

ERM & the New SoA CERA Credential

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Münchener Rück
Munich Re Group



Top 10 International (outside US & Canada) Markets for SoA

Country	FSA's	FSA's by Mutual Recognition	ASAs	ASA's by Other Than Exam	Total	CERA's	CFA's
Hong Kong	275	6	164	7	452	4	4345
China	178	2	151	3	334	5	
United Kingdom	50	13	26	136	225	3	6368
Taiwan	71	0	134	2	207	6	
Singapore	40	0	32	 6	78	4	2452
Australia	10	5	10	41	66	2	
Malaysia	23	0	27	1	51	1	
Japan	29	0	13	2	44	1	
Bermuda	28	3	10	2	43	1	
Switzerland	21	0	10	4	35	1	1841

FAQs by Location (Indicative Only)

Australia & New Zealand	1,300	UK & Ireland	7,000
Hong Kong	400	Western Europe (rest)	8,200
Singapore	150	Eastern Europe, ME	600
Japan	1,500	Africa (all)	700
India	200	North America	18,000
China & Rest of Asia	450	Mexico & South America	1500
	4,000		36,000



Agenda

SoA's New CERA Credential

- ☐ Overview of the SoA's New CERA Credential
- ☐ Benefits of the CERA Designation
- ☐ CERA Curriculum
- ☐ How to Get the Credential
- ☐ SoA's CERA & ERM Resources
- ☐ Alternative Credentials
- ☐ Positioning of Actuaries in ERM

ERM

- ☐ ERM Defined
- ☐ History of ERM
- ☐ Importance of ERM
- ☐ The ERM Cycle
- ☐ ERM Industry Trends
- ☐ ERM References

Overview of the SoA's New CERA Credential

- ❑ new **C**hartered **E**nterprise **R**isk **A**nalyst (**CERA**) credential
- ❑ first **new credential** introduced by SOA since 1949 (almost 60 years!)
- ❑ since 2003 the SoA's Board has been fielding interest from **employers**. Approved by SoA's **Board** in November 2005
- ❑ approximately **150** CERA's currently in the workforce. SoA's goal is to have **300** CERA's by year end
- ❑ **Enterprise Risk Management (ERM)** is now best practice. CERA brings **consistency** and **standardization** to ERM practice
- ❑ expands actuarial skill set into **non-traditional** sectors, such as broader Financial Services
- ❑ "Leave it to actuaries to not only create a new designation, but to develop an ERM credential that makes ERM seem **logical** & **clear** while other industries are still struggling with the concept" Risk & Insurance, June 2008
- ❑ SoA's **President** Elect of SoA is an ERM champion and CERA inaugural class member.



Benefits of the CERA Designation

Candidate Benefits

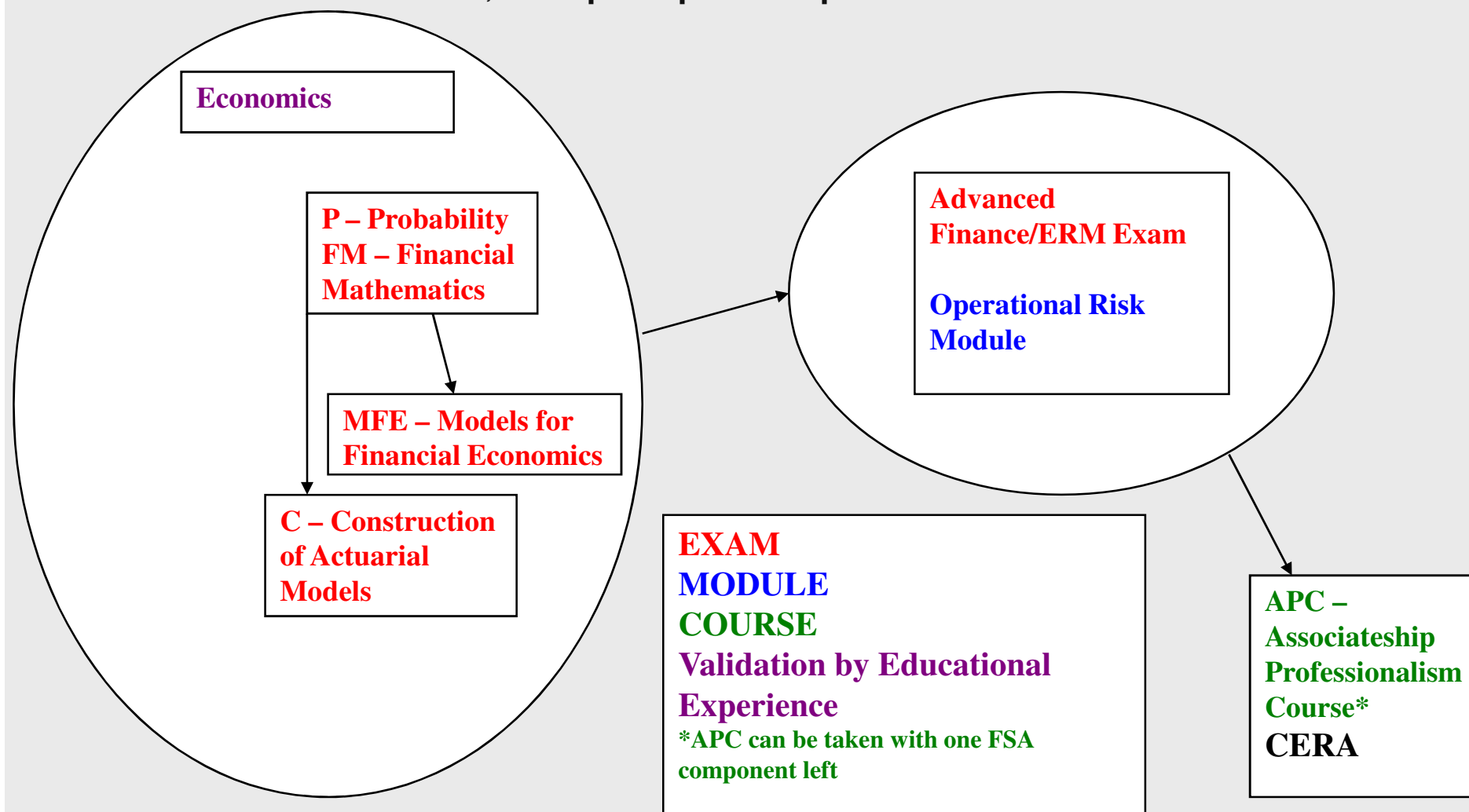
- ☐ **comprehensive** and **rigorous** ERM training
- ☐ expands **employment** opportunities
- ☐ **differentiates** them from other risk professionals
- ☐ **advances** the field of ERM
- ☐ expands **professional** network by being a member of the SoA

Employer Benefits

- ☐ helps **internal** ERM program
- ☐ **differentiates** firm as ERM experts
- ☐ CERA's possess strong **quantitative** and **financial** assessment skills
- ☐ Converts **risk** into **opportunity**

CERA Curriculum

- approximately **3-4 years** to obtain the CERA credential
- includes **actuarial science, ERM principles** and **professionalism**:



How to Get the Credential if you are an FSA/ASA

Experienced Practitioner's Pathway (EPP)

- ☐ SOA & CAS members with 3+ years of senior level, substantive experience
- ☐ application process – review team
- ☐ attendance at two-day seminar
- ☐ CERA EPP deadline has been extended to December 31, 2008.

Exam Process

- ☐ current **Fellows** - Advanced Finance/ERM Exam
- ☐ current **Associates** - Advanced Finance/ERM Exam & Operational Risk Module
- ☐ Can also be used for **CPD** (from 2009)

EPP Experience Requirements: members should meet several of the following:

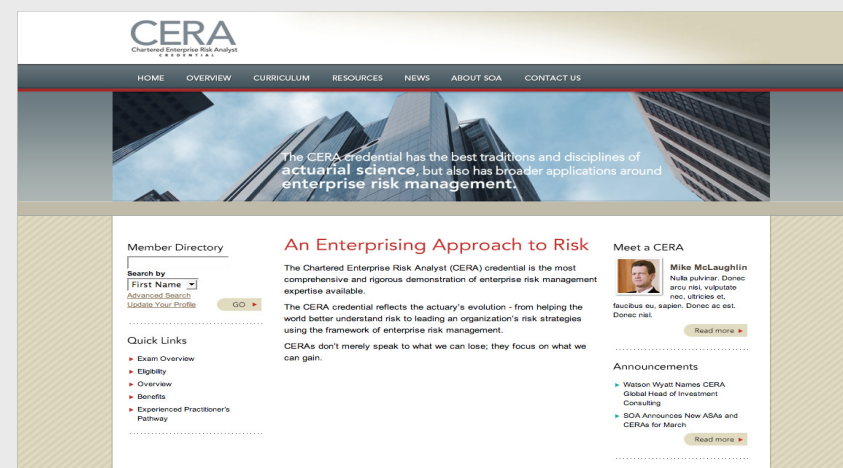
- ✓ performed work at a senior level in ERM field
- ✓ advanced the actuarial profession with ERM field
- ✓ significant visibility in ERM field
- ✓ made substantial contributions to the ERM field
- ✓ experience as a risk officer
- ✓ key contributor to organization's risk committee
- ✓ managed interactions between multiple risks
- ✓ developed or implemented methodology for monitoring, measuring and managing of risk
- ✓ academic research has resulted in practical industry ERM applications



SoA's CERA & ERM Resources

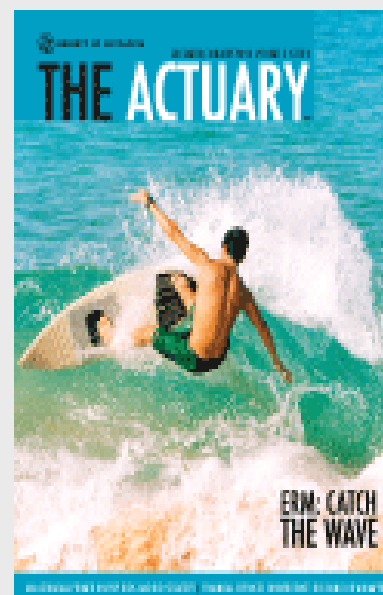
www.CERAnalyst.org

- ❑ provides an overview of the CERA credential
- ❑ features current CERAs and their work in ERM
- ❑ the CERA curriculum and registration
- ❑ information about the SOA



Joint (with CAS) Risk Management Section

- ❑ ERM Speciality Guide
- ❑ newsletter focusing on ERM topics
- ❑ booklist & SoA Syllabus on ERM
- ❑ research papers – diversification; Copulas; etc.
- ❑ annual ERM Symposium (www.ermsymposium.org)



Alternative Credentials

TABLE 3 **Actuaries With Other Credentials**

	Actuaries With			Total
	MBA/CBA	CFA	FRM/PRM	Actuaries
FSA/ASA	680	556	51	17,881
FCAS/ACAS	152	22	4	3,982
Combined	832	578	55	21,863

Source: Actuarial membership in the Society of Actuaries and the Casualty Actuarial Society based on the membership directory maintained by the Society of Actuaries as of Aug. 15, 2005 (see: www.soa.org)

SoA Competing Professions Survey, 2002 to 2008			
	Percentage of respondents		
Competing Professions	2002	2005	2008
Accountants	43	40	31
Economists	21	22	18
Investment professionals			33
Financial engineers	42	42	36
MBAs	45	47	37
Risk analysts	37	41	36
Statisticians	22	27	27
None of these	19	20	27
Other	8	6	4

