



Casualty Loss Reserve Seminar

ERM-2: Economic Capital and Risk Appetite for P/C Insurers

by Joe Lebens and Tom McIntyre

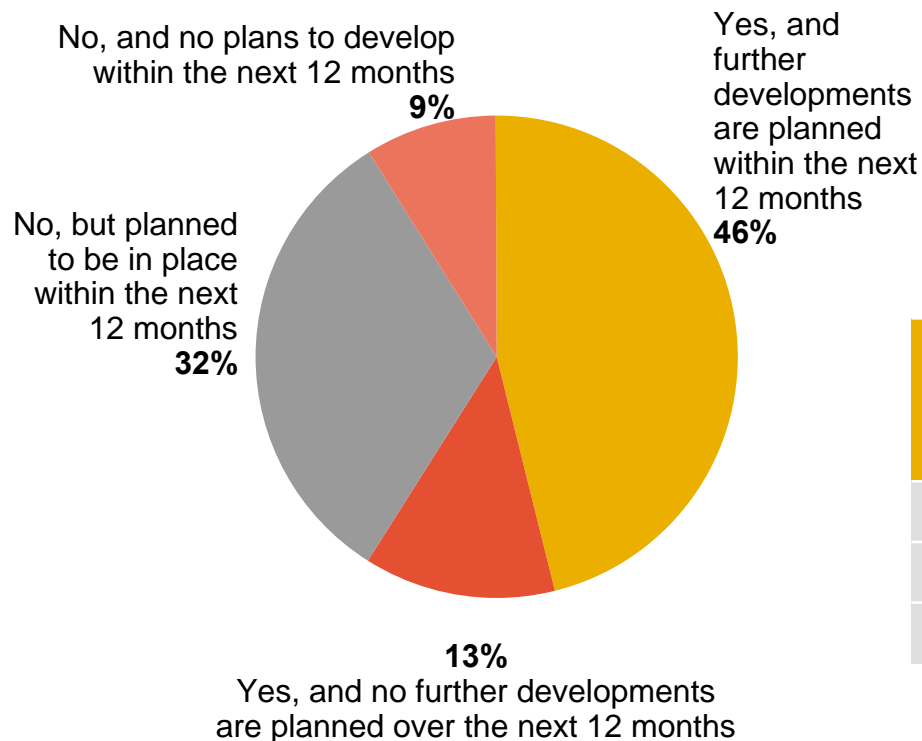
12:30 – 2:00pm Tuesday September 21, 2010

Agenda

- 2010 Enterprise Risk Management Survey
- Defining Risk Appetite
- Risk Appetite Case Study
- Risk Tolerances/Limits and Economic Capital
- Economic Capital – One Year Market Consistent Aggregation
- Economic Capital – Dynamic Financial Analysis

2010 ERM Survey Results

The proportion of respondents who have a documented risk appetite has increased from 47% in 2008 to 59% in 2010



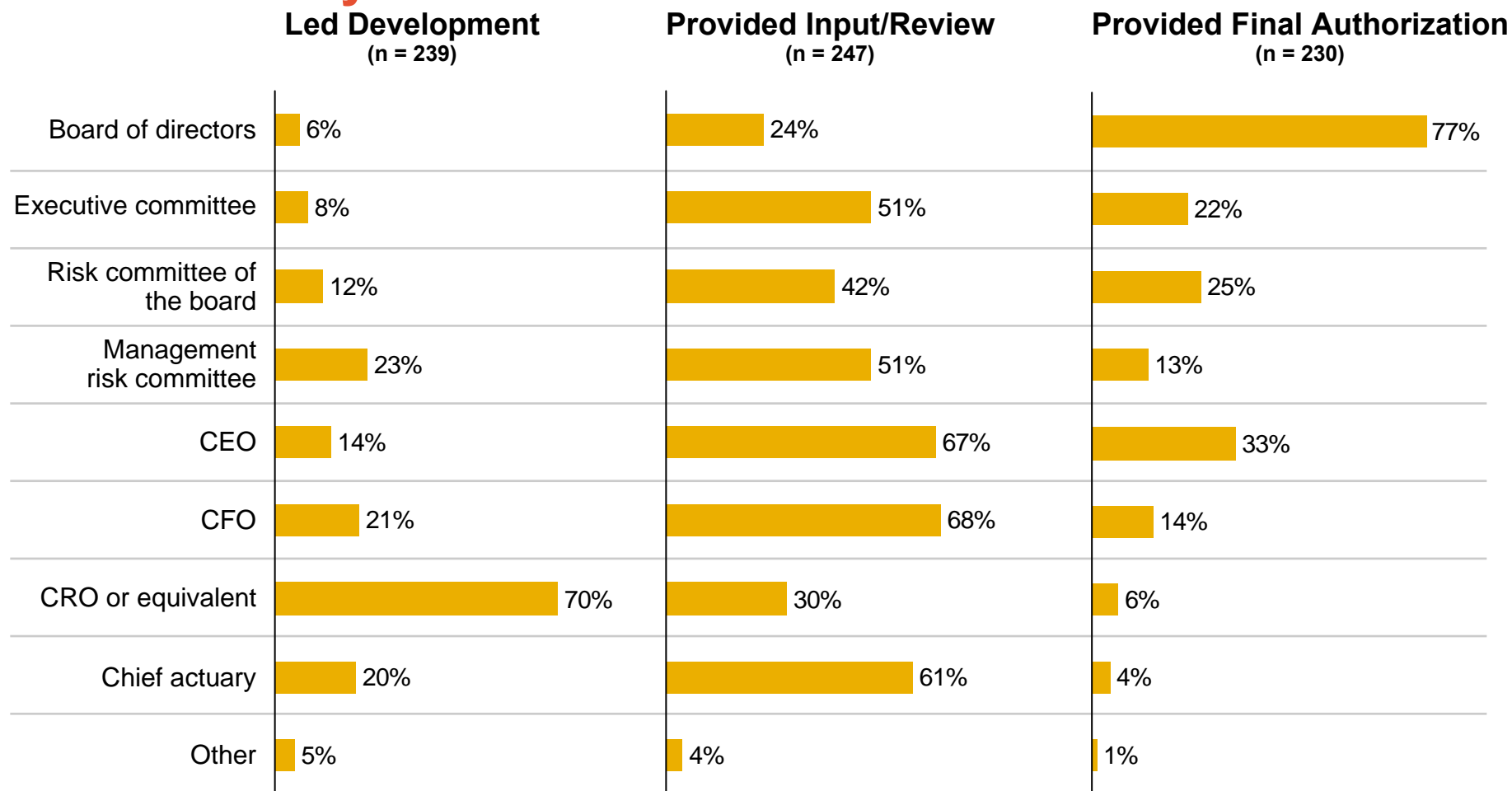
	In Place		Not in Place, but Planned		No Plans	
	2008	2010	2008	2010	2008	2010
Small	34%	53%	44%	35%	22%	12%
Medium	56%	59%	33%	32%	11%	9%
Large	58%	71%	33%	29%	9%	0%

Source: 2010 Towers Watson ERM Survey

Q.12 Do you have a documented risk appetite/tolerance statement? Please select one response.

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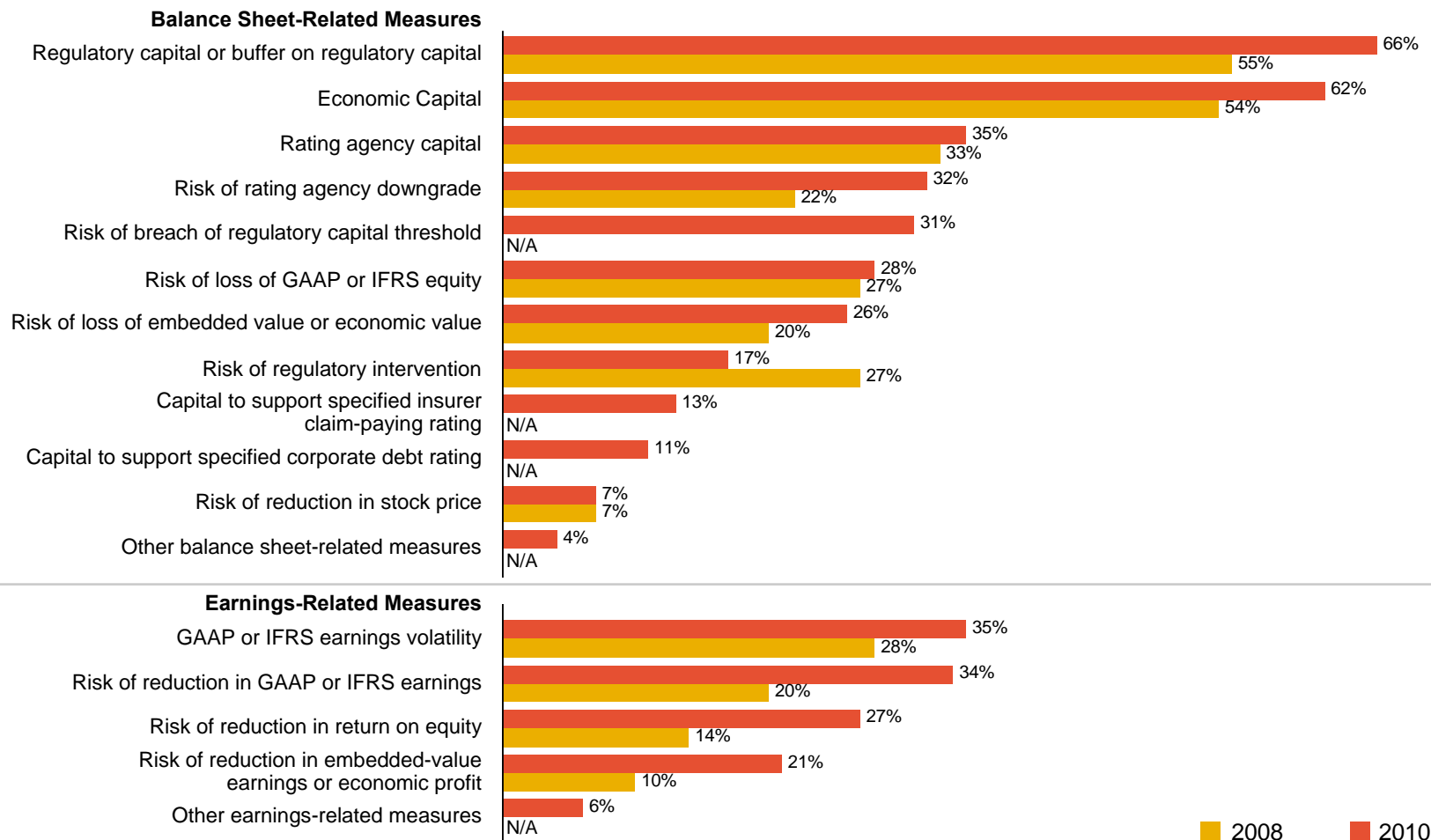
Development of risk appetite is typically led by the CRO, takes input from many areas of the company and is authorized by the board



Source: 2010 Towers Watson ERM Survey

Q.13 Who was involved in the development and approval of the current overall risk appetite statement? Please select all that apply.

