Our core beats digital.
Solutions along the value chain

Monte Carlo | 8 September 2019
Torsten Jeworrek • Anthony Kuczinski
Agenda

1. Global reinsurance landscape
   Torsten Jeworrek

2. A world of risks, a world of opportunities
   Torsten Jeworrek

3. Solutions along the value-chain – Our core beats digital
   Torsten Jeworrek • Anthony Kuczinski
Global reinsurance landscape

1. Moderate reinsurance premium growth expected until 2021, with lower rates than primary insurance premium growth


P-C RI: Ceded premiums 2018

<table>
<thead>
<tr>
<th>Region</th>
<th>Premiums 2018</th>
<th>Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>€73bn</td>
<td>32%</td>
</tr>
<tr>
<td>North America</td>
<td>€72bn</td>
<td>32%</td>
</tr>
<tr>
<td>Asia Pacific</td>
<td>€55bn</td>
<td>24%</td>
</tr>
<tr>
<td>Latin America</td>
<td>€15bn</td>
<td>7%</td>
</tr>
<tr>
<td>Africa/Middle East</td>
<td>€12bn</td>
<td>5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>~€227bn</td>
<td>100%</td>
</tr>
</tbody>
</table>

P-C RI and PI real growth rates (CAGR)

<table>
<thead>
<tr>
<th></th>
<th>RI</th>
<th></th>
<th>PI</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>16–18</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>2%</td>
</tr>
<tr>
<td>19–21</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Munich Re Economic Research
Traditional reinsurance market with stable development

Alternative capital reevaluating investment case

**Trends**

**Traditional market**
- Capital base of the reinsurance industry overall stable over the last years
- Many reinsurers use dividend payments and share buy-backs to manage their capital more actively

**Non-traditional capacity/Alternative Risk Transfer (“ART”)**
- Total capital employed slightly growing to ~100 bn USD (Q1 2019)
- 17/18 loss events resulting in material lock-ins
- Market has developed multiple forms to unlock and redeploy capital, so actual capacity reduction from lock-in limited
- Increasing interest in portfolios with lower concentration risk.
- Inflows to opportunistic, highly concentrated strategies stalled after two consecutive years of under-delivering and losses to capital
- Nevertheless, alternative capacity still concentrated in Florida/U.S. East Coast Nat Cat and retro market
- We continue to utilize this capacity source for capital management

---

Dedicated reinsurance capital

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>292</td>
<td>320</td>
<td>340</td>
<td>332</td>
<td>345</td>
<td>341</td>
<td>346</td>
</tr>
</tbody>
</table>

Source: AM Best, Guy Carpenter, Aon Benfield, Munich Re

1 Sum of reported top 50 fund NAV plus guess on non-reported capital
A world of risks, a world of opportunities

Challenges we are facing as an industry and we should be dealing with to remain relevant

- Political Uncertainties
- Geopolitical Volatility
- New Trade Forms of Energy
- New Trade Wars
- Old Risks New Risks
- Climate Change
- Cyber Risks
- Digitalisation
- New Forms of Mobility
## Digital transformation demands new solutions from (Re)Insurance industry

<table>
<thead>
<tr>
<th>Risk Category</th>
<th>2018 Percentage</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Interruption</td>
<td>42%</td>
<td>1</td>
</tr>
<tr>
<td>Cyber incidents</td>
<td>40%</td>
<td>2</td>
</tr>
<tr>
<td>Natural catastrophes</td>
<td>30%</td>
<td>3</td>
</tr>
<tr>
<td>Changes in legislation and regulation</td>
<td>21%</td>
<td>5</td>
</tr>
<tr>
<td>Market developments</td>
<td>22%</td>
<td>4</td>
</tr>
<tr>
<td>Fire, explosion</td>
<td>20%</td>
<td>6</td>
</tr>
<tr>
<td>New technologies</td>
<td>15%</td>
<td>7</td>
</tr>
<tr>
<td>Climate change</td>
<td>10%</td>
<td>10</td>
</tr>
<tr>
<td>Loss of reputation or brand value</td>
<td>13%</td>
<td>9</td>
</tr>
<tr>
<td>Shortage of skilled workforce</td>
<td>9%</td>
<td>NEW</td>
</tr>
</tbody>
</table>