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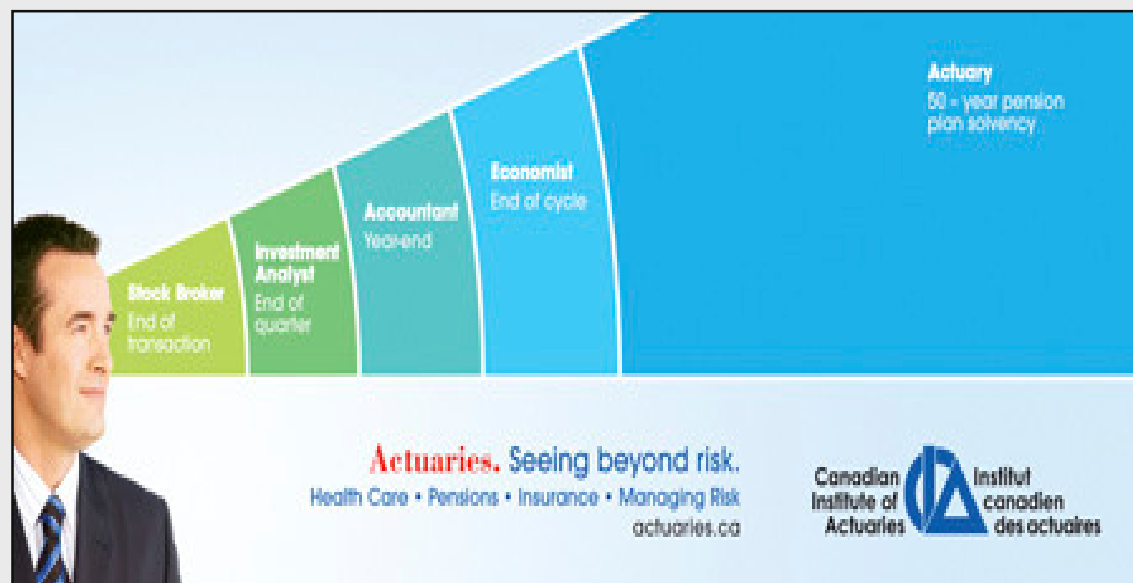
Actuaries are Positioned as ERM Experts

The Evolution of the Actuary	Emergence	Description	Time to Emerge
Actuary of the 1st kind	17th century	life insurance actuaries using deterministic methods	
Actuary of the 2nd kind	20th century	casualty actuaries using probabilistic methods	250
Actuary of the 3rd kind	1980's	investment actauries applying financial economics (Bühlmann)	70
Actuary of the 4th kind	current	actuaries working in ERM (Embrechts)	25

Source: Stephen P. D'Archy, CAS Presidential Address, 2005



SoA tagline: "Risk is Opportunity"
(www.imageoftheactuary.org)



ERM Defined

- ❑ Enterprise Risk Management (**ERM**) is the discipline by which an organization in any industry assesses, controls, exploits, finances & monitors risk from **all sources** for the purpose of increasing the organization's value to shareholders
- ❑ ERM is **co-ordinated** risk management - placing greater emphasis on **cooperation** among units to manage an organizations full range of risks as a whole
- ❑ ERM aims to seek out opportunities in risk
- ❑ Also know as:
 - Integrated Risk Management (IRM),
 - Holistic Risk Management,
 - Corporate Wide Risk Management,
 - etc.



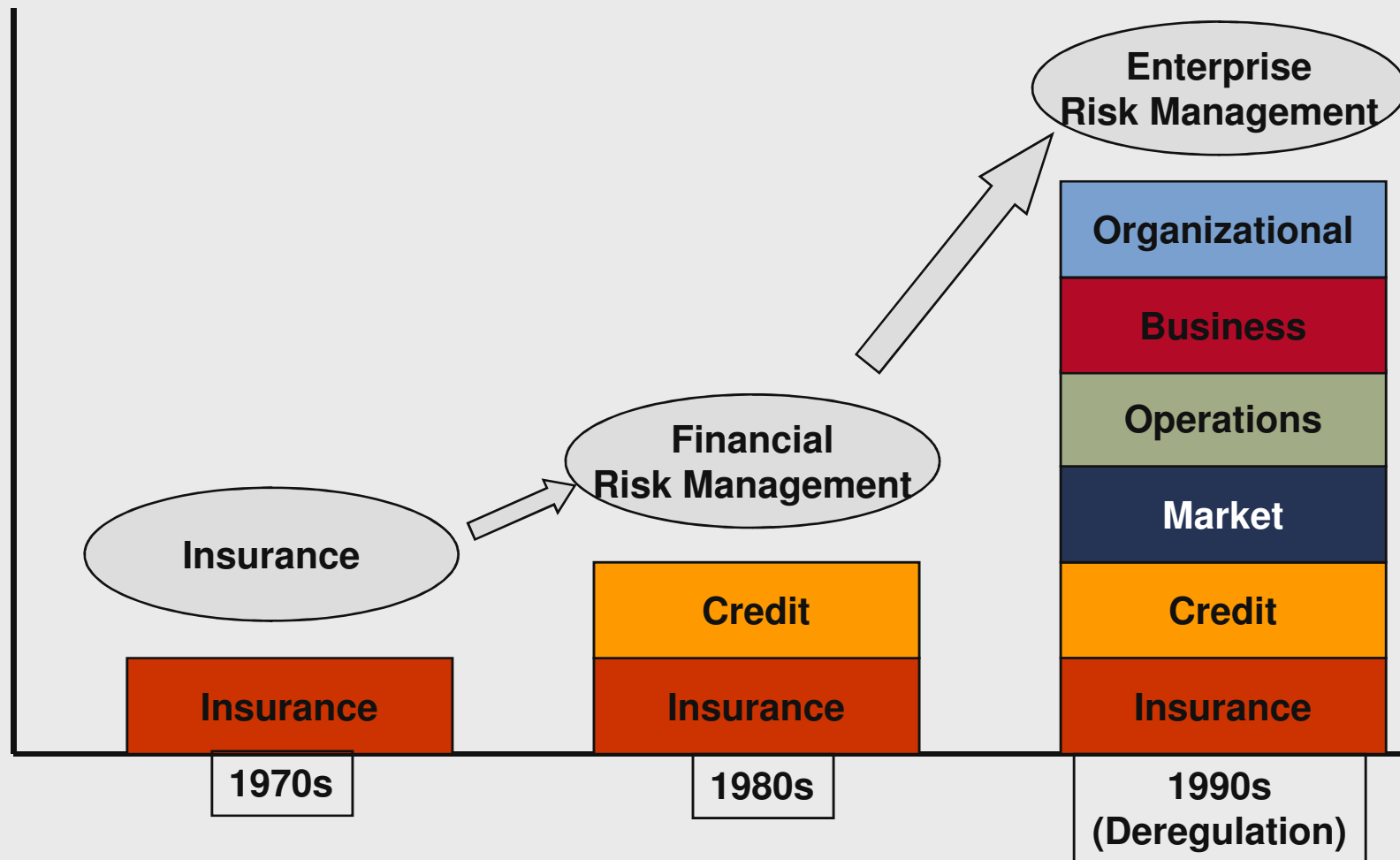
The philosophy of ERM addresses issues that we, as a profession, have always dealt with

Source: The Actuary, July 2008

History of ERM

- ❑ traces its roots to the early 1970s when Gustav Hamilton of Sweden's Statsforetag proposed the “**risk management circle**” to describe the interaction of all elements in the risk management process (assessment, control, financing and communication).
- ❑ in the 20th century, risk managers were primarily responsible for managing “**pure**” risks through the purchase of **insurance**
- ❑ concept of risk management soon became associated with **financial risk management** with the use of derivative financial products.
- ❑ organizations have traditionally used the “**silo**” approach to risk management that looks at the individual performance of a business unit

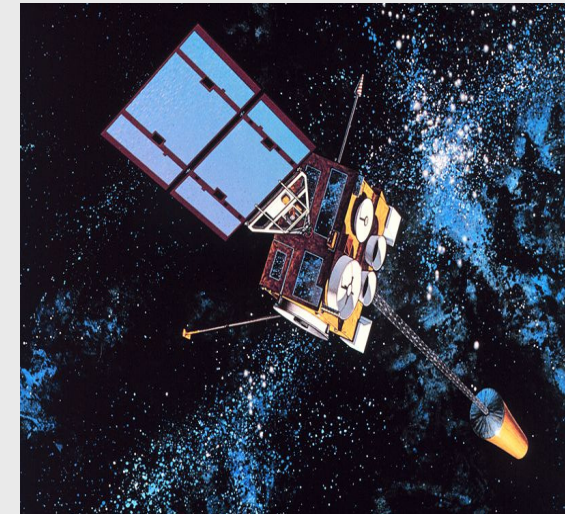
Evolution of Energy Industry Risk Practices



Source: 2003 RIMS Conference

The Evolution of Financial Risk Management

1952	Mean Variance	Markowitz
1958	Indifference Theory	Modigliani & Miller
1960's	Capital Asset Pricing Model (CAPM)	Sharpe
1973	Options-Pricing Model	Black, Scholes & Merton
1976	Arbitrage Pricing Theory	Ross
1979	Binomial Option Pricing Model	Cox
1980's	ARCH Time Series	Engle & Granger
1990's	Dynamic Hedging	Hull, <i>et al</i>
2000	Regime-Switching Lognormal (RSLN)	Hardy



Source: Harvard Business Review, September 2008: "The New Arsenal of Risk Management" modified (*red* indicates Nobel Prize winning topics)