As in 2008, balance sheet solvency is the principal focus of risk appetite statements, but earnings-related measures are being included with greater frequency as well

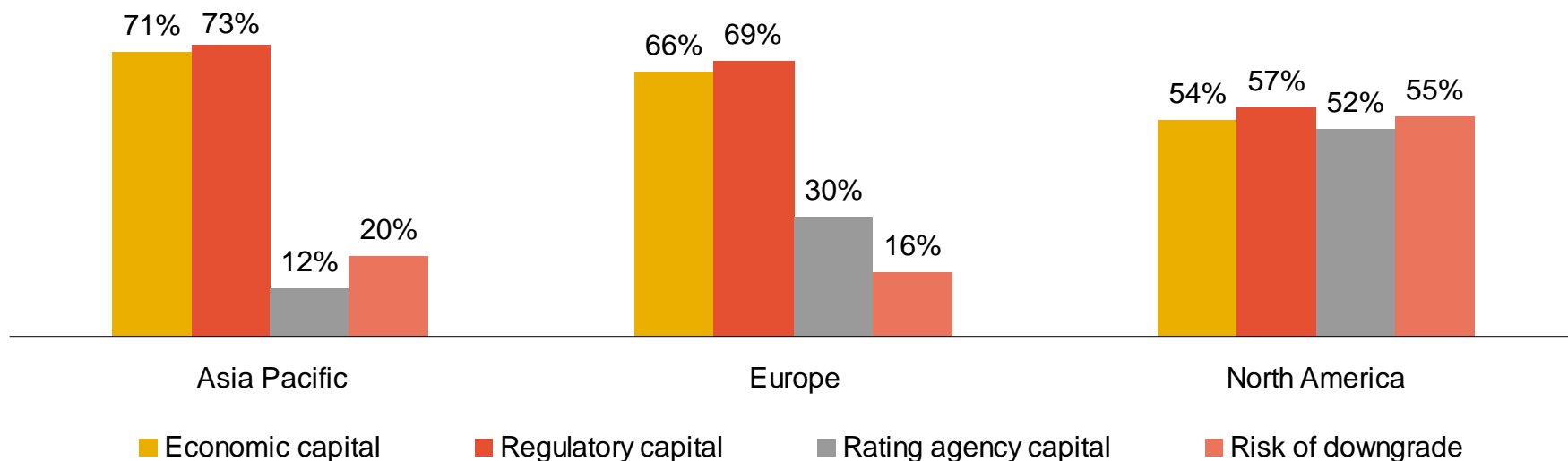


Source: 2010 Towers Watson ERM Survey

Q.14 Which of the following measures of risk are used in your risk appetite/tolerance statement? Please select all that apply.

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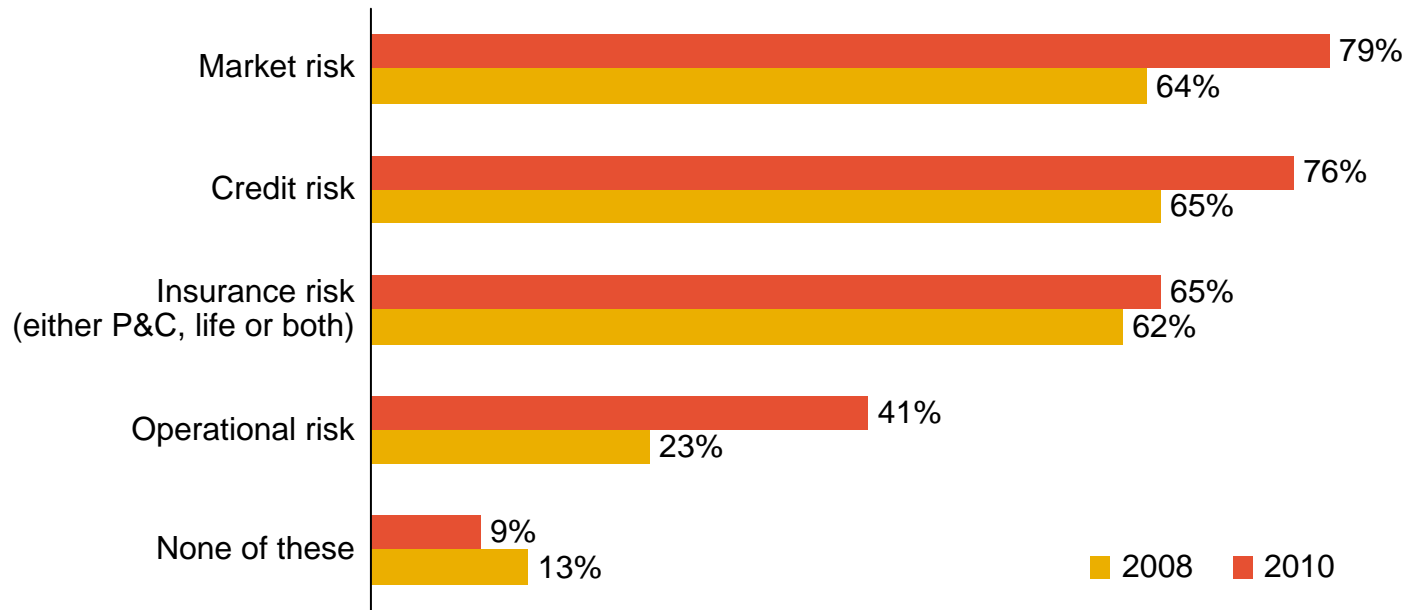
Regulatory and economic capital are the key metrics used in risk appetite statements across each of the major regions



Source: 2010 Towers Watson ERM Survey

Q.14 Which of the following measures of risk are used in your risk appetite/tolerance statement? Please select all that apply.

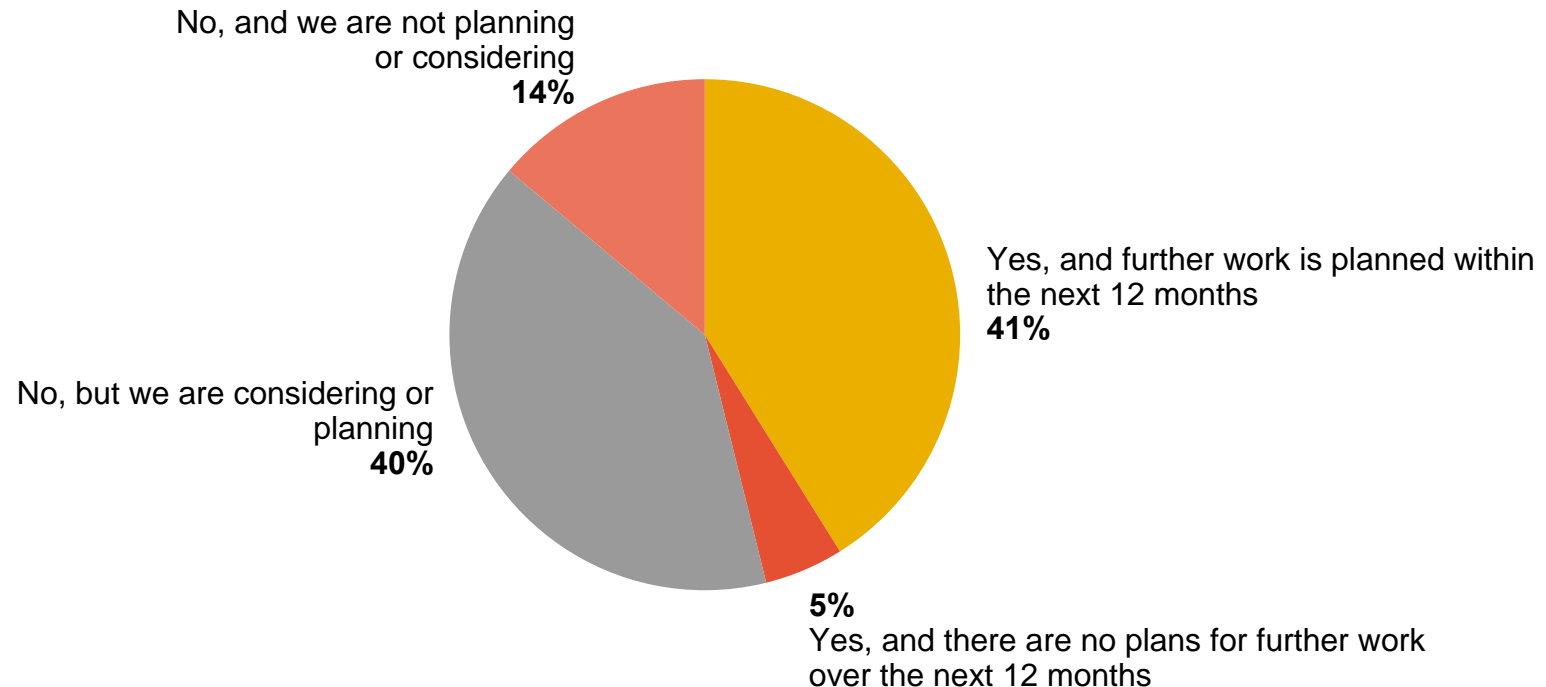
The focus on market, credit and operational risk limits has heightened, perhaps as a result of the financial crisis



Source: 2010 Towers Watson ERM Survey

Q.17 For which of the following types of risk have you set limits to govern day-to-day risk taking within the business? Please select all that apply.

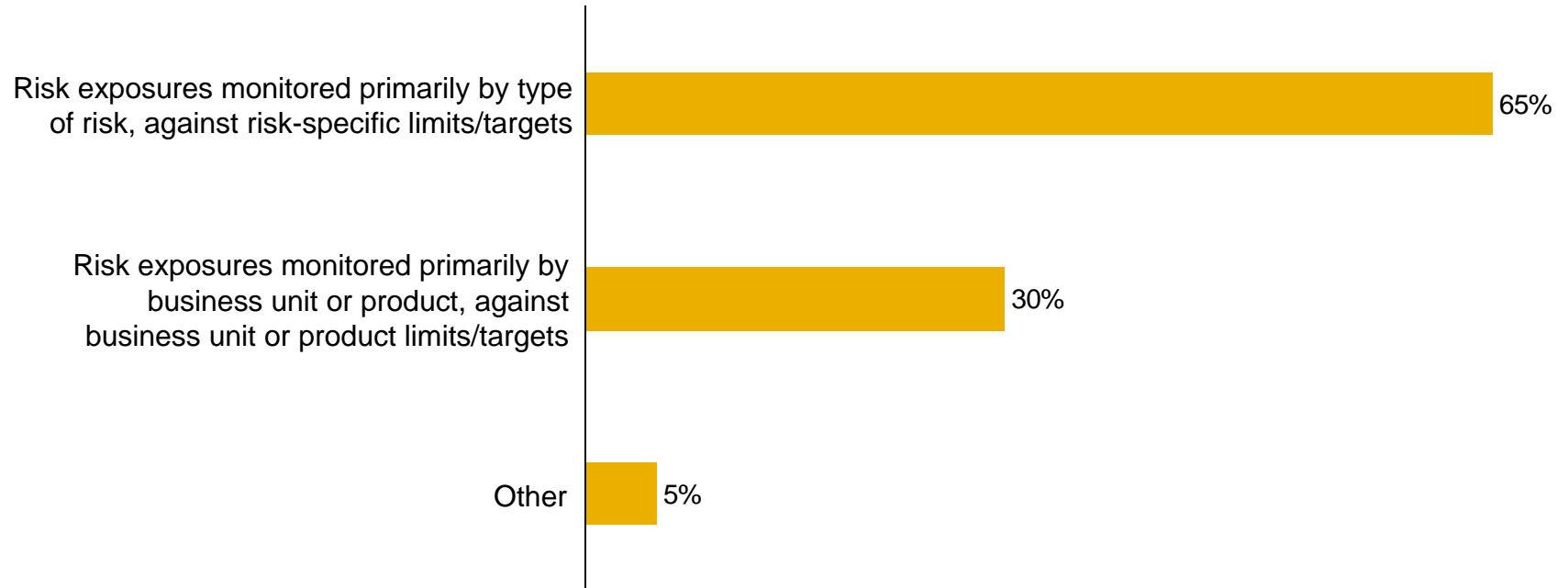
Companies are increasingly recognizing the importance of consistency between their risk limits and their risk appetite



Source: 2010 Towers Watson ERM Survey

Q.18 Have you demonstrated/modeled the consistency of your bottom-up risk limits with your top-down risk appetite/tolerance statement?

