ANALYSTS' DINNER – UPDATE ON SOLVENCY II

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Solvency II – Fuelling a global trend towards risk-based supervision(?)

Influence of Solvency II on other supervisory regimes

- Various supervisory regimes aiming for recognition under Solvency II ("equivalence"), e.g. Bermuda and Switzerland
- Adjustments of risk-based-capital-type models in USA and Canada
- Planned adaptations of Solvency II, inter alia in Japan, Israel and Mexico

Evidence of the trend

- Multilateral framework aiming for worldwide coherence of supervision among global insurance companies
- Harmonisation: No separate framework
- Convergence: No additional supervision

Convergence towards a common framework to be expected in the medium term

Munich Re well positioned to manage changes and capture opportunities arising from Solvency II

Main implications of Solvency II

Convergence of enterprise risk management standards in the industry

Impact on product design and pricing

Strengthened market discipline through increased transparency requirements

Impact on Munich Re

- Harmonisation between internal steering and regulatory requirements
- Some convergence with financial reporting
- Approval of internal model to gain better recognition of diversified business structure
- Additional reinsurance business potential due to changed/increased capital requirements
- Capitalising on already existing enterprise risk management framework

Impact on insurance industry

- Enhanced comparability between insurance companies across different business models and countries
- Shift towards less capital-intense products especially as regards participating features
- Changes in asset allocation due to link between ALM and Solvency II
- Increased interaction with supervisors

Increased focus on risk and capital management
Munich Re's enterprise risk management framework principles

Pillars of Solvency II

Quantitative
- Solvency requirements
  - Standard approach or internal model

Qualitative
- Supervisory process
  - Efficient risk management and control

Transparency
- Market transparency
  - Disclosure requirements to strengthen market discipline

Market-consistent valuation using the cost of capital concept
Standard model calibration: Value-at-Risk 99.5%

Use test requires capital models to be used for risk and capital management

Munich Re's internal model scaling standard model calibration with 175% reflecting AA-company security requirement

Munich Re has been using own capital model for steering purposes, capital management and performance measurement for several years now

Munich Re has already been reporting risk figures internally and externally, as well as disclosing methods, for several years now

Munich Re's risk model already fulfils many requirements of Solvency II today

Successful work in the remaining period provides good starting point for Solvency II

Timetable for the remaining period based on the proposal of the European Parliament

2012 | 2013 | 2014 | 2015 | ...
---|---|---|---|---

- Adoption of the Level 1 Framework Directive (Omnibus II)
- Consideration of further Quantitative Impact Study (QIS6) at national level
- Publication of the Omnibus II Directive in the EU official journal
- Finalisation of Level 2 measures and draft binding technical standards (Level 3)
- Transposition into national law

Solvency I
Phasing-in of Solvency II
Full application of Solvency II
Recovery period of the MCR
Recovery period in case of non-compliance with SCR
First report (MCR\(^2\), SCR\(^4\), own funds, balance sheet, profit and loss account)
Adoption of Solvency II
1.7.

Soft-launch of Solvency II during the first year after transposition, and transitional measures, will give the insurers time to smoothly adapt the new regime

2 Recovery period means the period during which companies have to ensure coverage of the MCR or SCR.
3 MCR: Minimum Capital Requirement.
4 SCR: Solvency Capital Requirement.
Insurance industry actively participates in shaping of the future supervisory regime

### Key industry issues regarding Solvency II ...

#### Valuation
- Expected profits included in future premiums (EPIFP) – Value in force (VIF)
- Contract boundaries
- Technical provisions (yield curve – counter-cyclical and matching premium)

#### SCR calculation
- Calibration (non-life underwriting and natural catastrophe risk)
- Complexity of standard formula
- Approval and standards of internal models

#### Processes and governance
- Proportionality
- Transitional measures (own funds, technical provisions)
- Own risk and solvency assessment (ORSA)

### ... and related concerns

Sustainability of traditional life business challenged
- EPIFP and thus a significant part of own funds put under regulatory scrutiny
- Valuation of technical provisions may depress net asset value

