

From tales to tools!

Implementing risk management in complex structures

PillarOne Conference

Brussels, 1st April 2009

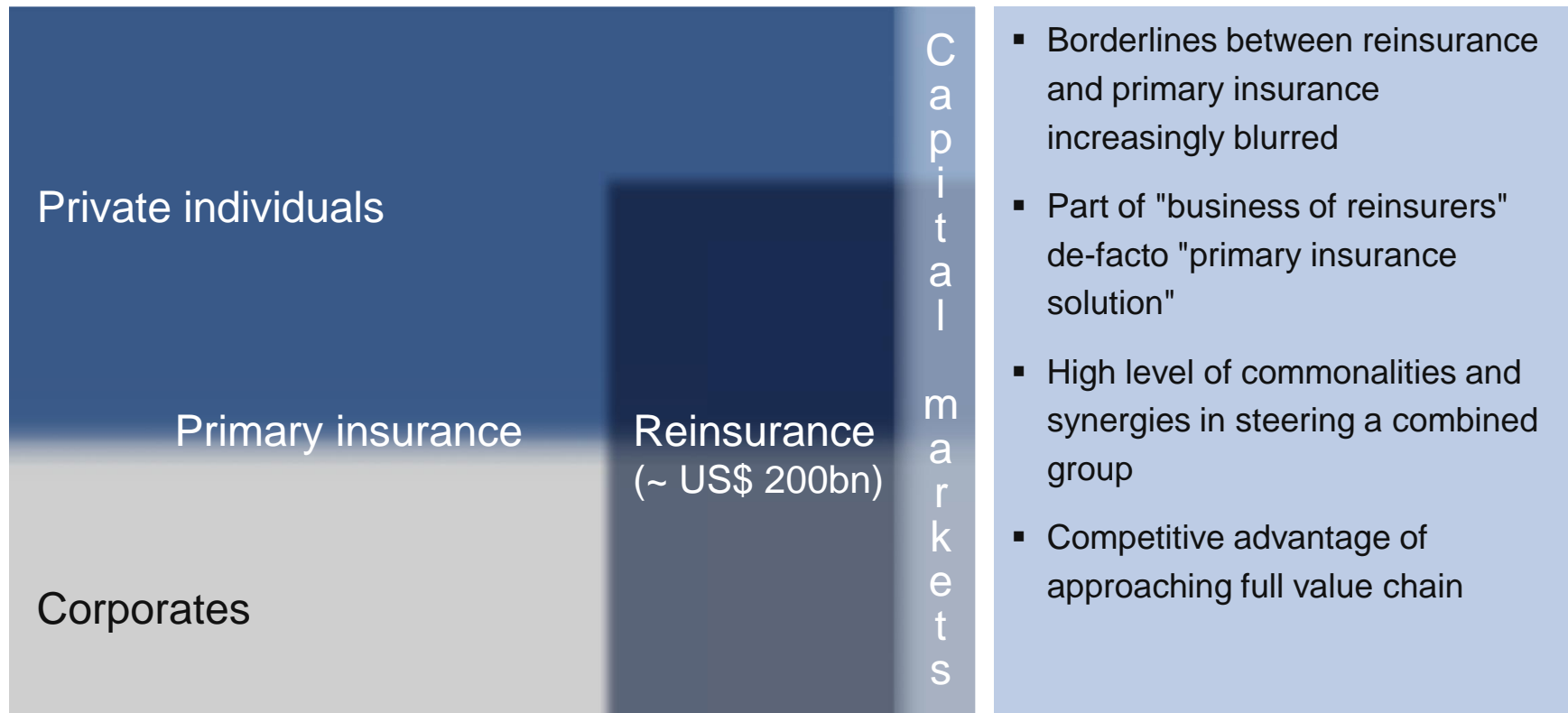
Dr. Bernhard Kaufmann

- From tales to tools!
- How to maneuver through the crises?



Overall market environment: One growing and converging global market for insurance risks

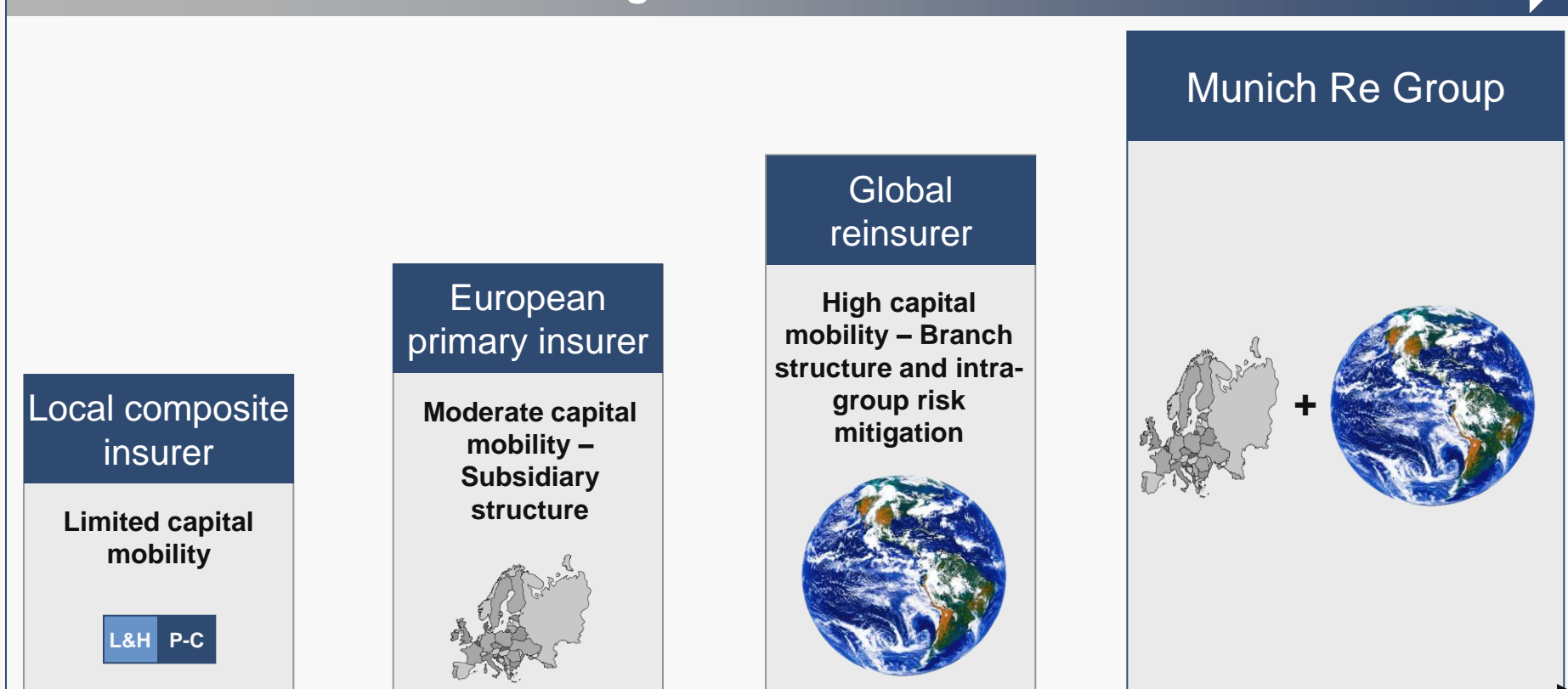
Attractive >US\$ 3 trillion market¹



¹ As at 2005.