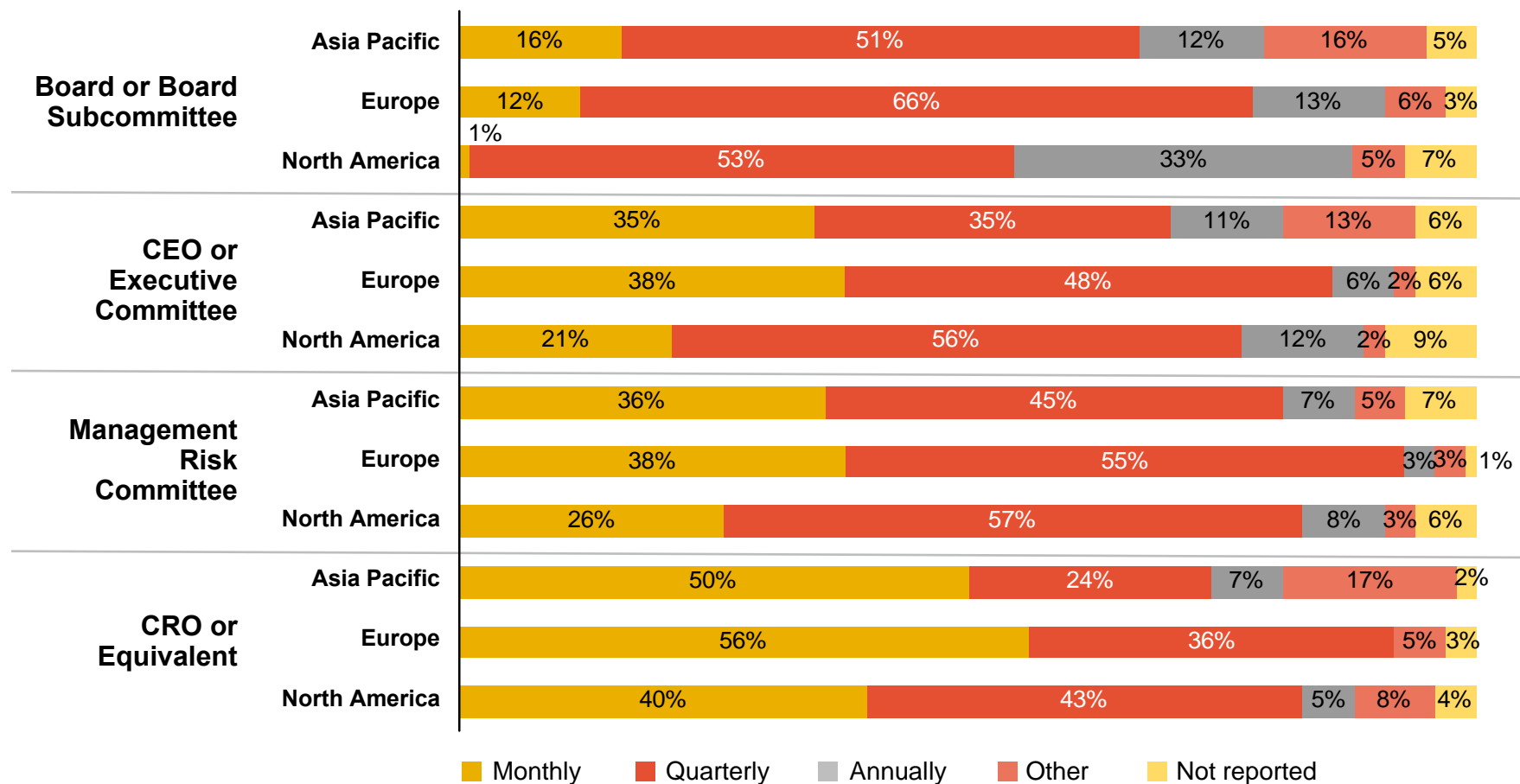
Companies predominantly monitor exposure by risk type, rather than by business unit or product line



Source: 2010 Towers Watson ERM Survey

Q.19 What is the primary line of reporting for risk exposures against limits, at the level immediately below the overall appetite statement?

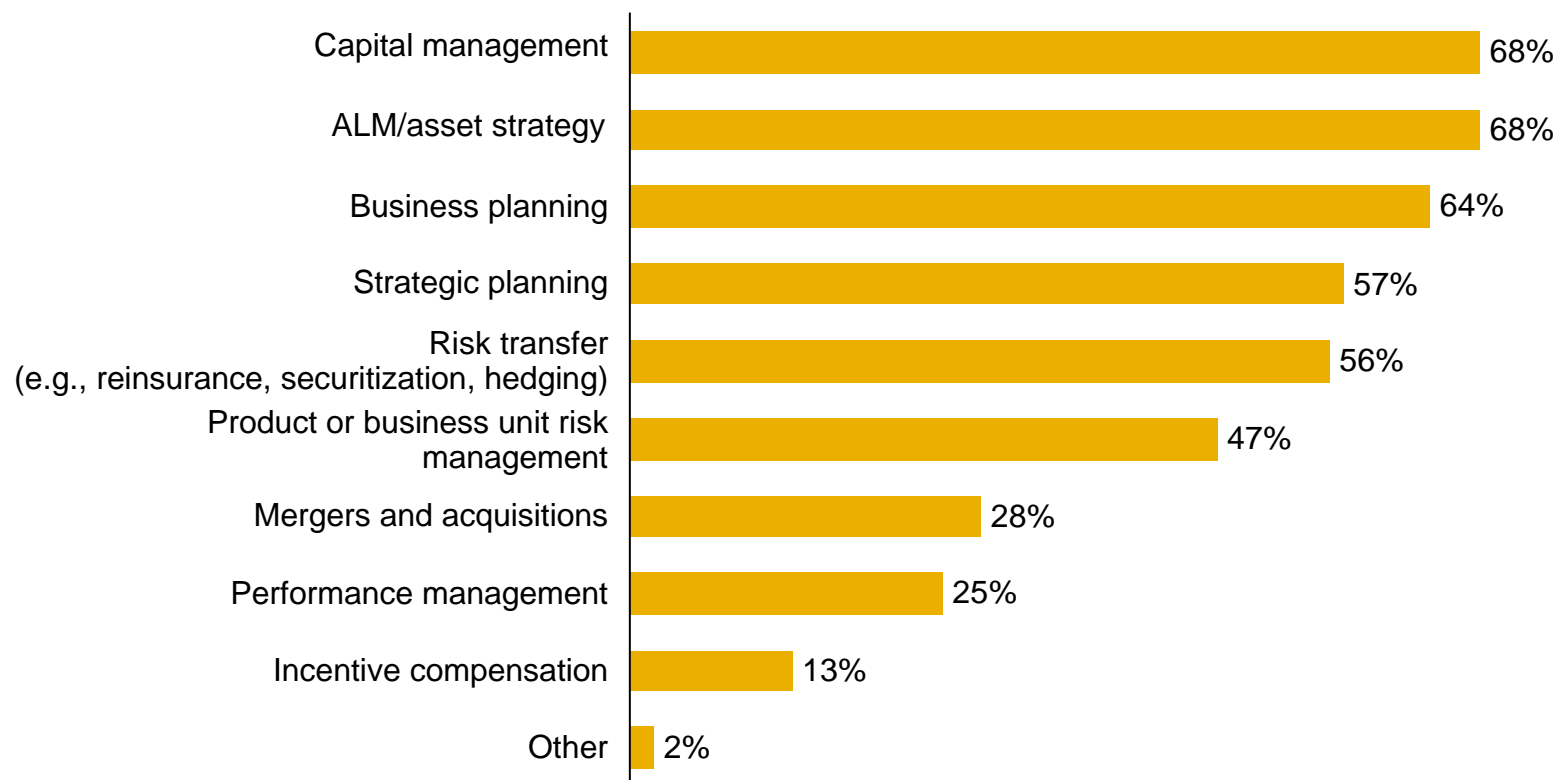
North American insurers report against risk appetite significantly less frequently than do insurers in other parts of the world



Source: 2010 Towers Watson ERM Survey

Q.20 At what level and frequency is risk exposure against risk appetite currently reported and monitored?

The risk appetite statement significantly impacts decisions about asset strategy and capital management



Source: 2010 Towers Watson ERM Survey

Q.22 Within which business processes is risk appetite explicitly referenced or monitored? Please select all that apply.

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Defining Risk Appetite

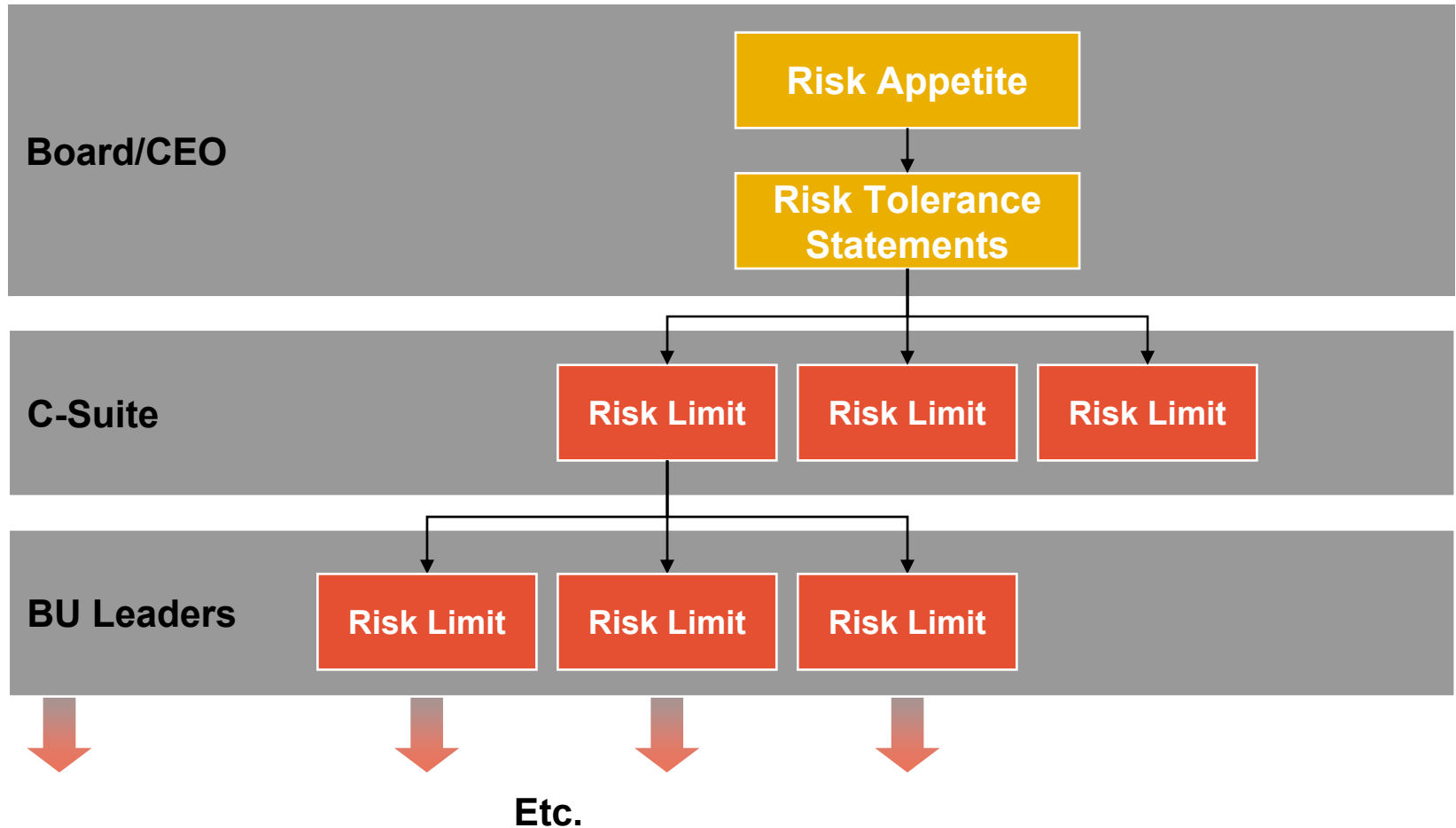
Risk appetite aims to provide a framework for managing risk in the business

- Defined formally by the board
- Communicates the board's views/expectations on risk
- Does not seek to address the detail of policies, procedures, etc.