Non-life companies may suffer from calibration and complexity issues
- Underwriting risk dominant driver for non-life companies (> 50% in QIS5)
- Standard formula complexity may overburden small and medium-sized companies
- Mounting requirements for internal model certification after financial turmoil
- Principle of proportionality still to be fleshed out in practice
- Overburdening reporting requirements (Pillar 3)

### Economic approach is a fundamental principle of Solvency II – majority of large European groups, as well as the industry as a whole, still support Solvency II

### Munich Re's enterprise risk management (ERM) – already Solvency II compliant

#### Components of Munich Re’s ERM

- **Risk strategy**
  - Clear limits define the framework for operational action

- **System consisting of triggers, limits and measures in conjunction with responsible management action**

- **Risk identification and early warning**
  - Comprehensive overview with special focus on main issues

- **Based on right balance between flexibility and stability**

- **ERM cycle**
  - Risk steering
  - Risk modelling

- **Risk management culture as solid base**

### Objectives

- Protect and generate sustainable shareholder value
- Ensure the highest degree of confidence in meeting policyholders' and cedants' claims
- Protect Munich Re's reputation

### Business-embedding

- Risk steering
- Pricing/underwriting
- Liability-driven investment strategy
- Performance measurement
- Management compensation

### Risk management is a key part of our corporate management – already in line with Solvency II
**ORSA requires forward-looking perspective – Munich Re invests in new analytical tools**

Increasing interdependencies may lead to loss cascades...

Example: Potential consequences of a prolonged heat and drought period (selected nodes)

<table>
<thead>
<tr>
<th>Nodes</th>
<th>Heat and drought</th>
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<td>River warming</td>
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<td>Nuclear power plant disruption</td>
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<td>Power cuts</td>
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<td></td>
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<td></td>
<td>Business interruptions</td>
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</tbody>
</table>

*... and complex accumulations...

Example: Terrorism

Influence of and impact on political and social environment

Example: Contingent business interruption

Complex global supply chains

... addressed in Munich Re’s ORSA²

- Ongoing project to build Complex Accumulation Risk Explorer (CARE) – analytical tool to assess risk of complex accumulations
- Emerging risks are part of regular risk reporting and included in the ORSA

**Certification process of Munich Re capital model well on track**

**Roadmap to certification**

- **2009**: Focus on market and credit risk
- **2010**: Focus on property-casualty risks and aggregation
- **2011**: Focus on life/health and operational risks; increased focus on solo models
- **2012**: Stronger focus on solo models; preparation of the formal application for group and solo entities

Various on-site visits in Munich and Düsseldorf as well as supervisory college workshops from 2009 until 2011

**Challenges and achievements**

- Standard formula not adequately capturing Munich Re’s risk profile
- “Moving target” of Level I – III requirements entails close monitoring of regulatory debate and participation in related consultations...
- … making adjustments to current model may be necessary depending on regulatory developments (e.g. EIOPA yield curve)
- Formal application remains a challenge due to strictly formalised requirements
- Certification of an internal model for subsidiary New Re in Switzerland under the Swiss Solvency Test

**Munich Re on track in the pre-application phase for the certification of its internal model – Still some challenges but first goals have been achieved**
Comparison of Munich Re’s capital model with the Solvency II standard formula

<table>
<thead>
<tr>
<th>Munich Re capital model</th>
<th>Draft implementing measures</th>
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<tbody>
<tr>
<td>Relevant risk-free interest rate term structure</td>
<td>Swap rates</td>
</tr>
<tr>
<td>Spread risks for European government bonds</td>
<td>Covered</td>
</tr>
<tr>
<td>Volatility risks</td>
<td>Covered</td>
</tr>
<tr>
<td>Diversification benefits between interest rate, currency and insurance risks</td>
<td>Covered</td>
</tr>
<tr>
<td>Insurance risk calibration</td>
<td>Specific for Munich Re’s risk profile</td>
</tr>
<tr>
<td>Group risk margin</td>
<td>Diversification between legal entities taken into account</td>
</tr>
</tbody>
</table>

Munich Re capital model tailored to Munich Re’s specific risk profile and built on economic principles of Solvency II