Munich Re Group strategy based on active steering of portfolio diversification benefits

Maximising diversification benefits ...



... by active portfolio steering in terms of product mix, segment mix, geographic mix, asset allocation and risk mitigation


ERGO Group
The primary insurance division of Munich Re

Europe

No. 11
 €16.8bn total premiums

No. 1 in health and legal expenses

33 million customers




Germany

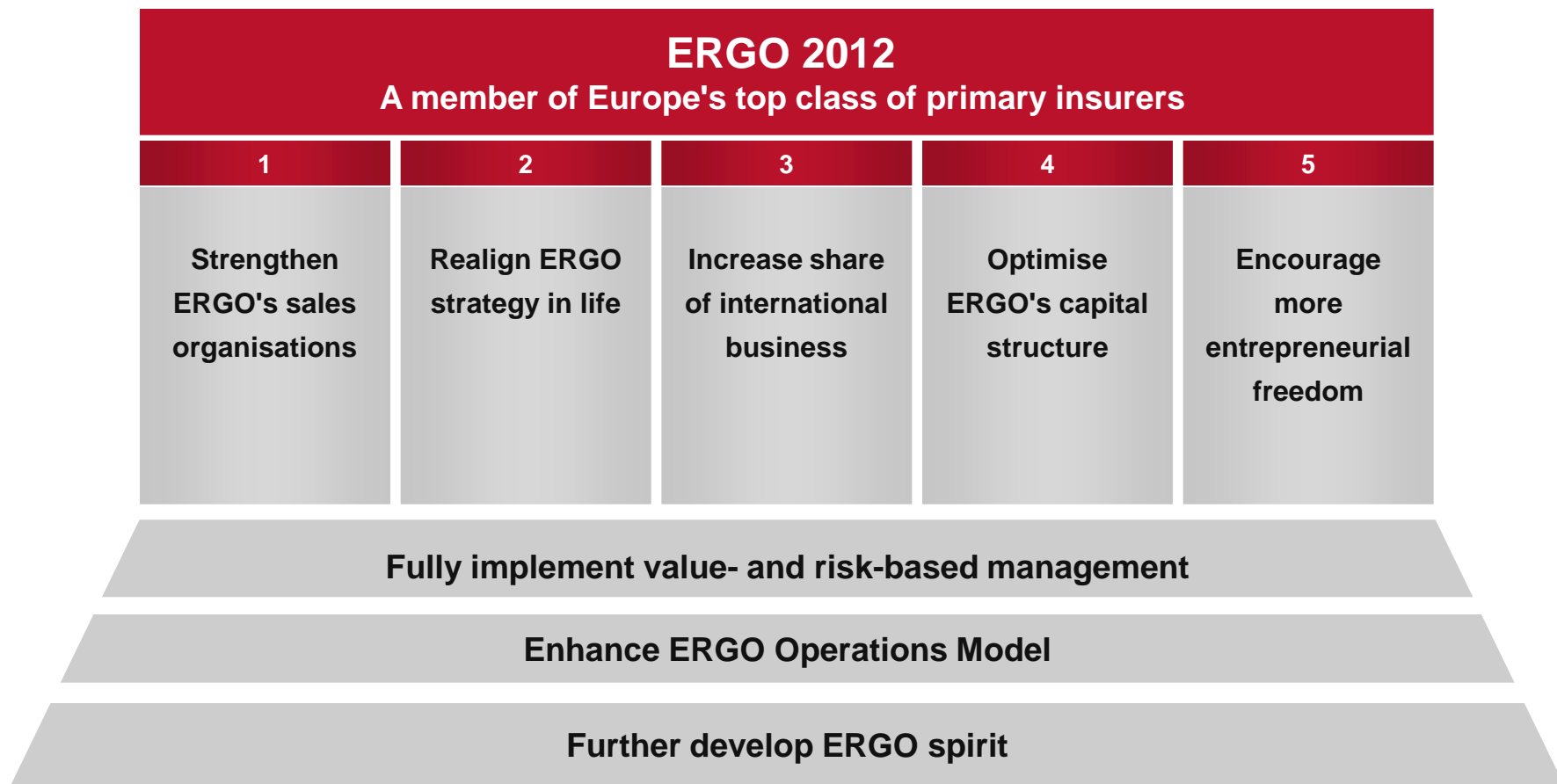
No. 2
 €13bn total premiums

No. 1 in health and legal expenses, No. 3 in life

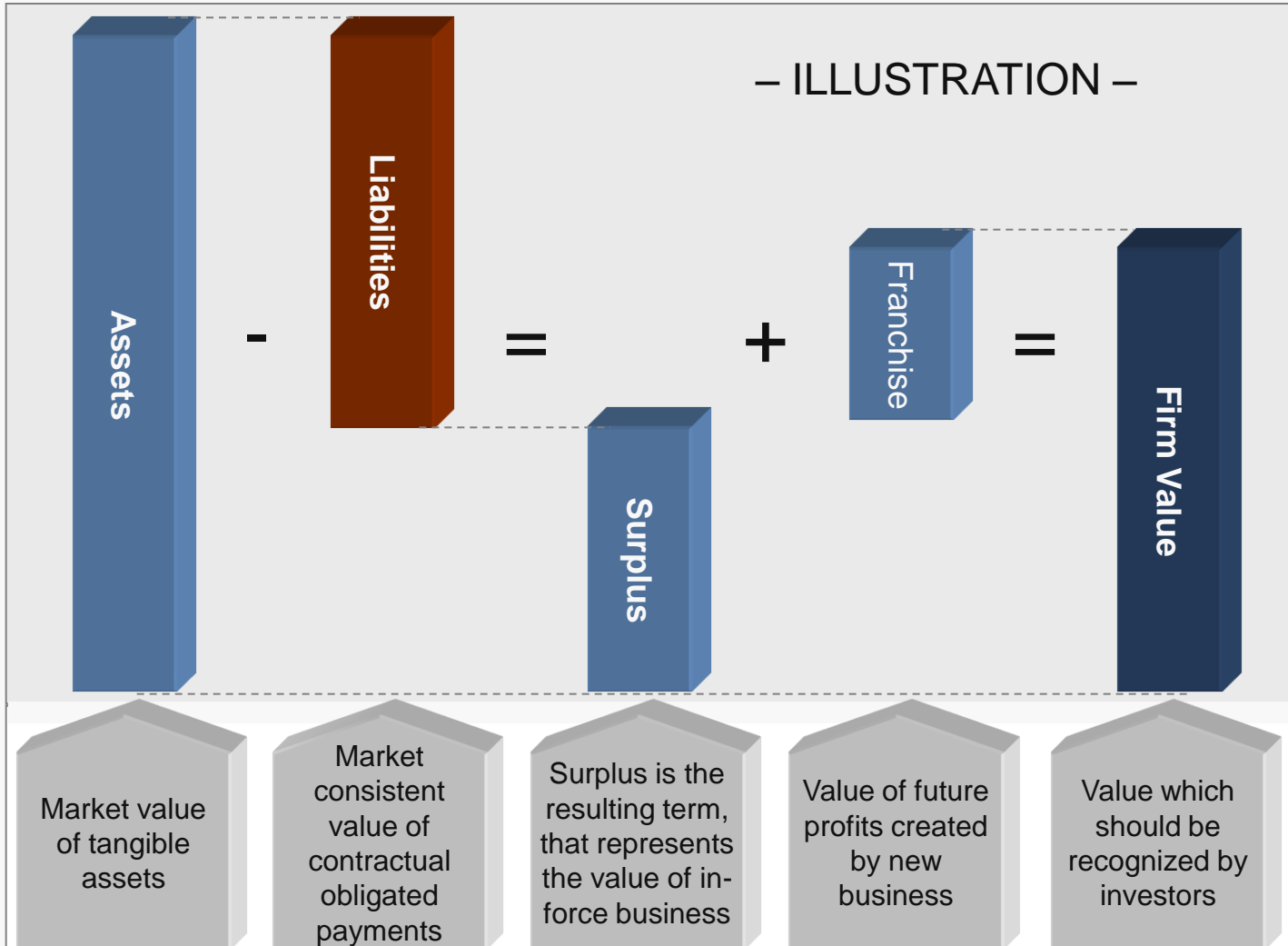
15 million customers




- 1 Integration** Benchmark case study for merger and integration
- 2 Best in class** Excellent portfolio management in non-life business
- 3 International** Systematic internationalisation
- 4 Synergies** Value-accretive synergies