Definitions

- **Risk appetite is...**
 - Total risk exposure
 - Generally expressed in **qualitative terms**
 - Set and endorsed by the board
- **Corporate risk tolerance is...**
 - Amount of risk
 - Expressed in **quantitative terms**
- **Risk limits are...**
 - The **more granular tolerance levels**

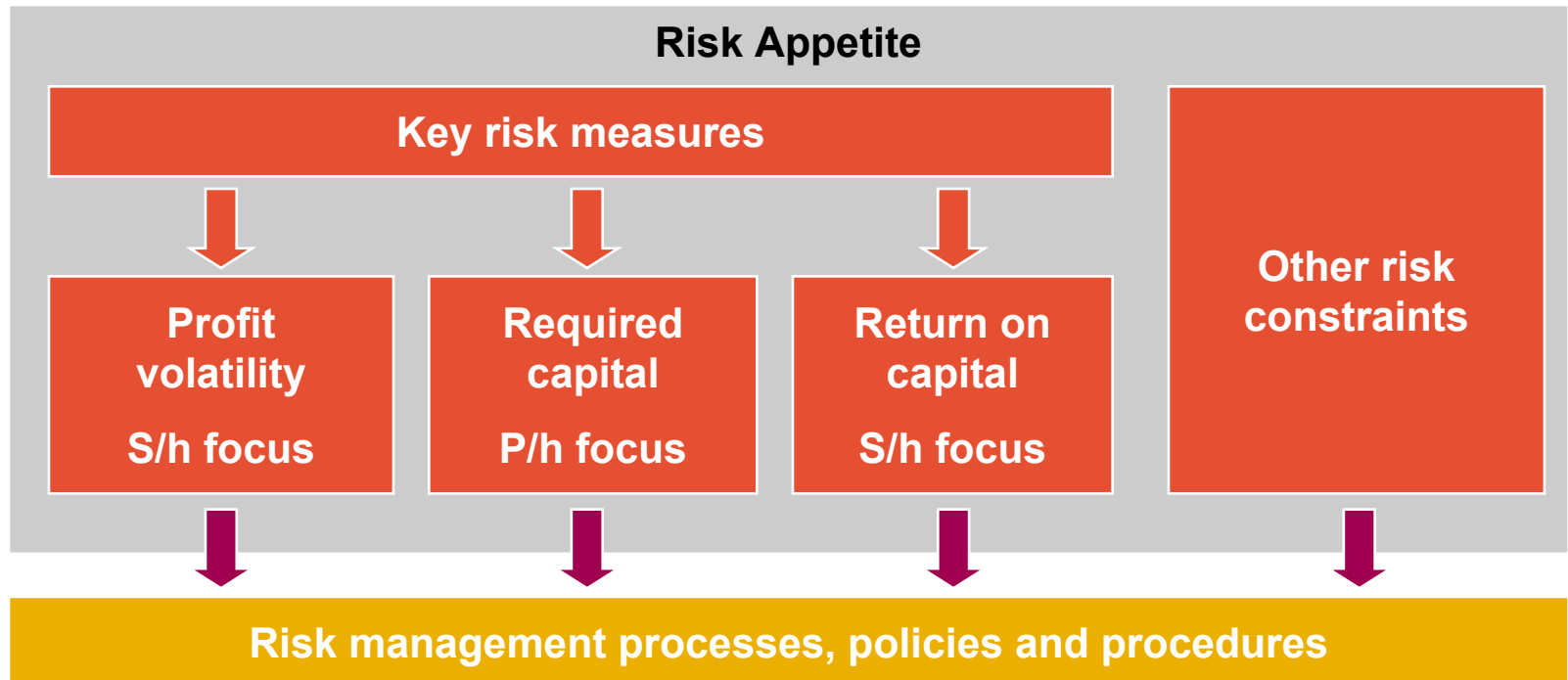
More granular expectations can be defined once the board and management agree on overall objectives



The risk appetite statement provides guidance for a variety of key stakeholders

1. Policyholders, Bondholders...and Regulators, Rating Agencies
2. Shareholders and Analysts
3. Management and Employees

Risk appetite is not captured by any one measure due to the varied characteristics of underlying risk events



Summary of risk appetite best practices

- Board and Management are engaged
- Calibrated to targeted financial performance indicators
- Risk profiles consider stress events
- Risk limits established quantitatively
- Regular monitoring and reporting

Risk Appetite Case Study

Common characteristics

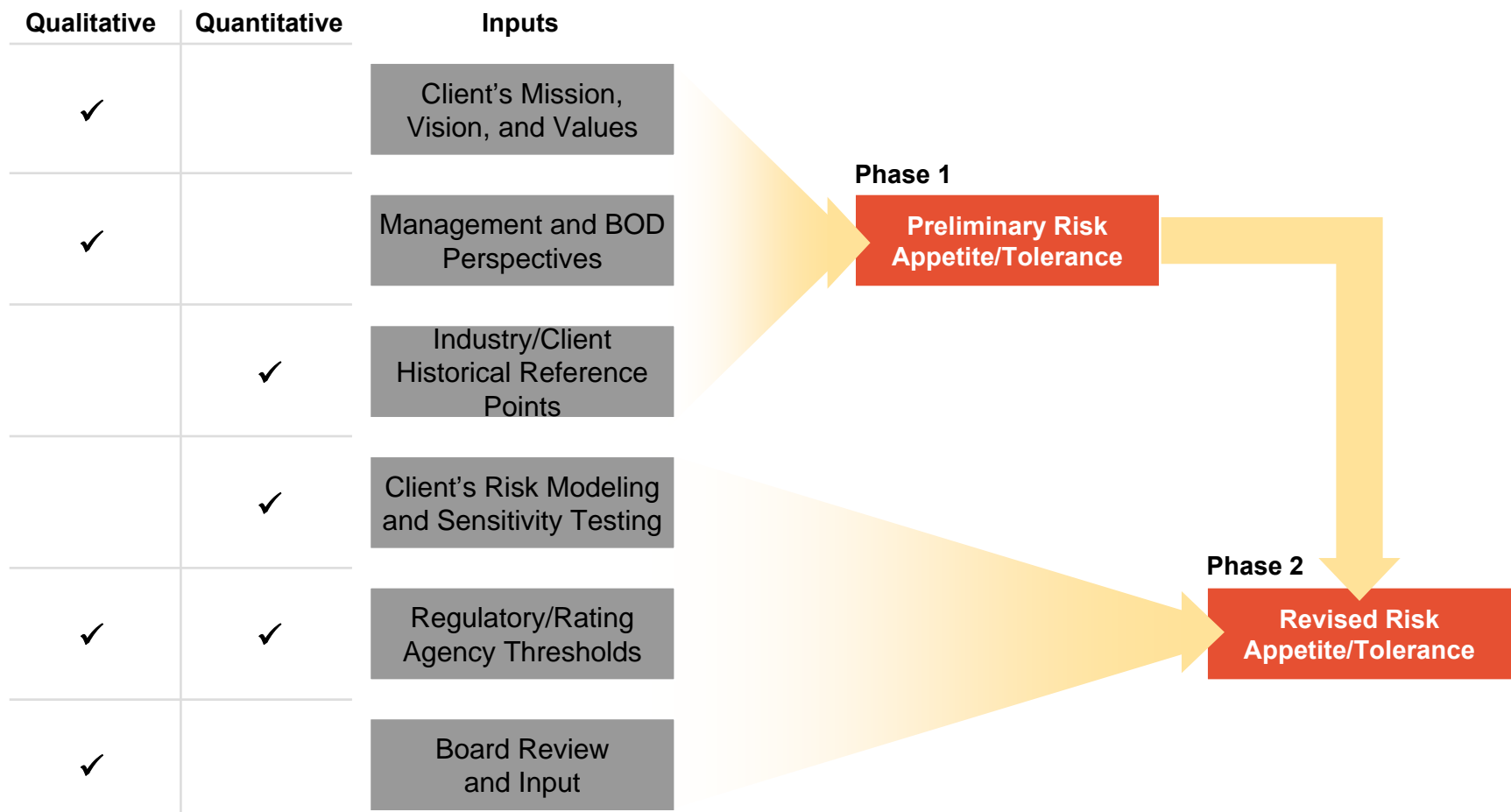
- Board members with varied backgrounds and different industries
- No/minimal Board engagement
- No common definition or understanding of “risk”
- No common perspective on amount of risk currently being accepted
- No common perspective on desired amount of risk to accept
- No risk appetite or risk tolerance statements

Common objectives

- Establish a common foundation of risk
- Develop preliminary risk appetite and risk tolerance statements
- Validate and refine the preliminary risk appetite/tolerance statements

Risk appetite can be defined using a combination of qualitative and quantitative inputs

Approach to Defining a Company's Risk Appetite/Risk Tolerance

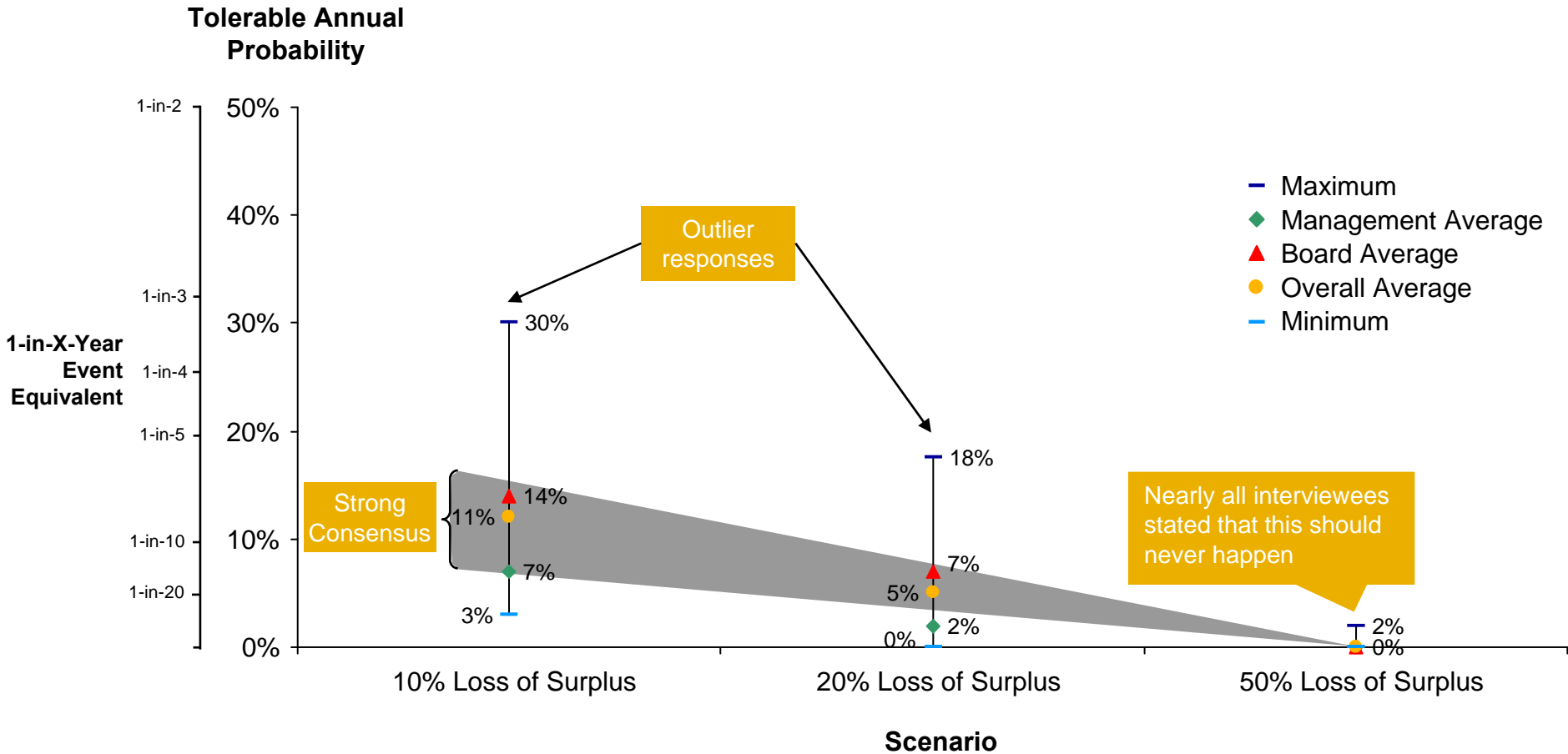


An initial phase might be aimed at establishing a common understanding and risk vocabulary

