

Swiss Re



Swiss Re's Enterprise Risk Management System

Financial Risk Seminar, Barbican Centre, London

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Financial Risk Seminar
Barbican, 23 March 2004
Swiss Re, H.P. Würmli



Agenda

Swiss Re and the risk environment

Swiss Re's risk management set-up

Transparency – Pillar 3

Qualitative risk management – Pillar 2

Quantitative risk management – Pillar 1

Summary



Swiss Re and risk

Taking risk is the core activity of Swiss Re

Risk represents at the same time

- Swiss Re's **opportunity to create value** for its shareholders, and
- a **threat** to its ability to deliver on the promises made to clients and shareholders alike



Swiss Re Group at a glance

Premiums earned amounted to **CHF 29.1 billion**

Total revenues amounted to CHF 34.5 billion

Total **investments** amounted to approx. **CHF 87 billion**

Leading position in **P&C reinsurance**: **9.5% market share**

Leading **L&H reinsurer**: **24.7% market share**

Leading provider of financial services solutions to targeted clients

Highly diversified portfolio by region and by line of business

Proven expertise in risk and capital management

Strong corporate culture based on 140 years of experience

All figures 2002



Swiss Re's history

1863	Foundation of the company
1906	San Francisco Earthquake, Swiss Re establishes its reputation
1910	First branch office in New York
1950-1956	Opening of offices in South Africa, Canada, Australia, Hong Kong
1968-1976	Creation of several advisory and service companies in Asia and South America
1994	Refocus on core business - selling majority shares in several insurance companies
from 1995	Development of financial services offerings
1996-2001	Strengthening of life and health business through the acquisitions of Mercantile & General Re Group, American Life Re Corporation and Lincoln Re



Which risk?

Risk to claims paying ability ...

Risk to shareholder value ...

... can manage risk to “net worth” and

... can manage operational processes



Large risks for reinsurer

Catastrophic events

Mistaken trends – misjudging price cycles

Bad investments

Has the world changed?

Are there new risks?

Are the new risks worse than what we had in past?

Are there trends?



New risks?

Terrorism



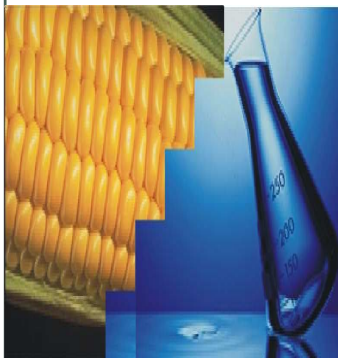
BSE



EMF



GMO

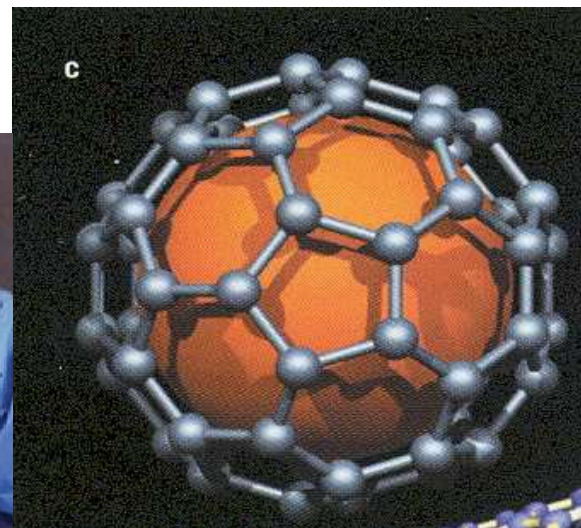


New risks?

Pervasive Computing



Nanotechnology



vJCD –Hospital Crisis

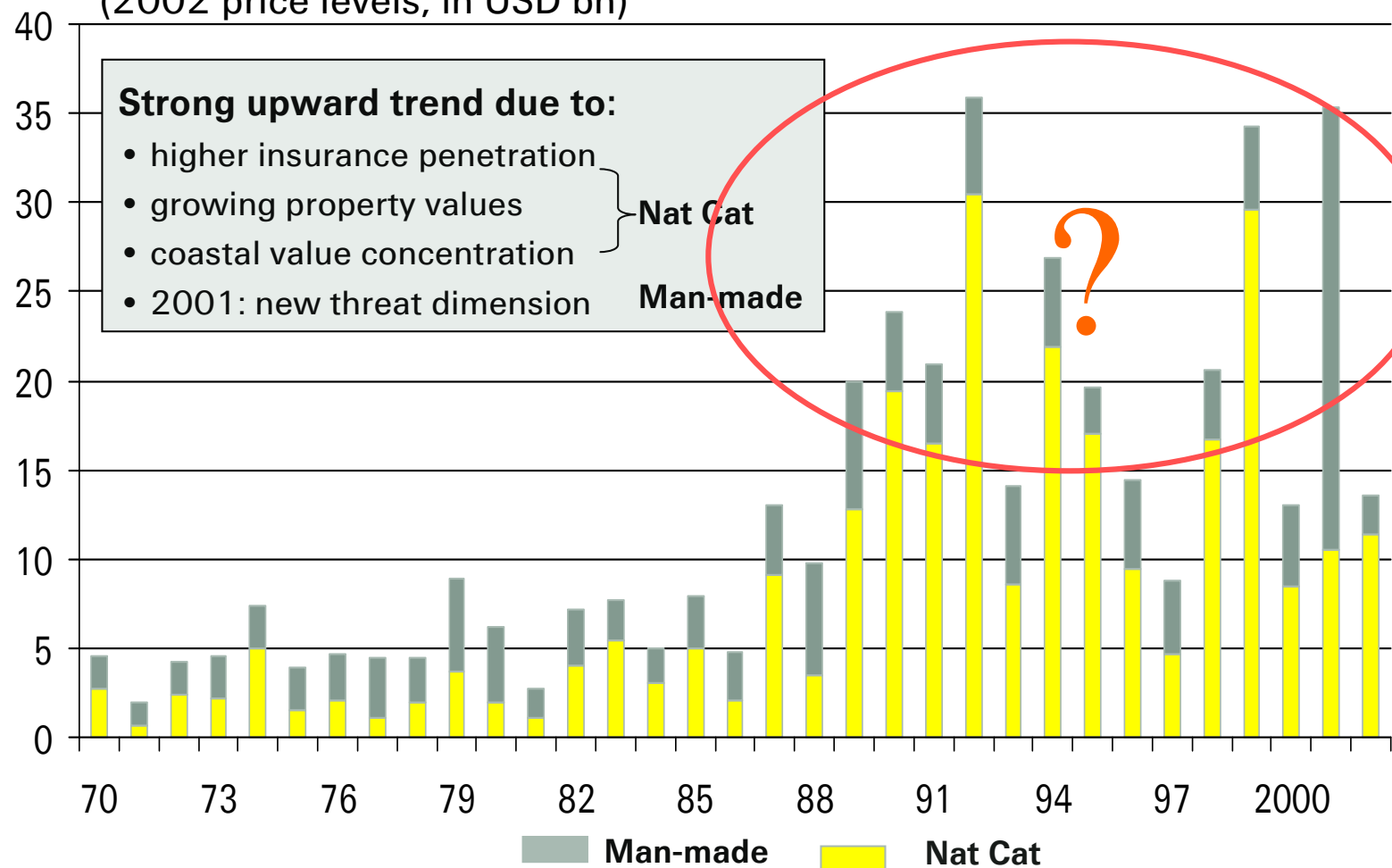




Losses caused by natural and man-made catastrophes

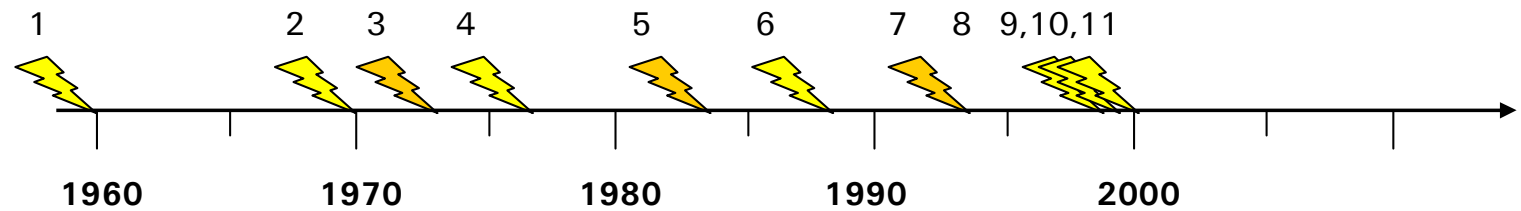
Trend?