Five pillars building on a strong foundation

Our overarching objective is to increase economic firm value



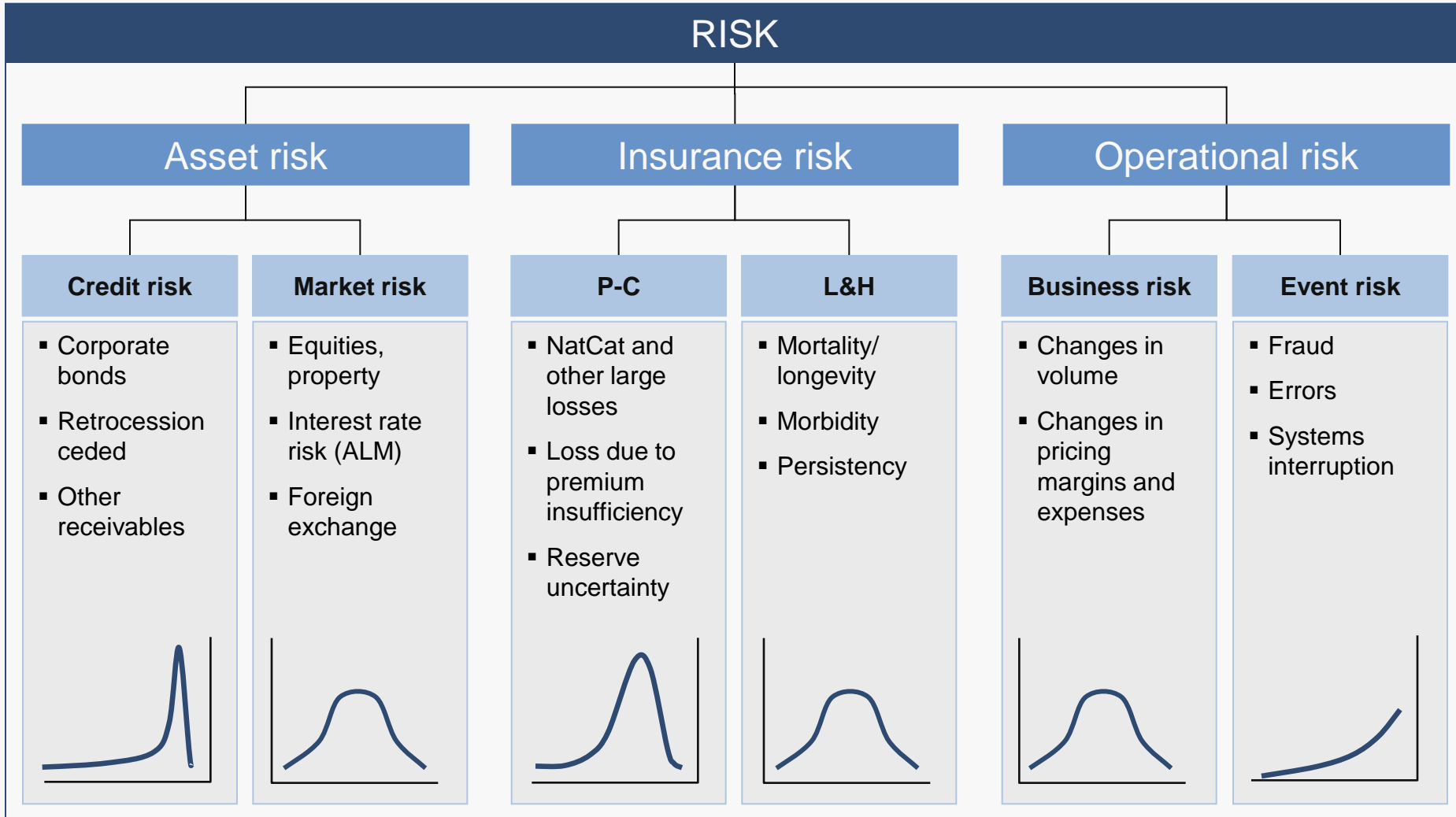
We apply market consistent valuation techniques to assess its surplus value

MCEV and EVA/VBM concepts are implemented for steering

Valuation of liabilities depends on risk preference

Franchise value is floating, therefore only surplus shows financial risk

Economic Risk Capital determined using a "risk building blocks" approach



“Okay, so you’ve got a model ... That don’t impress me much”!

Economic Risk Capital

- Quarterly assessment of Economic Risk Capital (ERC) at Group and divisional level
- Relevant bodies (e.g. Risk Committee) discuss quarterly capital reports
- ERC strongly embedded in key management processes, e.g.
 - Strategic Risk Management Framework (ALM, insurance risk steering, risk mitigation)
 - Capital allocation and pricing
 - Performance measurement
 - Embedded in annual planning process
- Consistent with principles of Solvency II
- Annual disclosure (since year-end 2001)

Risk modeling is routine process embedded in relevant management applications

Economic risk capital as of 31.12.2008

Breakdown of Group required economic risk capital (ERC)

€bn

Risk category ¹	Group		RI	PI	Div.	Explanation
	2007	2008				
Year ended	2007	2008	2008	2008	2008	
Property-casualty ²	7.0	8.0	7.8	0.6	-0.4	+€500m changed approach towards Storm Europe ³ , +€250m decreased external risk mitigation, +€200m exposure change
Life and health	3.3	4.0	3.5	1.1	-0.6	Higher PV of adverse scenarios due to lower interest-rates, mainly US and CAN
Market	7.9	5.4	4.3	3.7	-2.6	Reduction in equities exposures and increase in interest-rate risk
Credit ⁴	1.5	2.7	2.1	0.7	-0.1	Thereof +€750m due to higher credit spreads and +€200 due to increase of credit exposures
Operational risk	1.2	1.4	1.0	0.4	0.0	Enhanced operational risk model
Simple sum	20.9	21.5	18.7	6.5	-3.7	
Diversification effect ⁵	-4.4	-5.0	-5.5	-1.3	1.8	
Sum ERC	16.5	16.5	13.2	5.2	-1.9	

Group ERC stable

¹ Risk categories broadly based on refined "Fischer II" risk categories recommended for standardised industry disclosures.

² Contains Credit reinsurance.

³ Different representation of scenario with neutral net effect on sum ERC.

⁴ Default and migration risk.

⁵ The measured diversification effect depends on the risk categories considered and the explicit modelling of fungibility constraints.

