ERM@Hannover Re

Some practical experience

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Chief Risk Officer and Chief Actuary

CAS Meeting
Seattle, November 19th, 2008

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Volume-league table

WE ARE AMONG THE TOP REINSURERS IN THE WORLD

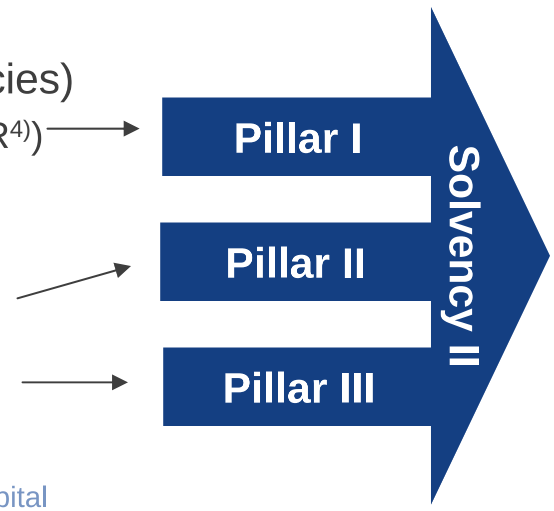
2007 figures in million USD[1)]

Rank	Group	Country	GWP	NPW
1	Swiss Re	CH	30,673	27,872
2	Munich Re	D	29,843	28,439
3	Berkshire Hathaway[2)]	USA	17,952	17,398
4	Hannover Re	D	12,327	10,779
5	Lloyd's[3)]	GB	10,361	7,990
6	SCOR	F	7,106	6,501
7	London Re	CDN	6,133	5,155
8	RGA Re	USA	5,371	4,909
9	Transatlantic Re	USA	4,283	3,953
10	Everest Re	BDA	4,078	3,919
11	Korean Re	ROK	3,890	2,775
12	Partner Re	BDA	3,810	3,757
13	XL Re	BDA	3,406	2,812
14	Aegon	NL	2,462	2,173
15	Odyssey Re	USA	2,283	2,089

1) Source: A.M. Best
2) GenRe Group; Berkshire Hathaway Re Group (National Indemnity)
3) 66 syndicates (as of 2007)

RISK MANAGEMENT IS KEY
Quantitative and qualitative view

- → Reinsurers offer various risk mitigation products
- → Reinsurers are part of worldwide financial markets stability considerations
  - Quantitative question No. 1: sufficient capital?
  - Qualitative question No. 1: strong risk-management processes?
- → Quantitative answers:
  - Accounting systems
    - Global (IFRS)
    - Local (HGB, US GAAP)
  - Solvency systems (supervisors, rating agencies)
    - Standard models (NAIC[1], RBC[2], CAM[3], BCAR[4])
    - Internal models
- → Qualitative answers:
  - ERM[5] systems/qualitative checks
  - Market discipline/transparency



1) National Association of Insurance Commissioners
2) Risk Based Capital
3) Capital Adequacy Model
4) Best Capital Adequacy Ratio
5) Enterprise Risk Management

CEIOPS (www.ceiops.org)*

EU REGULATORY TOY NO. 1: SOLVENCY II (EFFECTIVE 2012?)

Three pillar approach - updated framework directive published March 2008

Solvency II

Pillar I

Quantitative
Capital Requirements

- Standard models and/or certified internal models
- Company individual risk structure determines risk capital
- Incentive: Decreased capital requirements if demonstrated by accepted internal models and used for internal steering purposes

Pillar II

Qualitative Requirements for Risk Management (Supervisory Activities)

- Use test: Demonstration of implementation for steering purposes
- Extended by Corporate Governance, internal control mechanisms (including internal audit), clean certified processes and sufficient data quality

Pillar III

Market Transparency (Supervisory Reporting and Public Disclosure)

- Supervisory reporting standards, but
- Market participants (Clients, Competitors, Shareholders, etc.) will imply standards for risk reporting
- Market (perception) will finally regulate

Main Idea: Economic view, total company approach, Solvency Capital Required (SCR) to balance the 99,5% (1 in 200 Year) Value at Risk (VaR) over a one year time horizon.