**Source:** Allianz Risk Barometer 2019

A world of risks, a world of opportunities

---

1. **Loss of reputation or brand value**
   - 2018: 37%
   - Rank: 3

2. **Fire, explosion**
   - 2018: 19%
   - Rank: 6

3. **Cyber incidents**
   - 2018: 37%
   - Rank: 2

4. **Natural catastrophes**
   - 2018: 28%
   - Rank: 3

5. **Changes in legislation and regulation**
   - 2018: 27%
   - Rank: 4

6. **Market developments**
   - 2018: 23%
   - Rank: 5

7. **Climate change**
   - 2018: 13%
   - Rank: 9

8. **New technologies**
   - 2018: 19%
   - Rank: 7

9. **Loss of reputation or brand value**
   - 2018: 13%
   - Rank: 8

10. **Shortage of skilled workforce**
    - 2018: 9%
    - Rank: NEW
Solutions along the value chain – Our core beats digital

3

CYBER SOLUTIONS

WILDFIRE RISK SCORE

PARAMETRIC SOLUTIONS

REMOTE INDUSTRIES
Evolution and exponential growth in cyber incidents

Major cyber incidents

- 2007: DDoS on Estonian gov't. sites
- 2009: DDoS attack on gov't./financial websites in South Korea
- 2010: Stuxnet
- 2011: Sony PSN data breach
- 2011: RSA SecurID infiltration
- 2012: Dropbox (68m records)
- 2013: Yahoo! (3bn records)
- 2013: Sony Picture hack
- 2014: Ebay (145m records)
- 2014: US federal (21m records)
- 2015: Anthem (80m records)
- 2015: US federal
- 2016: Yahoo (500m records)
- 2016: Anthem (500m records)
- 2016: NotPetya
- 2017: WannaCry
- 2017: Marriott (500m records)
- 2018: Google+ (52m records)
- 2018: Marriott (90m records)
- 2018: Twitter (330m records)
- 2018: Facebook (90m records)
- 2018: NotPetya
- 2018: Twitter (57m records)
- 2017: LinkedIn (112m records)
- 2016: Bank of Bangladesh attack (estimated $81m stolen)
- 2020: Evolution and exponential growth in cyber incidents

1. Sensitive personnel data stolen from US govt. employees gone through security clearance background checks.
Recent market trends and developments
Underscore the necessity and potential of cyber insurance

Global IT security investments will further grow:

- Most new buyers are SMEs (small sized: <€50m)
- Top buyers by industry:
  - Healthcare
  - Manufacturing
  - Professional services
  - Financial institutions
- Top cover elements:
  - BI (growing importance)
  - Data breach (remaining important)
Solutions for cyber in a data driven world

Co-operation and service offerings include:

- Legal advice and wording analysis
- Workshops, training and client seminars
- Technical risk assessment support
- White-label concept design for cyber products
- Support for pricing and accumulation control
- Advice on “silent cyber” in traditional lines of insurance
- Threat intelligence sharing and cyber-claims information exchange
- IT service provider database and third-party services
- Innovative cyber products and co-creation in the cyber network
- Post-incident services and solutions

Cyber challenge accepted – Munich Re’s cyber strategy reflects an active appetite for taking risks and driving innovation
3 Cyber insurance market with strong expected growth
Munich Re – Cyber reinsurer of the year 2017, 2018 and 2019

GWP global cyber insurance market\(^1\)

- **RoW**
- **US**

<table>
<thead>
<tr>
<th>Year</th>
<th>Digitalisation</th>
<th>Claims</th>
<th>Legislation</th>
<th>Total in $bn</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>2017</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>2018</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>2019</td>
<td>7</td>
<td>6</td>
<td>7</td>
<td>20</td>
</tr>
<tr>
<td>2020</td>
<td>8</td>
<td>7</td>
<td>8</td>
<td>23</td>
</tr>
</tbody>
</table>

GWP Munich Re cyber portfolio

- **PI**
- **RI**

<table>
<thead>
<tr>
<th>Year</th>
<th>PI</th>
<th>RI</th>
<th>Total in $m</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>100</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td>2015</td>
<td>150</td>
<td>75</td>
<td>225</td>
</tr>
<tr>
<td>2016</td>
<td>200</td>
<td>100</td>
<td>300</td>
</tr>
<tr>
<td>2017</td>
<td>250</td>
<td>150</td>
<td>400</td>
</tr>
<tr>
<td>2018</td>
<td>300</td>
<td>180</td>
<td>480</td>
</tr>
</tbody>
</table>

Cyber is one of Munich Re’s main strategic growth areas

---

\(^1\) Estimates by Munich Re

Image: AndroDrone, ZephyrImages
Solutions along the value chain – Our core beats digital

WILDFIRE RISK SCORE

PARAMETRIC SOLUTIONS

REMOTE INDUSTRIES
Losses caused by wildfires in California have increased in recent decades

...mostly due to the increase of values in high hazard areas but probably also due to a changing climate.
We have developed a new wildfire risk score map for California, Colorado and Arizona to support customers and insurance companies managing wildfire risk.