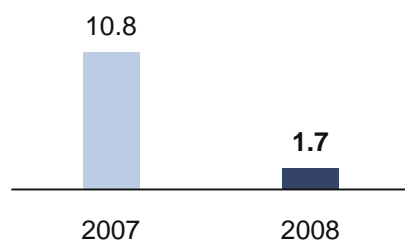
Economic risk capital as at 31.12.2008

Breakdown of Group required ERC for market risk

€bn						
Risk category	Group		RI	PI	Div.	Explanation
Year ended	2007	2008	2008	2008	2008	
Equity	6.3	2.4	1.1	1.4	-0.1	Disposals and hedging strategies
Interest rate ¹	1.7	3.6	3.4	3.2	-3.0	Increase in investment volume in the RI segment and low interest-rate environment in the PI segment
Real estate	1.5	1.5	1.0	0.6	-0.1	No relevant changes
Currency	1.0	2.3	2.2	0.1	0.0	Refined replication of liabilities rather than change in positions
Simple sum	10.5	9.8	7.7	5.3	-3.2	
Diversification	-2.6	-4.4	-3.4	-1.6	0.6	
Sum ERC	7.9	5.4	4.3	3.7	-2.6	Diversification before consideration of fungibility constraints

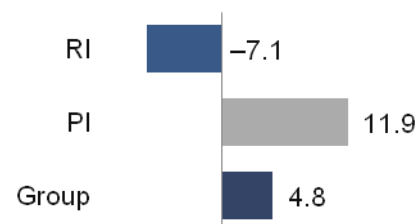
Equity

Equity backing ratio after hedges %



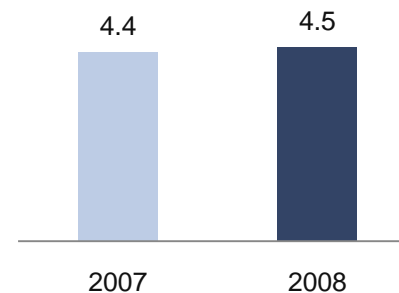
Interest rate

Net DV01² in €m



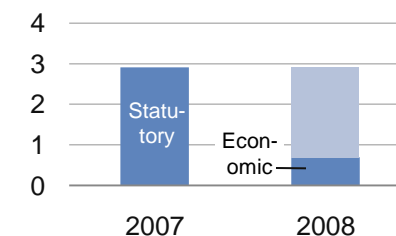
Real estate

Real estate quota² %



Currency

Changed view on CAD liabilities €bn



¹ Includes interest rate risk as well as spread risk.

² Proportion of property and real estate to total investments at market values.

Capital position

Summary of economic capital disclosure

Position as at 31 December 2008 (31 December 2007)					
€bn			31.12.2008	31.12.2007	
Available financial resources	24.6		24.6	34.3	
Economic risk capital ¹	9.4	7.1	16.5	16.5	
Economic capital buffer		3.1	5.0	8.1	17.8
Economic capital buffer after share buy-back and dividends ²		2.0	5.0	7.0	16.3

Solvency II capital
 Hybrid capital



Strong economic capital position despite capital market crisis and significant capital repatriation in 2008

¹ Solvency II capital based on VaR 99.5%, Munich Re internal risk model based on 175% of Solvency II capital. Solvency I ratio is 264% as at 31.12.2008.

² Announced dividends in 2009 of €1.1bn, €0.05bn outstanding from 2008/2009 share buy-back programme.

Market-consistent valuation Primary Life

Strong impact of extreme capital markets on EEV earnings

€m

European
Embedded Value
31.12.2007

5,406



EEV earnings

-2,237



Currency movements

-6



Value of acquired/
(divested) business

388



Capital
movements

-42



European Embedded
Value 31.12.2008

3,509

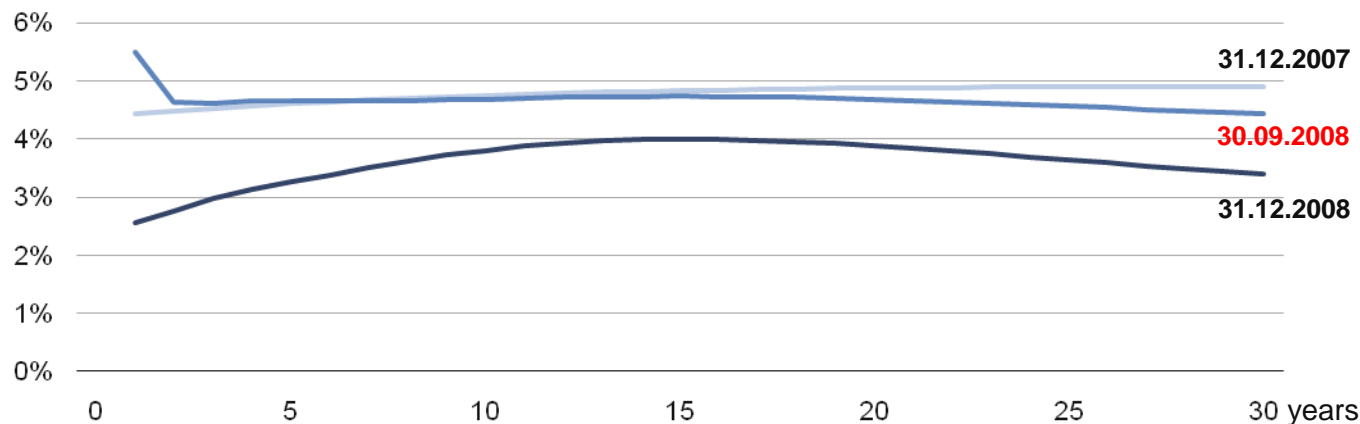


- Negative EEV earnings due to strict application of market-consistent valuation in dislocated capital markets
- Majority of EEV losses attributable to combination of low swap yields and extremely high implied volatilities at year-end 2008
- Positive contribution by acquisitions in Austria, Germany, and Italy

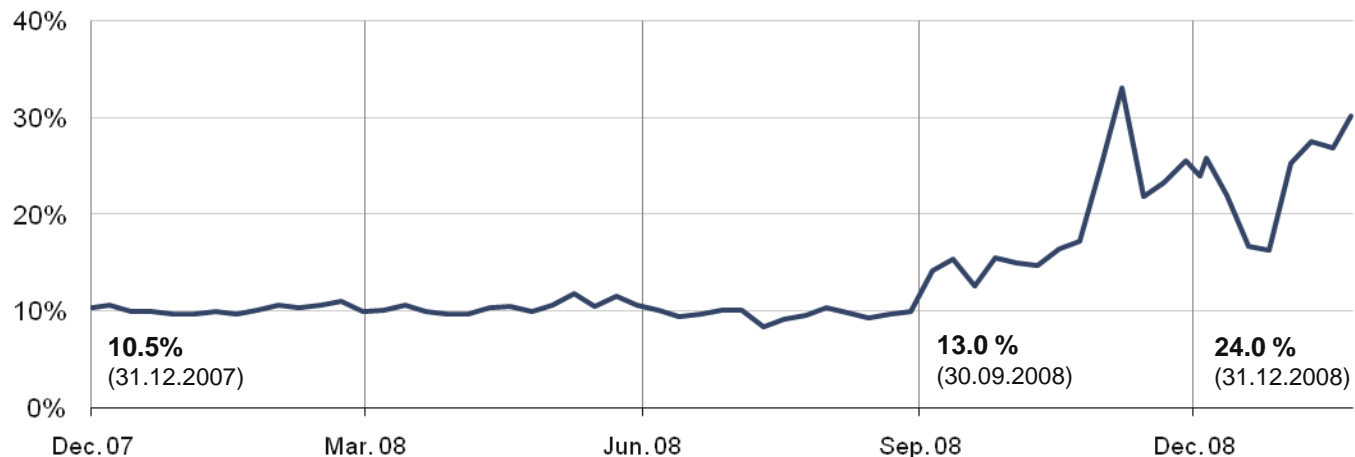
Market-consistent valuation Primary Life