Real World Imperfections

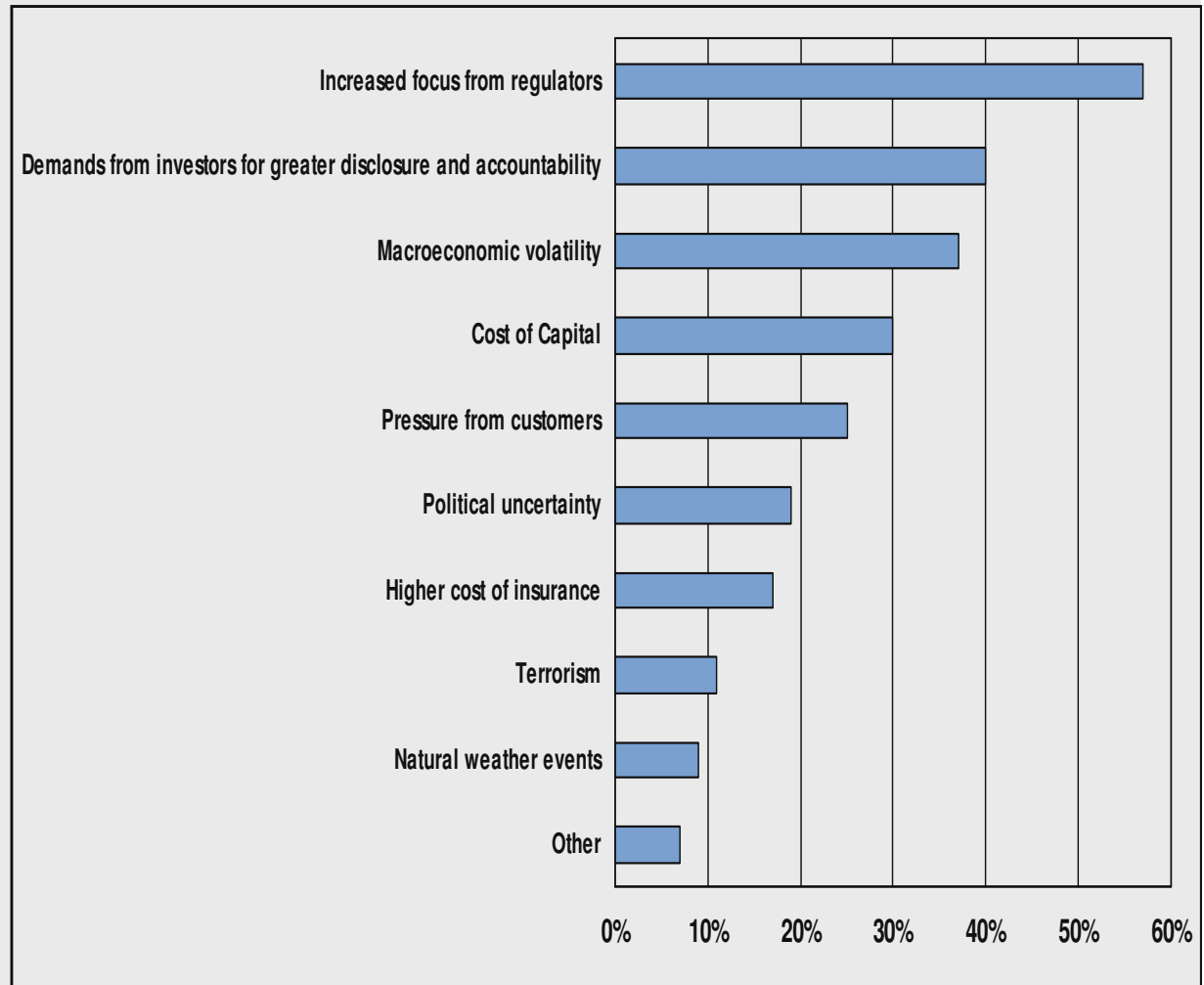
Agency Costs
Asymmetric information & signalling effects
Bankruptcy & financial distress costs
Behavioral Finance
Contagion
Moral Hazard
Regulation
Taxation
Transaction costs

Covered in
Financial Economics
FSA Module

Importance of ERM

- ☐ understand the shock resistance of the **enterprise** to its key risks
- ☐ better manage **enterprise** risk exposure
- ☐ greater transparency – reduction of **agency** costs
- ☐ focus from **rating agencies**
- ☐ **regulatory** compliance
- ☐ **globalization** in a continuously **competitive** environment

drivers to strengthen risk management



Source: The Economist Intelligence Unit in February 2007

Pros & Cons of the ERM Framework

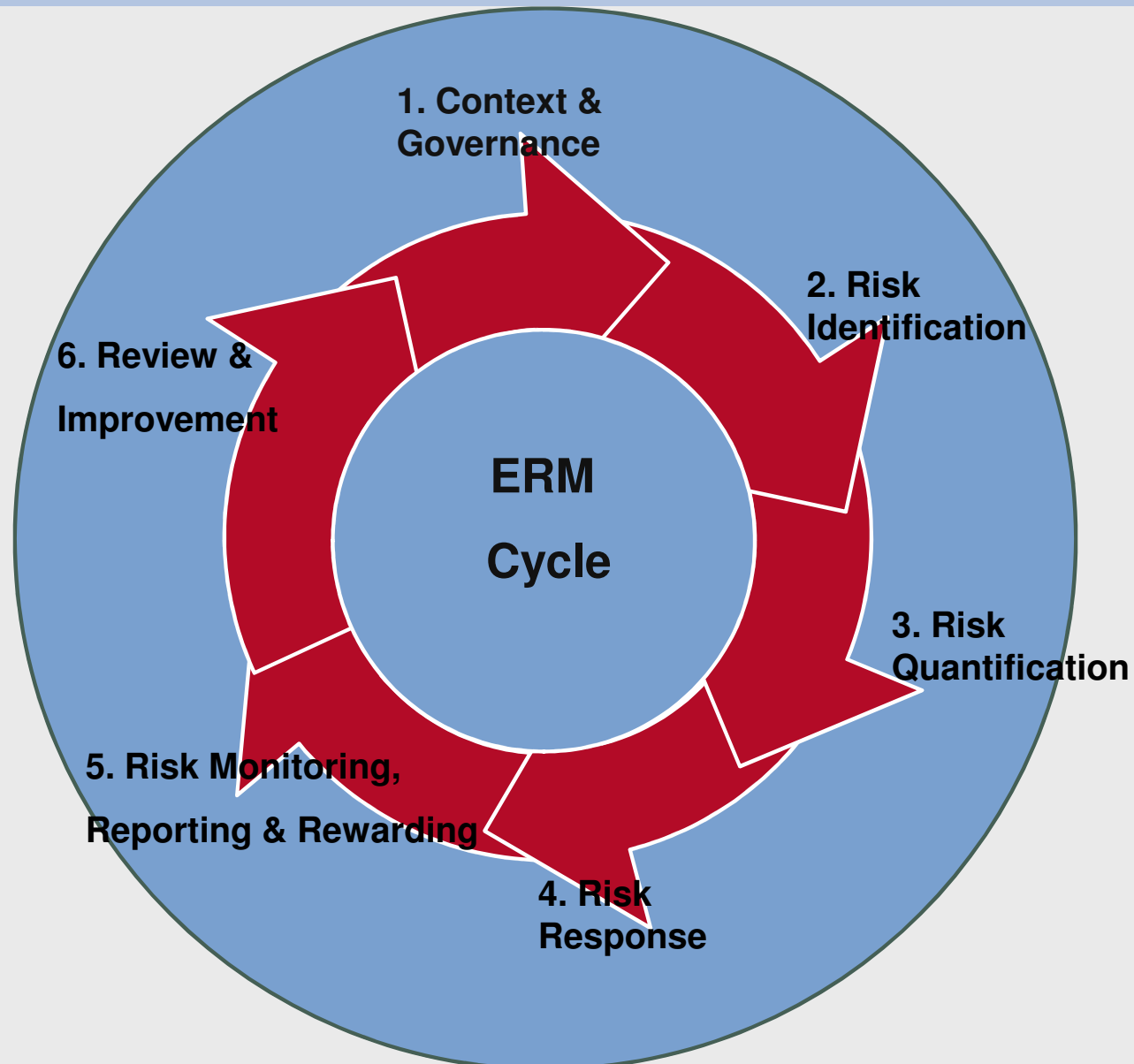
Pros:

- ☐ aligns risk appetite and corporate strategy
- ☐ links growth, risk and returns
- ☐ improves risk responses
- ☐ reduces operational surprises and losses
- ☐ recognizes and acts upon opportunities
- ☐ deploys resources effectively

Cons:

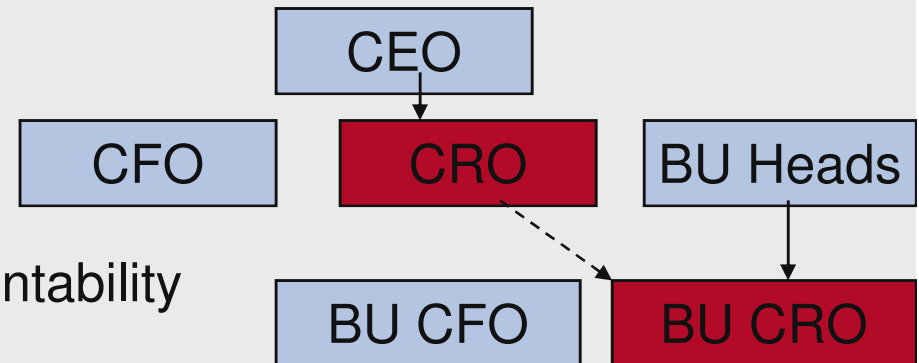
- ☐ human judgement
- ☐ breakdowns
- ☐ collusion
- ☐ cost versus benefit
- ☐ management override
- ☐ new risks – „Black Swans“

The ERM Cycle



Risk Context & Governance

- ❑ support at **senior** levels
- ❑ **proactive** – not reactive or static
- ❑ clarity of **roles**, understanding & accountability
- ❑ resources & culture - **involve** business unit leaders
- ❑ establishment of **risk appetite** appropriate to achieve strategic objectives
- ❑ **no** single “**template**” for sound risk governance practices – the approach must reflect particular legal and regulatory environment
- ❑ strength of implementation depends on **consistency** of processes across all business functions and geographical locations for all types of risk
- ❑ **evolves** over time, responding to changes in the external environment



The Rise of the CRO Role

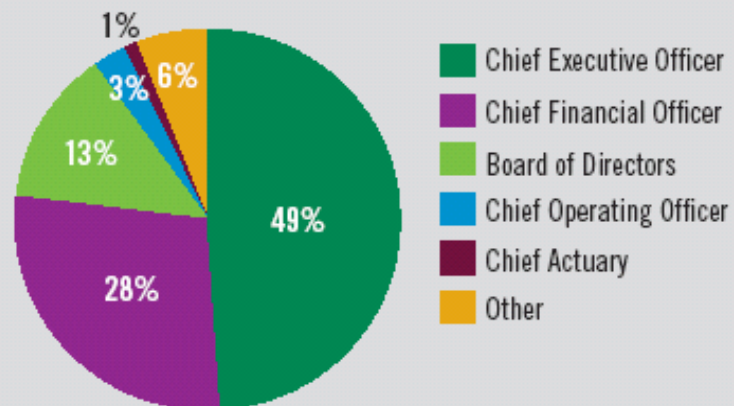
EXHIBIT 1

Who Is Responsible for Risk Management?