Annual insurance cat. losses 1970-02 (Property/BI) worldwide
(2002 price levels, in USD bn)



Source: Swiss Re sigma 2/2003

Pharma: example for growing product liability claims



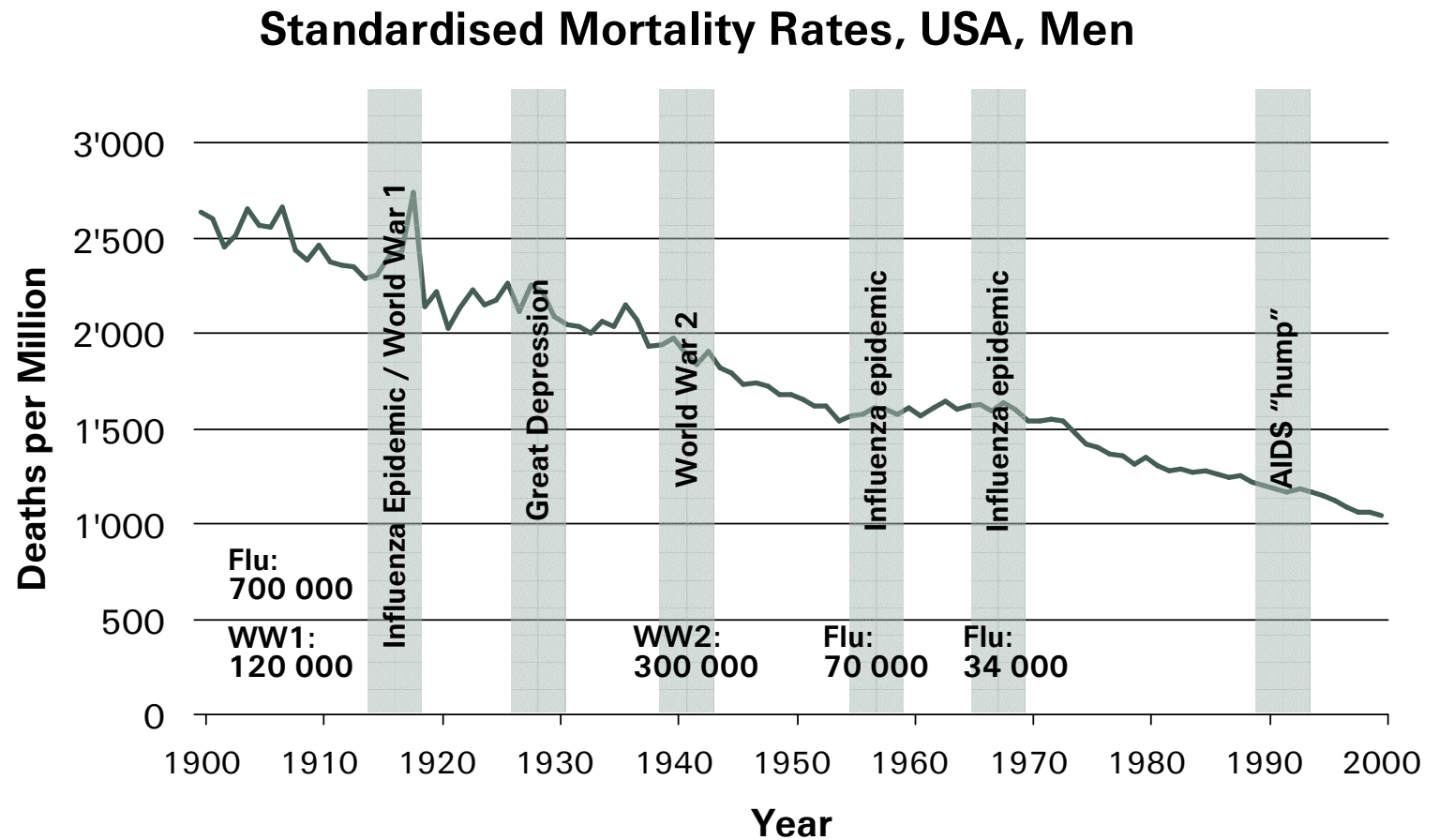
Trend?

Classical pharma Extensive loss history

- 1 Thalidomide
- 2 Mexaform SMON
- 3 DES
- 4 Dalcon Shield
- 5 Factor VIII (AIDS)
- 6 L-Tryptophane
- 7 Breast implants
- 8 Fen/Phen
- 9 Rezulin
- 10 Hip implants
- 11 Baycol/Lipobay

Life & Health insurance: population mortality trend in U.S.A.

Trend?

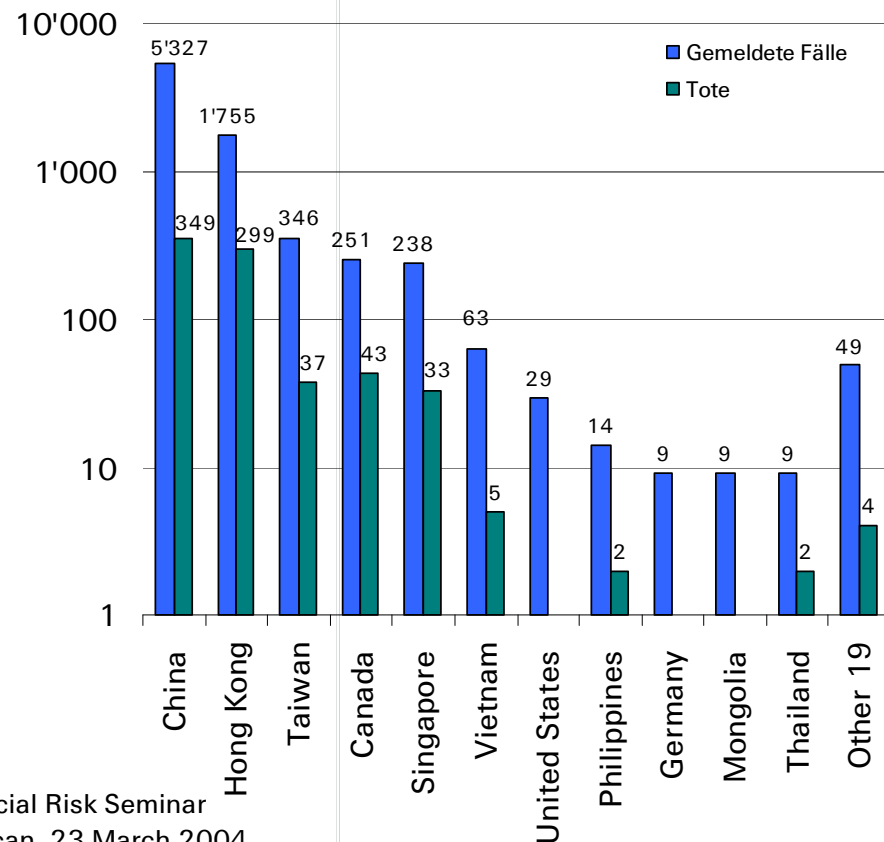


Sources: Stanford University, US Food & Drug Administration,
US Civil War Center & Center for Disease Control



Epidemics and insurability

SARS number of reported cases and deaths



Influenza pandemics 1918 / 19

- More than 20 m deaths caused by "Spanish Flue"
- US death toll 500 000; insurance claims of USD 125 m (0.5% of US GDP)

