeling/measurement tools aren't sophisticated enough



Base: All Respondents Q.30 What are the reasons you are not using risk and capital management tools more in decision making?

Allowance for risk is only infrequently incorporated into incentive compensation

- More than half of respondents (57%) indicate that risk measures are not incorporated into their organization's incentive compensation



Base: All Respondents Q.31 To what extent are risk measures incorporated into your organization's incentive compensation?

Agenda

- Defining ERM
- Economic Capital
- Adding value through ERM
- Where is the market? - Surveys
- **ERM tools and techniques**
- The CRO function

Best practice companies integrate well-designed financial models and analysis into the way they run their business

Design

- Base on company's unique needs and intended uses
- Reflect company's requirements for speed vs. accuracy
- Focus on what is material

Integrity

- Platform
- Data
- Company experience validated against industry norms
- Disciplined model revision process
- Subject to independent review

Efficiency

- Efficient updating and maintenance
- Consider interaction with other systems and processes
- Integrated with other processes — e.g., planning, pricing, investment

Financial Model

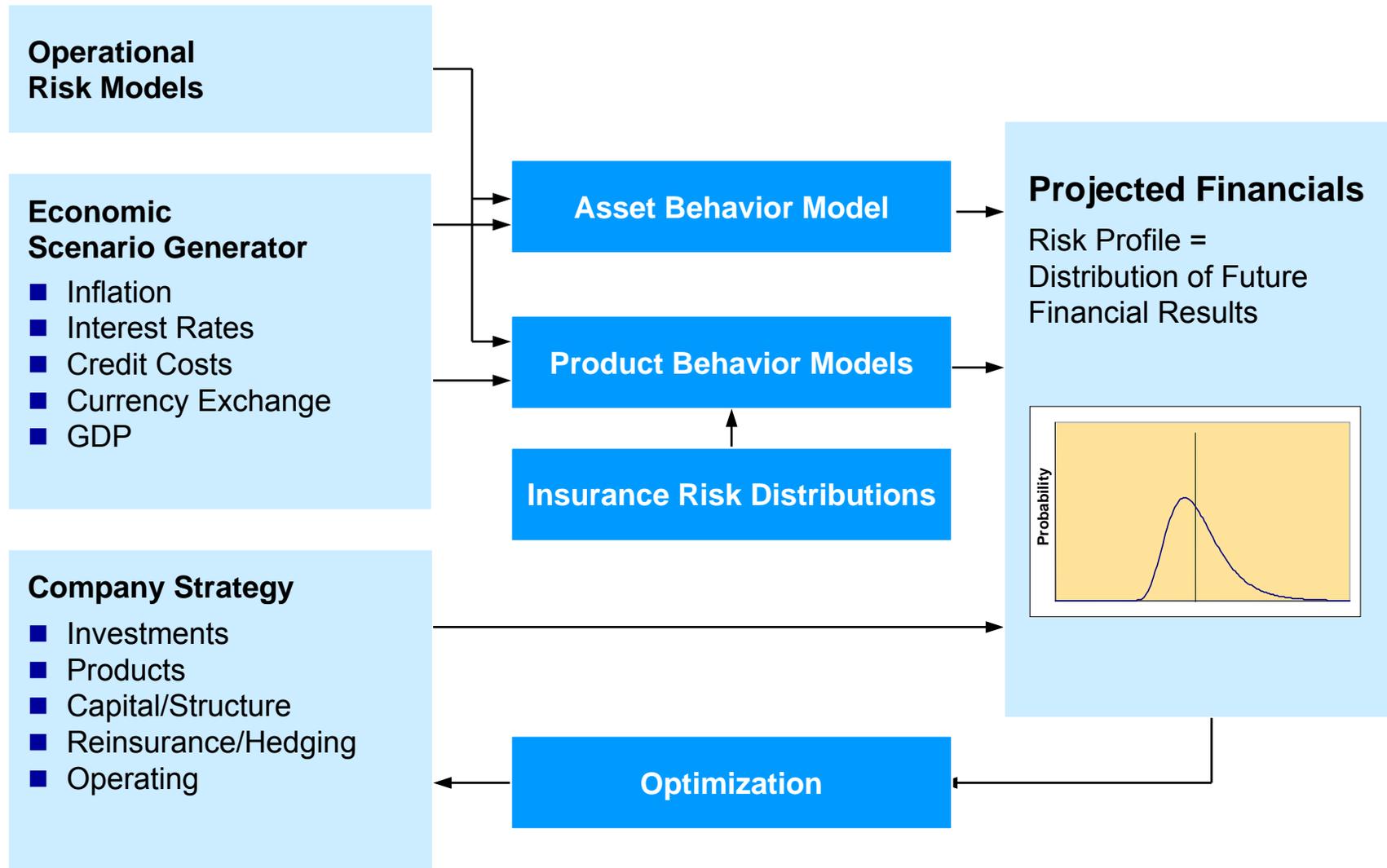
Uses:

- Cash flow testing
- Long-term plan
- Short-term plan
- ALM
- ERM
- "What if" testing
- Embedded value
- Capital management
- Risk analysis
- Reinsurance strategy
- Distribution management

Results

- Link to actions that will build value
- Available on a timely basis

Enterprise risk models help translate risk into financial measures



Assumptions and Calibration are two critical steps in model construction

- Assumptions refer to the mean value of key economic variables:
 - bond yields
 - inflation
 - dividend yields
 - equity risk premia
 - claim trends
- Well researched in a multi-period time frame
- Calibration refers to more subtle aspects of the models behavior
 - Degree of mean reversion
 - Probability of 'extreme' values
 - Key linkages between variables (e.g., correlations)

Key purpose of model is to test retention / transfer / mitigation strategies



- Overlay business strategies (e.g., product mix, asset allocation) and risk management strategies
- Link results to financial measures
- Develop results distribution for each strategy

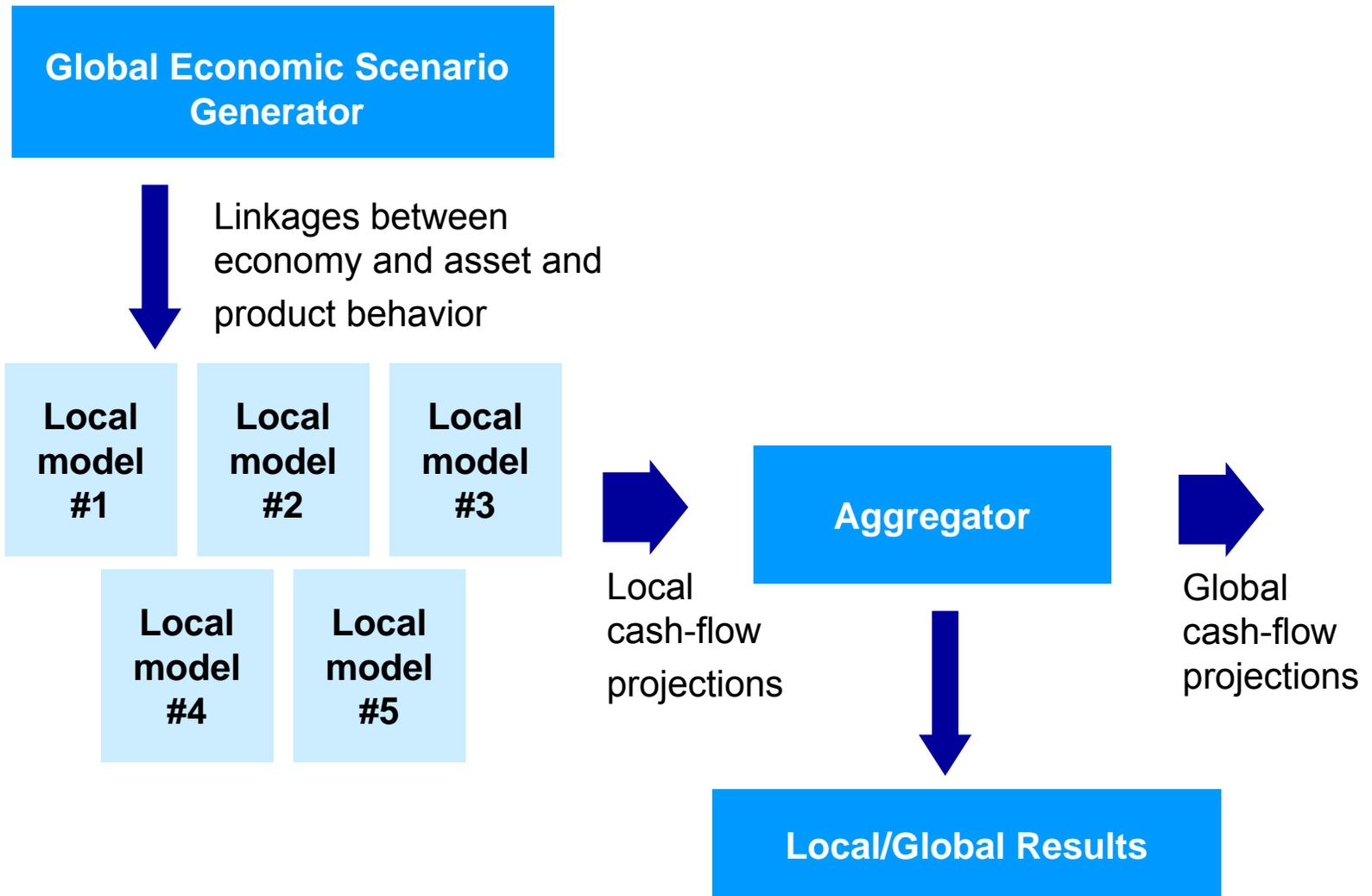
For each strategy:

- Establish economic capital
- Allocate capital to business segment

For each strategy:

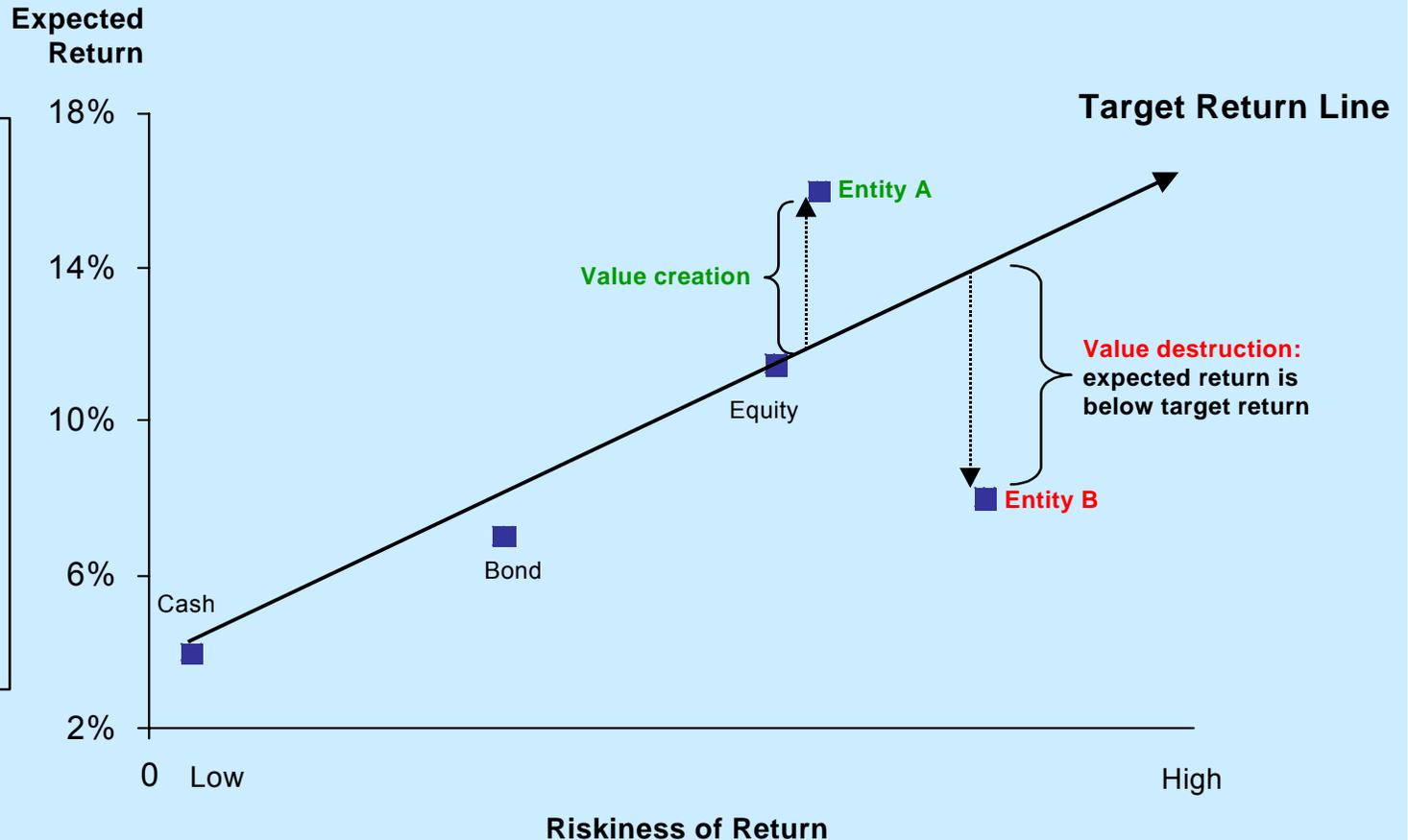
- Determine expected financial return
- Determine riskiness of return
- Compare to alternatives