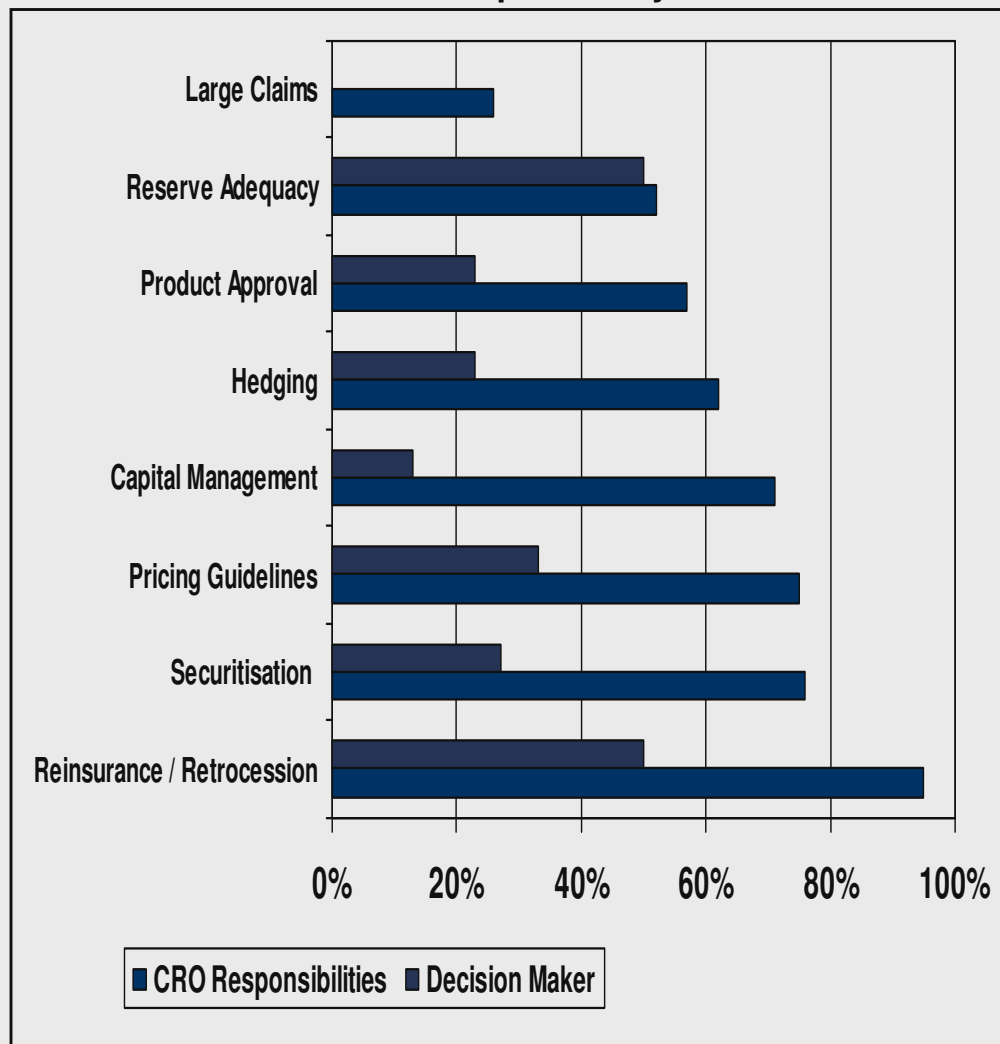
EXHIBIT 2

Where Does the Risk Management Function Report?



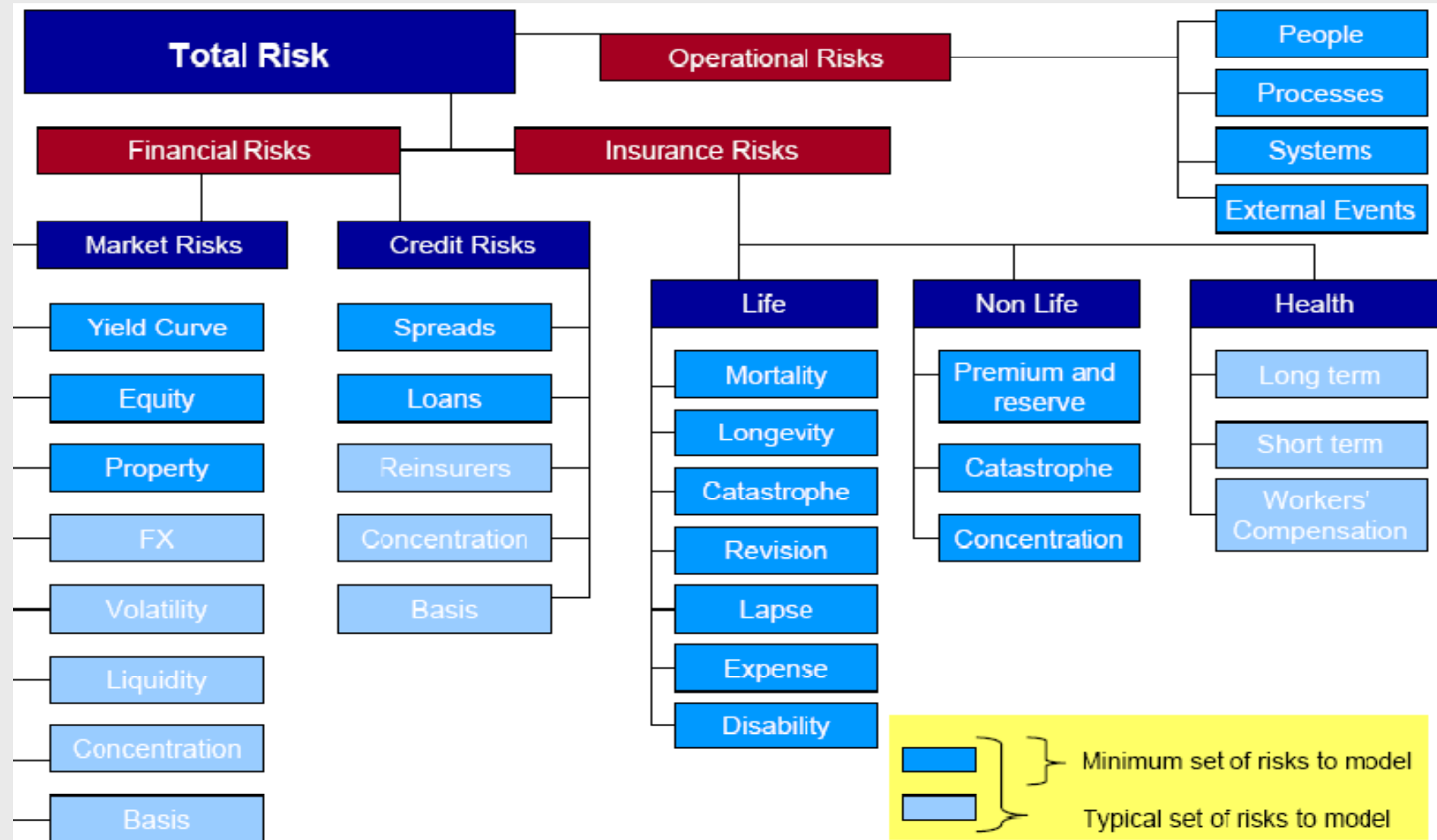
Source: Tillinghast

CRO Responsibility



Source : Survey of the Geneva Association

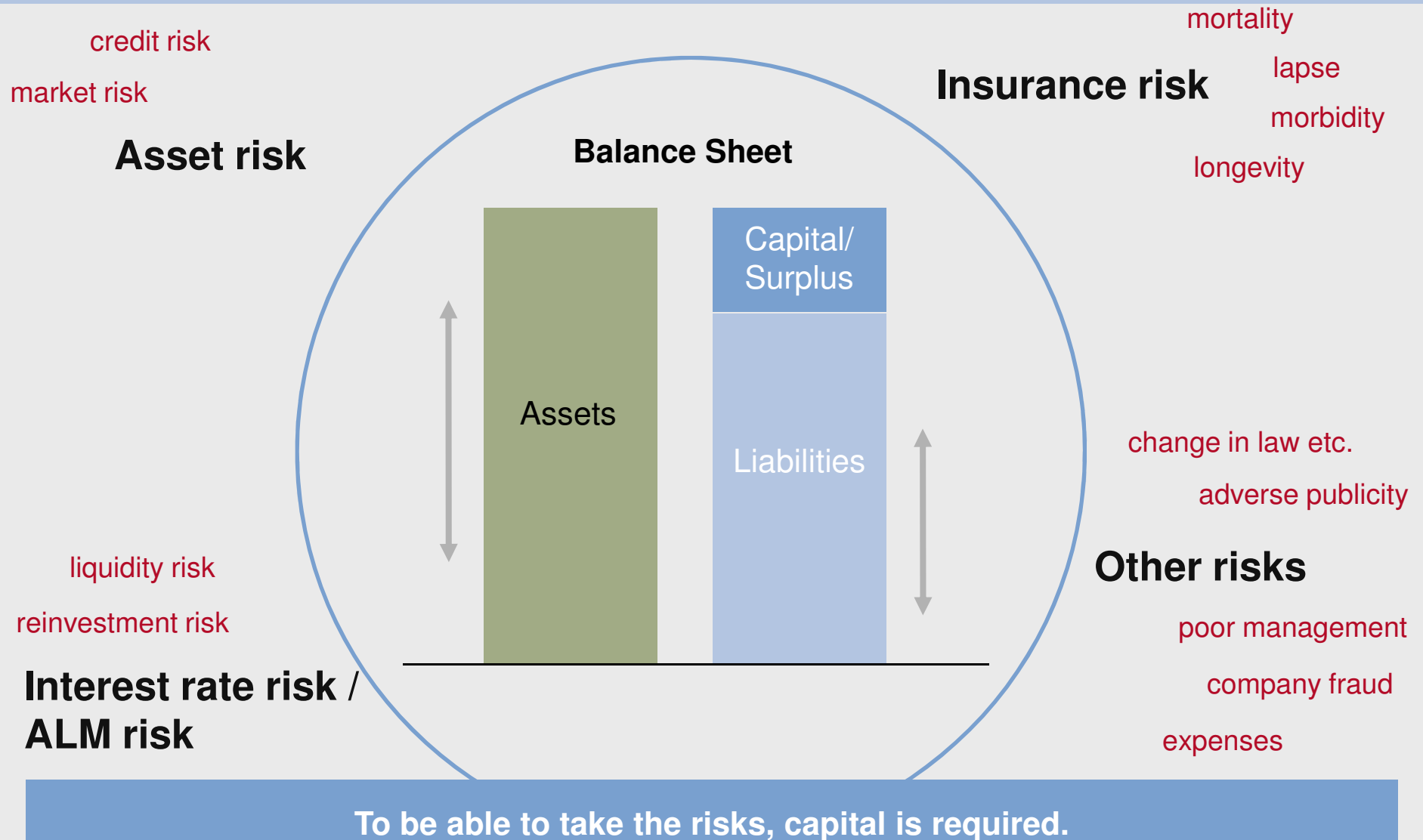
Risk Identification – The Risk Landscape...