SARS

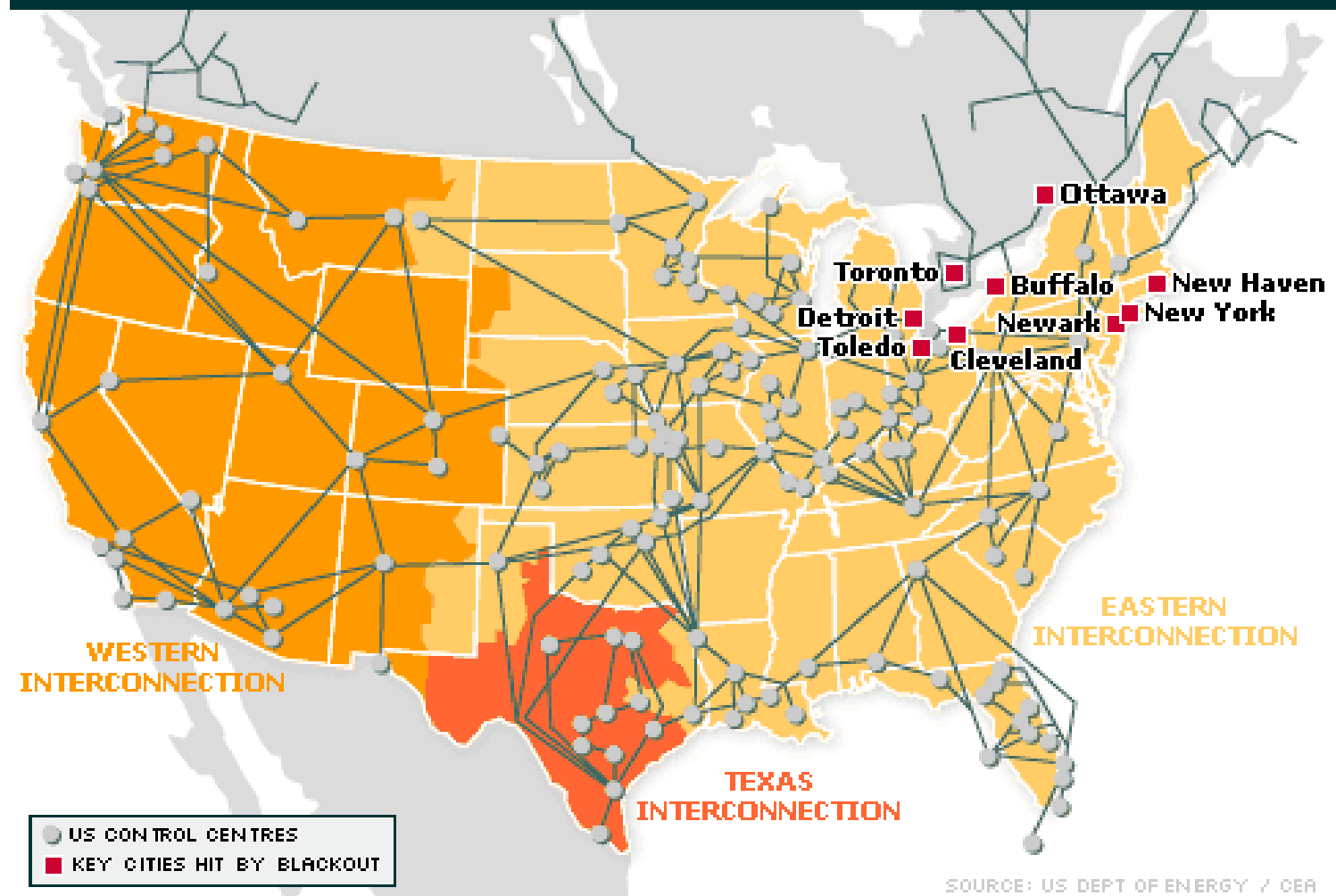
- 774 SARS deaths for period 1 November 2002 to 31 July 2003 (of a total of 8,099 cases in 30 countries)



NY Black Out August 2003

Trend?

NORTH AMERICAN ELECTRICITY GRID



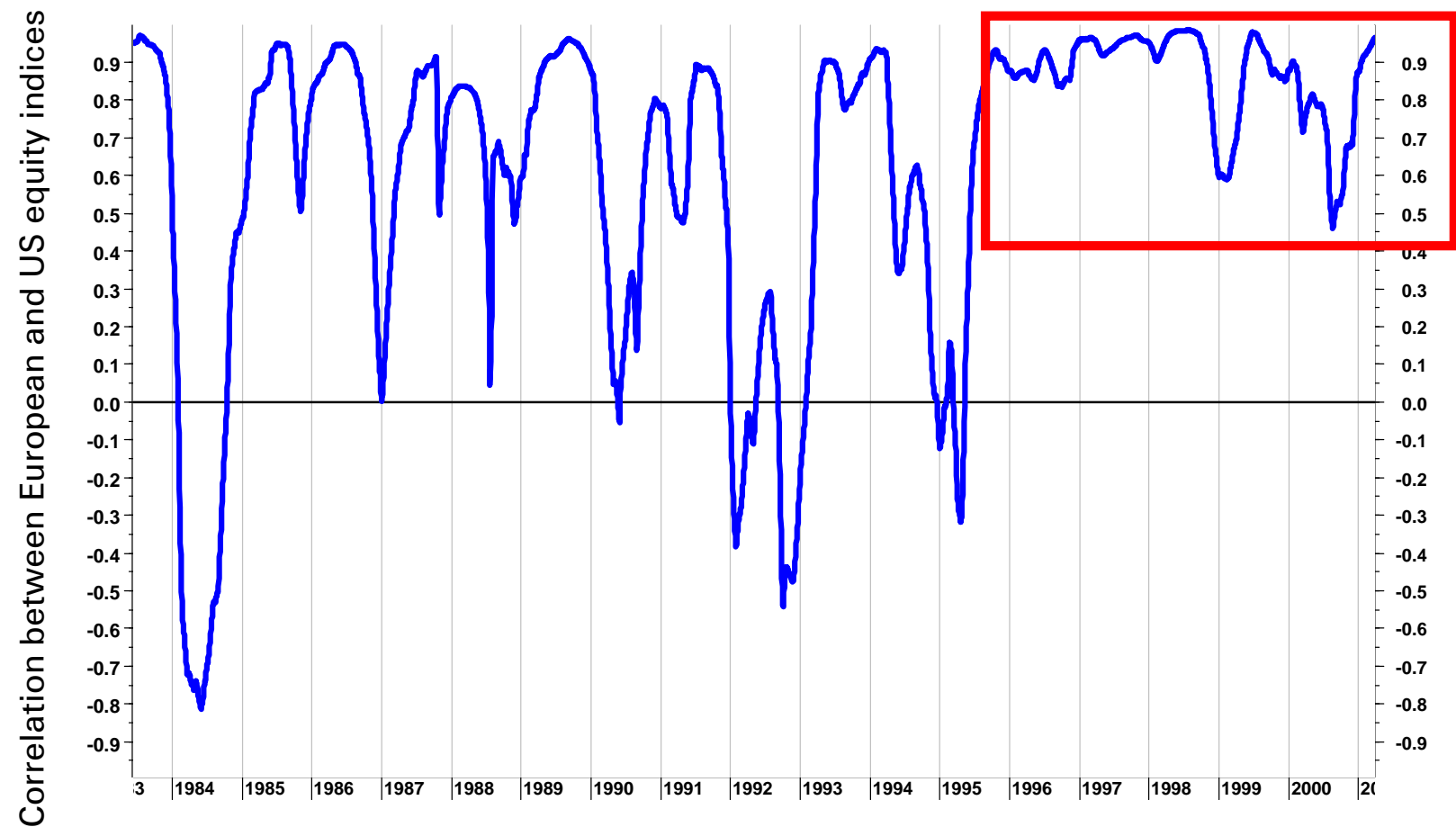
SOURCE: US DEPT OF ENERGY / CEA



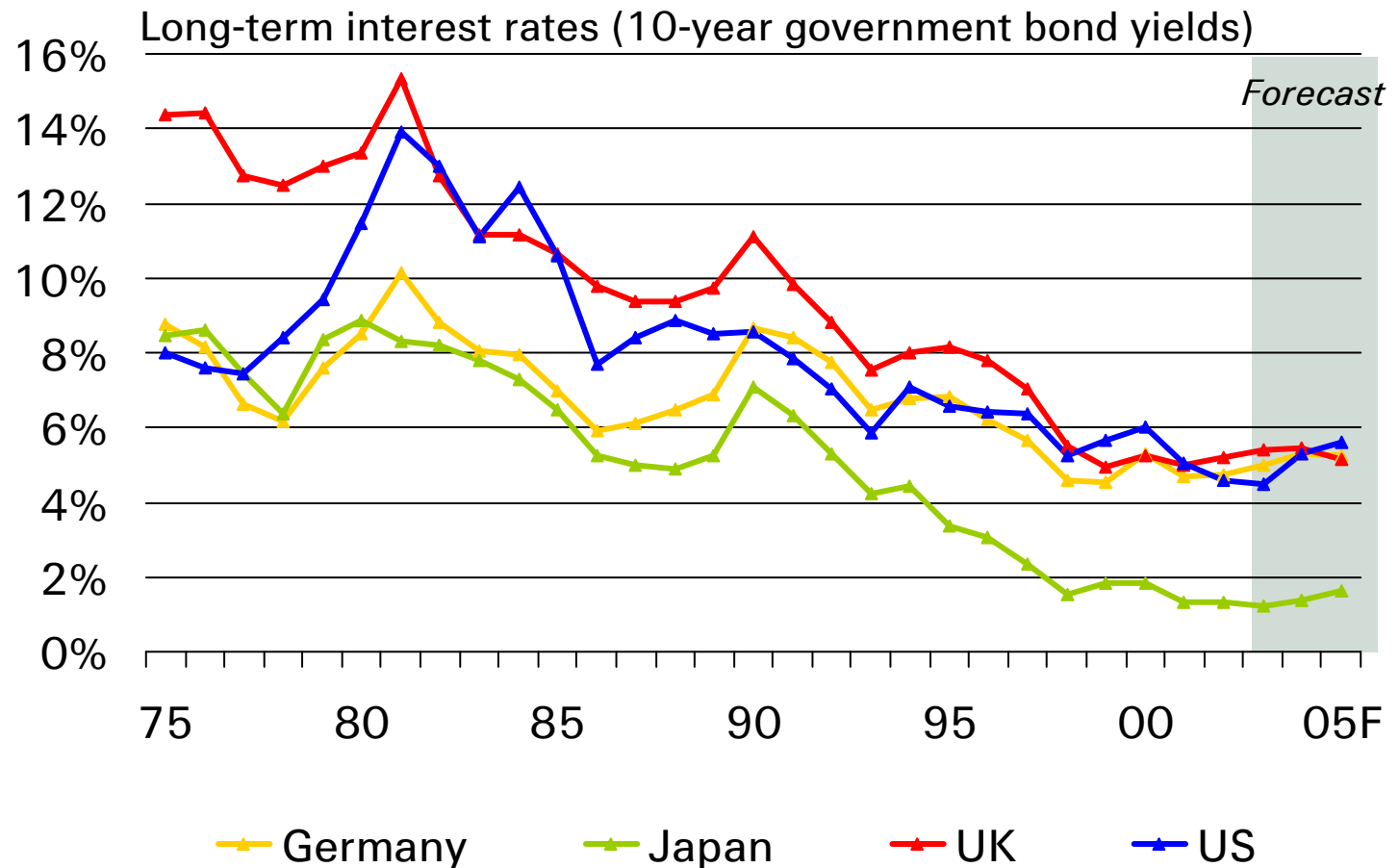
Globalisation leads to increased correlation between financial markets

Trend?