- Capture existing perspectives on risk
- Measure how much uniformity there is among the group
- Use a common set of questions
- Play back the results

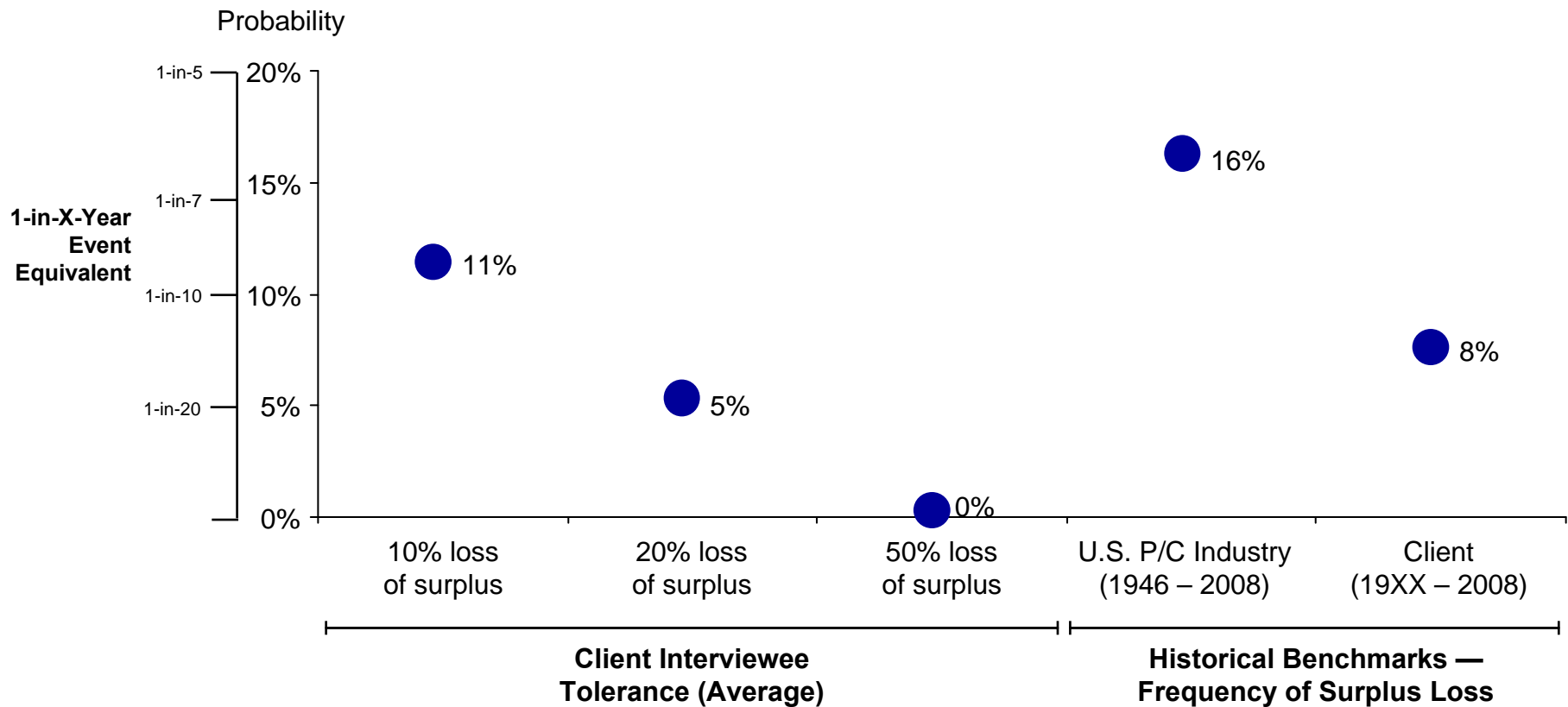
For example, participants might be asked about their willingness to sustain various levels of surplus declines...

Tolerance for Loss of Surplus



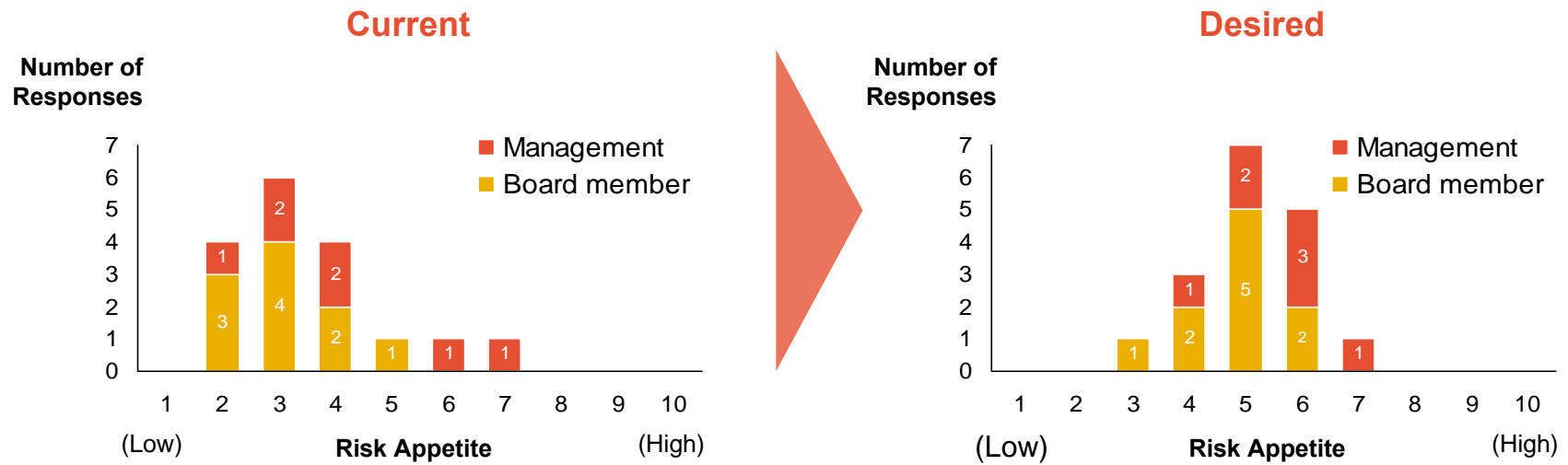
...and the responses can be compared to the historical experience for both the industry and company

Comparison of Client's Tolerance for Surplus Losses to Historical Experience



Some questions can be aimed at comparing the perceived current and desired risk appetites

Client's Risk Appetite



Average Scores

	Current	Desired
Management	4.1	5.6
Board	3.1	4.8

This interview/feedback approach can lay the foundation for developing a risk appetite statement

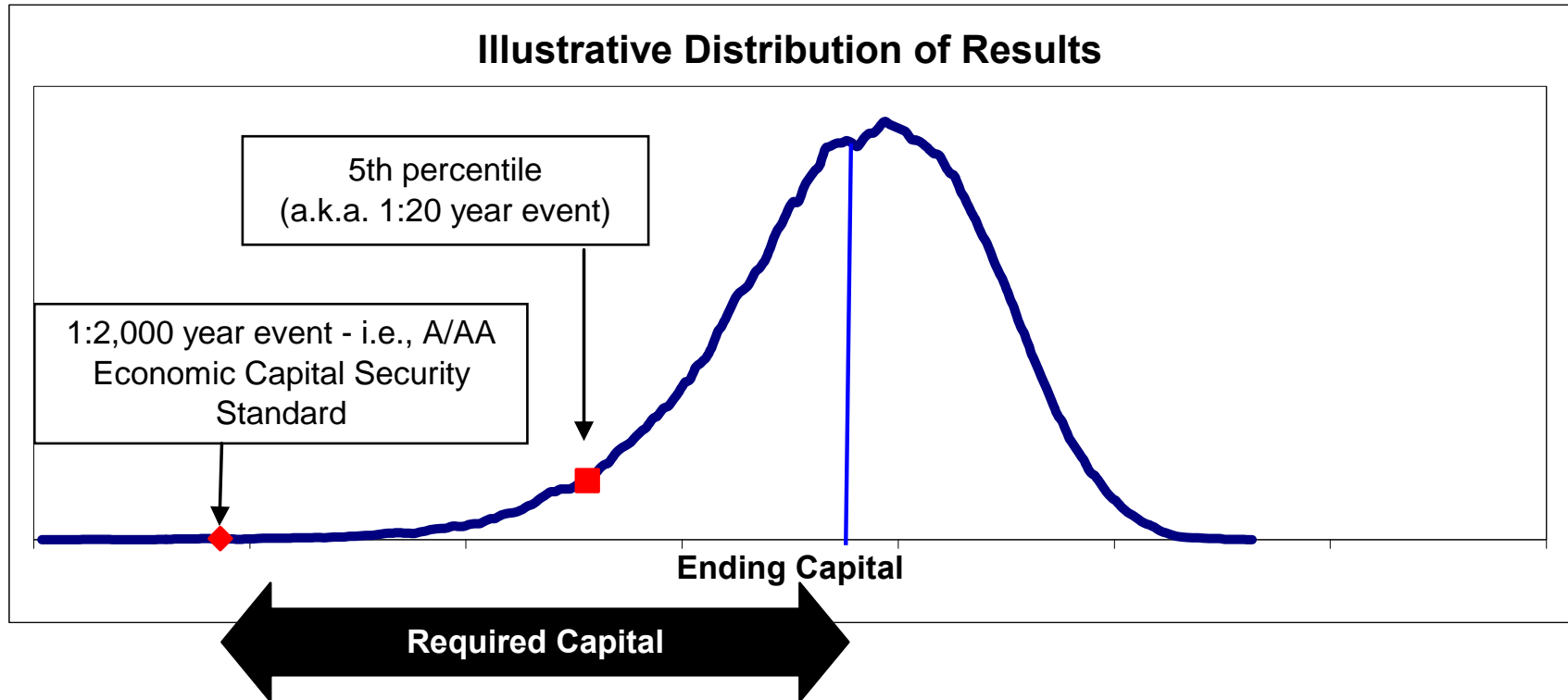
- Consistent vocabulary
- Consistent appetite for risk
- Preliminary risk appetite statement

Additional phases involve validation and refinement

- In subsequent phases:
 - Quantify the existing risk
 - Compare results with the preliminary risk tolerances
 - Some incompatibility is inevitable
 - Refine the preliminary risk appetite statement
 - Develop plan to move from existing to target
 - Establish risk monitoring and reporting processes
 - Establish risk limits
 - Refine risk modeling/quantification

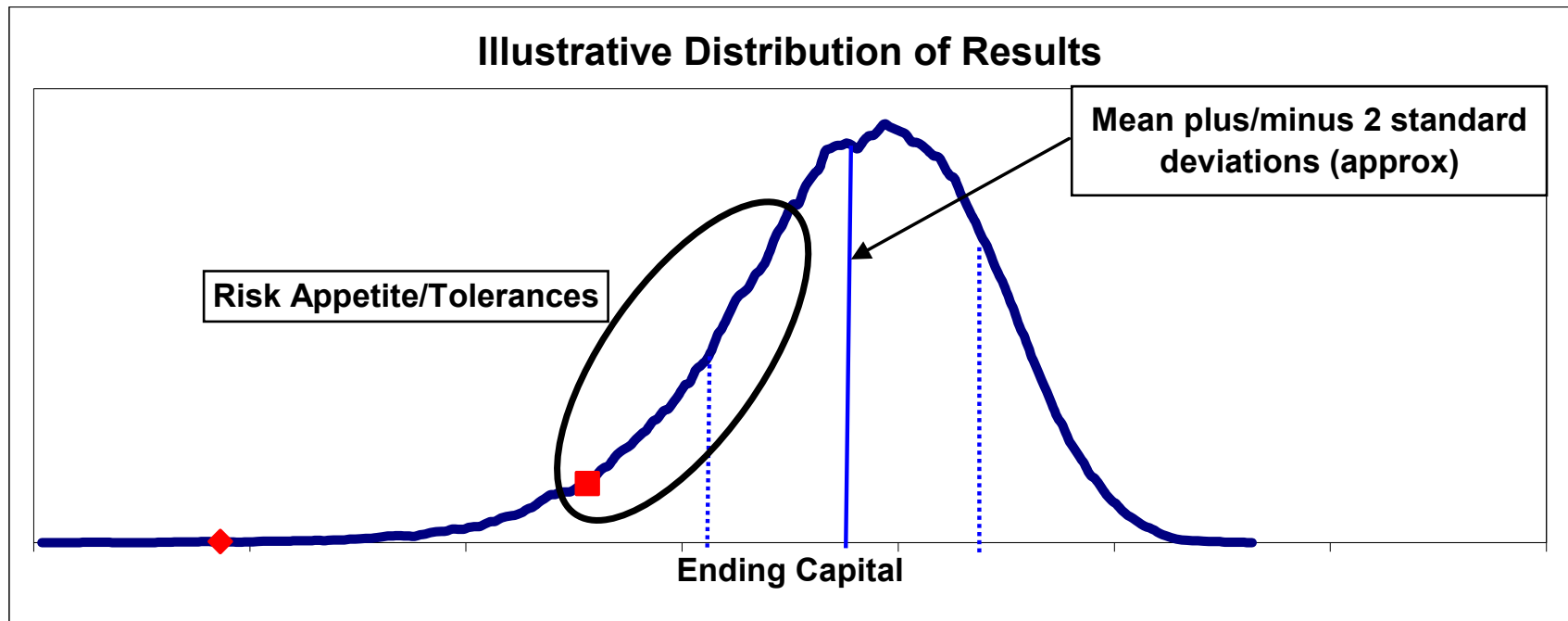
Risk Tolerances/Limits

Economic capital usually focuses on remote tail events...