We enhanced external data with our claims experience & scientific assessment of the impacts of climate change.

Munich Re internal & enriched external data

New Munich Re Wildfire Risk Score Map

New Hazard Zones

External data modified by Munich Re

Big range of proprietary information & data
… to come up with a new Wildfire Risk Score Map and a more accurate Risk Index

Turning vulnerability into resilience. Smart exposure management and claims control with Munich Re’s HD Wildfire Risk Index
Solutions along the value chain – Our core beats digital

CYBER SOLUTIONS

WILDFIRE RISK SCORE

PARAMETRIC SOLUTIONS

REMOTE INDUSTRIES
Parametric trigger solutions
Advances in technology enhance trigger design and loss detection

- Parametric solutions are products designed with a trigger beyond a tolerable threshold and an according payout mechanism.

- Easily verifiable parameters determine the payout, hence the pre-agreed payment can be swiftly made.

Payment triggered by event occurrence exceeding parametric threshold.

Pre-agreed payment structure based on event parameter or index value.
3 Broad range of applications for parametric triggers

New forms of data analysis and real-time monitoring allow structuring of new solutions

For example: Minimum magnitude within a defined area
For example: Satellite and drone-based gauging of vegetation or flooding
For example: (smart) machines overheating

Earthquake
Economic impact of draught and flood
Operating Temperature

Payout is triggered by event occurrence Exceeding parametric threshold

For example: Minimum magnitude within a defined area
For example: Satellite and drone-based gauging of vegetation or flooding
For example: (smart) machines overheating
Parametric solutions bear beneficial characteristics – But basis risk must not be ignored

- **SPEED**
  Parametric triggers ensure rapid recovery thanks to a simple and quick payout process that provides liquidity when it is needed most. No physical damage is required.

- **CLOSING GAPS**
  Previously uninsurable risks arising from natural catastrophes can be covered. The product is easily customizable and allows limiting risk in a cost-efficient manner.

- **UNPRECEDEDENT LEVEL OF TRANSPARENCY**
  Pre-agreed independent third parties provide the data needed to trigger the cover – this information can be accessed immediately after the event.

- **NO DEDUCTIBLES**
  Parametric products typically don’t have a deductible, so there is no financial commitment from your side once all triggers have been met.

- **REDUCED CLAIMS-RELATED EXPENSES**
  The simplicity of the payout process substantially reduces administrative costs.

Solutions along the value chain – Our core beats digital
Solutions along the value chain – Our core beats digital

3

C Y B E R  
S O L U T I O N S

W I L D F I R E  
R I S K  S C O R E

P A R A M E T R I C  
S O L U T I O N S

R E M O T E  
I N D U S T R I E S
Challenges you face during a hurricane event

» High volume of incoming claims
» Difficulties in short-term planning
» Challenges in securing and placement of resources
» Restricted access to affected areas and limited ability to gain on-the-ground insight
» Improving customer experience in case of loss
Remote Industries approach – algorithm-based, automated claims processing for natural catastrophes

High-resolution aerial imagery
Deep Learning
Video Inspection Tool
Simple web tool or API

Automated claims processing from aerial imagery leads to lower claims handling costs, faster reaction times and better fraud detection possibilities
How Remote Industries works during a hurricane

**Hurricane loss prediction**
- Better loss-aggregate planning
- Improved planning of inside and field adjuster resources
- Pre-storm assistance to policyholder

**Hurricane claims management**
- Pre-First Notice of Loss awareness in many cases
- Faster adjustment of property claims
- Better claims segmentation/triage
- Better steering of adjuster resources

**Post-hurricane repair identification**
- More accurate underwriting at the UW desk
- Higher quality of policies renewed
- Confirmation of repair completion from storm event
Munich Re is investing in digital solutions to extend your reach beyond traditional (Re)Insurance

At our core, we are in the people business. When the worst happens, our job is to help alleviate human suffering.

We develop digital solutions to serve our customers in new, smarter, better ways.
Disclaimer

This presentation contains forward-looking statements that are based on current assumptions and forecasts of the management of Munich Re. Known and unknown risks, uncertainties and other factors could lead to material differences between the forward-looking statements given here and the actual development, in particular the results, financial situation and performance of our Company. The Company assumes no liability to update these forward-looking statements or to make them conform to future events or developments.