Significant change of market environment

€ Swap Yield Curve



Implied Volatility for € Swap Yields (term of 10 years, tenor of 20 years)



Bloomberg data 31.12.2007–19.02.2009

- Decrease of swap yield curve by 100bp for 10 years and 150bp for 30 years
- Inverse term structure at the long end leads to low reinvestment yields below average guaranteed rate reducing the “intrinsic value” of the value in-force
- At the same time interest rate **volatility** more than doubled, leading to a significant increase (e.g. by 880% for German primary life business) of the “time value” of the PVIF (TVFOG)...
- ...however, negative impact mitigated by ERGO’s swaption hedging programme

Market-consistent valuation Primary Life

Significant impact of strict approach on German primary life

31.12.2007 €m	
Intrinsic value	2,594
TVFOG	-138
PVFP	2,456
30.9.2008 with capital market parameters as at 30.9.2008 €m (approximation)	
Intrinsic value	2,011
TVFOG	-513
PVFP	1,498
31.12.2008 €m	
Intrinsic value	1,349
TVFOG	-1,359
PVFP	-10

Split of PVIF in “intrinsic” and “time” value:

Parameters as at 30.9.2008

- **Intrinsic value** decreased mainly by impairment on equities and lower interest rates
- **TVFOG:** Negative value increased due to rising volatilities and a new ordinance for policyholder participation (“MindZufVer”)

Parameters as at 31.12.2008

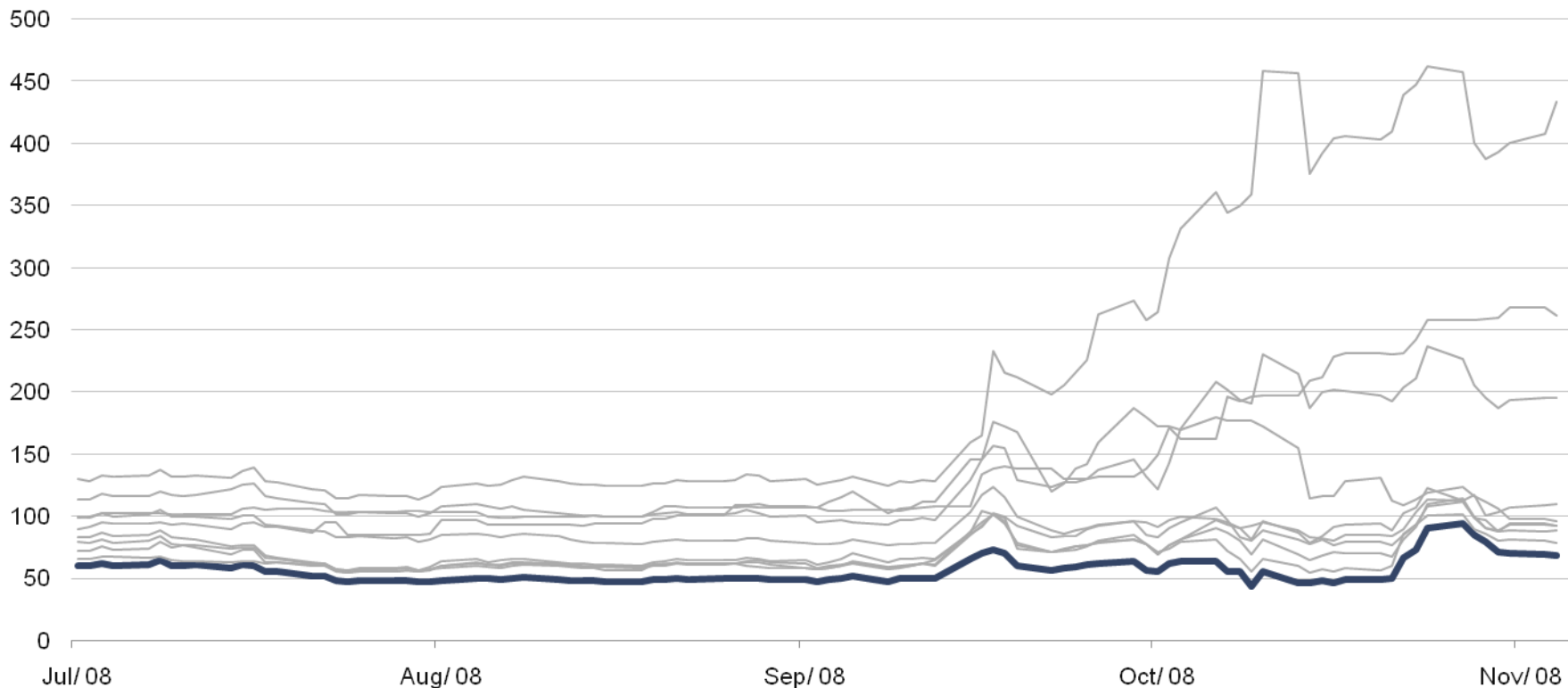
- **Intrinsic value** further reduced mainly due to the swap yield curve shift
- **TVFOG:** Negative value doubled caused by swap yield curve shift and extreme implied volatilities

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Outside view on Munich Re Group: Risks from the financial market crisis are under control