Volatility of own funds under Solvency II – something to get accustomed to

Examples of volatility drivers
- No risk-free investment available – deliberately taking investment risks
- Insufficient supply of investable assets for long maturities
- Sensitivity to changes in level and volatility of interest rates
- Risk margin reflects capital consumption over the business run-off

Indication of Solvency II volatility
Calibration of MCR implies a 15% risk of losing ~35% points on solvency ratio over one year by reduction of own funds

Solvency II own funds will be more volatile than existing frameworks – Volatility will become a mark of the “new normal” regulation
Impact of the SCR on the volatility of solvency ratio under Solvency II

Impact of economic profits and losses on SCR and solvency ratio

SCR can dampen... ...or amplify volatility of own funds

Reduction of risk exposure as a result of decreased market values and/or outright sales

As a result, the negative impact of decrease in own funds on the solvency ratio is partly compensated by a reduction of the SCR

The volatility of the solvency ratio depends on the source of the change – SCR can dampen own funds volatility or amplify it

Significant change of market risk factors impacting solvency ratios to a large extent ...

**Interest rate risk**

QIS5 shock: -31%

**Spread risk**

QIS5 shock: +116 bps

**Market**

Spread risks for EU government bonds not covered by QIS5

**Equity risk**

QIS5 shock: -30%

**Interest volatility risk**

QIS5 shock: +9.2 pts

The QIS5 shock for market risk realised over seven quarters since 31.12.2009

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1 10 year EUR swap. 2 "ECB AAA and other European government bond rates" over swap.
3 Spread risks for EU government bonds not covered by QIS5
4 EuroStoxx50.
5 EUR swaption volatilities 10Y in %.
6 Source: Bloomberg.
... with substantial impact on average solvency ratios (VaR 99.5%) of European insurance companies

Estimated development of average own funds of European insurers since QIS5¹

<table>
<thead>
<tr>
<th>Date</th>
<th>Realised market risk captured in the SCR</th>
<th>Realised market risk not captured in the SCR</th>
<th>Adjustment for loss absorbency of tech. provisions and deferred taxes</th>
<th>30.9.2011</th>
<th>Increase of Iliquidity Premium</th>
<th>Recognition of additional CCP or MP² components</th>
<th>30.9.2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>31.12.2009</td>
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Non-quantified effects of the SCR on the solvency ratio

- Increase of SCR
  - Increase of insurance risk: Increased market value of insurance liabilities due to lower interest rates
  - Increase of interest rate risk: Increased market value due to lower interest rates

- Decrease of SCR
  - Decrease of equity risk: Lower market value due to depreciation of equity markets

Market movements negatively impacted QIS5 solvency positions – Counter-cyclical measures are likely to compensate for a material amount

1 Munich Re estimates based on reported results from EIOPA’s QIS5 report. Incorporating only effects from financial markets development without taking possible management actions into account.
2 CCP = Counter-Cyclical Premium; MP = Matching Premium.

Sensitivities of economic solvency ratios for Munich Re based on 175% of VaR 99.5%

<table>
<thead>
<tr>
<th>ESRs¹ for MR Group as at 31.12.2010</th>
<th>Current situation</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Ratio as at 31.12.10</td>
<td><strong>136</strong></td>
</tr>
<tr>
<td>Interest rates +100bps</td>
<td><strong>148</strong></td>
</tr>
<tr>
<td>Interest rates −100bps</td>
<td><strong>123</strong></td>
</tr>
<tr>
<td>Equity markets −30%</td>
<td><strong>134</strong></td>
</tr>
<tr>
<td>Interest rates −100bps/Equity markets −30%</td>
<td><strong>118</strong></td>
</tr>
</tbody>
</table>

Munich Re able to withstand another extreme economic stress as experienced in Q1–3 2011 without breaching its internal(!) limit

1 Economic solvency ratio defined as available financial resources over economic risk capital (based on 175% of Solvency II calibration target).
Aiming for higher target capitalisation – Management intervention much more granular than supervisory scheme

Munich Re actions

- >140% Excellent capitalisation
  - Capital repatriation
  - Increased risk-taking
  - Holding excess capital to meet external constraints