*) Committee of European Insurance and Occupational Pensions Supervisors

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German "MaRisk" from 2009

ADVANCED PILLAR II CONTRIBUTION

P/L responsibility and risk control must be segregated

→ German "advanced" Pillar II introduction: MaRisk[1)]

- Minimum requirements for the risk management of insurance undertakings
- Valid from 2009

→ Principle based requirements

- Strategic Framework
- Organisational Framework
- Internal Steering and Control System: IKS[2)]

→ Organisational Framework: Clear separation required between:

- Units responsible for "creating and reporting profits and losses"
  - Underwriting
  - Accounting
- Independent risk controlling function
  - Quantitative Risk Management
  - Qualitative Risk Management
- Process independent internal auditing

1) Mindestanforderungen an das Risikomanagement in Versicherungen
2) Internes Kontroll- und Steuerungssystem

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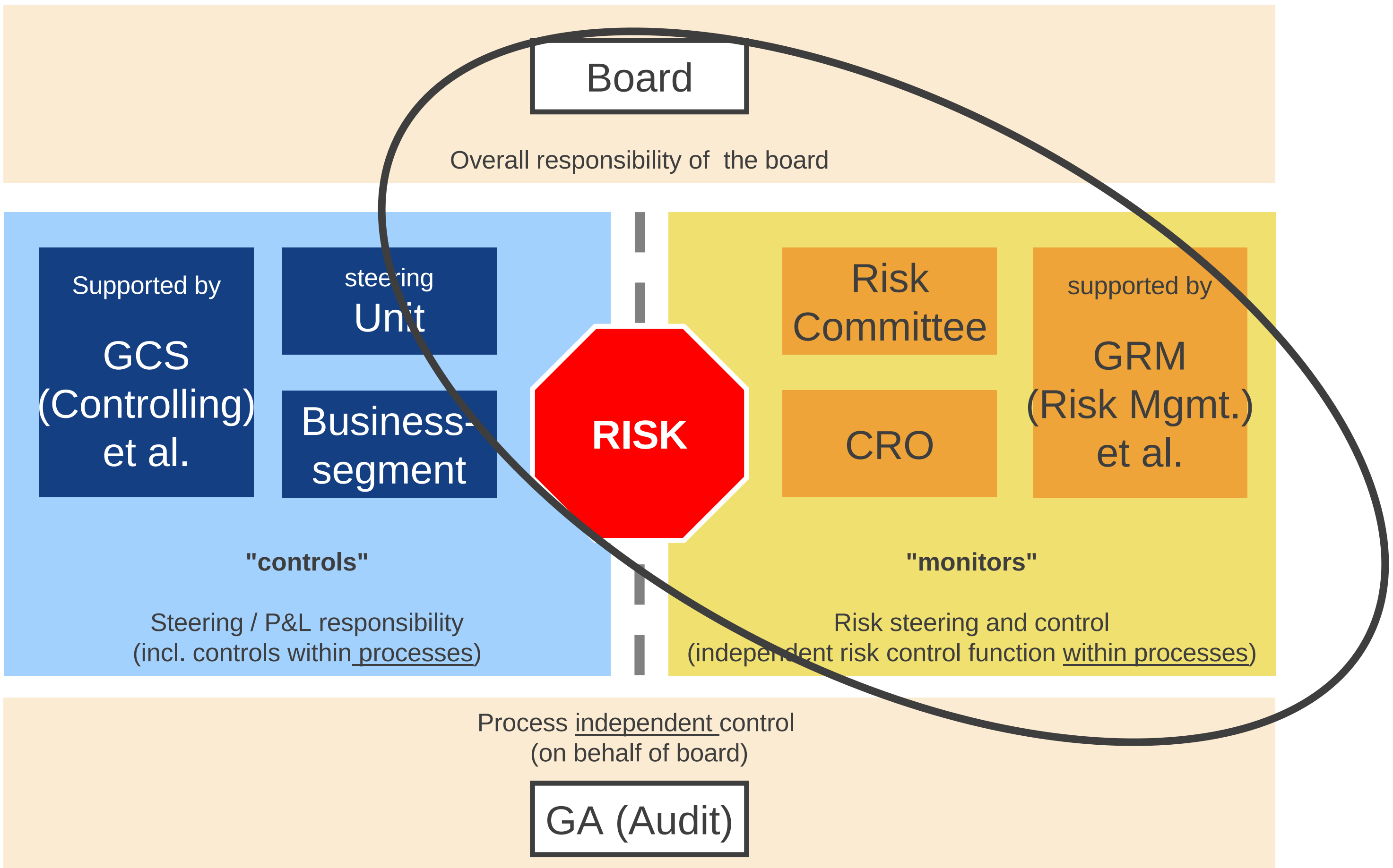
Internal Steering and Control System