Munich Re CDS spreads in basis points, 1 July 2008 to 5 Nov. 2008¹

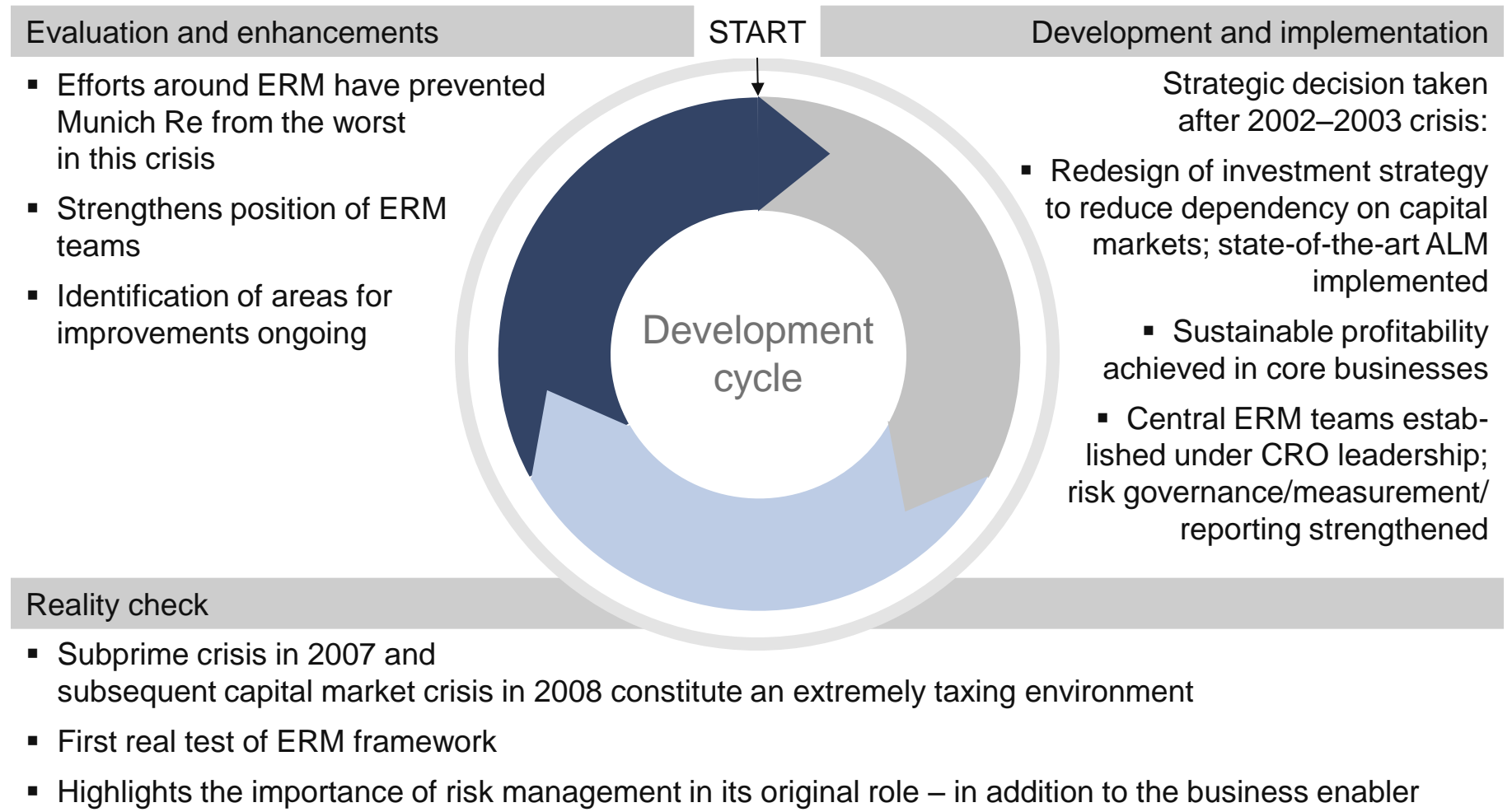


Source: Bloomberg

**CDS Spreads underline Munich Re's strength
Clients obtain added value with particular security**

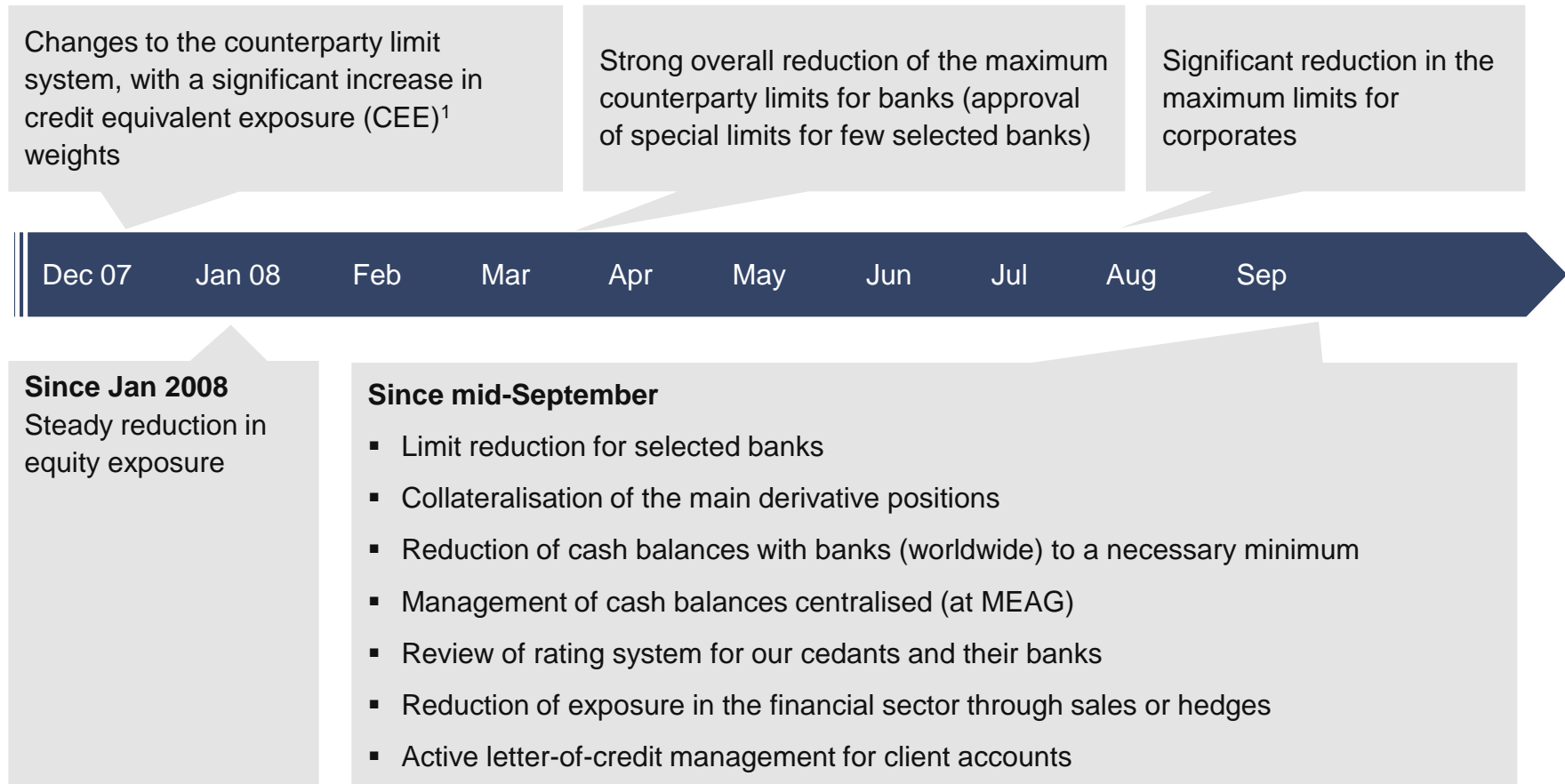
¹ 5-year CDS for Munich Re (solid line) and selected peers (insurance and reinsurance companies)

First real test for risk management frameworks after 2001



Capital market crisis

ERGO has taken measures proactively and early in the crisis



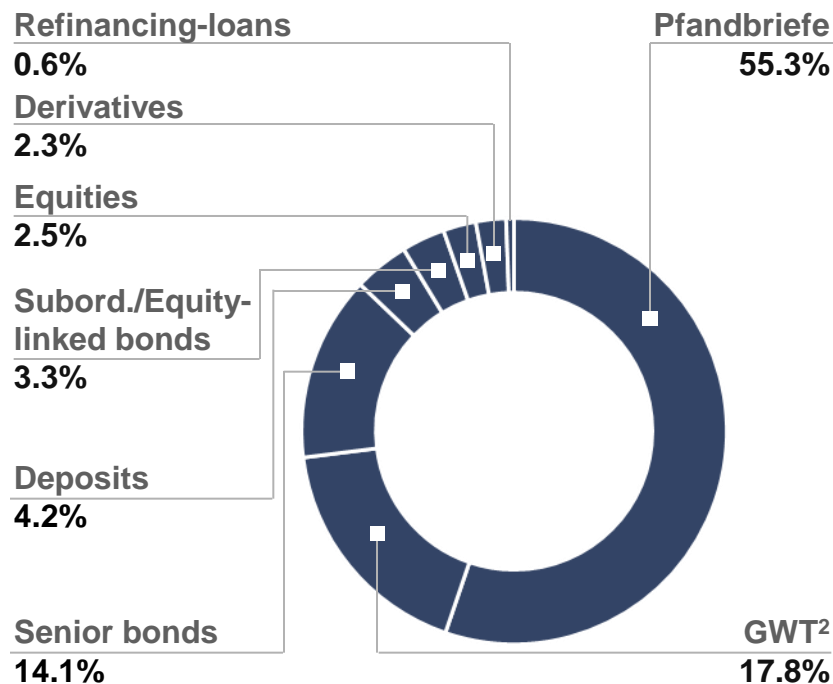
Crisis management with focus on capital preservation

¹ Credit equivalent exposure: Risk-weighted market values, e.g. Pfandbriefe 12.5%, equities 100%.