- 100%–140% Comfortable capitalisation

- 80%–100% Adequate capitalisation
  - Tolerate and monitor
  - (Partial) suspension of capital repatriation

- <80% Below target capitalisation
  - Risk transfer
  - Scaling down of activities
  - Raising of (hybrid) capital

Munich Re solvency ratio

- Regulatory actions
  - 35–100% Below target capitalisation
    - Obligation to submit a comprehensive and realistic recovery plan
    - Insurer to take necessary measures to achieve compliance with the SCR

- <35% Insufficient capitalisation
  - Obligation to submit a short-term realistic finance scheme
  - Regulator may restrict or prohibit the free disposal of insurer's assets
  - Ultimate supervisory intervention: Withdrawal of authorisation

Munich Re's risk strategy to safeguard target capitalisation through a comprehensive limit and trigger system …

Core components of Munich Re's risk strategy

Objectives
  - Maintaining Munich Re's financial strength
  - Protecting and increasing shareholder value
  - Protecting Munich Re's reputation

Implementation
  - Comprehensive limit and trigger system expressing MR's risk appetite and risk tolerance for various risks, e.g.
    - Financial sector
    - Pandemic exposure
    - Counterparty credit risk
    - Liquidity
    - Economic solvency ratio
    - Government bond exposure
    - AL mismatches
    - Individual nat cat exposures

Risk appetite
  - In broad terms: Risk types which are generally acceptable

Risk tolerance/limits
  - How much of the risk is desirable at group/segment level, i.e. definition of risk criteria and limits

Budgets
  - How much of the risk is acceptable in specific terms by business unit (operational budgets)

Early warning triggers
  - Early warning indicators to minimise the probability of breaching a limit

Measurement & controlling
  - Roles and responsibilities
  - Processes
  - Frequency of measurement
  - Time to react

Effective risk management through operationalised risk strategy and streamlined governance
Enterprise risk management fully integrated into business strategy and daily business

**Achievements**
- "Duration hedge" between primary and reinsurance has worked
- Substantial measures taken at early stage to address interest rate sensitivity in primary life
  - Duration increase – enhance cash flow matching
  - Purchase of receiver swaptions – reduce convexity risk

**Outlook**
- Further prolongation and convexity hedges planned
- Committed to optimising Munich Re Group’s duration mismatch through active duration steering within the reinsurance segment

**Solvency II will change reinsurance demand**

**Traditional motives for reinsurance …**
- Stabilisation of earnings
- Peak-risk management – portfolio homogenisation
- Additional impact of price and capacity of reinsurance

**… not fully recognised yet**
- Cap on cession (50%) compared to full economic effect
- Use of historical reinsurance purchase compared to forward-looking perspective
- Reliance on simple volume-based measures for reinsurance recognition

**Better reflection of reinsurance under Solvency II – Driver of future reinsurance demand**
- Reinsurance will be transformed into a powerful capital management tool
- (Partial) internal models allow for more complex products
- Internally set targets, e.g. for solvency or peak exposures, may also trigger increased reinsurance purchase
Capitalising on business opportunities

**Distribution of solvency ratios**

- **Gumbel fit**
- **QIS5 report**
- **Market capital shortfall**: ~€50bn

**Segmentation of business opportunities**

- Companies in the left tail have the highest demand for solutions to improve solvency ratio but high default risk may discourage reinsurers.
- Companies in the middle face new demand for reinsurance as a result of Solvency II.
- Companies in the right tail are economically strong and remain the classic buyers of reinsurance cover.

**Prototypical non-life example**

- Small company writing various business lines.
- Solvency I ratio 130%, Solvency II ratio ~70%.
- SCR reduction through quota share treaties in dominant business lines.
- Immediate improvement of SII ratio to ~90%.
- Future reserve risk reduction improves projected Solvency II ratio in 2014 to ~110%.

Seizing business opportunities within Solvency II

**Profit potential**

- **Scenario 1**: High shortfall, high incentive for reinsurance, high real economic assumptions.
- **Scenario 2**: Realistic shortfall, realistic risk calibration, adequate incentive for reinsurance, short transitional period.
- **Scenario 3**: Low shortfall, low incentive for reinsurance, low economic assumptions, long transitional period.