Example: correlation between US & Europe



Interest rates are low – for how long will they remain low?



New risk? Trend? Terrorism

9/11 was not the beginning of terrorism.

The event though made us aware how vulnerable our modern society has become to actions of extremists that aim to destroy our life and property.

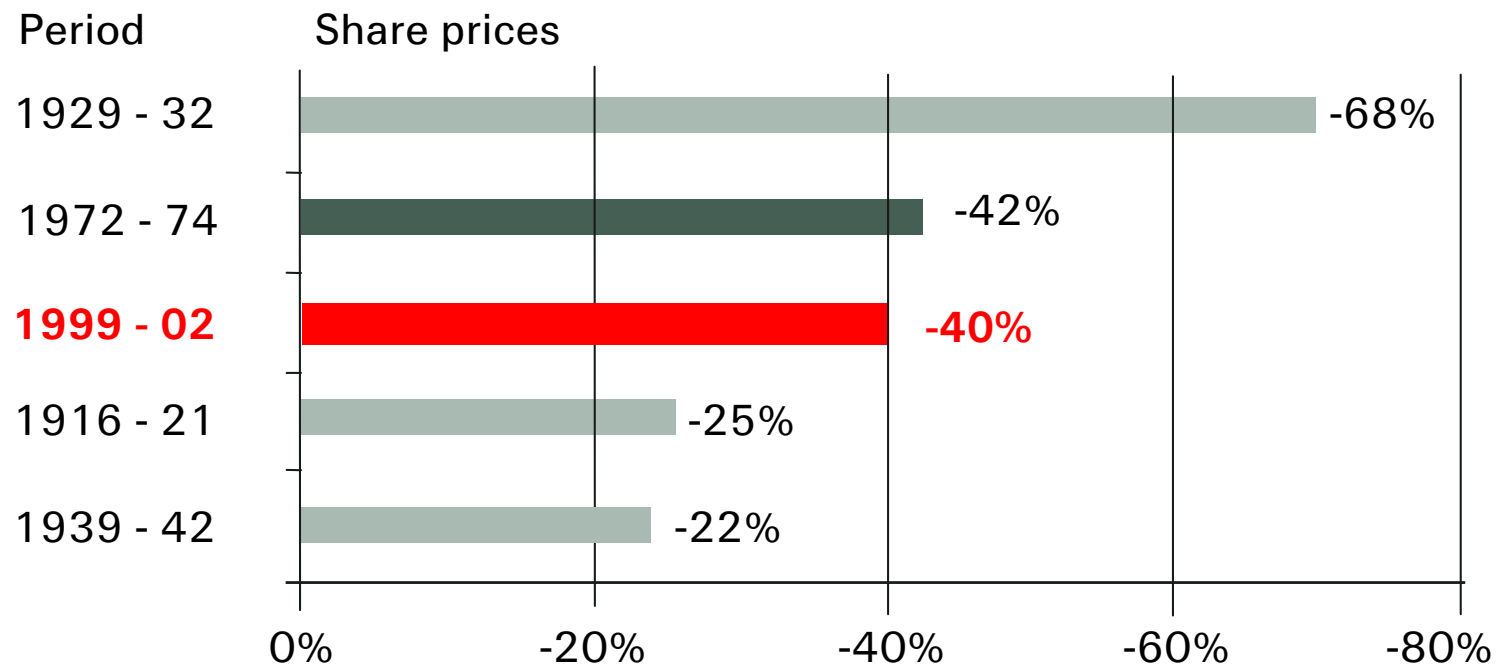
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Slide 17





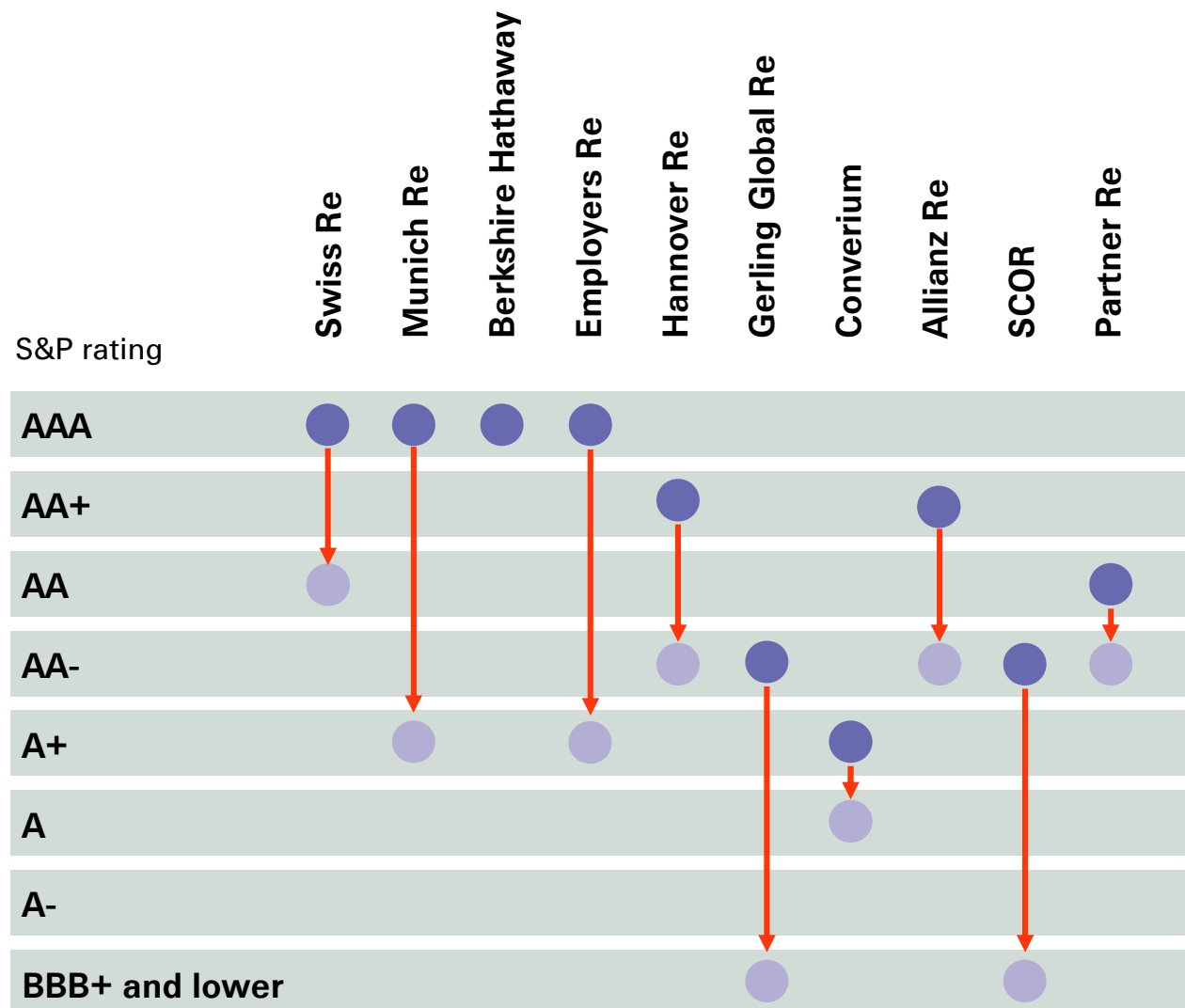
Prolonged bear market



Only two stock market crashes in 100 years were
more severe than today's



Reinsurer rating downgrades 2001-2003





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Summary



Philosophy of risk management: The art

- **Risk management is not the avoidance of large losses and more than about how large potential claims are financed:**

The art of risk management is to find the right balance between the opportunity to take risk and create value for the firm and the threat risk poses to the survival of the firm.