Exposure to the financial sector

Credit equivalent exposure continuously reduced throughout 2008

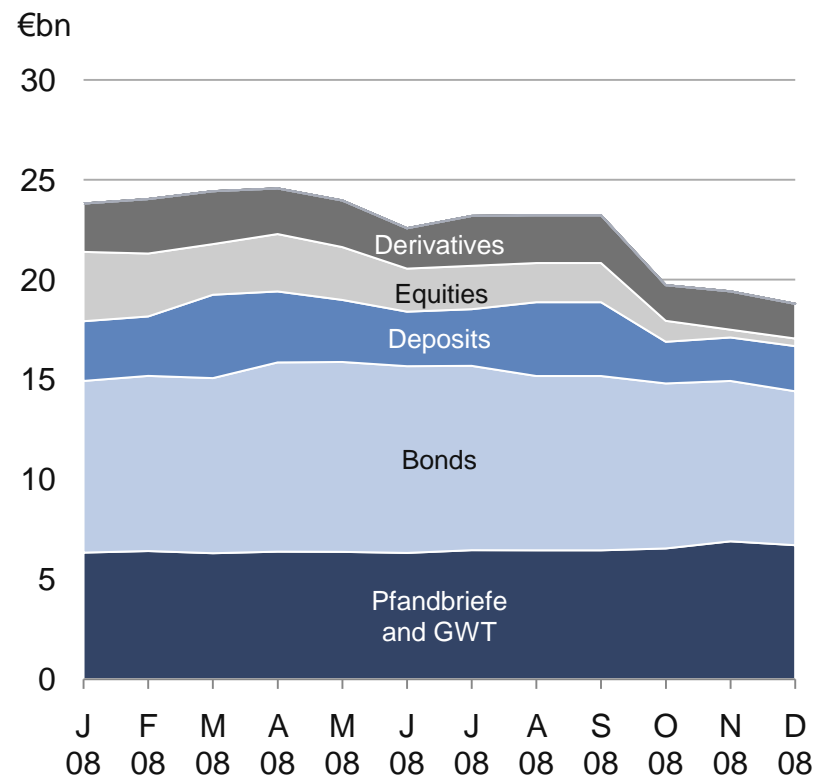
By security type¹



Market value 31.12.2008: €69.2bn

Note: Single name hedges on equity exposures (€257m) in place, further index hedges in place

Development of CEE³ over time



A total of ~73% of market values is attributable to Pfandbriefe and GWT²;
Exposure to financial sector mainly focused on Germany (56%)

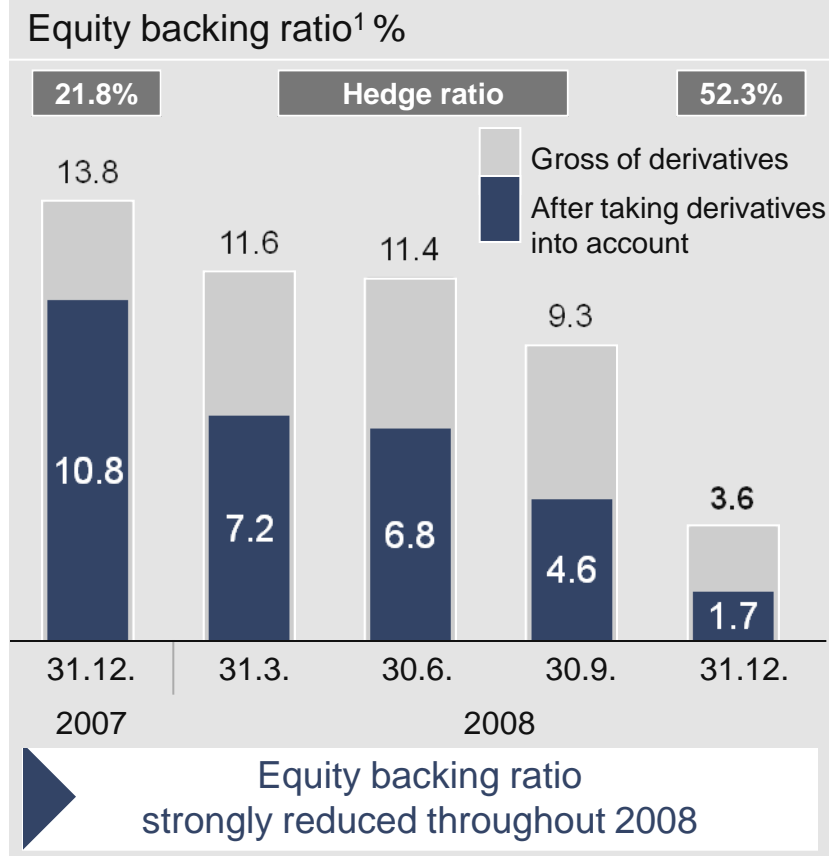
¹ Economic view – not fully comparable with IFRS figures. ² GWT = Gewährträgerhaftung (Guarantors' liability).

³ Credit equivalent exposure: Risk-weighted market values, e.g. Pfandbriefe 12.5%, equities 100%.

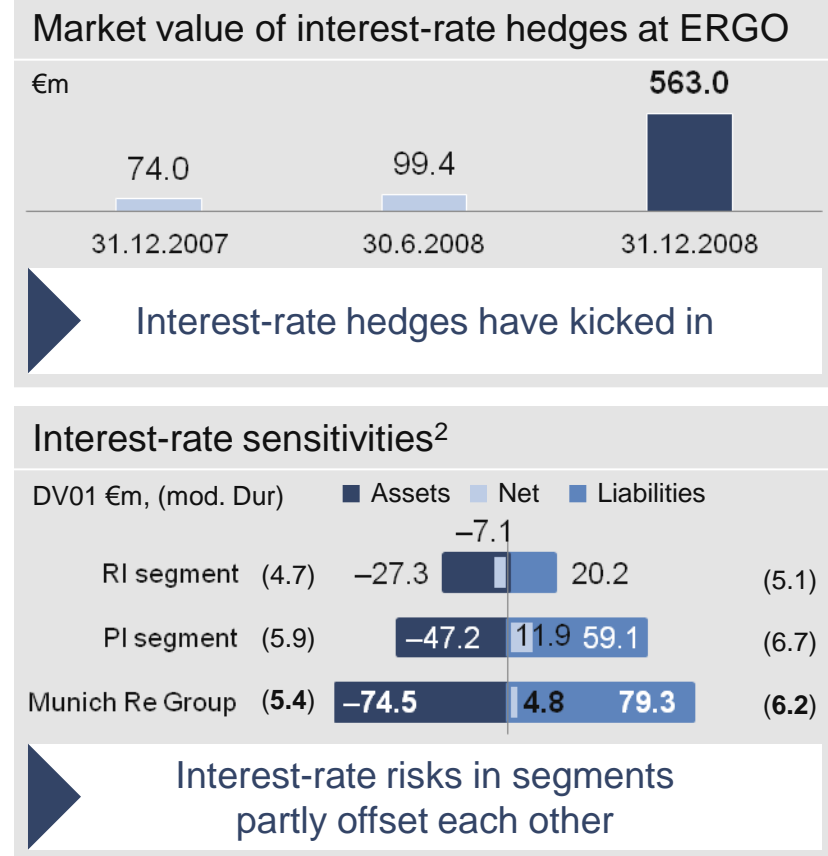
Risk mitigation activities

Capital market impacts reduced

Equity hedging



Interest-rate hedging



Hedging activities successful during 2008

¹ Proportion of investments in equities, equity funds and shareholdings to total investments at market values.