Analytical framework is built on local and global economic models



Models monitor value creation and destruction across various business units

1. Each economic scenario generates a cash-flow projection with a rate of return
2. The average rate of return across all projections is the **expected return**
3. The volatility of returns across scenarios determines the riskiness of returns and, hence, the **target return**



Agenda

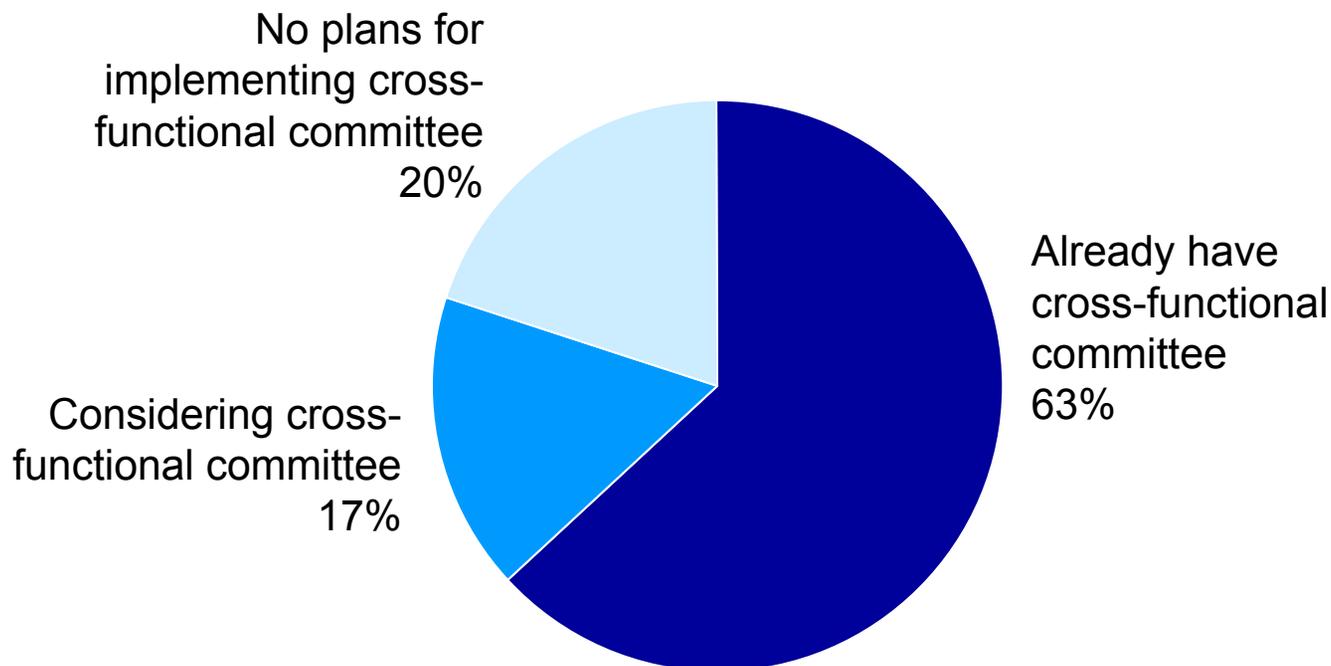
- Defining Enterprise Risk Management (“ERM”)
- Economic Capital
- Adding value through ERM
- Where is the market? - Surveys
- ERM tools and techniques
- **The CRO function**

ERM and the role of the Chief Risk Officer (“CRO”)

- Roles and responsibilities
- Governance
- Functions
- Role of actuary

Cross-functional risk management committees have increased dramatically

- Almost two thirds of respondents (63%) in our 2004 survey already have cross-functional risk management committees, and an additional 17% are considering such a committee
- Just under half of US headquartered respondent companies and over 70% of non-US insurers have such a committee