- **Challenge:**
 - **common risk culture**
 - **complete & accurate assessment of risk**



Philosophy of risk management: Swiss Re's objective

From Swiss Re's risk management perspective the company needs

- to **clearly define its risk appetite** with respect to the various risks it is or wants to be exposed to, and
- to **make sure that risk is managed** so as to stay within the self imposed boundaries

Risk appetite needs to be defined to **reflect** Swiss Re's **risk tolerance** and the amount of **available risk capital**



Philosophy of risk management: The three pillars

- **Pillar 1** – Quantitative risk management: definitions and quantification methods for risk capital, capital adequacy, capital allocation, limit setting and control; systematic description and comparison of risks for the Group as a whole and for sub-portfolios.
- **Pillar 2** - Qualitative risk management: description of risk management organisation and processes; promotes clarity, completeness and accuracy.
- **Pillar 3** – Transparency: leads to proper behavior, and promotes mutual understanding, trust, and discipline in taking risks.

(In analogy to the three “pillars of prudential supervision”)

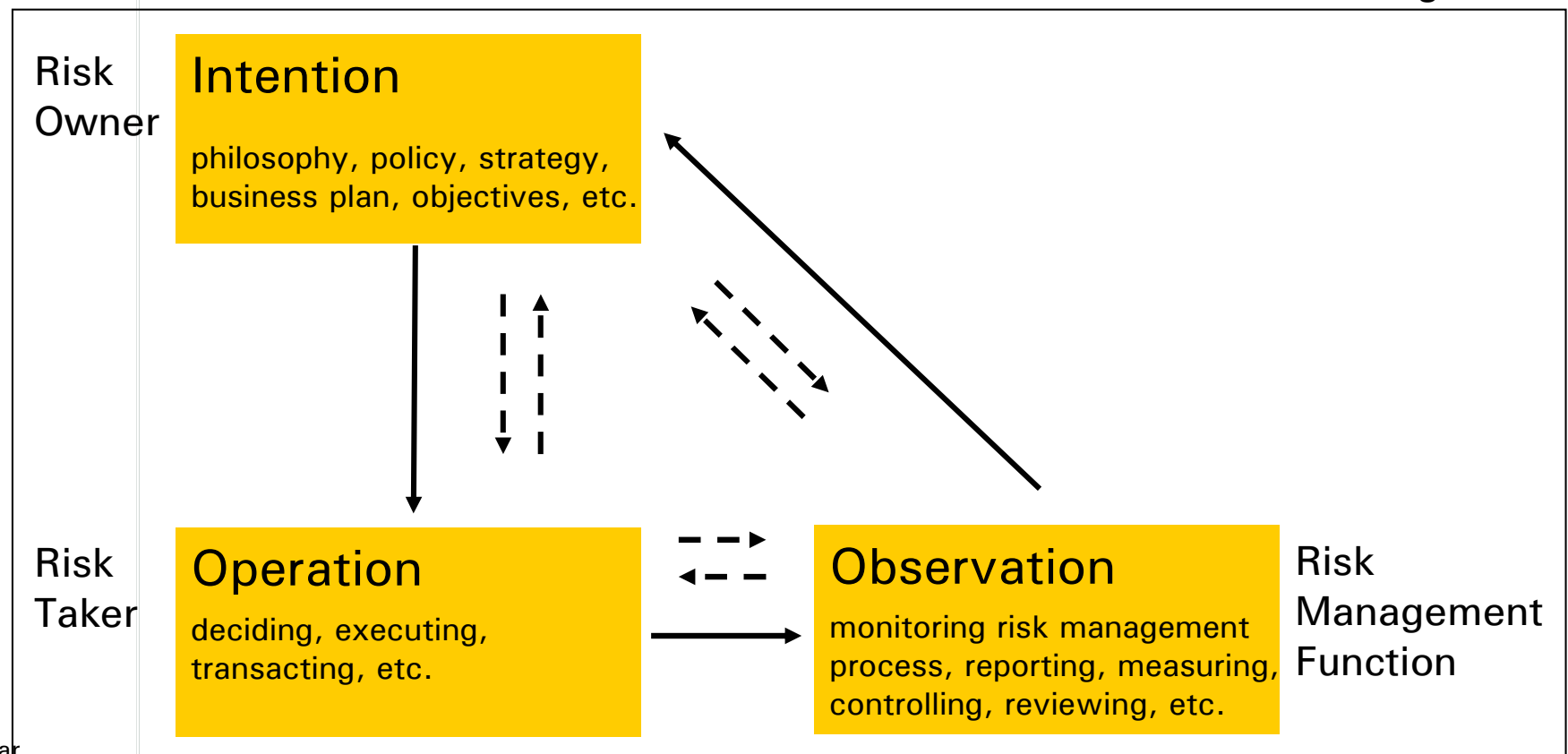


Pillar 3 Transparency

- Internal transparency
 - Visible operations, activities, risk exposures
 - clearly defined responsibilities, processes
- Risk disclosure and dialogue internally among
 - Swiss Re's business groups & business units
 - central corporate functions
 - Executive Board
 - Board of Directors
- In future: extensive risk disclosure and dialogue with
 - investors & shareholders
 - rating agencies
 - clients
 - regulators

Pillar 2 Qualitative RM: Risk management schema

Risk Management





Pillar 2 Qualitative RM: Instruments

- Guidelines & Policies (RM, Reinsurance, Investment, Credit RM, HR Guidelines)
- Guidance notes
- Common economic framework across the firm
- Approval processes, approval committees
- Reporting processes
- Limit allocation processes (delegation of authority with escalation procedure for limit excesses)

Pillar 1 Quantitative RM: Controlled risk taking?

- How can risks be taken in a controlled way?
- What are possible dominant threats:
 - too much exposure towards some risk
 - potential materialisation of very rare and very large events
 - hidden risks
 - unexpected dependencies – hidden risk concentrations
 - market “mispricing”
 - others ...



Pillar 1 Quantitative RM: Warehousing risk

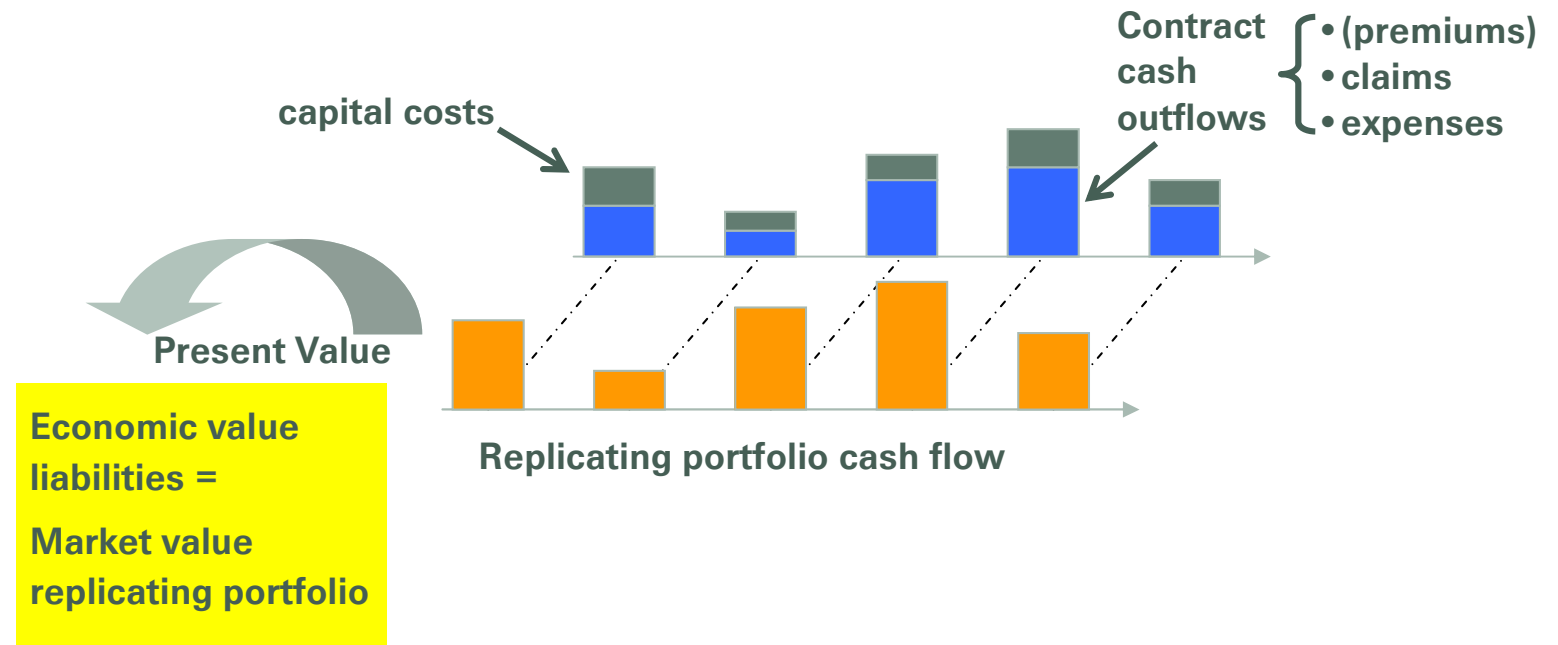
- In order to produce insurance covers insurers
 - pool a large number of sufficiently independent risks, so that future aggregate claims become more predictable
 - use financial markets to bridge the gap between today's premiums and tomorrow's claims
 - hold risk capital to absorb negative deviations from expectations
- Identify systematic / accumulating risks in your portfolio