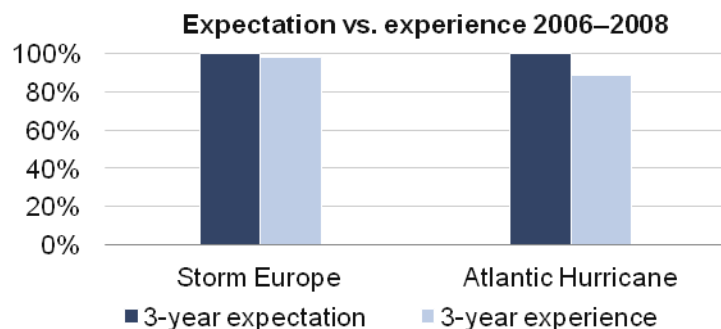
² DV01: Sensitivity in absolute terms (€m) to parallel upward shift of yield curve by one basis point. DV01 reflects the size of the fixed income portfolio.

Risk modelling

Model validation: Comparison of expectation and experience

Majority of exposures well captured by Munich Re risk models ...

Insurance risks¹



Risk category	ERC 1.1.	ERC 31.12.	Δ AFR ² 2008	Explanation
Equity	6.3	2.4	-4.1	Euro Stoxx down 44%
Credit	1.5	2.7	-0.3	Lehman, others
Interest rate	1.7	3.6	-2.9	Yield curve decline and spread widening
Currency	1.0	2.3	-0.5	Losses in CAD and GBP
Implied volatility	n/a	n/a	-0.6	Sharp rise of IR volatility
All other effects			+2.1	Technical results, etc.
Economic loss			-6.3	

... but certain model components need review

- Credit default and migration**
 Massive increase of ERC held for tradeable credit risks (+85%) due to widening of credit spreads during 2008. Pro-cyclical behaviour of credit risk models should be analysed and addressed
- Credit spread (part of fixed income)**
 Calibration of spread volatility risk should be reviewed in the light of this crisis
- Implied volatility risk**
 We will introduce an explicit risk category for implied volatility risk in our risk model

Munich Re risk model overall on track in an exceptional year, selected reviews necessary

¹ Storm Europe mainly composed of Emma and Kyrill, Atlantic Hurricane mainly composed of Dean, Gustav and Ike.

² Rough estimates, after tax and policyholder participation.

Historical analysis

What did you do in the last three major economic crises in the 20th century?

	Economic environment	Impact on Munich Re
Hyper-inflation 1922/23	<ul style="list-style-type: none"> ▪ Default of German government and corporate bonds ▪ Depreciation of saving accounts and life insurance policies ▪ Collapse of economic life (salary depreciation, increasing unemployment) 	<ul style="list-style-type: none"> ▪ Initially, claims inflation leading to high combined ratios, subsequently new contract conditions introduced (e.g. interim premium adjustments) ▪ Munich Re investments only partially affected due to foreign participations and real estate <p>Strong competitive position of Munich Re due to available capacity</p>
World economic crisis 1929–32	<ul style="list-style-type: none"> ▪ Decreasing turnover of companies ▪ Crash in stock markets and high corporate default rates ▪ Protectionist trade policy ▪ High unemployment rates 	<ul style="list-style-type: none"> ▪ Drop in premium by 25% ▪ High losses in credit and life insurance ▪ Positive claims development <p>Overall positive and relatively stable returns in each year</p>
Monetary reform 1948	<ul style="list-style-type: none"> ▪ Increased money supply and subsequent inflation in Germany (Reichsmark) ▪ Default of German government and corporate bonds ▪ 90% depreciation of private pension policies 	<ul style="list-style-type: none"> ▪ Munich Re suffered losses due to the depreciation of Reichsmark ▪ Rebuilding of foreign business accelerated by rapid setup of the DM opening balance sheet <p>Financial strength was re-established within three years (e.g. premium increase by 30%)</p>

**Munich Re successful in mastering prior crises,
but current situation requires analysis of further scenarios**

Scenario analysis

Stress-testing revealed impacts by segment and line of business

Development of broad range of scenarios

Development and refinement of economic scenarios with focus on global economic crisis since October 2008

Example 1: Global recession in industrialised countries

- Global recession/stagnation
- Loss of confidence leading to relatively slow regeneration process
- Further bankruptcies and downgrades of financial institutions possible
- In the course of expansive monetary policy, mostly further decreasing key interest rates expected
- Growing unemployment rates

Materialised

Example 2: Severe global economic crisis for several years

- Significantly decreasing economic prosperity
- Deflationary trend followed by potentially strong inflation
- Severe unemployment
- Low oil price due to lower investments and consumption
- Danger of global disintegration
- Growing concerns on illiquidity of states
- Very large number of bankruptcies
- Long-lasting, massive loss of confidence

Likelihood increased

Mainly affected lines of business

Credit reinsurance

- Significant increase of losses due to higher default rates

Life primary insurance and reinsurance

- Existing business affected by lapses, low interest rates, increased claims
- Decreasing new business

Casualty reinsurance

- D&O and PI: increase of loss frequency at early stage of recession

Sensitivity of premium volume and claims varies by line of business

MR Group-wide risk limit & trigger system in 2008

Summary of Strategic Risk Management Framework

Whole Portfolio Risk Criteria		Supplementary Risk Criteria	
Financial Strength	Financial Distress	Concentration Limits	Liquidity
<p>Must pass in three dimension:</p> <p>1. Economic Risk Capital: 175% of VaR99.5%</p> <p>2. Rating: at least „AA“</p> <p>3. Solvency: at least 100% of Solvency requirement</p>	<p>Limits the probability of an economic annual loss to max. 10%</p>	<p>Group-wide limits for systematic / single risks (as a % of AfR):</p> <ul style="list-style-type: none"> ▪ Nat cat scenarios ▪ Terrorism ▪ Pandemic ▪ Counterparty credit risk (measured as credit equivalent exposure) ▪ Insurance single risk: max. PML for property, casualty, marine, life, health 	<p>Must have sufficient liquid and fungible assets to</p> <ul style="list-style-type: none"> ▪ Meet known and expected liquidity demands ▪ Cover large claims shocks ▪ Meet collateral calls <p>In addition, monitor a „run-on-the Bank“ scenario</p>

Main Additional Risk Criteria for Asset Risk

1. **Strategic ALM-limits for Reinsurance Group and ERGO**
2. **MVaR/CVaR:** Limits per legal entity
3. **Other Investment Limits:** limits market value of Alternative Investments, Non-Investment-Grade Investments and Non-standard structures

A holistic framework protecting both shareholder and policyholder interest