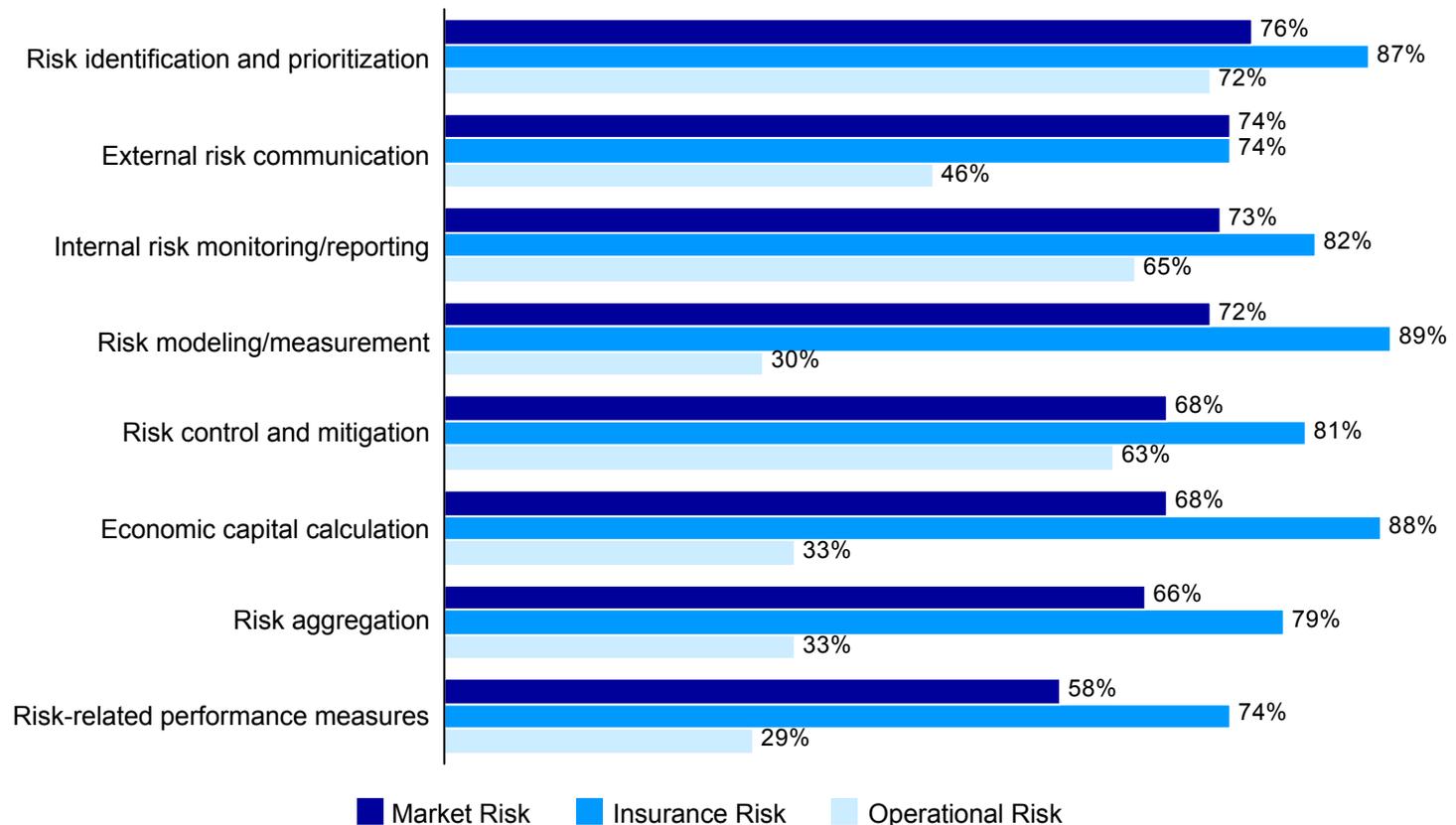
Base: All Respondents Q.6 Does your organization have a cross-functional risk management committee?

Risk management committees typically include broad set of senior management

- Audit: Board, CEO, COO, CFO, chief actuary, general counsel
- ALM: CEO, COO, CFO, CIO, chief actuary, portfolio managers
- Investment: Board, CEO, COO, CFO, CIO, general counsel, chief actuary, head of marketing
- Compliance/market conduct: Compliance officer, LOB heads, head of internal audit
- Executive: CEO, CFO, senior LOB functional managers
- Risk management: CEO, COO, CFO, CIO compliance officer, risk manager, ALM manager, chief underwriter, head of tax, chief actuary, controller, treasurer, head of internal audit, LOB heads, general counsel, head of reinsurance, head of HR

Accountability has improved as roles and responsibilities have been assigned

- Insurance risk is the most likely area to have clearly defined and assigned roles and responsibilities while operational risk management processes are not



Base: All Respondents* Q.7 For which of the following risk management processes are roles and responsibilities clearly delineated and assigned?
 *Percentages exclude not applicable.