Pillar 1 Quantitative RM: Accounting views and constraints

- Accounting convention
 - Internal **economic view** (IFRS fair value accounting?)
- Constraints
 - Local statutory accounting view
 - Rating agency view
 - GAAP accounting view
 - Market constraints (supply/demand, liquidity etc.)
- Economic Value Management (EVM)
 - Framework that harmonises performance and risk measurement across Swiss Re Group, firmly based on “fair values”

Pillar 1 Quantitative RM: Economic value



- To determine the economic value of liabilities, a replicating portfolio is used, i.e. ...
- ... a portfolio of assets traded in the financial markets having a payment stream that matches the contract's expected cash flows, thus 'valuing' the liability.



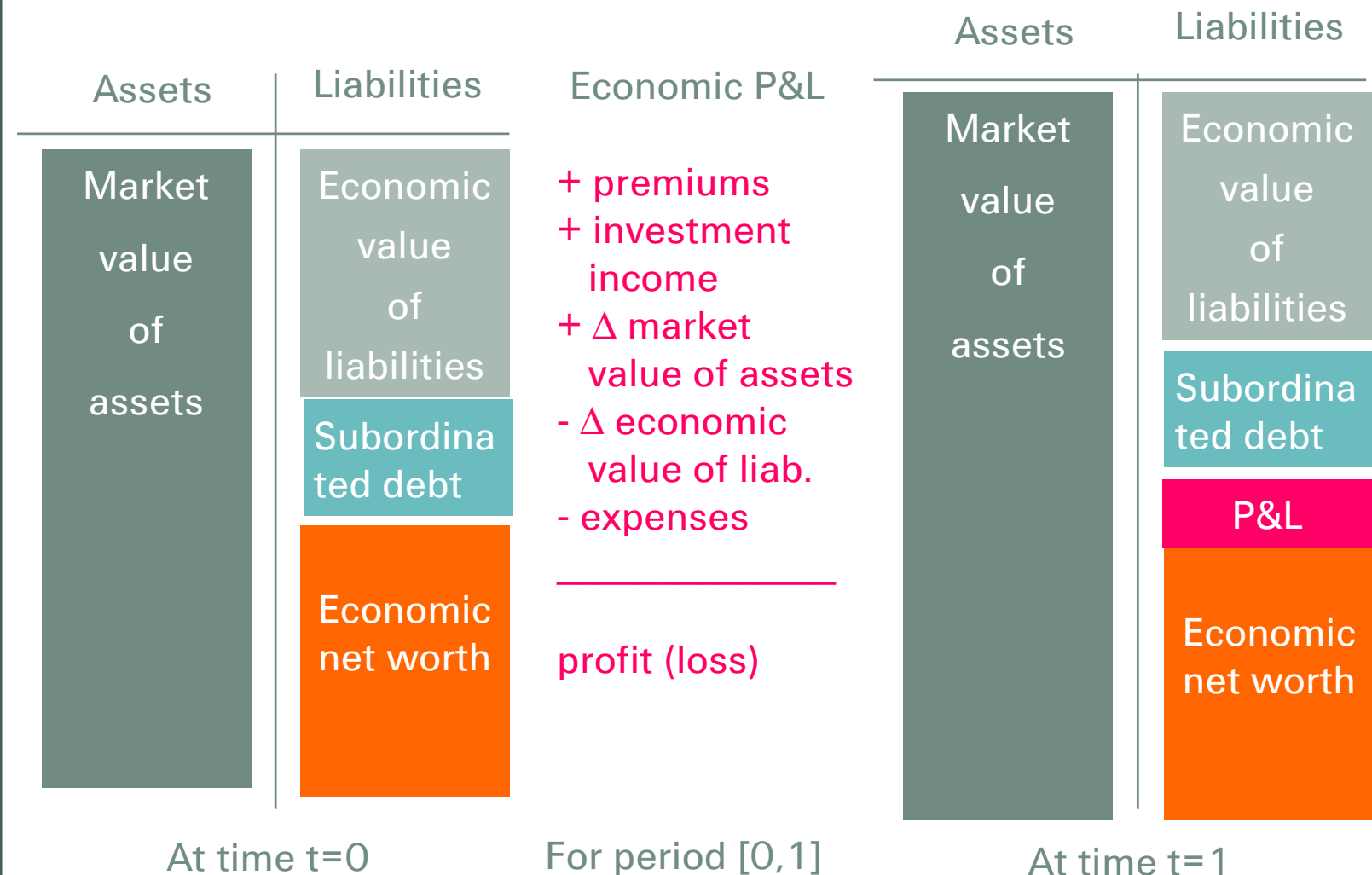
Pillar 1 Quantitative RM: Economic vs. accounting view

"Reported earnings follow the rules and principles of accounting. The results do not always create measures consistent with underlying economics. However, corporate management's performance is generally measured by accounting income, not underlying economics. Therefore, risk management strategies are directed at accounting, rather than economic performance."

Enron in-house risk-management handbook



Pillar 1 Quantitative RM: The economic balance sheet



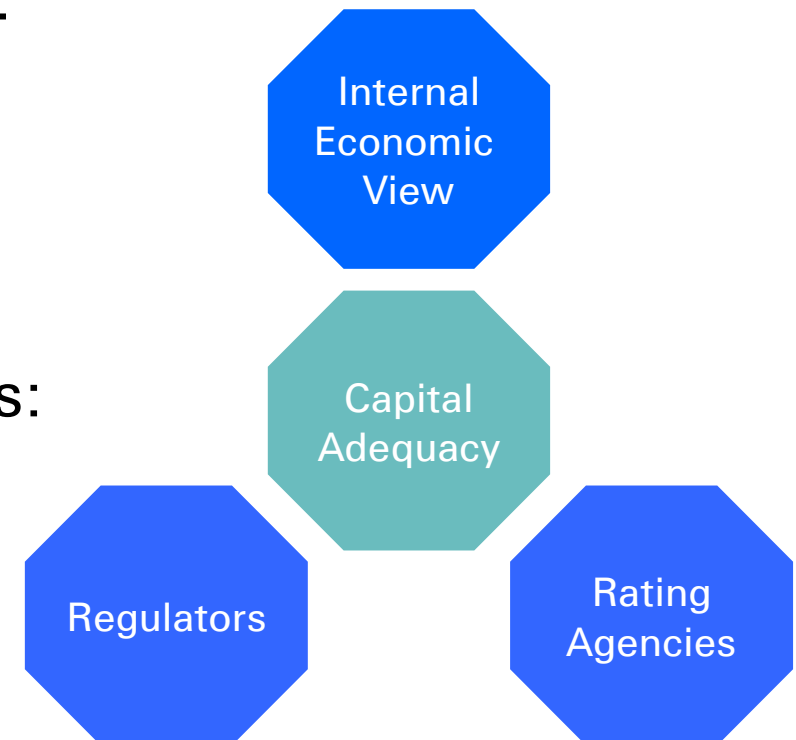
Pillar 1 Quantitative RM: Capital adequacy

Claims paying ability
depends on many factors:

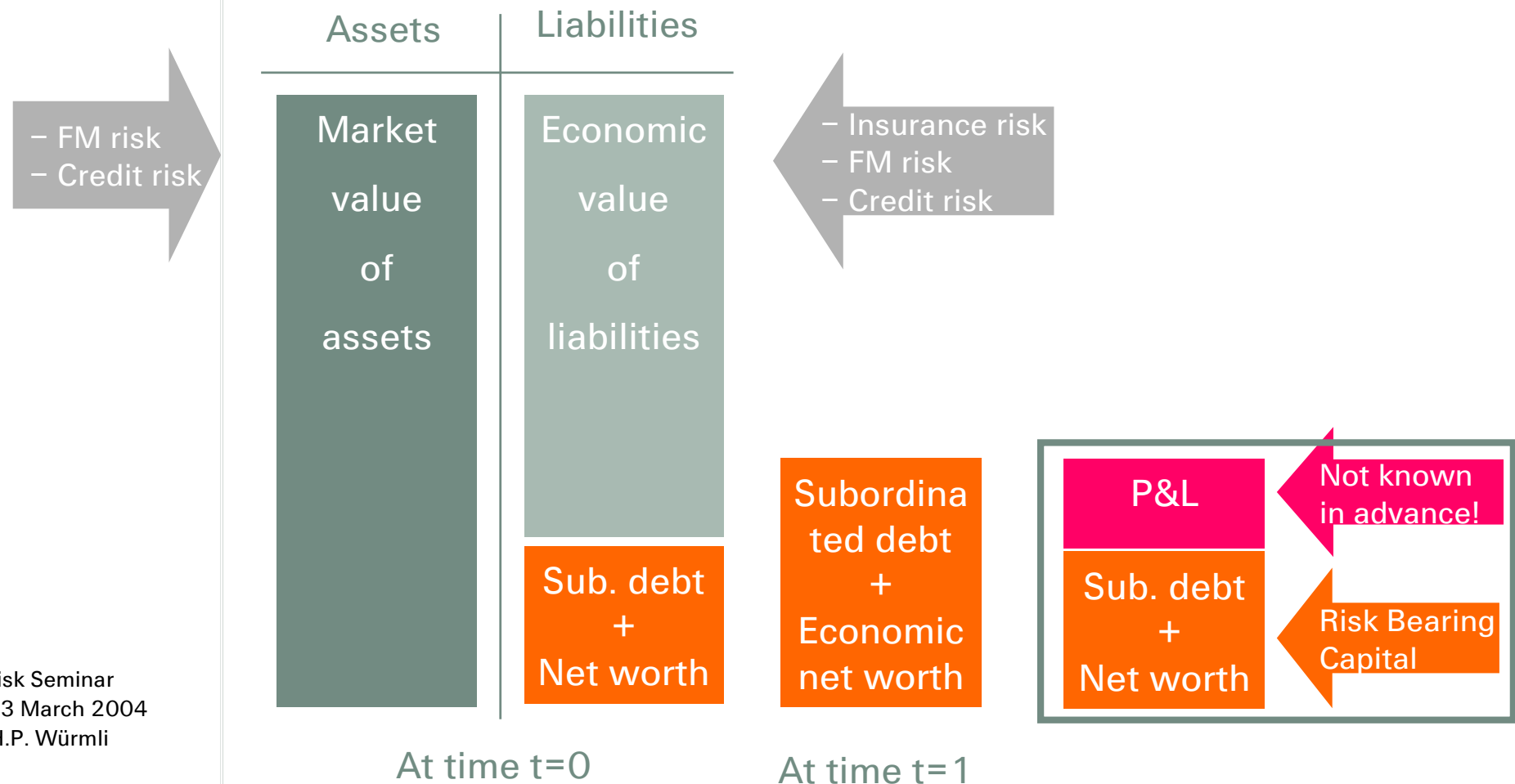
Capital adequacy one
important factor

Capital adequacy compares:

- Available capital
- Required capital



Pillar 1 Quantitative RM: Available capital – “Risk Bearing Capital”





Pillar 1 Quantitative RM: Modelling P&L, Net Worth, RBC

- RBC to act as buffer against downside risk for as long as is necessary
- Modelling RBC requires
 - models and assumptions for future P&L(s)
 - assumptions about possibility to raise capital within reasonable time frame
- Goal of modelling has to be clear: risk tolerance has to be explicitly defined
- Swiss Re decisions:
 - one year time horizon
 - require withstanding “two consecutive 100 year events”



Pillar 1 Quantitative RM: Shortfall as a measure of risk

- Overall one year P&L probability distribution contains the downside risk information
- Meaning of “severity of potential loss” is given by a risk measure applied to the P&L distribution
- There are various risk measures available, e.g.:
 - Quantiles: “VaR at α level”
 - Shortfall: “average of losses occurring less often than once in x years”
- Shortfall captures tail behaviour (“fat tails”) better than VaR



Pillar 1 Quantitative RM: Required capital – Swiss Re RAC

Depletion Capital

Average of the 1 % worst economic P&L outcomes (1 % shortfall)

Risk Tolerance Capital

Capital required to withstand a second large event on post-depletion book

Risk Adjusted Capital
(RAC)

Depletion Capital

+

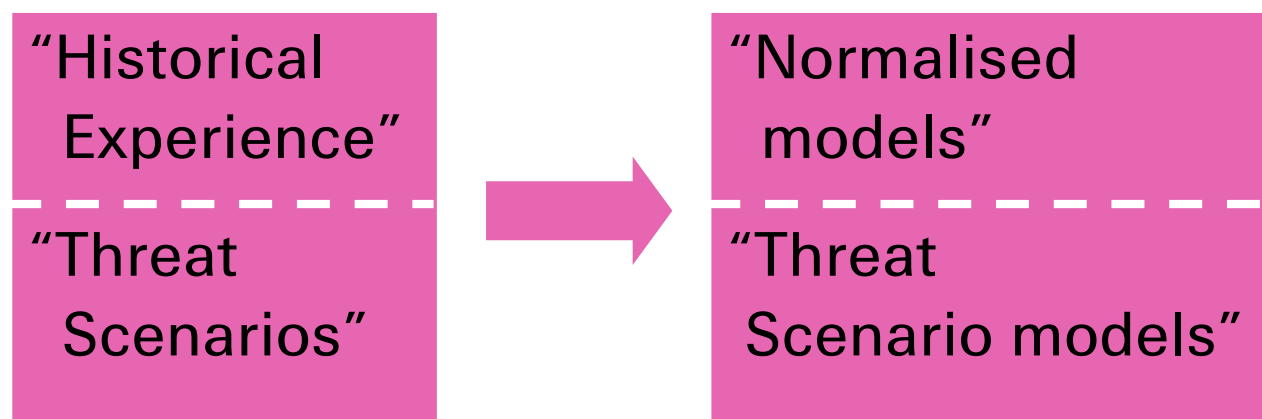
Risk Tolerance Capital

Pillar 1 Quantitative RM: How Swiss Re models P&L

- Risk factor modelling, e.g.
 - earthquake frequency / severity per location, tropical cyclone etc.
 - mortality rates, mortality rate “spikes”
 - financial market indices, rates
 - default rates, spreads per industry, country
- Modelling exposures of our portfolios to these risk factors: how do risk factors impact P&L
- Wherever possible causal models (not statistical ones)

Pillar 1 Quantitative RM: Insurance risk factor modelling

- Past experience does not fully capture future risk
- Threat scenarios:
 - capture potential “unobserved” events
 - representative for accumulation effects





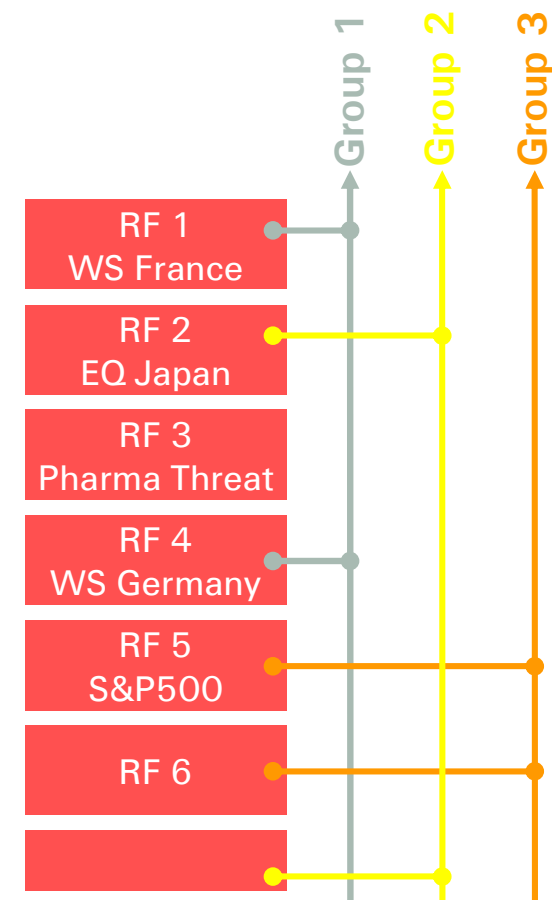
Pillar 1 Quantitative RM: Dependences

- Risk factors can be dependent among each other
- Independence of risk factors is assumed if scientific evidence available (e.g. geographic distance, unrelatedness, non-infectiousness etc.), where
 - tail dependencies relevant
 - statistical evidence for independence of tail events generally not available due to their rareness
- Dependencies of P&L of different lines are caused by exposures to the same risk factor or to the same dependent risk factors
- Dependencies partially modelled with copulas