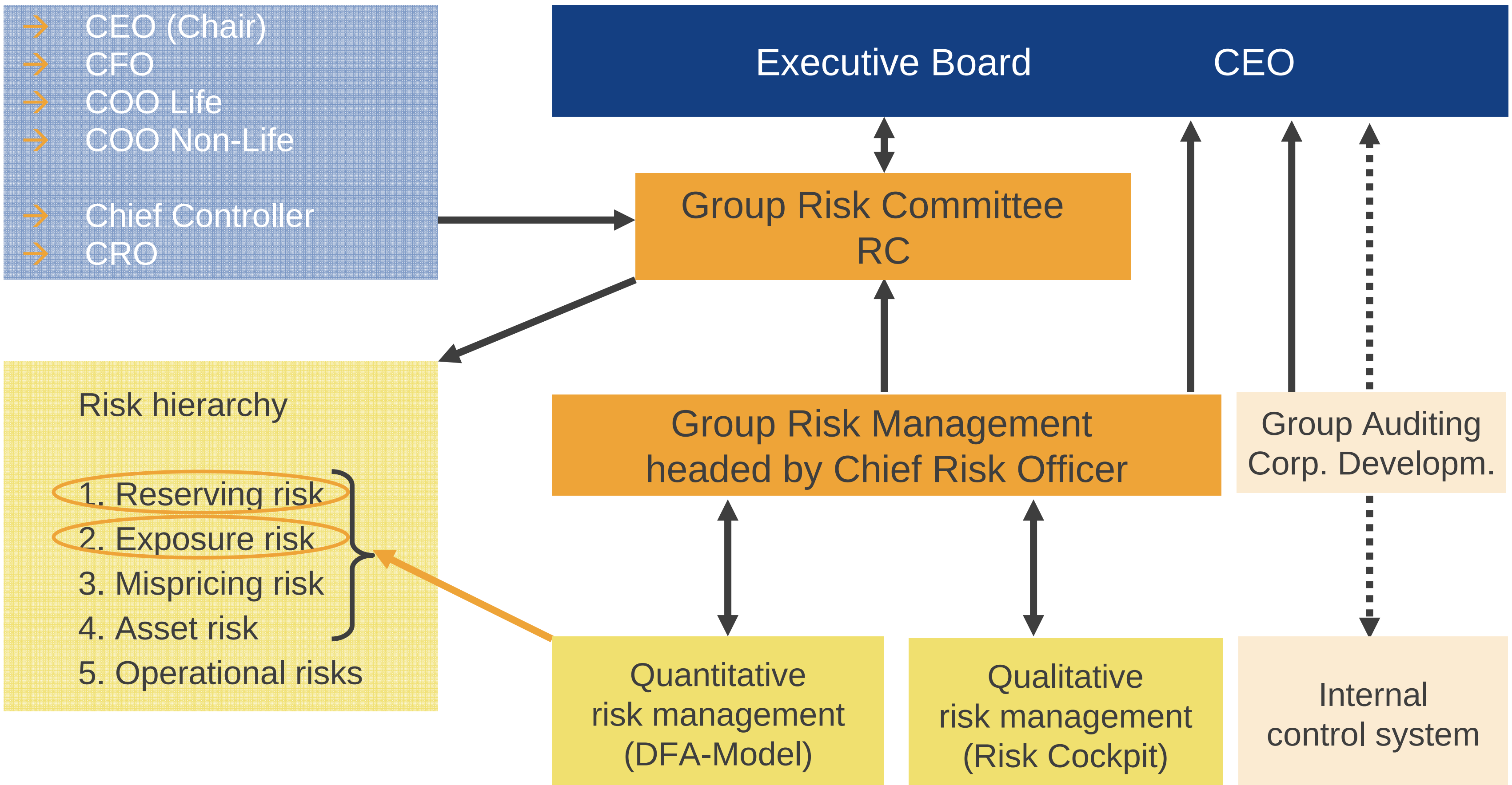
HANNOVER RE APPROACH "BLUE VS. YELLOW"

ISKS*



* Internes Steuerungs und Kontrollsystem

CENTRALISED GROUP RISK MANAGEMENT
Reporting structure



GRM STRUCTURE FROM JUNE 1ST, 2006

Successor to Underwriting and Actuarial Services (Established 1996)

GRM-RES — Reserving

GRM-AGG — Aggregat Control

GRM-MOD — Natural Catastrophe Modeling

Internal Model → GRM-DFA — Dynamic Financial Analysis

GRM-ORR — Oper. Risk / Risk Reporting

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STARTING POINT: RISK MAP

26 individual sources of risk

- **Liability risk**
  - **U/W risk life**
    - Catastrophe risk
    - Longevity risk & mortality risk
    - Morbidity & disability risk
    - Lapse risk
    - Reserving risk
    - Credit risk
  - **U/W risk non-life**
    - Premium risk (incl. mispricing risk)
    - Catastrophe risk
    - Reserving risk
    - Credit risk
- **Asset risk**
  - **Market risk**
    - Equity risk
    - Interest rate risk
    - Spread risk
    - Real-estate risk
    - Foreign exchange risk
  - **Credit risk**
    - Corporate bonds
    - Settlement risk
- **Operating risk**
  - **Operational risk**
    - Regulatory and compliance risks
    - Loss of key personnel
    - Insufficient systems (actuarial, controlling, accounting)
    - Loss of infrastructure
    - Insufficient data quality
  - **Business risk**
    - Reputational risk
    - Balance sheet risk (OCI, collaterals)
    - Strategic risk
    - Emerging risk

