Global Climate Services –
Adaptation for the Finance Sector

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3rd February 2011
Forecast from Tuesday 25th January

Data time 2011012500

Tropical cyclone strike probability for 24hrs centred on T+012
(shows probability of a tropical cyclone passing within c.300km)
Adaptation in the Financial Markets:
Insurance, catastrophe bonds, commodity and equity derivatives, asset & credit risk management
Climate application case study:

£7bn Thames Water buy-out

Tailored seasonal forecast of UK drought risk 2006/07 following major drought

• Seasonal climate forecast systems and historical data tailored for a private equity fund.

• Specific risk assessment of exceedance of critical thresholds were assessed

• Risk assessment informed in multi-billion pound decision, potentially saving company huge losses.
Barclays Bank: Managing Climate Risks in Africa, 2009

Key report looking at adaptation opportunities and both natural and man-made climate changes:

• Current climate risk in South Africa, Kenya, Ghana

• Regional economic impacts of climate

• Country focus on Water, Energy, Health & Agriculture

• Case studies provide risk & resilience perspectives and opportunities for developing markets

“El Nino is key”
The energy industry is leading the world on natural & human climate change

EP2: The Impact of Climate Change on the UK Energy Industry
Understanding impacts: What’s normal in a changing climate?

- Predicting the expected normal climate for each year 2007-2011 hour by hour

(EDF Energy, 2007)

With ever warmer seasons in the UK – historical records and return periods become are misleading.

EDF knew they needed a better estimate of what to expect for the coming years to make operational and strategic business critical decisions.
Objective scenarios of impacts on UK storms & rainfall, and Chinese typhoons, including post-IPCC AR4 science update:

- 1-in-200 year typhoon loss in China could reach £1.1 billion for a global temperature rise of 4°C (2008 exposure levels and £)

- Average annual insured wind losses for the UK could rise by 25% to £827 million for slight southward shift in storm track; which could arise from current natural climate variations.

- Insured flood losses occurring on average once every 100 years in the UK could rise by 30% to £5.4 billion for a global temperature rise of 4°C
The Climate Service for Reinsurance

Reports, whitepapers, regular forecasts, podcasts and teleconferences in four key areas:

- Tropical storms on seasonal timetable
- Seamless global risk forecasts
- Science communication
- Research
Project 1
Aim: landfalling tropical storms on seasonal timescales
Combining human expertise and models

- Dynamic forecast models
- Statistical forecast model
- Research studies e.g. El Nino
- Forecasts from other centres
- Climate trends
- Ocean temperature

Long range forecast
What do we provide?
Tropical storm Outlook

- **Seasonal forecast** for the North Atlantic for the next 6-months:
  - tropical storm frequency
  - ACE index

- **Probabilistic forecasts**:
  - range of storm numbers
  - exceedance of certain thresholds (to aid assessment of risk)
## Verification – 2011 forecasts

2011 Atlantic tropical storm season forecasts – preliminary verification as of 8th Nov. 2011

<table>
<thead>
<tr>
<th>Forecast</th>
<th>Period of forecast</th>
<th>Tropical storm frequency</th>
<th>ACE index</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Forecast</td>
<td>Observed</td>
</tr>
<tr>
<td>March</td>
<td>April–September</td>
<td>11 (8–16)</td>
<td>14</td>
</tr>
<tr>
<td>April</td>
<td>May–October</td>
<td>16 (11–21)</td>
<td>19</td>
</tr>
<tr>
<td>May*</td>
<td>June–November</td>
<td>22 (17–28)</td>
<td>19</td>
</tr>
<tr>
<td>June</td>
<td>July–December</td>
<td>23 (17–29)</td>
<td>18</td>
</tr>
<tr>
<td>July</td>
<td>August–January</td>
<td>20 (15–26)</td>
<td>17</td>
</tr>
<tr>
<td>August</td>
<td>September–February</td>
<td>14 (10–18)</td>
<td>13</td>
</tr>
<tr>
<td>September</td>
<td>October–March</td>
<td>7 (4–9)</td>
<td>5</td>
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</tbody>
</table>

* Note each forecast was released with relevant deterministic skill information i.e. correlation of forecasts and observed outcomes for 1987 – 2008. For May, this was 0.59 for storm numbers and 0.74 for ACE.
Landfalling research: Tropical Storm Tracks

Hindcast start: June 1st
Period: JASON 1989-2002 (12 members per year)

The increased resolution helps to produce more realistic tropical storm tracks
Project 5
Aim: Seamless forecasts and global risk warnings
Operational climate service

- Monthly global view of risk and extreme weather
  - Met Office Hadley Centre and weather operations working together
  - “Synoptic Climatology” – the science of what weather causes climate anomalies
  - 2 weeks to ~5 years ahead overview
  - Structured by peril and my major insured regions
  - Reports released since July 2010

Hazards predicted for 22 November - 20 December from 22 November 2010
**Scenario based science:**
Potential influence of climate factors on European winter 2010/11

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Predicted phase</th>
<th>Impact on temperature in Northern Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>climate change</strong></td>
<td>contribution from anthropogenic factors derived from modelled trend</td>
<td>warmer than average</td>
</tr>
<tr>
<td><strong>QBO</strong></td>
<td>westerly</td>
<td>warmer than average</td>
</tr>
<tr>
<td><strong>NAO</strong></td>
<td>negative</td>
<td>colder than average</td>
</tr>
<tr>
<td><strong>ENSO</strong></td>
<td>La Niña</td>
<td>warmer than average</td>
</tr>
<tr>
<td><strong>volcanic activity</strong></td>
<td>not present</td>
<td>no impact</td>
</tr>
</tbody>
</table>

Dec – Feb temperature using all statistical predictors vs. 1971-2000

Dec – Feb temperature using all statistical predictors except North Atlantic Oscillation

**NB** this is not the overall forecast as detailed analysis of the dynamical model is included separately.
Global Risk Forecast released 26th August

Forecast for September – November 2010

Seasonal Hazard Risk – September/October/November

High probability of well above normal precipitation

Enhanced probability of well above normal precipitation

Likely contribution from more active than normal tropical storm season

High probability of rainfall well above normal
Closing comment: How do we aid financial market growth and stability?

- Weather & climate science now uses multiple-model analysis of the physical system to overcome structural and natural uncertainty.

- How can this best be applied to modelling environmental financial risk management?

- Do we want probabilities or plausible scenarios for decision making? Or both?
A revolution in risk modelling is taking place

- Changing global agenda means science becoming more business-focused e.g. forecasts of next 10 years & more past data
- Computing and science enabling forecasts capable of capturing extreme weather systems more accurately over longer timescales.
- Technology gives opportunities to overcome data exchange limitations.
- Markets seeking transparency and inter-operability, enabling plug and play user interfaces for analysts and CEOs.
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