- Economic capital analysis, for valid reasons, emphasizes remote risks and scenarios that threaten company solvency
- These analyses are usually performed using a one-year market consistent methodology or using a runoff methodology as in a multi-year dynamic financial analysis model.

... Risk appetite/tolerances, usually emphasizes less remote occurrences.



- Many insurers focus on 10, 20 or 50 year return periods for setting risk tolerances
- When practical these processes often leverage their economic capital models to monitor risk positions

Sample Risk Tolerance

Risk	Maximum 1:20 Year Hit to Economic Capital	Modeled Risk Position	Risk Dashboard
Catastrophe Exposure	10%	7.3%	In compliance
Non-Cat Pricing Risk	12.5%	11.1%	Caution >80% of limit
Equity Risk	5%	6.2%	Risk position exceeds established limit
Interest Rate Risk	15%	6.7%	In compliance

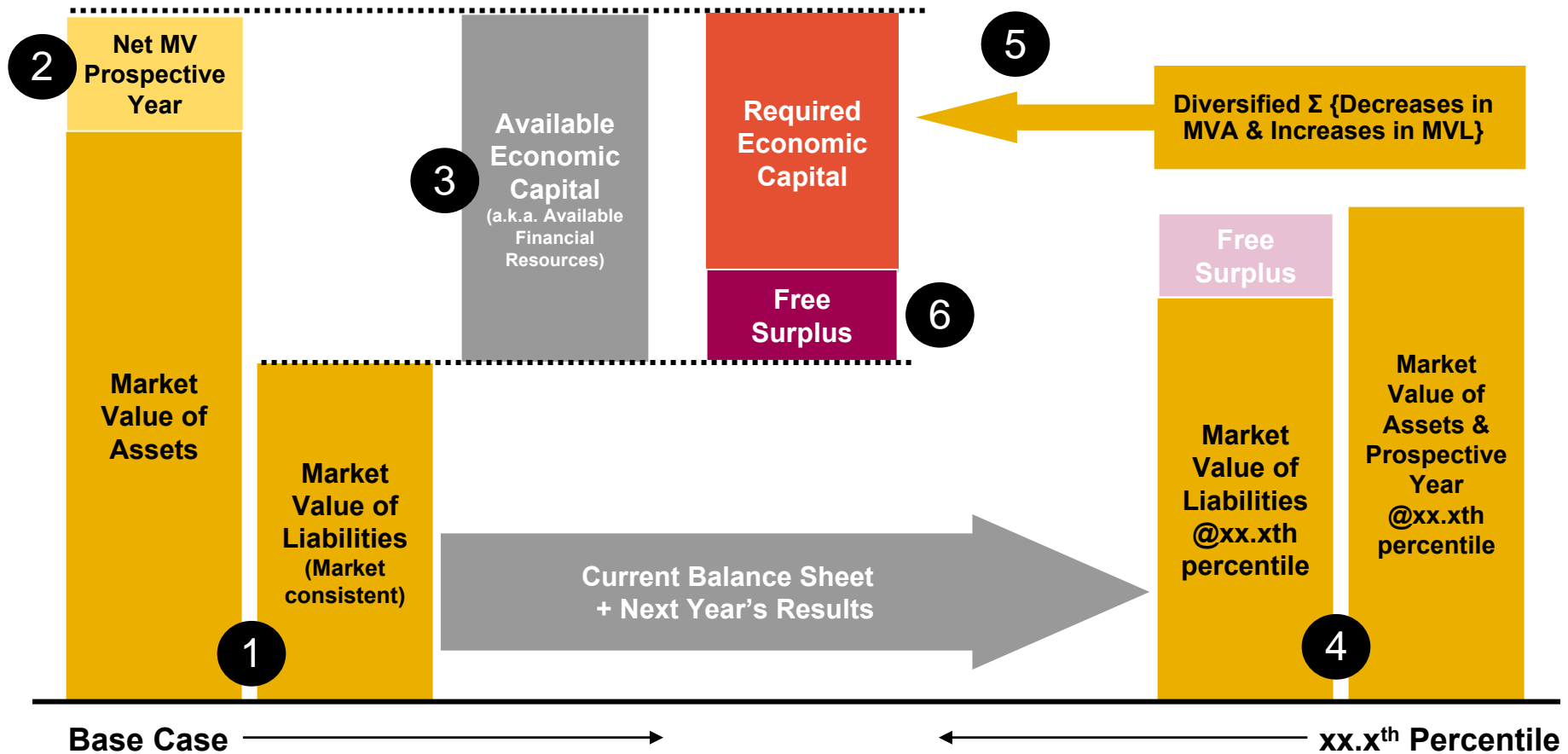
Annually

Monthly and on demand

- Risk tolerance is based on 1:20 rather than 1:2,000 year events
- Tolerances vary based on risk characteristics, e.g., higher limits for “paper losses” and/ or areas of competitive advantage

Economic Capital One-Year Market Consistent Aggregation

Definition of Economic Capital



- The one year aggregation process follows this balance sheet-to-balance sheet approach.
- DFA or run-off methods seek the same results but capture the prospective business by modeling earnings rather than adjusting the initial balance sheet.
- In either case, the capital “consumed” at the selected percentile defines the required economic capital

The Economic Balance Sheet

- All assets are marked to market values
- All liabilities are carried at market consistent values
 - Market consistent value = NPV of best estimate plus a “market value margin”
- The present value of one year of new business is included on the starting balance sheet
- Carried economic capital is sometimes called “available financial resources” or “AFR”

Market Value Margin

- Consider a buyer’s perspective on loss portfolio transfer (LPT)
- Best estimate (nominal) = \$1 million
- Best estimate (net present value) = \$800,000

- The buyer must hold capital on its balance sheet if they are to assume the liabilities.
- The buyer requires a return on that capital that must be added to the price.
- So for example if the LPT price is \$850,000, MVM is \$50,000.

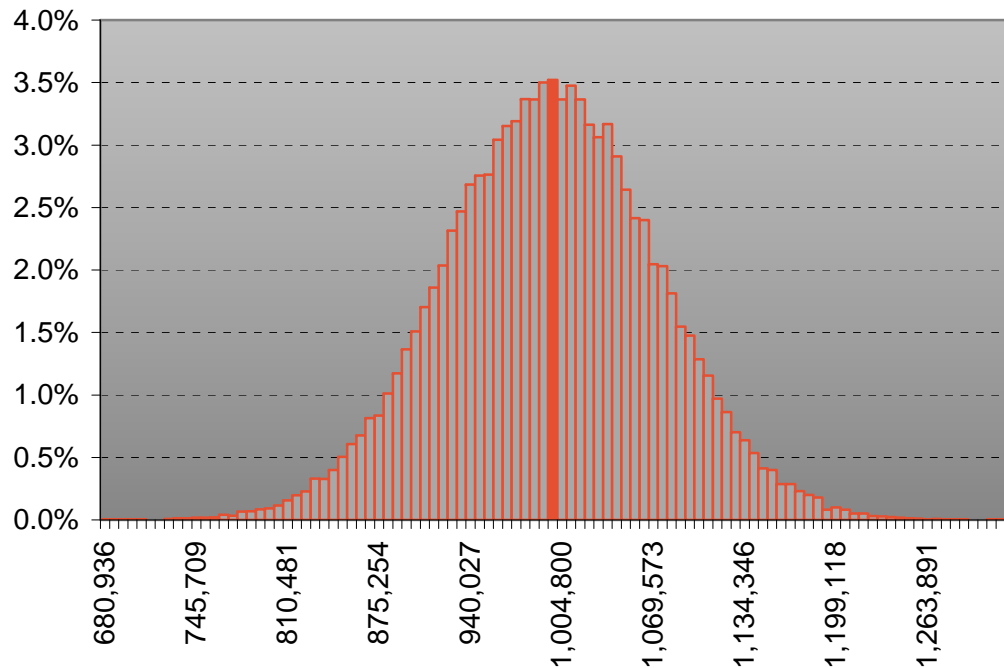
(See Philbrick – “Accounting for Risk Margins” CAS Forum 1994 and/or CRO Forum – “Market Value of Liabilities for Insurance Firms” July 2008 for additional discussion.)

ABC Insurance Company – Economic Balance Sheet

- Investments - \$1 million
- Loss reserves - \$600,000 (w/MVM)
- New business - \$135,000 (w/MVM)
 - NEP = \$1.5 million
 - Loss Ratio = 70%
 - Discounted Loss Ratio = 63%
 - Expense Ratio = 28%
 - Expected Profit Margin = 9%
 - For simplicity, assume that the loss ratio includes the MVM
- Carried EC = \$535,000
- Modeling assumptions:
 - Investments – Normal with a standard deviation of \$75,000
 - Loss reserves – Normal with a standard deviation of \$30,000
 - Losses on new business – Lognormal with a CV of 10%
 - The marginal distributions for assets and liabilities were restated to capture deviation from their mean value, i.e., contributions to profit/loss (a.k.a. required EC)
 - All distributions EC distributions were modeled as Normal with mean = \$0.