. . . addresses the main risk drivers of Hannover Re

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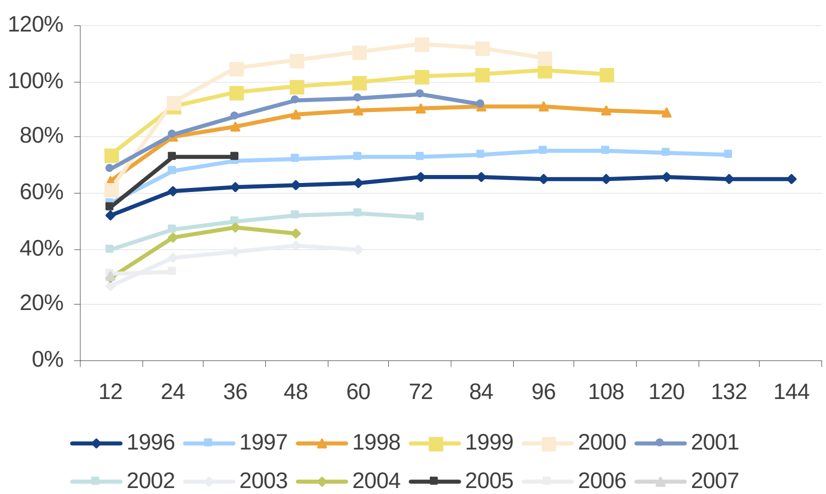
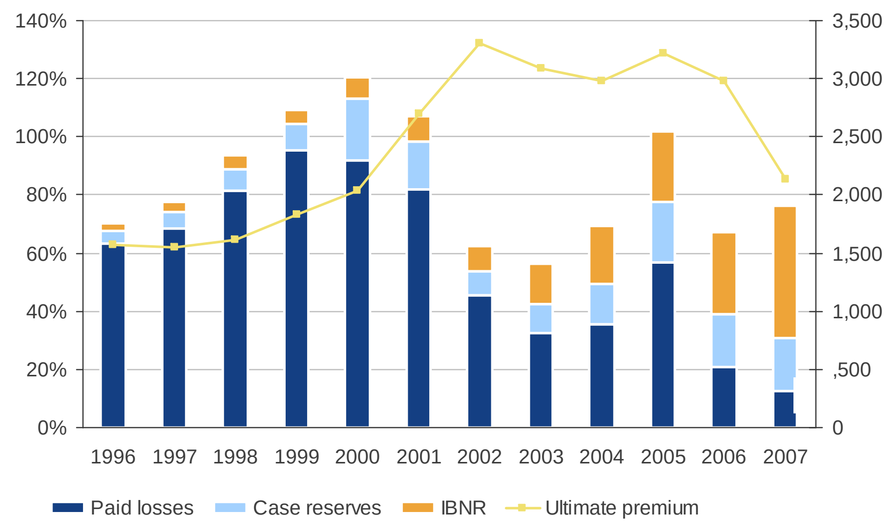
Reserve Risk Example

RESERVE ANALYSIS AND PUBLIC DISCLOSURE

Example (61% of HR Group reserves shown in 9 individual triangles)

U/W year	IFRS earned premiums	Statistical data (as provided by cedants)												Booked data			
		12	24	36	48	60	72	84	96	108	120	132	144	Ultimate loss ratio	Paid losses	Case reserves	IBNR balance
1996	1,571	52.2%	61.1%	62.2%	62.7%	63.8%	65.7%	65.6%	65.4%	65.3%	65.7%	65.3%	64.9%	70.2%	63.2%	4.3%	2.7%
1997	1,546	56.4%	67.6%	71.3%	72.1%	73.0%	73.2%	73.9%	74.8%	75.4%	74.6%	73.9%		77.5%	68.4%	5.6%	3.5%
1998	1,612	64.1%	80.0%	84.2%	87.9%	89.6%	90.5%	91.0%	91.0%	89.9%	88.7%			93.7%	81.3%	7.4%	5.0%
1999	1,834	73.6%	91.4%	96.0%	98.4%	99.9%	101.9%	103.0%	104.4%	102.4%				109.3%	95.5%	9.1%	4.6%
2000	2,036	61.7%	92.3%	104.5%	107.9%	110.2%	113.6%	112.0%	108.4%					120.4%	91.9%	21.1%	7.5%
2001	2,694	68.7%	81.1%	87.6%	93.5%	94.0%	95.4%	91.6%						107.1%	81.8%	16.4%	8.9%
2002	3,304	40.1%	47.3%	50.0%	52.3%	52.9%	51.0%							62.6%	45.5%	8.1%	9.0%
2003	3,083	26.8%	36.9%	39.1%	41.3%	40.1%								56.5%	32.3%	10.1%	14.0%
2004	2,983	29.5%	43.9%	47.4%	45.8%									69.2%	35.6%	13.6%	20.0%
2005	3,221	54.9%	72.7%	73.4%										101.9%	56.6%	20.9%	24.5%
2006	2,982	30.9%	32.1%											67.2%	20.7%	18.3%	28.2%
2007	2,140	30.6%												76.1%	12.5%	18.2%	45.4%