Pillar 1 Quantitative RM: Dependence among risk factors

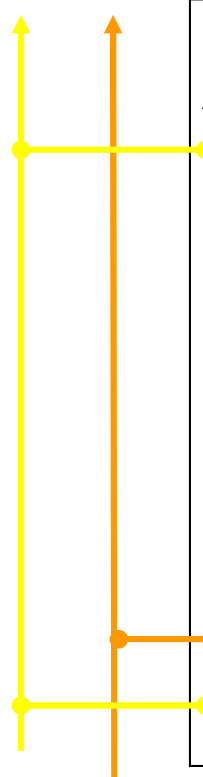
- Dependence structure is complex
- Not all risk factors fully dependent: partial dependence is often appropriate
- Tail dependence





Pillar 1 Quantitative RM: Dependence among LoB (example)

Dependence structure

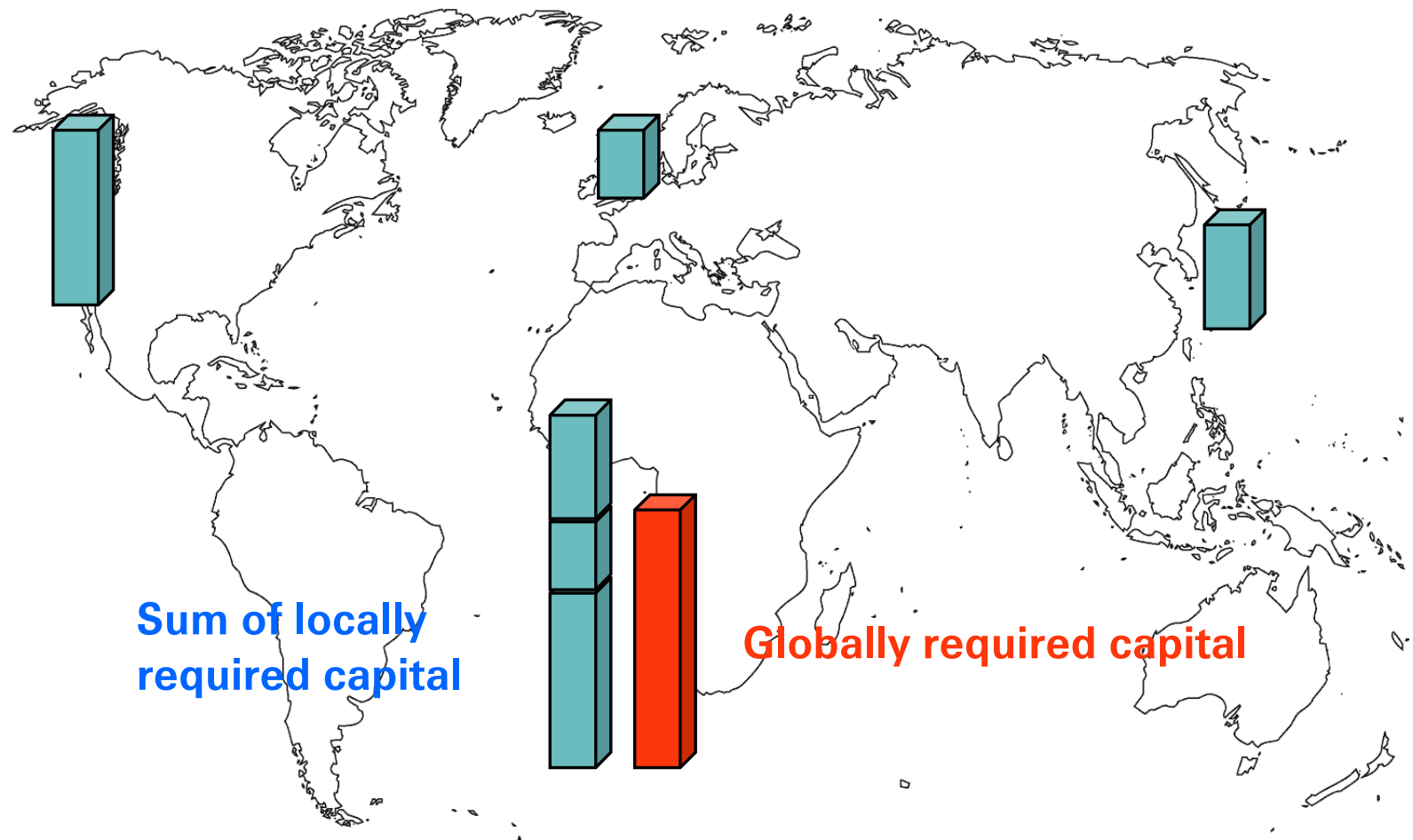


LOB Risk factor	Property	Aviation	Liability	Life	Marine
RF 1 TC Florida					
RF 2 Pharma Threat					
RF 3 EQ California					
RF 4 Midair collision					
RF 5 Epidemic					
RF 6 S&P500					
Surge Atlantic					



Pillar 1 Quantitative RM: Partial independence → diversification

The total required capital exceeds the sum of the individually calculated amounts



Capital Adequacy Framework in a nutshell

Model

- risk factors
- dependence
- portfolio

Calculate

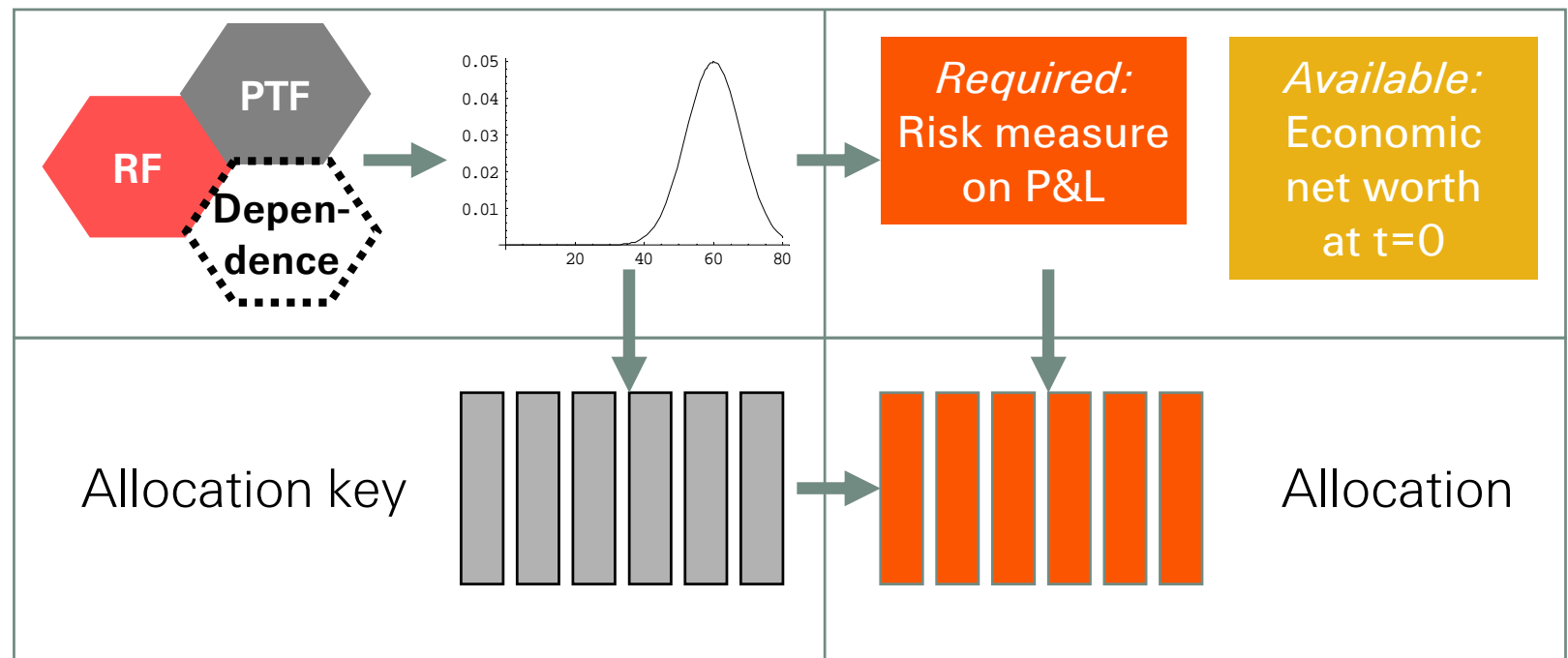
- distribution

Apply

- risk measure
- allocation key

Compare

- available vs.
- required capital





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Summary: ERM at Swiss Re

- Swiss Re's enterprise-wide integrated risk management deals with all risks it is either consciously taking or involuntarily facing
- Risk policy, RM processes and quantitative risk models are building blocks for the implementation of a suitable integrated risk management framework ...
- ... but are only effective if the "human factor" is taken into account. Swiss Re therefore fosters
 - an enterprise-wide risk and knowledge culture backed by the Board of Directors, the CEO and the Executive Board and through the support of formal and informal networks