**Scenario 1**

- High shortfall
- Negative market environment
- Large events depleting own funds
- Realistic economic assumptions

**Scenario 2**

- Realistic shortfall
- Improving market environment
- On average, realistic risk calibration
- Optimistic economic assumptions

**Scenario 3**

- Low shortfall
- Positive market environment
- Optimistic assumptions on valuation and (esp. insurance) risk calibration
- Enhanced use of risk dampeners
- Adequate incentive for reinsurance
- Low economic impact of reinsurance adequately reflected

**Market capital shortfall**

- **Scenario 1**: Significant
- **Scenario 2**: Moderate
- **Scenario 3**: Low

**Positive business impact expected from Solvency II**

- Extent dependent on final specifications.
Impact of Solvency II on clients and products

Changes and challenges
- Challenges client-specific ...
- ... with regional differences and also having an impact outside Europe (e.g. Bermuda).
- Risk assessment for each segment ...
- ... increasing transparency as regards economic value contribution of different activities ...
- ... possibly triggering adjustments of clients’ portfolios: Expansion into new lines of business vs. adaption and termination of certain lines of business

Solvency II – a catalyst for a trend which has been developing for some time: Enterprise risk management

There is no general rule for “winners” and “losers” – risk mitigation techniques like reinsurance offer solutions to reduce the competitive disadvantage

Advantages of reinsurance solutions

<table>
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<tr>
<th>Criterion</th>
<th>Reasons</th>
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<tbody>
<tr>
<td>Capital strength and rating of reinsurer</td>
<td>Rating and capital strength of reinsurers are differentiating criteria</td>
</tr>
<tr>
<td></td>
<td>Explicit consideration of reinsurance credit risk through a deduction from capital relief (see chart)</td>
</tr>
<tr>
<td>Advantages of reinsurance solutions</td>
<td>Effective and available independent of capital market access</td>
</tr>
<tr>
<td></td>
<td>Faster and more flexible than capital market solutions</td>
</tr>
<tr>
<td></td>
<td>Reinsurance available to all insurance segments and provides highest confidentiality</td>
</tr>
<tr>
<td>Capital management by reinsurance</td>
<td>Capital management as an additional driver for reinsurance</td>
</tr>
<tr>
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<td>Comparison of internal cost of capital with the cost of reinsurance (cost of capital + administration cost + counterparty risk) will be possible and will influence decisions</td>
</tr>
</tbody>
</table>

Solvency II will lead to transparency in risk capital relief and will make the added value of reinsurance much more visible

1 Chart based on QIS5 technical specifications.
Business opportunity segmentation

Life business
- Largest potential for products covering market risk
- Underwriting risks less important and generally written in connection with services

Non-life business
- Largest potential for nat cat, retrospective covers and quota share treaties depending on client risk profile
- Standard formula favours proportional treaties

Business opportunities will arise but careful selection will be required

Key takeaways

We have already been steering our business in line with Solvency II principles for years – Management intervention kicks in much earlier and is more granular than supervisory scheme

Solvency II will foster less capital-intense products that allow for more efficient hedges

Solvency II will lead to selective additional business potential for reinsurance while classic motives for reinsurance still remain valid

Increased transparency requirements enhance comparability across Europe

Solvency II own funds will better reflect economics of insurance business

Solvency II will support analysts and investors in assessing the economic position of insurance undertakings
### Financial calendar

#### FINANCIAL CALENDAR

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>2 February 2012</td>
<td>Preliminary key figures 2011 and renewals</td>
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<tr>
<td>13 March 2012</td>
<td>Balance sheet press conference for 2011 financial statements</td>
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<tr>
<td>14 March 2012</td>
<td>Analysts’ conference, London</td>
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<tr>
<td>26 April 2012</td>
<td>Annual General Meeting, Munich</td>
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<tr>
<td>8 May 2012</td>
<td>Interim report as at 31 March 2012</td>
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Appendix

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