Source: Tillinghast

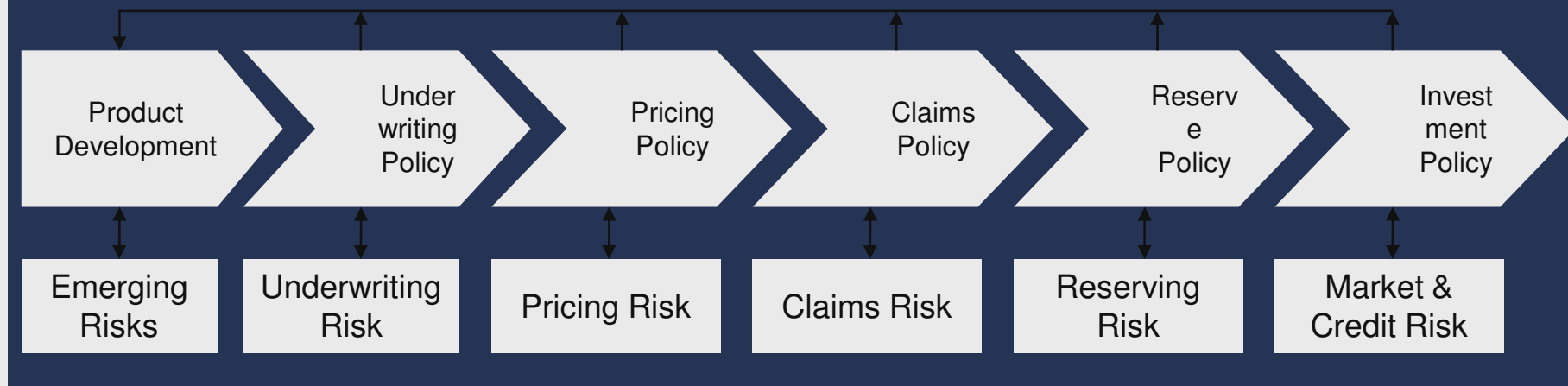


Risk & Capital



Insurance Companies Deal with all Kinds of Risks along their Value Chain

Management of all Core Risks



And Process Risks

Operating Risk

Liquidity Risk

Determines Shareholder Value

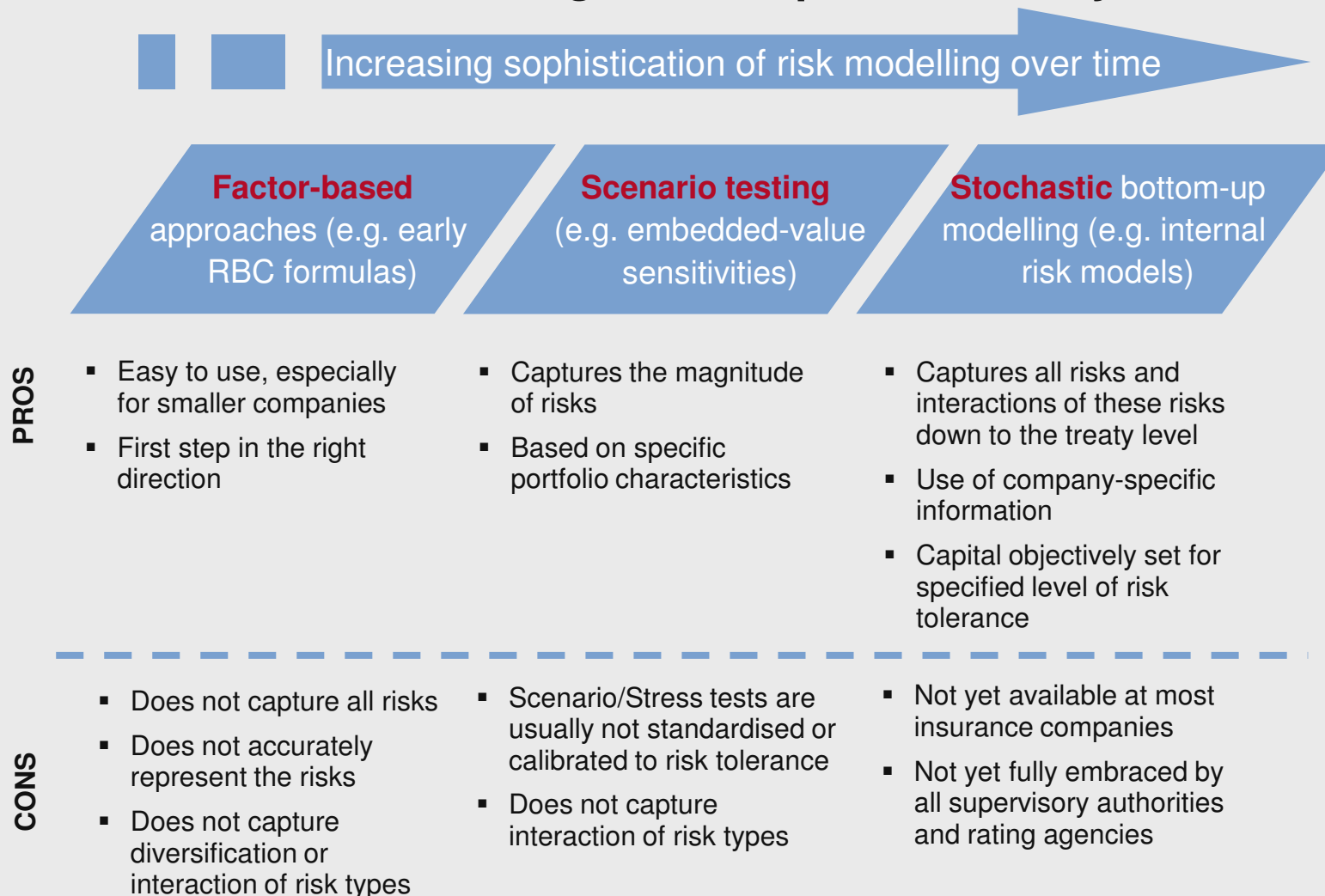
Economic Profit

Economic Capital



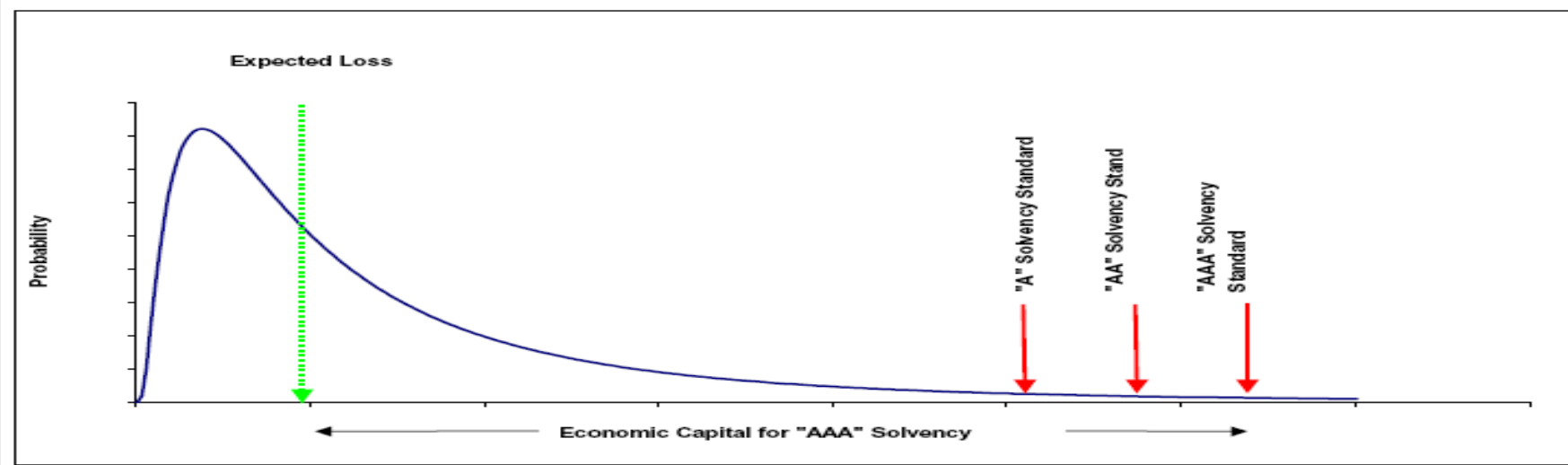
Risk Modelling

becomes more demanding and complex over the years

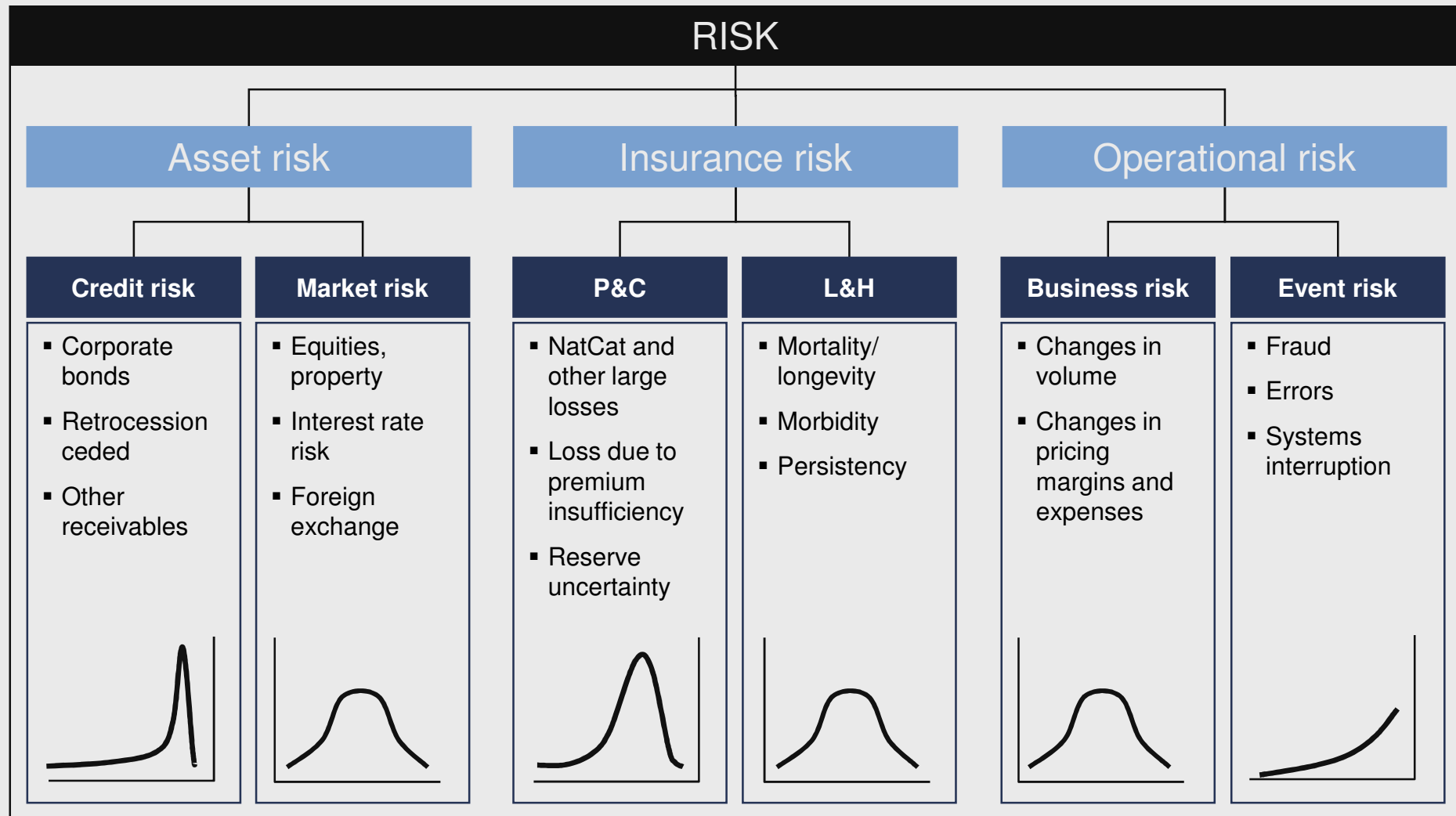


Risk Quantification Techniques

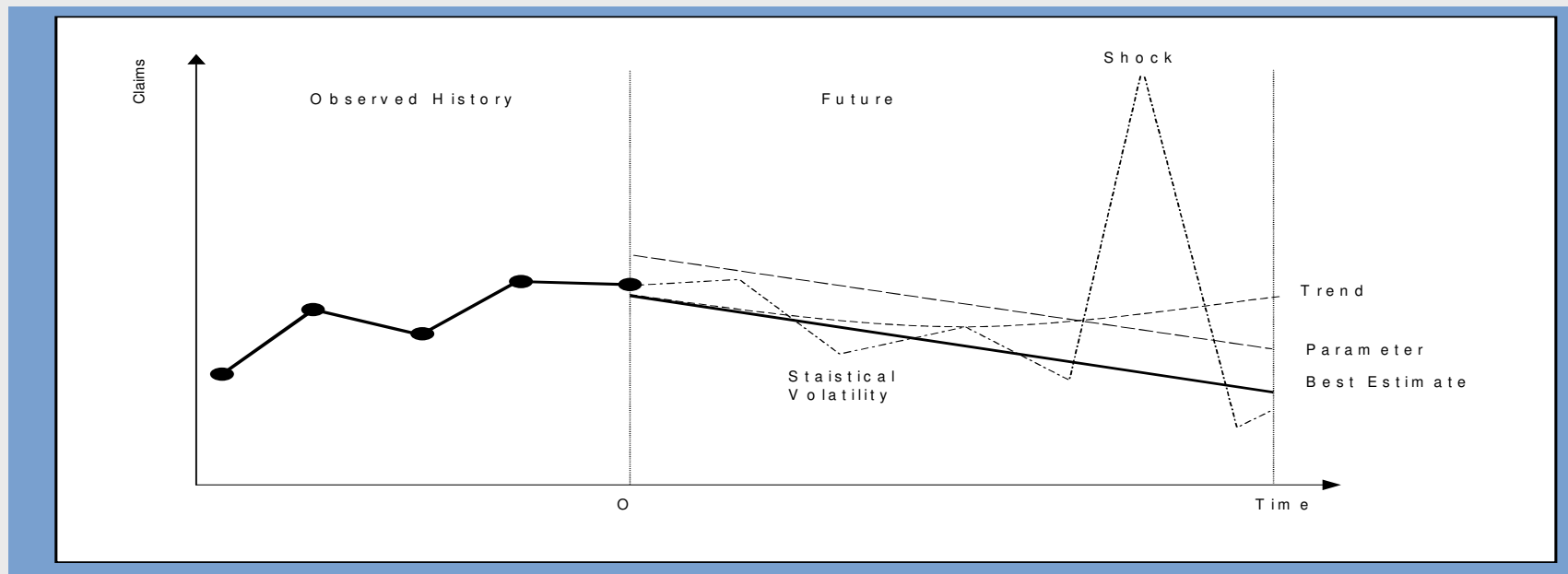
- ❑ key modern technique is **Economic Risk Capital (ERC)**
- ❑ using **VaR**; **CTE**; etc, techniques
- ❑ increasingly **stochastic** modeling
- ❑ VaR is well established for **financial** risks (Jorion, etc.)
- ❑ one year view sometimes difficult to apply for business with long term **insurance** risks
- ❑ Also use “**Greeks**” to quantify risk inherent in hedging platforms



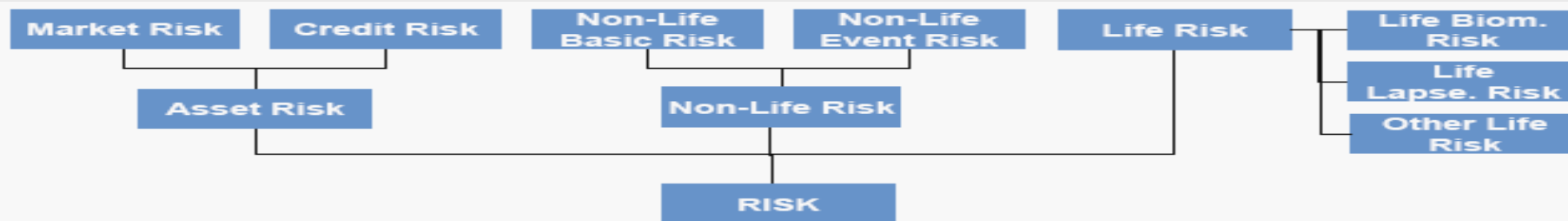
Modelling Individual Risks



Modeling the Risk Components for Insurance Risks



Risk Correlations, Aggregation & Diversification



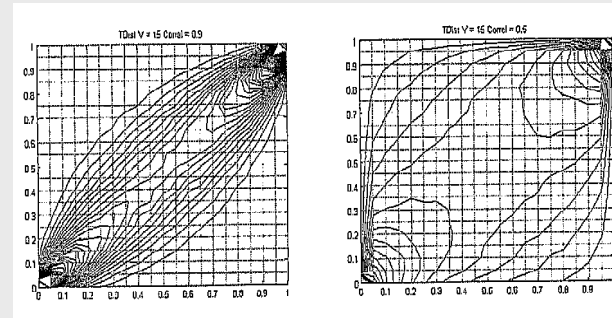
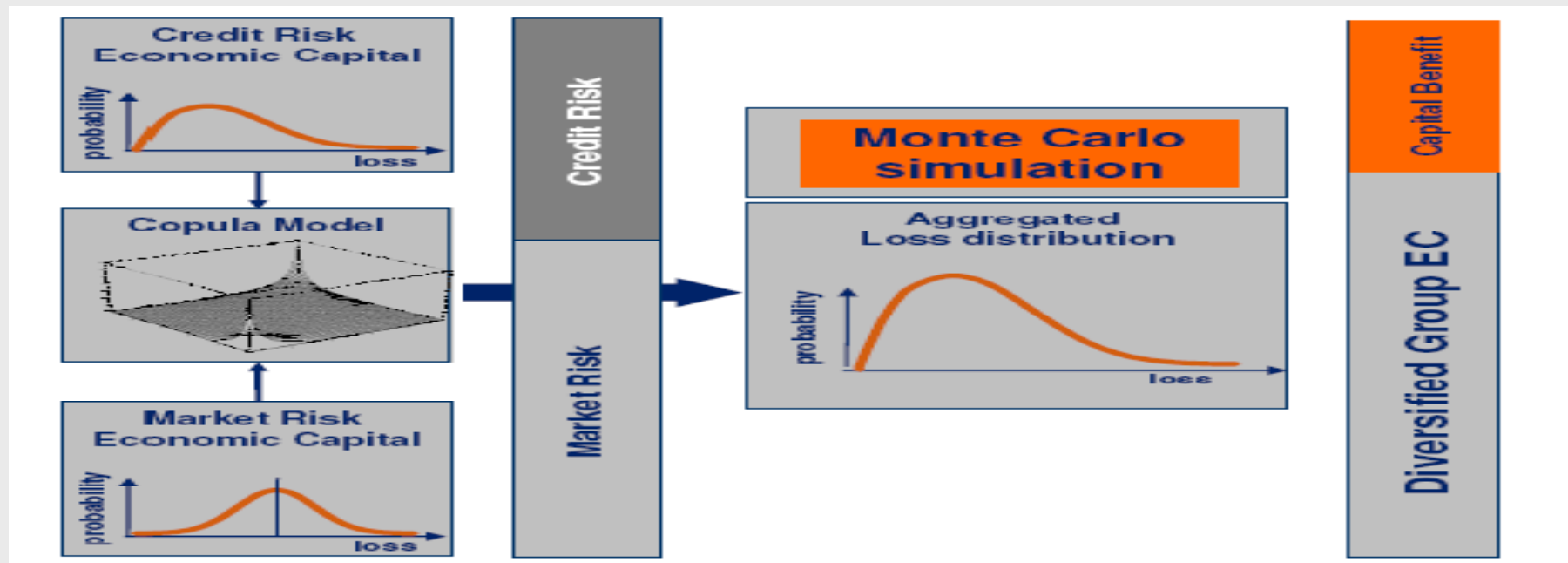
The individual Risks are aggregated incorporating their dependency structure represented by a Correlation Matrix:

$$\begin{pmatrix} 1 & \rho_{1,2} & \rho_{1,3} & \rho_{1,4} & \rho_{1,5} \\ \rho_{2,1} & 1 & \rho_{2,3} & \rho_{2,4} & \rho_{2,5} \\ \rho_{3,1} & \rho_{3,2} & 1 & \rho_{3,4} & \rho_{3,5} \\ \rho_{4,1} & \rho_{4,2} & \rho_{5,3} & 1 & \rho_{4,5} \\ \rho_{5,1} & \rho_{5,2} & \rho_{5,3} & \rho_{5,4} & 1 \end{pmatrix}$$

	Int	Exp	Cred	Morb	Lapse	Mort	Oper
Int	1.00	0.25	0.75	0.25	0.25	0.00	1.00
Exp		1.00	0.75	0.25	0.25	0.00	1.00
Cred			1.00	0.10	0.10	0.00	1.00
Morb				1.00	0.10	0.00	1.00
Lapse					1.00	0.00	1.00
Mort						1.00	1.00
Oper							1.00

Modelling Dependencies Using Copulas

Possibility to take linear as well as non-linear dependencies into account by using copulas