Each “portfolio” has a distribution of expected results

PDF Charts



Risk Selection and Information

Risk **Investments**

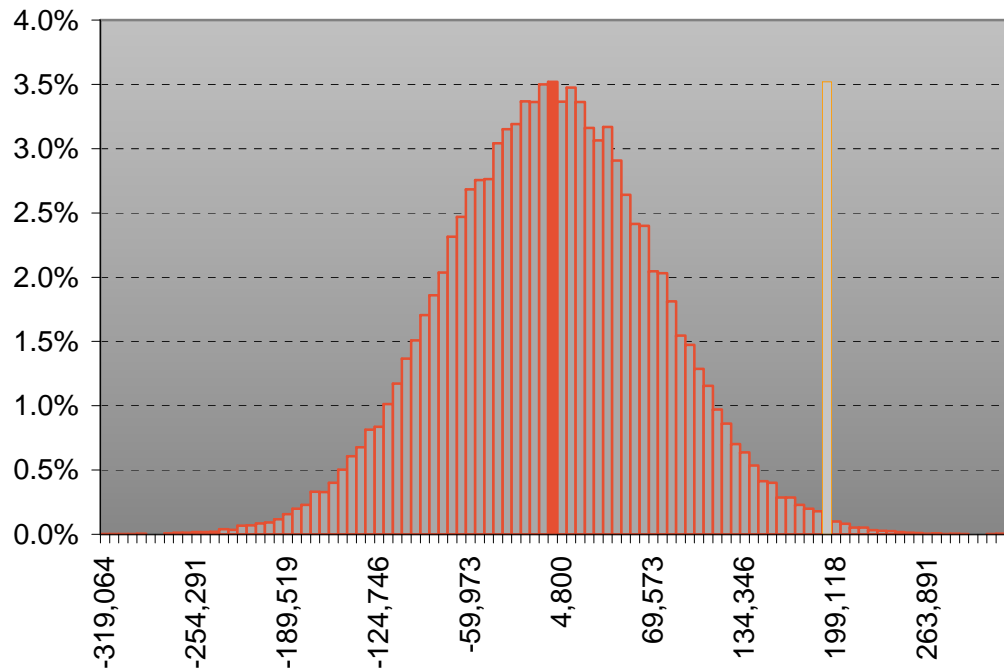
Mean	<input checked="" type="checkbox"/>	1,000,155
StDev		75,092
Percentile	<input type="checkbox"/> 99.5%	1,194,859

Percentile	Value
0.5%	804,670
1.0%	824,452
10.0%	904,420
50.0%	1,000,233
90.0%	1,096,021
99.0%	1,176,600
99.5%	1,194,859

- Investments vary (mostly) between \$900,000 and \$1.1 million.
- Converting to contribution to profit/loss simplifies the aggregation of asset and liability risks

Restate each marginal distribution in terms of economic capital (change from the mean)

PDF Charts



Risk Selection and Information

Risk **Investments**

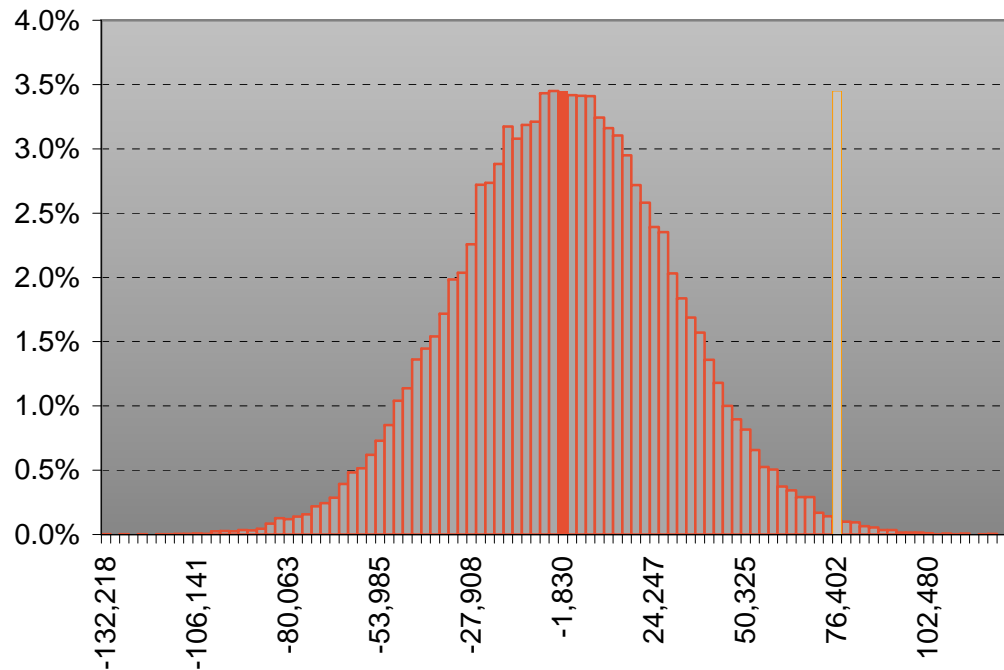
Mean	<input checked="" type="checkbox"/>	155
StDev		75,092
Percentile	<input checked="" type="checkbox"/> 99.5%	194,859

Percentile	Value
0.5%	195,330
1.0%	175,548
10.0%	95,580
50.0%	233
90.0%	96,021
99.0%	176,600
99.5%	194,859

- Convert all marginal distributions to the distribution of their economic capital, i.e., an investment scenario below the mean consumes capital
- Positive values herein are increases in required EC (i.e., subtract simulations on prior page from the mean)
- Stand alone economic capital for investment risk at the 99.5% level is \$194,859.

Loss reserve distribution

PDF Charts



Risk Selection and Information

Risk Loss Reserves

Mean	<input checked="" type="checkbox"/>	-	2
StDev			30,079
Percentile	<input checked="" type="checkbox"/>	99.50%	77,950

Percentile	Value
0.5%	-78,417
1.0%	-70,307
10.0%	-38,660
50.0%	-20
90.0%	38,333
99.0%	70,118
99.5%	77,950

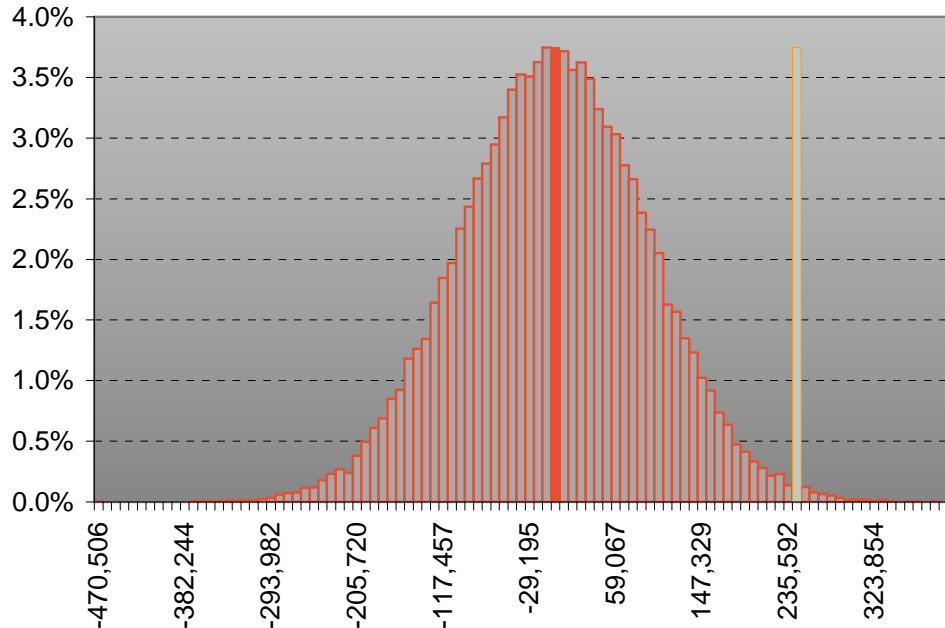
- Stand alone economic capital for reserve risk at the 99.5% level is \$77,950.

New Business Loss Distribution

PDF Charts



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Risk Selection and Information

Risk New Business ▼

Mean	<input checked="" type="checkbox"/>	35
StDev		95,040
Percentile	<input checked="" type="checkbox"/> 99.50%	248,062

Percentile	Value	Implied Loss Ratio
0.5%	-244,920	46.7%
1.0%	-222,516	48.2%
10.0%	-121,919	54.9%
50.0%	180	63.0%
90.0%	121,261	71.1%
99.0%	222,807	77.9%
99.5%	248,062	79.5%

- Expected losses are based on NEP = \$1.5mm with a 63% loss ratio
- Contributions to required economic capital were modeled as a Normal distribution with mean = \$0 and SD = \$94,500
- Stand alone economic capital for new business risk at the 99.5% level is \$248,062.

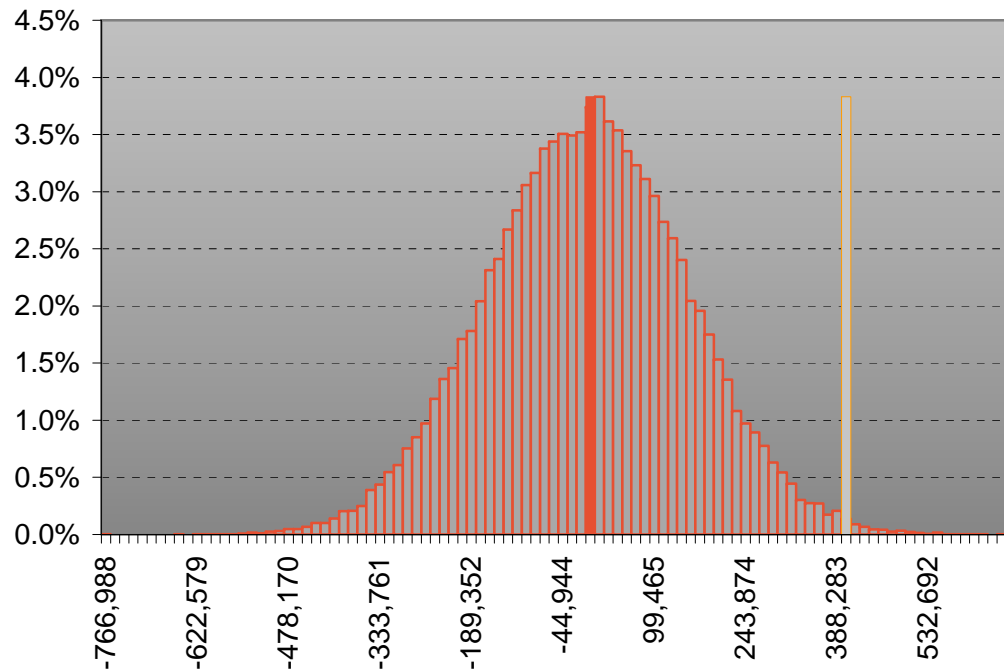
Correlation matrix

	Investments	Loss Reserves	New Business
Investments	1.00		
Loss Reserves	0.25	1.00	
New Business	0.25	0.75	1.00

- Marginal distributions were aggregated using a Gaussian copula and the selected correlation matrix.

Aggregate Economic Capital Distribution

PDF Charts



Risk Selection and Information

Risk Total

Mean	<input checked="" type="checkbox"/>	202
StDev		157,203
Percentile	<input checked="" type="checkbox"/> 99.50%	404,209

Percentile	Value
0.5%	-403,426
1.0%	-364,388
10.0%	-202,435
50.0%	1,652
90.0%	200,345
99.0%	368,927
99.5%	404,209

- At the 99.5% or “1-in-200 year” level, the company would “consume” \$404,209 of capital.

Capital Allocation

Risk Diversification Aumann-Shapley Allocation

Simulation Range 5

Simulation	Sim Index	Investments	Loss Reserve	New Busines	Total
5863	-5	73,346	62,192	267,559	403,097
4278	-4	90,767	69,457	242,997	403,221
4987	-3	144,214	52,590	206,457	403,261
38018	-2	155,639	50,523	197,602	403,763
38603	-1	91,216	38,759	274,204	404,179
37094	0	32,294	53,888	318,025	404,207
39591	1	175,677	36,741	192,053	404,471
41165	2	113,766	81,708	209,389	404,863
7394	3	66,232	89,985	248,700	404,917
38219	4	162,327	79,816	163,633	405,776
49769	5	148,508	59,409	198,209	406,126

Allocated Capital	113,958	61,348	228,902	404,207
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- Capital allocations are based on a range of values centered on the 99.5th percentile.
- We ran 50,000 trials in this example.