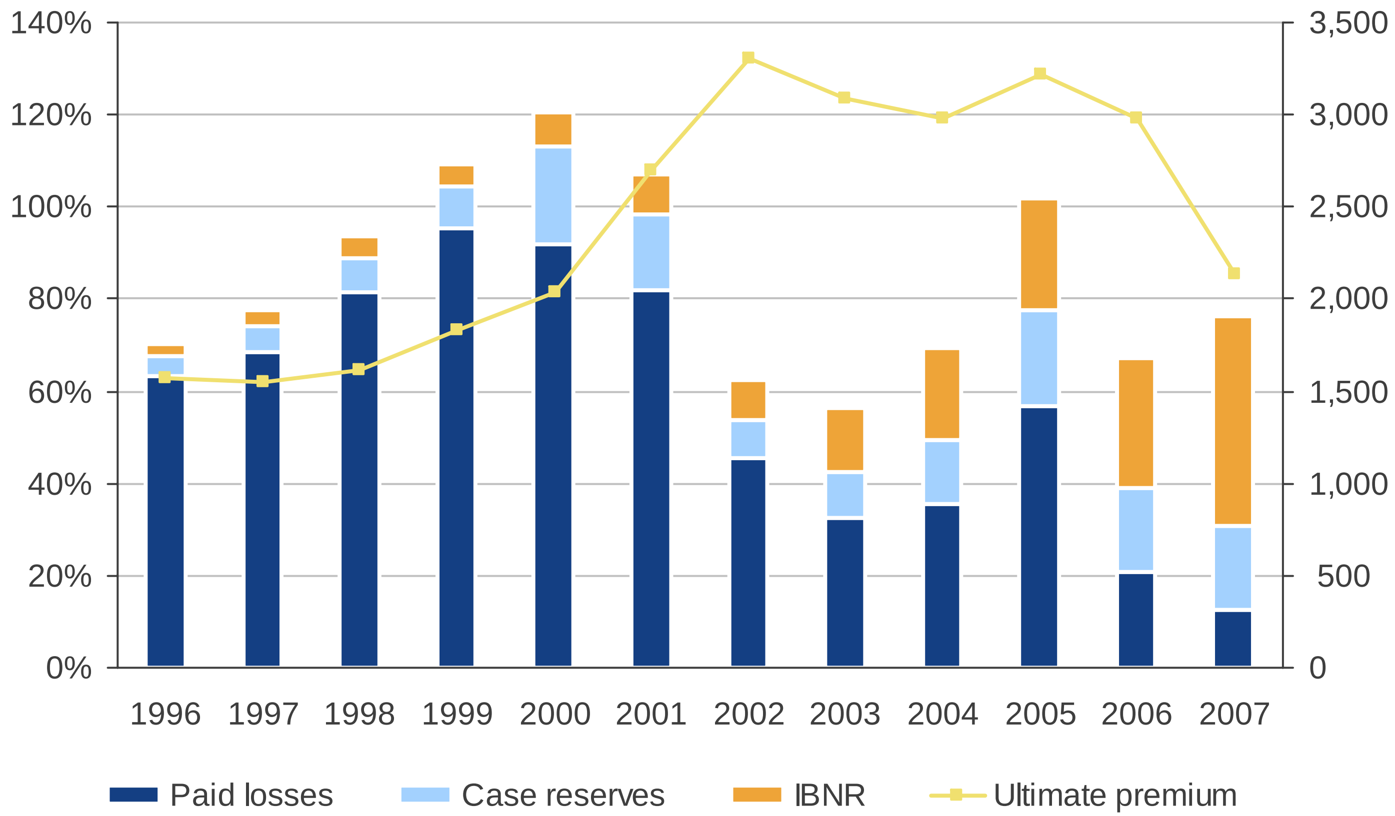


* As of 31 Dec 2007 (in m. EUR), consolidated, IFRS, development in months

Reserve Risk Example continued

RESERVE ANALYSIS AND PUBLIC DISCLOSURE

Clear visibility of hard and soft markets



UY 1998 - 2001 due to soft market and World Trade Centre in 2001
UY 2005 suffered from hurricanes Katrina, Rita, Wilma