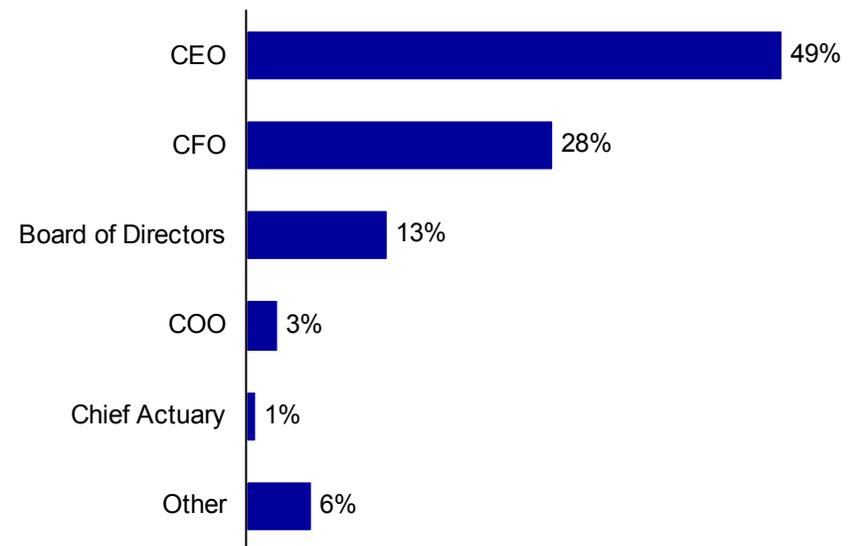
The person responsible for risk is most likely to report to the CEO

- Almost 40% of respondents indicate that the CRO is responsible for risk management in their organization.
- Almost half of respondent firms (49%) have the person responsible for risk management report to CEO, up from 26% in 2002

Responsible for Risk Management



To Whom Primarily Reports



Base: All Respondents Q.4 Who is responsible for risk management in your organization? Q.5 To whom does the person responsible for risk management primarily report?

The CRO role has evolved from technician to policy developer

- CRO is more accountable for the risk management and the development of the enterprise risk management framework including economic capital
- The role is seen as more integrative and cross-functional; not based in silos as in prior experience
- The CRO is now viewed as having a role on par with other C-level executives
 - Senior position is necessary for risk management oversight over many business functions
 - It also enables the CRO to influence business policy, particularly where business risks are taken or where they need to be mitigated or avoided

Internal role within firm

- Create risk culture
- Senior manager, report to Board, CEO, CFO
- Articulate risk appetite
- Advocate doing business – given risk appetite
- Needs to create processes to execute mandate
- Valued partner vs. future scapegoat

Internal ERM processes

- Information gathering across organization
- Consistent, firmwide risk framework
- Exposure assessment and quantification
- Analysis of risk mitigating strategies
- Execution of hedging, insurance and other risk management transactions
- Monitoring and reporting to CEO and Board

External role with stakeholders

- Communicate and articulate firm's risks and responses to shareholders and others
- Focal point for rating agencies and regulators
- Credibility:
 - How “real” is the responsibility?
 - How much influence in the C-suite?
 - How effective before, during and after a crisis?
- Valued partner or future scapegoat?

The CRO tends to come from within for insurance organizations

- In our research we found approximately two-thirds of insurance CROs were promoted from within:
 - Originated from a variety of functional areas
 - internal audit
 - risk management
 - strategic planning
 - CROs hired from the outside came from positions in accounting, risk management and consulting

Actuaries face competition for CRO role

- Majority of insurance companies (56%) appoint the CRO from an existing internal position
 - Actuarial (47%)
 - Finance (16%)
 - Other (37%)
- For insurance companies that recruit the CRO from the outside, actuarial is still the leading source discipline
 - Actuarial (33%)
 - Banking (27%)
 - Risk management (13%)
 - Other (27%)
- 2001 research study

Qualifications and attributes

- Is there a preferred path to becoming CRO?
 - Knowledge of how the firm operates
 - Corporate finance (CFO, Treasurer)
 - Trading, especially derivatives
 - Insurance

- Are qualifications or accreditations necessary?
 - FSA, FCAS, FRM, PRM, CFA
 - Ph.d., MBA

Can anyone do ERM?