Source: DFine Consulting

Munich Re's ERC Showing Diversification Effects

€bn		31 December 2007		
Risk category ¹	Group	Reinsurance	Primary insurance	Diversification effect
Risk segment				
Property-casualty ²	7.0	6.9	0.5	−0.4
Life and health	3.3	2.7	0.9	−0.3
Market	7.9	6.2	3.3	−1.6
Credit	1.5	1.2	0.3	0.0
Operational risk	1.2	0.8	0.4	0.0
Simple sum	20.9	17.8	5.4	−2.3
Diversification effect ³	−4.4	−3.8	−0.9	0.3
Total ERC	16.5	14.0	4.5	−2.0

€4.4bn diversification effect between risk segments evaluated at Group level

€2.0bn diversification benefit between reinsurance and primary insurance on aggregate level

Risk Response Techniques

Avoid	not accept the risk - e.g. exit the business
Accept	accept the level of risk and take no further action to minimize it further
Transfer	transfer the risk - e.g. to a reinsurer or the capital markets (securitization)
Mitigate	take action to manage risk through natural hedges or other controls

Transfer to the Capital Markets via Insurance Linked Securities (ILS):

- ☐ Extreme mortality (e.g. Avian Flu) ; Longevity risks – not diversifiable risks
- ☐ Risks which have limited reinsurance capacity
- ☐ Insurance risks (e.g. mortality/longevity) have limited correlation with the financial markets

Reinsurance vs. ILS

	Reinsurance	ILS
Credit risk	Will depend on rating of the reinsurer	Cat bonds avoid credit risk to the issuer
Basis risk	None – as reinsurance is based on company's actual portfolio	Significant – as insurer pays own losses but receives payoff on index
Moral Hazard	Primary firm may be lax in uw – reinsurer needs to align interests	Defining ILS on index controls moral hazard
Size & Costs	Could be done for smaller deals & on a less costly basis.	Need to be of a certain size to be economically viable. Costly.
Capacity	Limited capacity	Independent capacity
Price Dependency	Prices may depend on market cycle	Limited dependency on insurance market cycle