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* As of 31 Dec 2007 (in m. EUR), consolidated, IFRS

Exposure Management Example

CLEAR BREAKDOWN OF RISK APPETITE

Limits exist from group risk model down to treaty departments

Global risk appetite for all risks (Group risk DFA model)	EBIT risk tolerance for 6 different return periods	**Maximum loss of EBIT:** According to limits
Global nat. cat. (All nat. cat. perils, annual aggregate, net exposure)	EBIT risk tolerance for 100y/250y	**Maximum loss of EBIT:** 100y: planned Non-Life EBIT ± $\Delta^{1)}$ 250y: (planned Non-Life EBIT ± $\Delta^{1)}$)$*$1.3
Local nat. cat. (Selected realistic disaster scenarios, single event, net exposure)	EBIT risk tolerance for realistic disaster scenarios	**Maximum loss of EBIT:** RDS[2]: planned Non-Life EBIT ± $\Delta^{1)}$
Capacities per Treaty Department (TD) (For over 250 perils, return periods and maximum liabilities, annual occurrence, gross exposure)	Maximum gross loss per Treaty Department	**Depending on individual peril**

1) Δ is reviewed and redefined by Executive Board annually based on current market situation
2) Realistic Disaster Scenario

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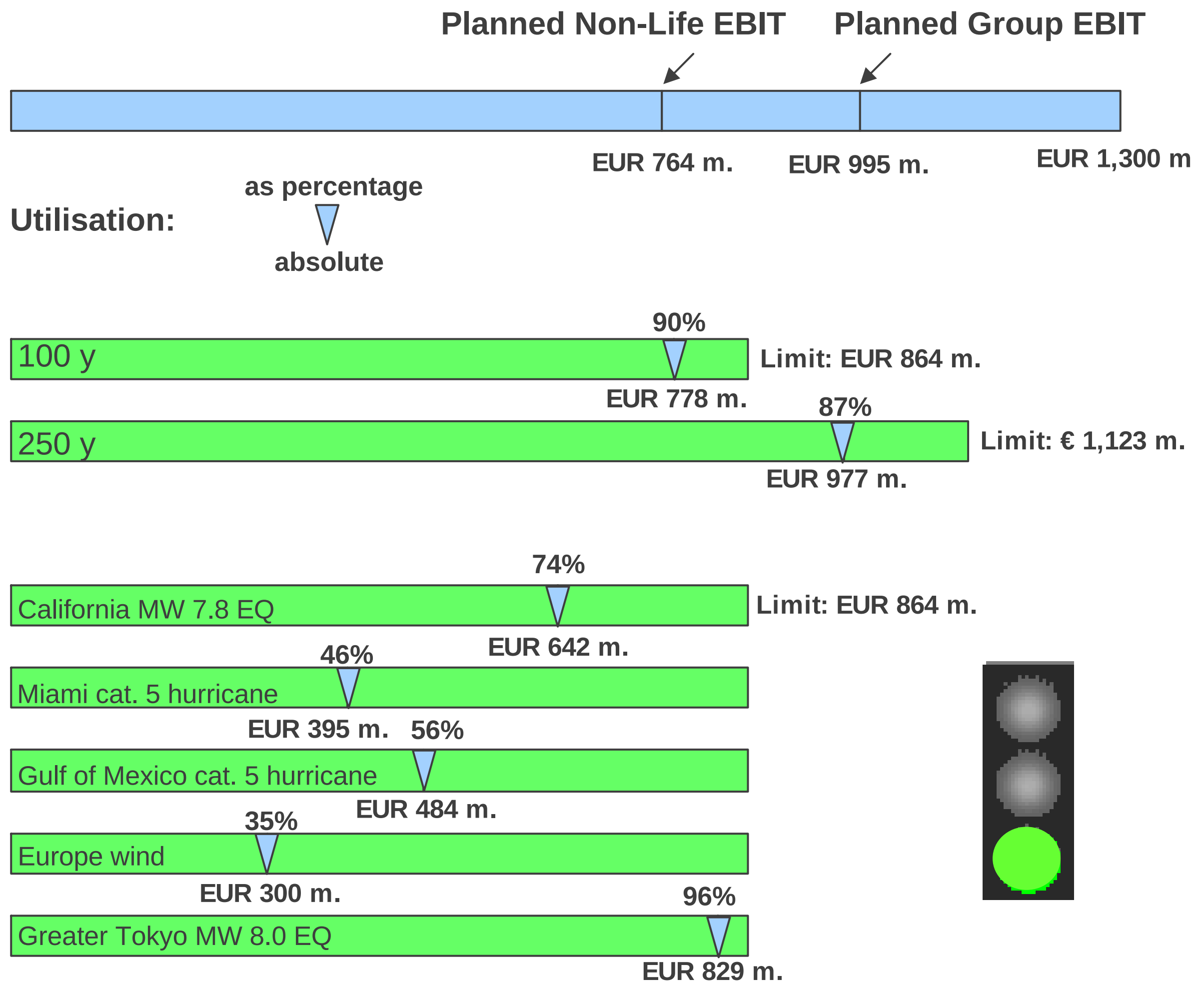
Exposure Risk Management Example continued