Economic Capital Summary

Risk	Carried Capital	Stand Alone Capital (99.5%)	Diversified Capital (99.5%)
Investments	—	\$194,859	\$113,958
Loss Reserves	—	77,950	61,348
New Business	—	248,062	228,902
Total	\$535,000	\$520,871	\$404,207

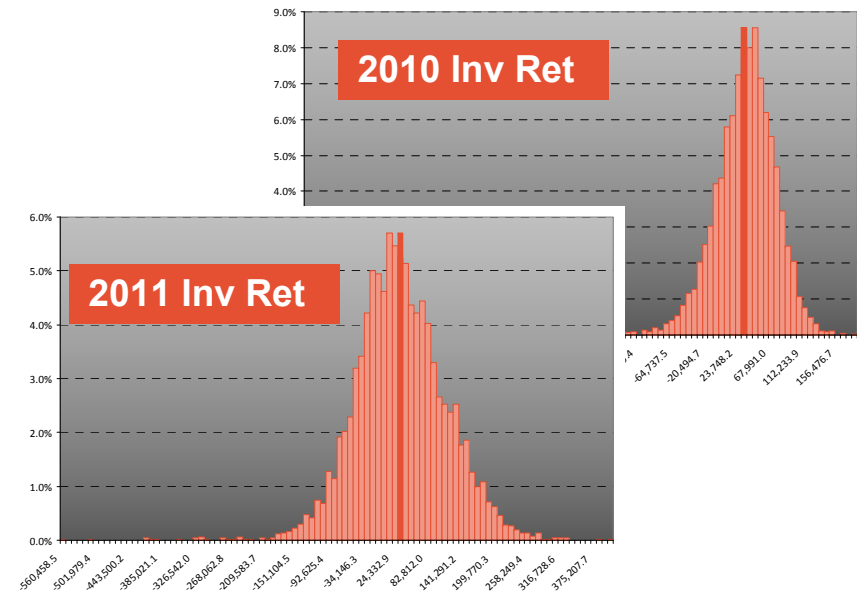
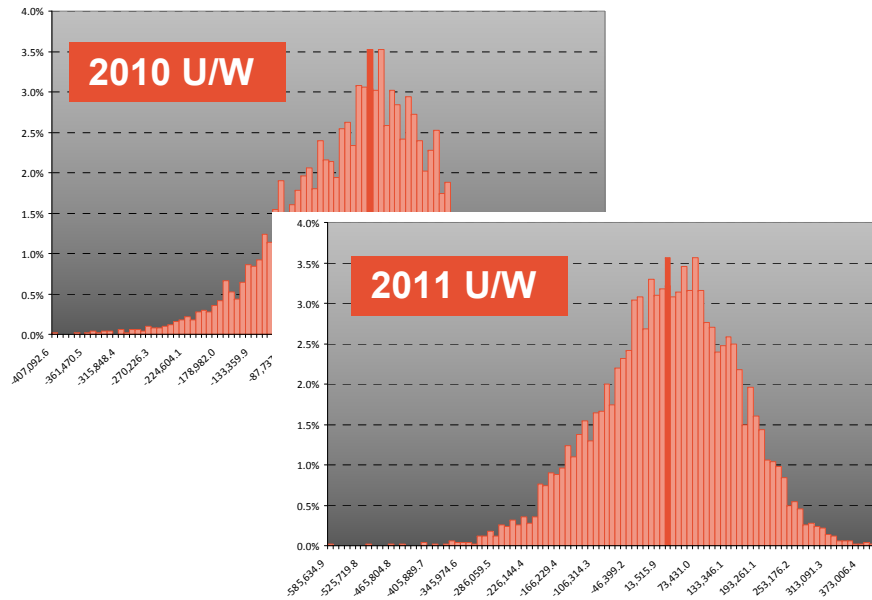
- The fully diversified required economic capital of ABC Insurance at the 99.5th percentile is \$404,207.
- The total diversification benefit is \$116,664.
- The firm has \$130,793 of excess capital at the 99.5th percentile level.

Economic Capital Analysis with DFA

ABC Insurance Company

- Investments - \$1 million
- Loss reserves - \$600,000
- New business
 - NEP = \$1.5 million
 - Loss Ratio = 70%
 - Expense Ratio = 28%
- Modeling assumptions:
 - Investments – 5 year corporate bonds
 - Loss reserves – Normal with a standard deviation of \$30,000
 - Losses on new business – Lognormal with a CV of 10%
 - **Two years of new business were included**

Risk aggregation with DFA



- The DFA model aggregates insurance and investment operations to forecast profit/(loss)
- Economic capital is held to cover potential losses

Distribution of profit/(loss)

Probability Distributions

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Results Run_08

Postpone

Refresh

Chart Parameters

Origin 2011

Variable Profit

Level Net

Class ABC

Percentile 0.50

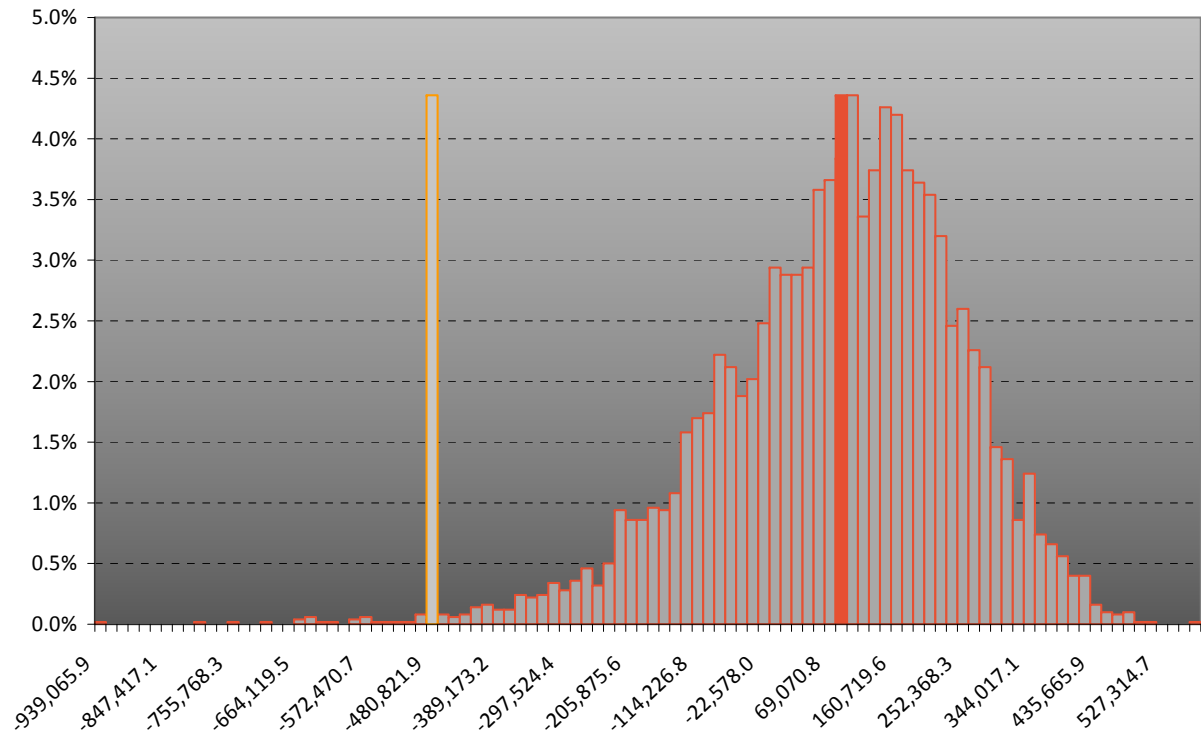
Cumulative

Sim 3,750

Summary

Mean	<input checked="" type="checkbox"/>	87,987.5
StDev		168,716.5
Percentile	<input checked="" type="checkbox"/>	-466,630.7

TVaR (plus)	91,461.2
TVaR (minus)	-598,017.3



- We focus on scenarios with losses, i.e., where capital is consumed.

Required economic capital is based on cumulative profit (losses)

- Profits for all projection years are calculated.
- Cumulative profit is measured through the end of each projection year.
- Select the minimum cumulative position throughout the projection period. If this is greater than zero then set to zero.
- The results of this process are then sorted across all simulations, VaR capital is then calculated simply by picking the nth smallest simulation.

Economic Capital

Simulum Capital

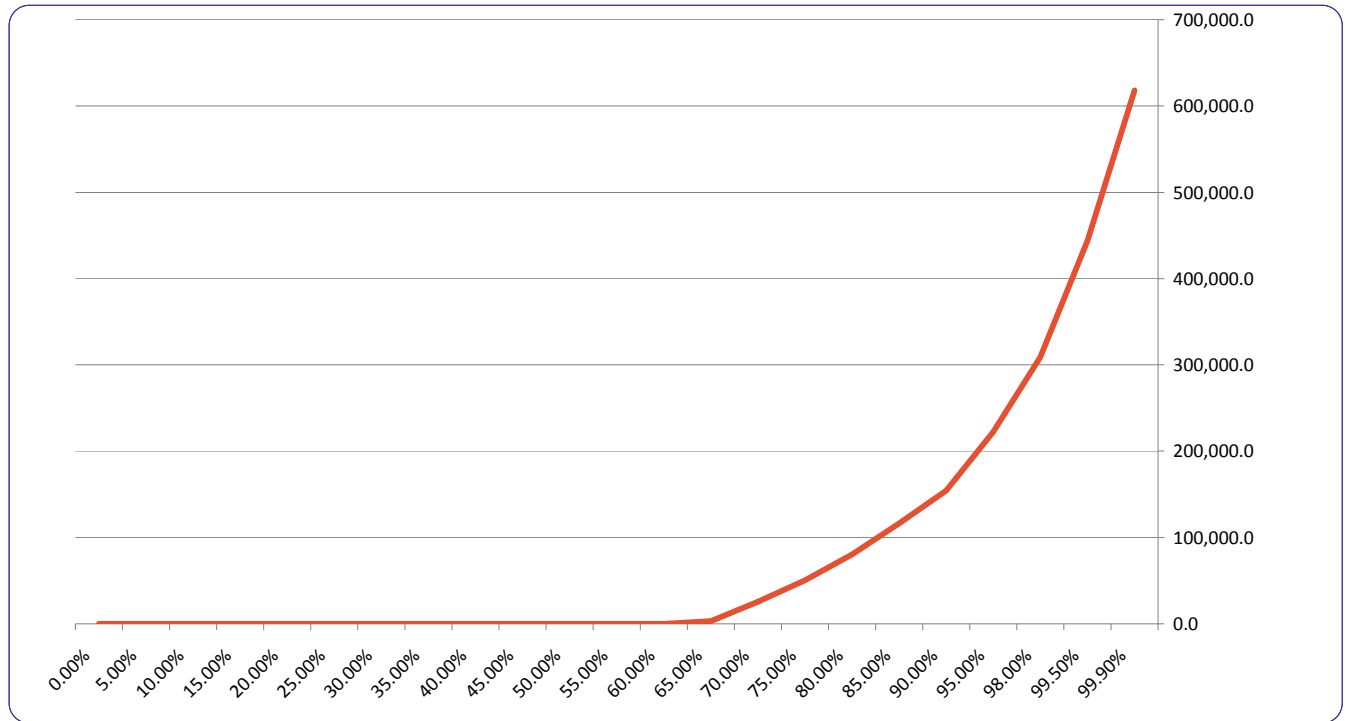
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Run Number Run_08 Gross/Net Net Last Origin 2011 Allow FY Profits

Ent/Lob ABC Risk Insurance Profit Discount Recalc

Percentiles	Amount
99.90%	618,268.0
99.50%	444,002.4
98.00%	309,061.9
95.00%	222,380.7
90.00%	154,585.6
85.00%	116,450.2
80.00%	80,441.4
75.00%	50,350.7
70.00%	25,702.8
65.00%	3,132.7
60.00%	0.0
55.00%	0.0
50.00%	0.0
45.00%	0.0
40.00%	0.0
35.00%	0.0
30.00%	0.0
25.00%	0.0
20.00%	0.0
15.00%	0.0
10.00%	0.0
5.00%	0.0
0.00%	0.0



- Two year projection through year end 2011, most scenarios are profitable
- Tail scenarios consume capital significant capital

Pros/Cons of One-year Aggregation versus Run-off

One-year/Aggregation

- **Advantages:**
 - Easier to combine life and p/c capital
 - Speed
 - Consistent with year-to-year solvency monitoring/financial statement analysis
- **Disadvantages:**
 - Relatively new to US P/C insurers
 - Resistance to closed form distributions

DFA/Run-off Analysis

- **Advantages:**
 - GAAP and/or statutory metrics
 - Calculate rating agency capital ratios
- **Disadvantages:**
 - Some DFA models are quite complex
 - Extended run times for large jobs

Risk Appetite

Sample Risk Tolerance

Risk	Maximum 1:20 Year Hit to Economic Capital	Modeled Risk Position	Risk Dashboard
Catastrophe Exposure	10%	7.3%	In compliance
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Annually

Monthly and on demand

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- Tolerances vary based on risk characteristics, e.g., higher limits for “paper losses” and/ or areas of competitive advantage

Questions?

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