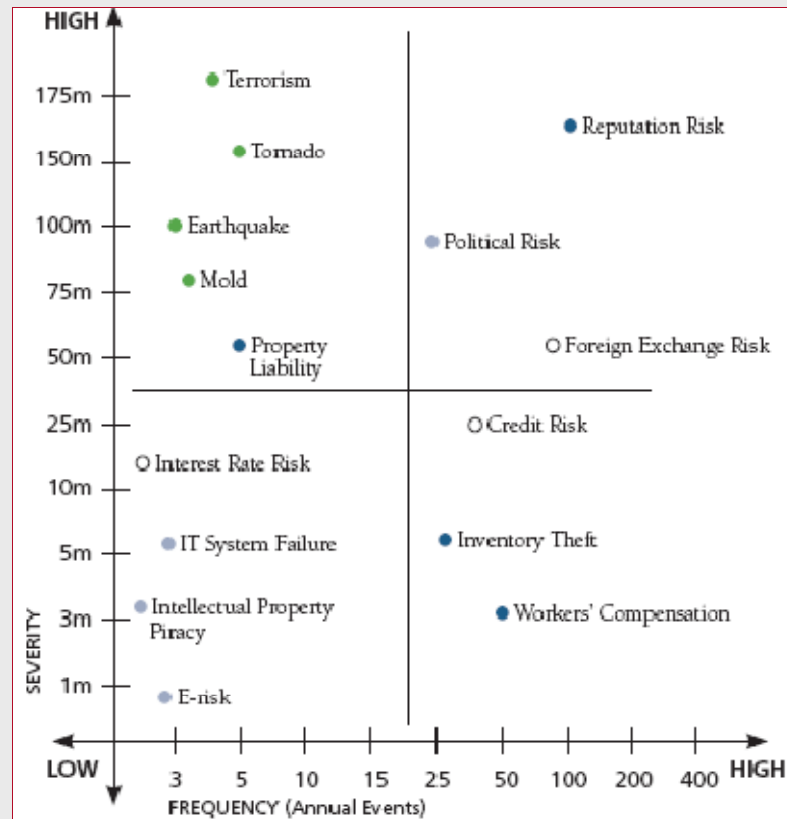
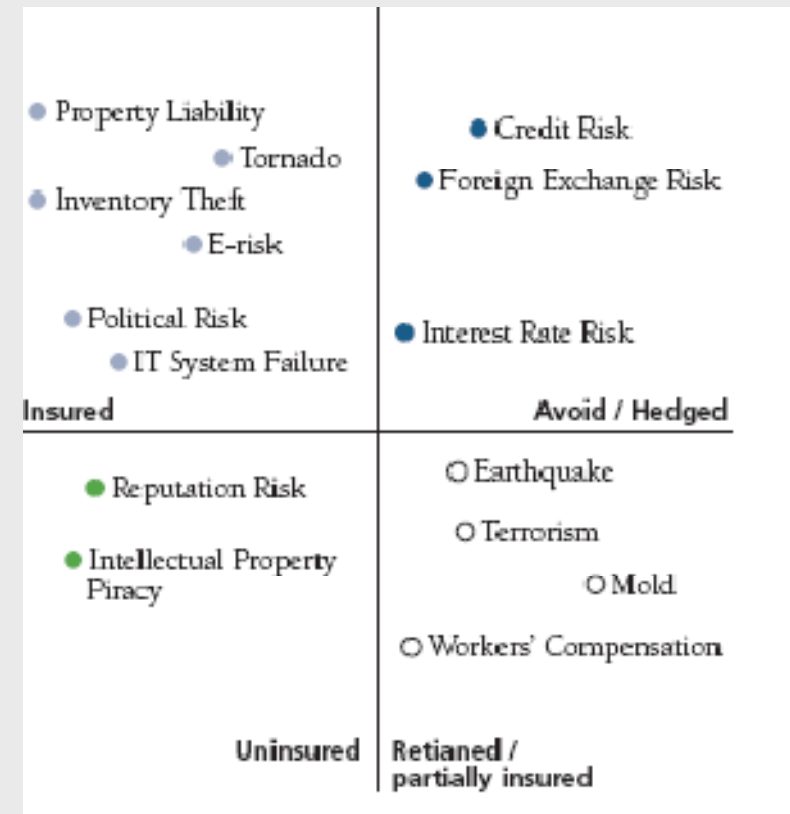
Step #5: Risk Monitoring, Reporting & Rewarding

- ❑ ERC numbers **reported** – and compared to accounting measures to illustrate financial strength
- ❑ ERC **projections** also shown
- ❑ ERC feeds into **MCEV** calculations
- ❑ Value Based Management using MCEV for **bonus** payments
- ❑ Consistent with **strategic risk management** principles
- ❑ Increasing **disclosure** by companies on ERC and ERM frameworks in general – in annual reports: example for Goldman Sachs:

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Market Risk.....	69
Credit Risk	73
Derivatives	73
Liquidity and Funding Risk.....	76
Operational Risk.....	81



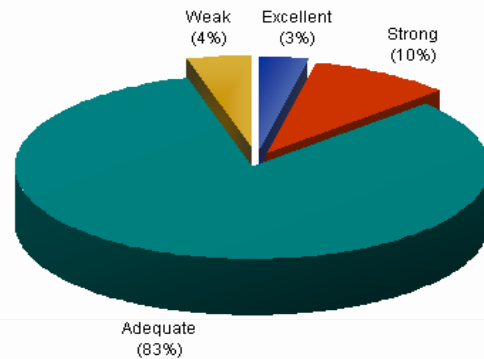
Risk Maps



State of ERM According to S&P

Global ERM Score Distribution, 2007

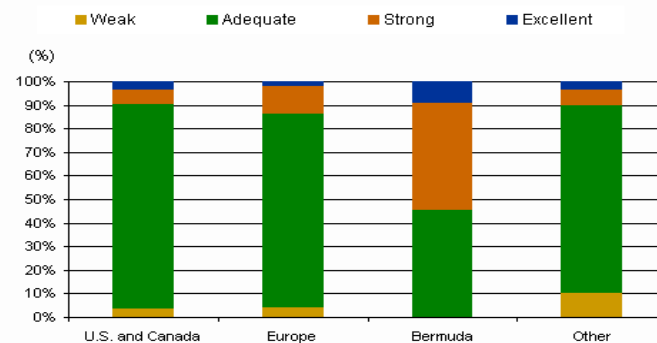
Total companies: 274



© Standard & Poor's 2008.

ERM Ratings Distribution, 2007

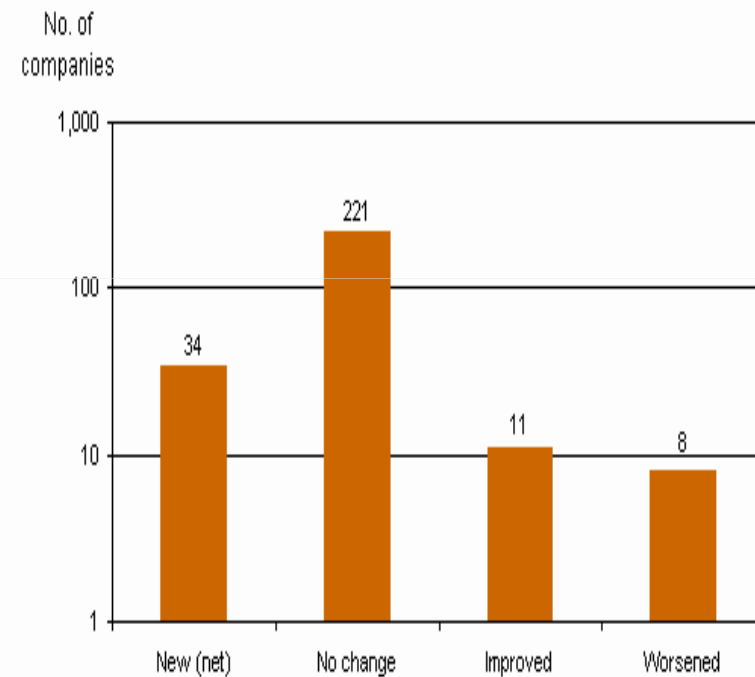
Total companies: 274



© Standard & Poor's 2008.

Changes To ERM Scores In 2007 From 2006

Total companies: 274



© Standard & Poor's 2008.



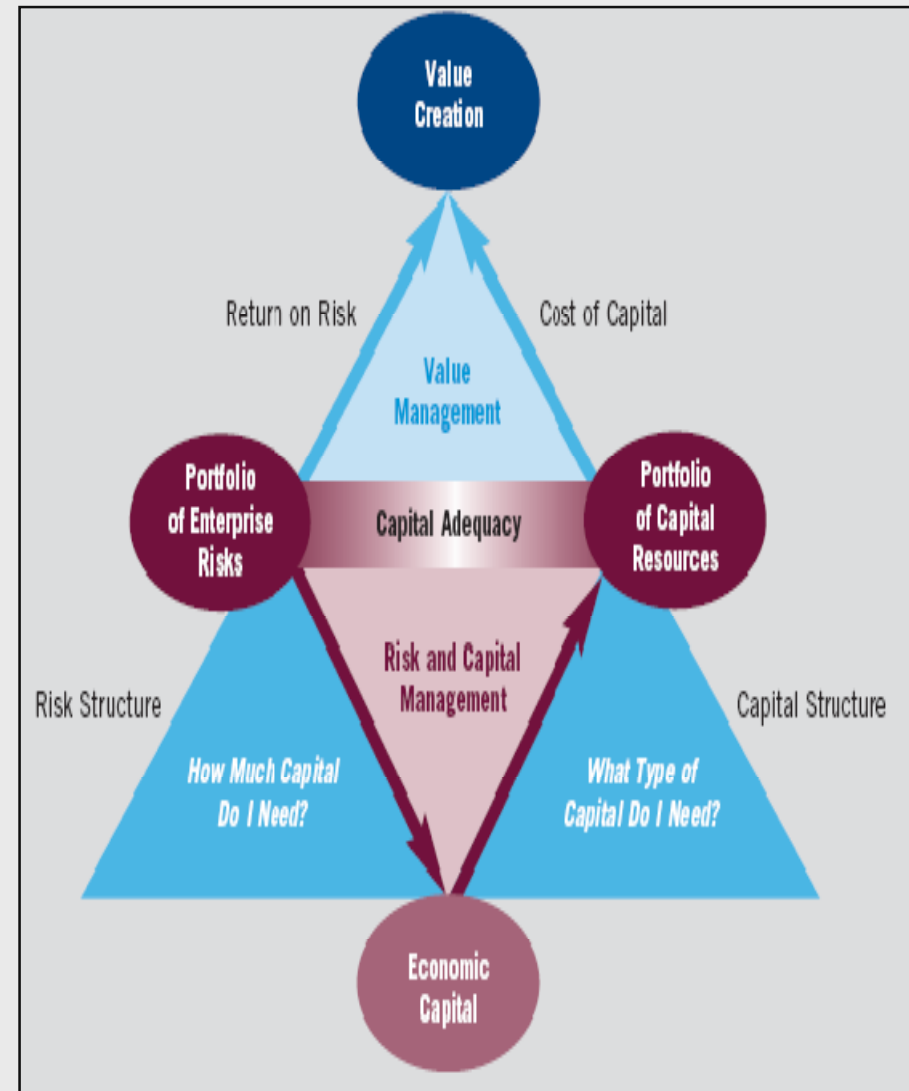
Standard & Poor's ERM Framework¹

Risk Management Culture	Clearly and consistently defined risk tolerance for all risks Strong risk governance
General Risk Controls Considerations	Company's methods to identify, monitor, measure, limit, offset, transfer, and exploit the risks of the company
Emerging Risk Management	Risks that do not currently exist, but occur slowly over time, are difficult to identify, and represent an idea more than factual circumstances
Risk and Economic Capital Models	Technical processes (data, assumptions, model, stress tests) a company uses to measure all risks and the way model results are incorporated into the company's decision making
Strategic Risk Management	Ways that risk management is integrated into the strategic decision making, product pricing, and performance evaluation

1) "Insurance Criteria: refining The Focus Of Insurer Enterprise Risk Management Criteria, Standard & Poor's, 02 June 2006