CURRENT* UTILISATION OF EXPOSURE RISK APPETITE

Global nat. cat.
(All nat. cat. perils, annual aggregate, net exposure)

Local nat. cat.
(Selected realistic disaster scenarios, single event, net exposure)



* Aggregates as at 1 Jan 2008; retrocession forecast as at 30 June 2008; exchange rates as at 30 Apr 2008

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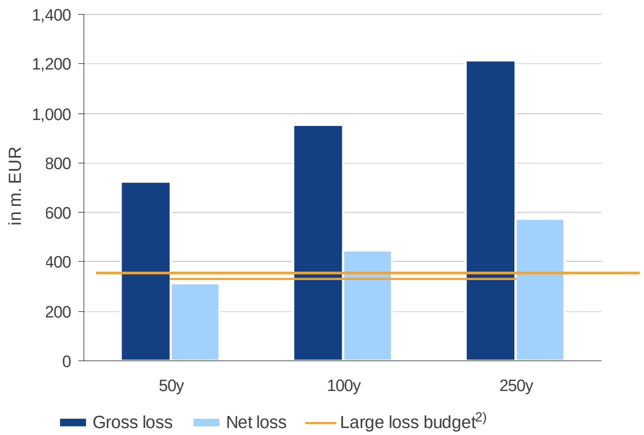
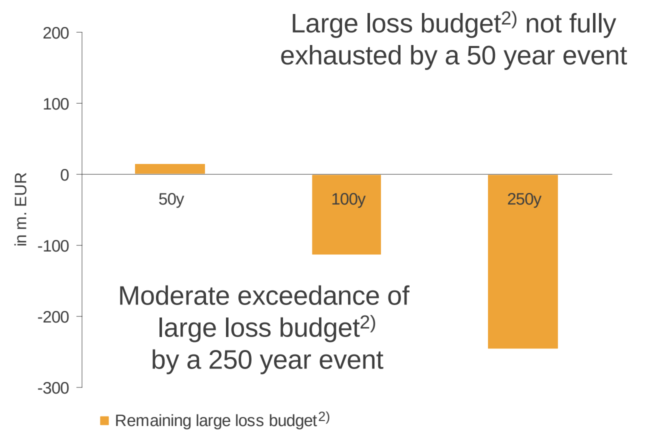
Exposure Risk Management Example continued

PEAK PERIL EXPOSURE

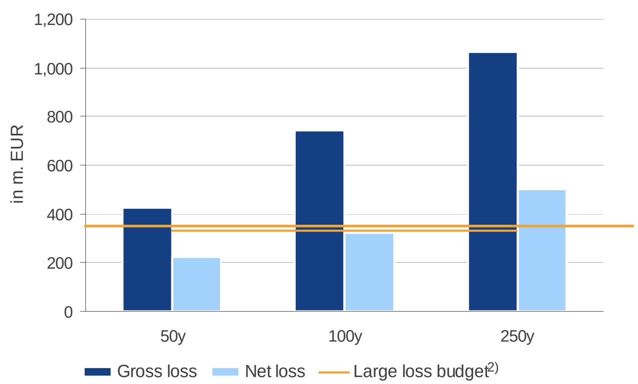
50y U.S. events do not exhaust our large loss budget[1)]

