Better Insurance
Decision Making through
Global Models

Gero W Michel
WRN: PPA For Risk Quantification & Risk Sharing

1. Identify, Evaluate, Minimize and Share the Cost of natural and man-made Hazard
2. Increase the penetration of Insurance
3. Enhance Resilience of Developed and Developing Countries
Models, Tools, Knowledge, & Advice

Non-Modeled Risk, Multi-Hazard, Extremes, Economic Impact, Risk Sharing/Financing, & Growth

WRN Hubs:
- Climate Risk Hub (CRH),
- Earthquake Risk Hub (ERH),
- Hydrological Risk Hub (HRH),
- Impact and Resilience Risk Hub (IRH),
- Financial Risk Hub (FRH),
- Geospatial, Platforms & Service Hub,

PD: Internal Translation!
Risk Assessment is crucial for our Value Chain

The uncertainty of the insurance business lies in the fact that the costs of goods sold is not known at the time of production/contract (Deutsche Bank, 2010)

Modelling must be an intrinsic part of the product

Value Creation

- Risk Discovery
- Risk Quantification
- Risk Control
- Risk Financing
- Risk Solutions
Price to Book: Large Volatility, Little Trust

Source: SNL and Deutsche Bank and SNL Financial
Improved Risk Management Through Science

- Define what is random and what can be learned;
- Create Tools and Models to implement what has skill;
- Maximize the Upside and Minimize the Costs for Risk Taking and Risk Sharing.
### 2011, 2nd Largest Loss Year, Ever [USD bn]

<table>
<thead>
<tr>
<th>Event</th>
<th>date</th>
<th>est. $bn</th>
<th>source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia, Queensland Floods</td>
<td>January</td>
<td>2,400</td>
<td>ICA</td>
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<tr>
<td>US winter freeze</td>
<td>Jan/Feb</td>
<td>1,425</td>
<td>PCS 26</td>
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<tr>
<td>Canada, Alberta Horizon fire</td>
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<tr>
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<td>PCS 28</td>
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<td>New Zealand EQ 2</td>
<td>22 Feb</td>
<td>1,000</td>
<td>PCS 29</td>
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<td>Japan, Tohoku EQ/Tsun</td>
<td>11 Mar</td>
<td>0</td>
<td>PCS 30</td>
</tr>
<tr>
<td>US Tornadoes Kansas/Missouri</td>
<td>26-30 May</td>
<td>0</td>
<td>PCS 31</td>
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<tr>
<td>US Tornadoes</td>
<td>26-30 May</td>
<td>0</td>
<td>PCS 32</td>
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<tr>
<td>US, Hurricane Irene</td>
<td>29 July</td>
<td>0</td>
<td>PCS 33</td>
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<tr>
<td>New York City, Irene</td>
<td>28 Aug</td>
<td>0</td>
<td>PCS 34</td>
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<tr>
<td>Denmark, flooding</td>
<td>2-5 Sep</td>
<td>0</td>
<td>PCS 35</td>
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<tr>
<td>US, Hurricane Irene</td>
<td>26-28 Aug</td>
<td>0</td>
<td>PCS 36</td>
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<tr>
<td>Thailand, flooding</td>
<td>29 Oct</td>
<td>0</td>
<td>PCS 37</td>
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<tr>
<td>France, floods</td>
<td>12 Nov</td>
<td>0</td>
<td>PCS 38</td>
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<tr>
<td>Worldwide</td>
<td></td>
<td>78,750</td>
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</table>

- Creep, ~20bn
- 107bn

**~15% modelled! not (X) or only partially (P) modelled**

1) US ToHa: Long tracks, largest loss year (USD 23bn)
2) THFL: Largest flood loss ever!
2011, The Year of the TH FL

- **Indirect and Global losses:** 70% global, 20% regional, 10% local; 12 times P&C premium TH!

- **Downgraded:** Major JP insurers due to THFL!

- **Defying Diversification:** Contingent Business interruption (CBI) destroys Diversification, *THFL is the “first” truly global insurance loss*
Indirect Losses cannot be modelled physically from the Bottom-up for large areas with the data available.

Systemic and global

Indirect Losses Can be Modelled with combinations of Indicators
Models, Trends & Interdependencies

- Complete suite of risk assessment models/tools
- Trends, clustering and forecasting
- What will matter tomorrow?
**Hazard Trends, USHU**

Clustering and Trends

1. High regime years: Katrina: 1/11
2. Low regime years: Katrina: 1/250
3. 2005: Katrina: 1/5

**Landfalling US HU: No Increase!**

**But Clustering in Time!**

\[ \text{ACE} = 10^{-4} \sum v_{\text{max}}^2 \]
Global View of Risk

- Who could have anticipated that THFL will become a global event and the largest FL event ever?
- Infrastructure undergoes the largest Value/Exposure growth WW (>100% annual growth in some developing areas)
- Regional models are insufficient to assess insurance risk

1) The market can afford one major risk a year
2) Faulty assumption of independence of basin

Models are insufficient to assess insurance risk
Global Solutions: Harmonized Global Risk View

**GWM**, Global Windstorm Model and Risk indices

**GEM**, Global Earthquake Model and Exposure

**GFM**, Global Flood Model, Risk and Mitigation

**GVM**, Global Volcano Model, Risk and Data

WRN
- Global Hazard and Risk Lookup
- Rating
- PMLs
- Multi-hazard

Global Convective Model, Risk Tools and Socio-Economic Impact

Systemic and global

Reading, GFDL, NCAR, Met Office

150 scientists, Ins., Governments

ESRI, IBM, Met Office, Deltares, ...

Bristol, BGS, Smithsonian...

Met Office, ESRI, CEDIM, Leeds

Tbd.

July 2011

Partially Open Source

Open Source
Global Climate Models

- Global TC models for current and Future Climate
- Basis for regional and global modeling
- Basis for evaluating global correlation (and teleconnections)
- New high resolution models allow consistent evaluation of intensities, around the globe

Kim et al. 2011 & Vecchi et al. 2011; in prep
Global Risk Indices

- Willis Global TC Risk Indices (with NCAR, Reading, Oxford, UK Met Office, CEDIM, NOAA, GFDL)
- Willis Hurricane Damage Index (WRN)

### Return period curves

<table>
<thead>
<tr>
<th>Return Period [yrs]</th>
<th>HIGEM GM</th>
<th>Willis GM</th>
<th>HIGEM FL</th>
<th>Willis FL</th>
<th>HIGEM SE</th>
<th>Willis SE</th>
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<td>211</td>
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</table>

### US economic losses [bn USD]

- GM: General Motors
- FL: Florida
- NE: Northeast
- SE: Southeast
Global FLOOD

“For any given flood-prone location, how can we create a global community platform that enables better understanding of the complex causes behind the risk of flood impact - the better to support the decisions, and also the education and communication, needed to mitigate that risk before, during and after the flood event itself?”

The GFM enables a holistic, integrated response to flood risk
Value Creation for Insurance: Focus on what has Skill!

- **Science is an intrinsic part of the product**
- **Increase Underwriting and Portfolio Management Skill using PPA**
- **Combined Tools/Models for direct and indirect losses**