Strategic Risk Management

- ❑ is the process of reflecting **risk & capital** in **strategic** choices & **value creation**
- ❑ has as its objective the **optimization** of risk adjusted results
- ❑ firm chooses **strategic alternatives** that have best return for the level of return
- ❑ uses ERC, MCEV, **RAROC**, IRR, etc.
- ❑ **full linkage** – the integration of risk, capital and financial management
- ❑ evaluates impact on **shareholder value**, leading to well defined strategic actions



Other Bodies Driving ERM Frameworks

❑ Rating Agencies (also NIARM)

❑ Regulators:

➤ NAIC, SEC - SoX



➤ OSFI – Supervisory Framework



➤ FSA – Guidance for Directors on the Combined Code



➤ Basle Accords, SST



➤ ASPRA – ERM Guidelines



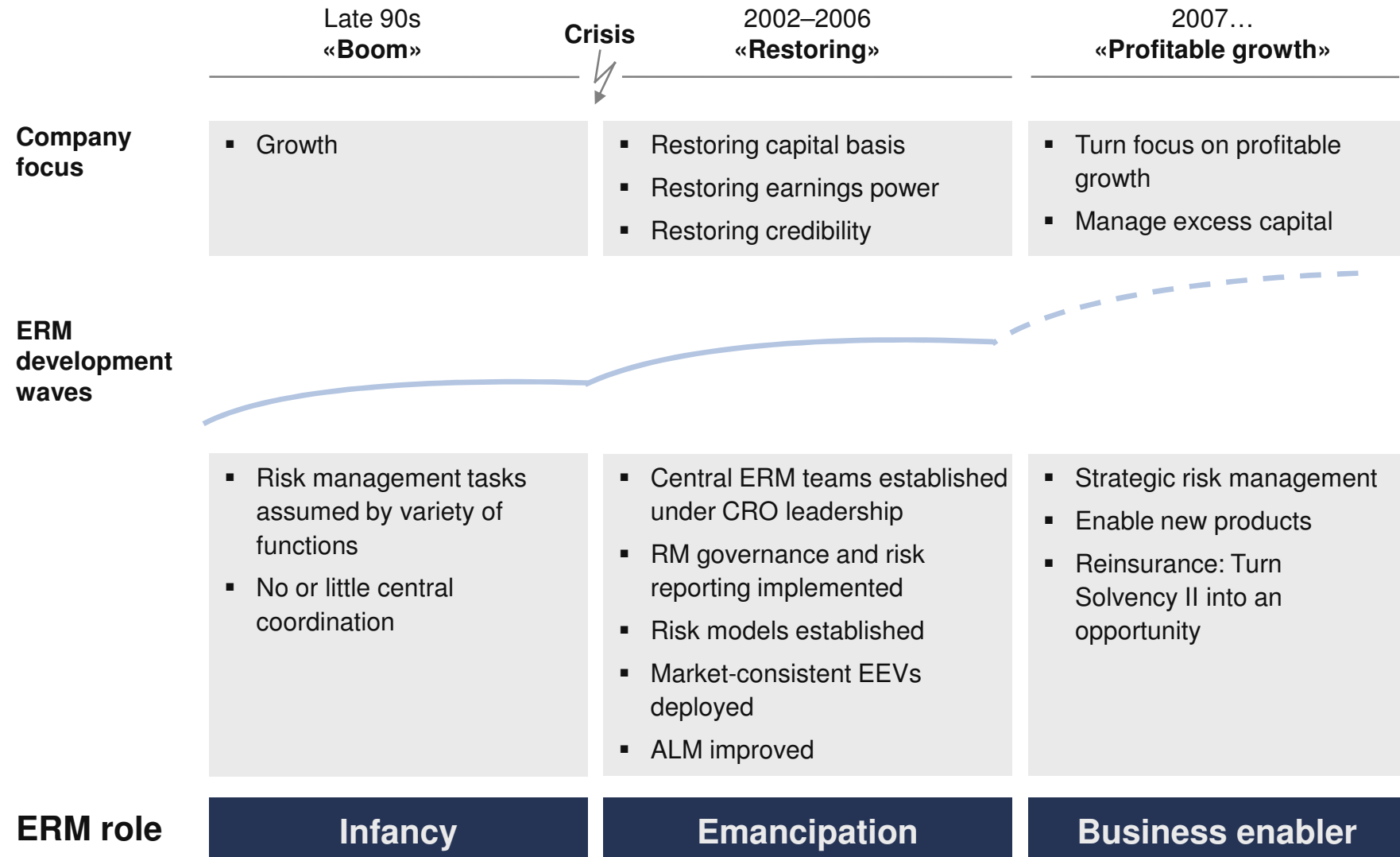
❑ Actuarial bodies – AAA, SoA, CAS, IAA, etc.

❑ Accounting bodies – COSO; Auditing Firms

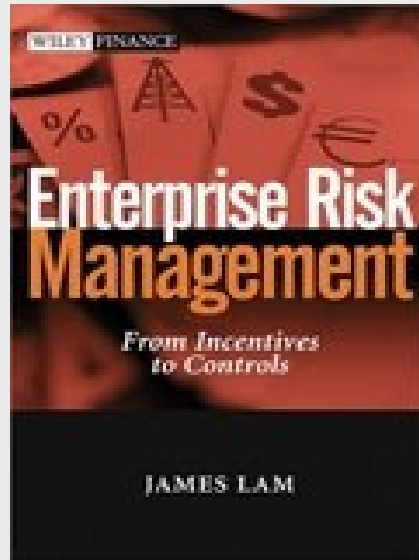
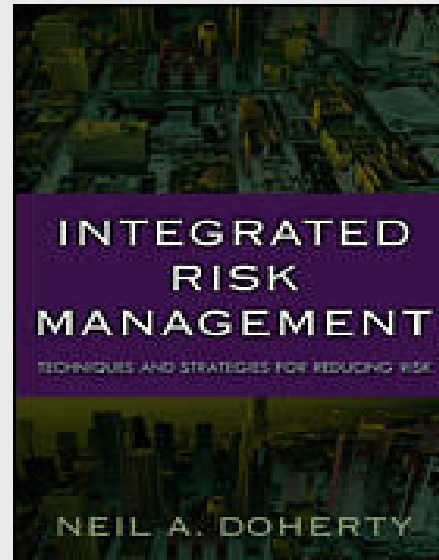
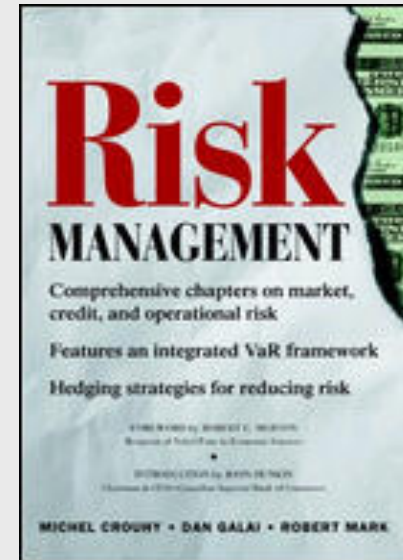
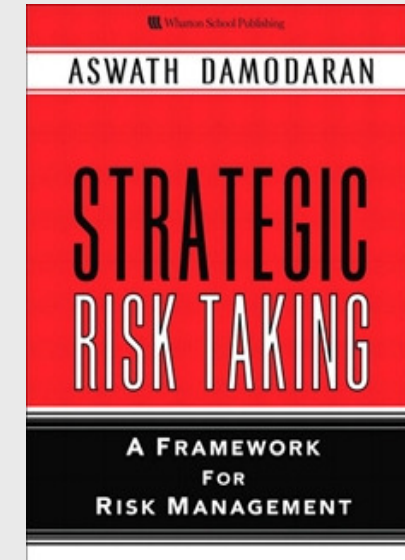
❑ Academics – ERM-II; Wharton; HBR; Damodaran; Shiller; etc.



Evolution of ERM

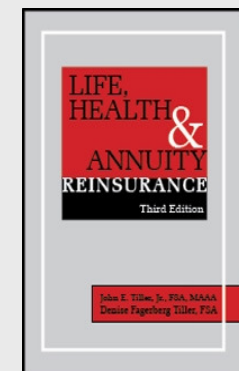


ERM References



Insurance Risk

Definition	mortality morbidity lapse look at components - level, volatility, trend, shock
How Measure	Economic Capital
How Manage	margins capital reinsurance, securitization
References	IAA Solvency Publication; Tilller



ERM References – Market Risk

Equity Risk

Definition	Equity guarantees retained by company
How Measure	VaR, CTE, etc.
How Manage	diversification hedge, ALM dynamic hedging
References	Hardy, CFA readings



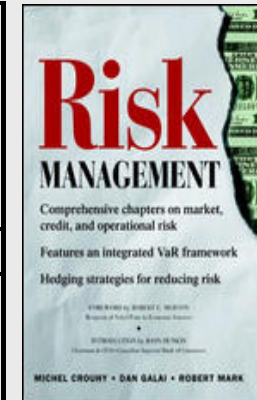
Interest Rate Risk

Definition	Interest rate guarantees retained by company
How Measure	VaR, CTE, etc.
How Manage	ALM hedge dynamic hedging
References	Basle Committee, Fabozzi, CFA readings

ERM References - Credit & Liquidity Risks

Credit Risk

Definition	credit risk as related to fixed income securities. spread risk as related to fixed income securities credit risk as related to derivatives credit risk as related to reinsurance counter-party risk
How Measure	Ratings; capital; etc.
How Manage	credit derivatives, diversification, concentration limits, and credit support agreements. due diligence and aggregate counter-party exposure limits.
Case Study	Enron & subsequent SEC investigations on Rating Agencies
References	Crouchy; Smithson; etc.



Liquidity Risk

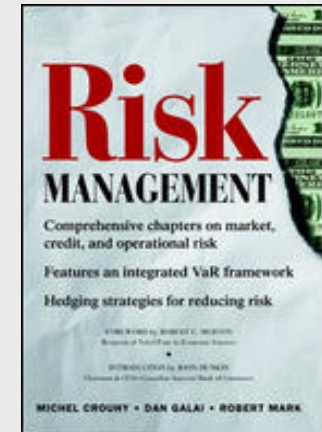
Definition	cashflow strain run on the bank hidden callable options
How Measure	liquidity ratios; scenarios; etc.
How Manage	diversification surrender charges contract design
Case Study	General American
References	"Liquidity Risk Measurement," CIA Educational Note Dynamic Financial Condition Analysis Handbook



ERM References – Operational & Strategic Risks

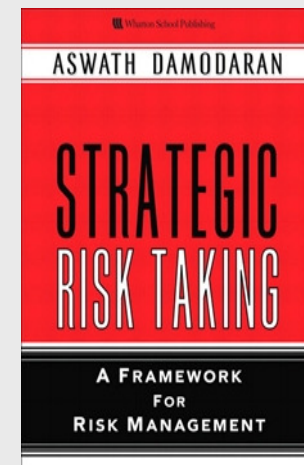
Operational Risk

Definition	the risk of direct or indirect loss resulting from inadequate or failed internal processes, people and systems or from external events.
How Measure	Economic Capital
How Manage	COSO Guidelines SoX



Strategic Risk Management

Definition	Strategic Risks – potential damage to reputation, competition, demographic trends, technological innovation, capital availability and regulatory trends.
How Measure	ERC, MCEV, RAROC, IRR, etc.



Thank you very much for your attention.



**Münchener Rück
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Questions?

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