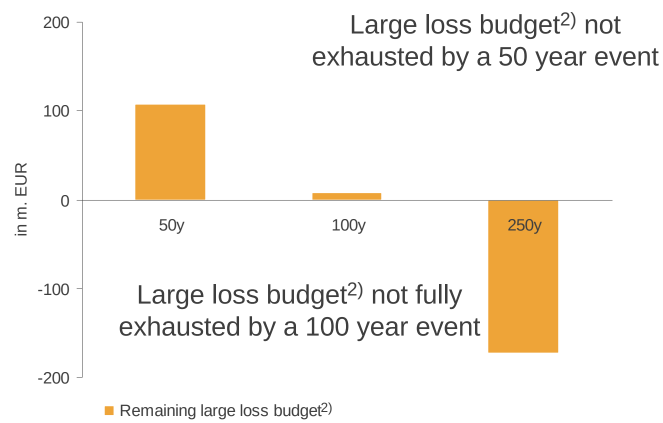
→ U.S. Atlantic Hurricane





→ California EQ



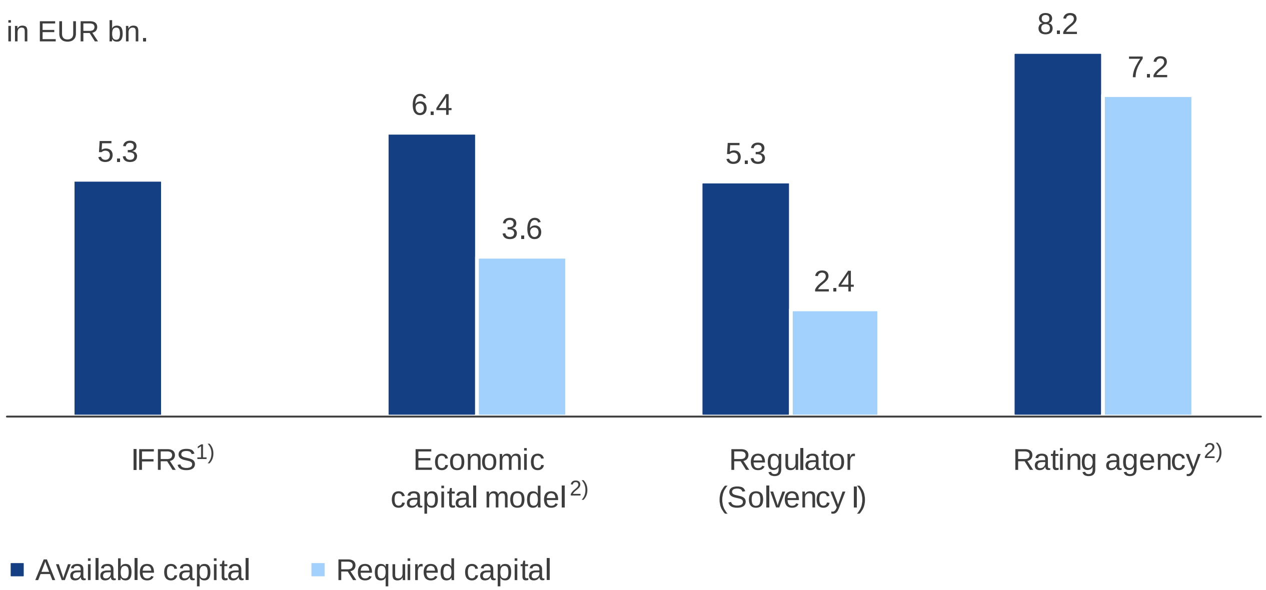


1) ~7% of net premium earned (Non-Life), overall large loss budget: 10%
2) Nat. cat. only

Dynamic Financial Analysis Example

CAPITAL MONITOR

Internal capital model provides market-consistent answers for steering



- → Economic capital = Market Value of Assets - Market Value of Liabilities
- → Market consistent:
  - use market values where available → mark to market
  - use market value models otherwise → mark to model

1) Policyholders' surplus as of 31 December 2007
2) AA-rating equivalent capital requirements, current assumption for internal model: 99,97% VaR.

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LESSONS LEARNED FROM THE CRISIS

Stuff happens... (Credit Crunch and Gustav + Ike in one year)

→ Increased mistrust from non-actuaries in actuarial models

- Perception of failed models rather than failed parameters
- Concerns about diversification effects
- Increased demand for conservatism (safety margins in addition to model results)

→ DFA-models combine different kinds of "randomness"

- Natural catastrophes: "Really random" events, underestimated consequences
- Economic scenario generators: "Assumed random" events, underestimated uniform behaviour of market participants (systemic risk), and the year is not over yet…
- Different time horizons for decisions (u/w: 1 year, capital market: daily)

→ Necessity to push hard for constructive alternatives going forward

- Underlining the purpose of models: decision aid, not decision maker
- Underlining the importance of key assumptions (spread of stocks over bonds???)
- Underlining the difference between "recalibration" and "remodelling"
- Broaden the scope of thinking (combination of models and scenario analysis)

→ Follow (and contribute to) best practices (e.g. CRO-Forum)

- CRO-Forum publications (www.croforum.org , latest: liquidity mgmt., financial crisis)

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Thank you for your attention!

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