Climate Resilience & Emerging Tools for Financial Institutions
ProAdapt Symposium - Panel 2

Emilie Mazzacurati, Founder and CEO, Four Twenty Seven
April 20, 2017
Award-winning market intelligence and advisory firm

We bring climate intelligence into economic and financial decision-making

www.427mt.com
Our services

**Business Climate Analytics**
- Monetize impacts on operations, supply chain, and distribution.
- Cost benefit analysis of risk management response in context of uncertainty
- Identify opportunities: new markets or strategic reallocation

**Social Climate Analytics**
- Quantify impacts on public health, safety, and natural resources.
- Develop localized adaptation strategy, empower community engagement
- Map growing market for adaptation and resilience investment opportunities

**Financial Climate Analytics**
- Equity and Fixed Income climate risk indicators and scoring
- Portfolio screening and scenario building tools
- Economic analysis of climate related events that inflect pricing

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Growing market and regulatory concern over climate risk

Source: TCFD Recommendations, December 2016
http://www.fsb-tcfd.org
A Critical Economic Issue

A Global Problem...

Climate change will cause billions of potential impact of climate on returns for portfolios, asset classes and industry sectors

...not well understood

Investors and business leaders are not equipped to integrate climate change projections into economic decisions.
Broad range of economic impacts from climate change

Physical risks
- Flooding
- Drought
- Sea level rise
- Heat stress
- Wind

Transition risks
- Policy
- Liability
- Technology

Potential financial impacts
- Production / operation disruptions (e.g. power, transportation, worker availability)
- Supply chain disruptions
- Physical damage to assets (and raising insurance costs)
- Changes in resource / input prices (e.g. water, energy, food)
- Changes in demand for products / services

Cicero: Shades of Climate Risk
http://www.cicero.uio.no/en/climateriskreport
Climate risk will affect markets unevenly

Regions most prone to floods, drought, extreme weather events

Macroeconomic risk

Cascading impacts on equity or bond markets

Agriculture & food
Insurance
Real estate
Manufacturing
Utilities

Region
City
Industry
Bond
Stock
Climate Risk in the Banking Sector

Transmission channels of physical risks and financial impact on banks

Physical risks
- Acute climate events
- Impact on bank's functioning
- Impact on cash flows
- Chronic climate shifts
- Impact on balance sheets

Financial risks
- Operational risks
- Credit risk
- Market risk
- Liquidity risk

Source: Assessing climate change-related risks in the banking sector, French Treasury, Banque Centrale de France, and AMF
http://www.tresor.economie.gouv.fr/File/433465
What Risk to Prioritize?

- **Operational risk is only the tip of the iceberg**
  - Enterprise risk management must be robust and account for climate projections
  - Redundant systems, multiple offices & facilities

- **Credit risk drives direct exposure**
  - Direct pathway from risk to financial impact
  - Loan duration = several years
  - Small holders or SMEs = more vulnerable
  - Portfolio often concentrated in certain sectors or geographies

- **Real assets create long-term exposure**
  - Risk concentrated on fewer, high value assets
  - Assets are long-lived, loans/equity mature over decades
  - Several asset types are structurally over-exposed and/or hyper-sensitive: ports, airports, dams, etc.

- **Financial markets lack transparency**
  - Limited info on underlying assets' vulnerability & preparedness
  - But: indirect pathway and easy to divest from a stock or bond
Modeling impacts across the corporate value chain

- Natural resources intensity
- Country of Origin
- Heat Stress
- Drought & Water Stress
- Flood Risk
- Sea-Level Risk
- Socio-economic context
- Weather volatility of sales
- Impact on consumers and markets
Quantifying risk in financial markets – Our approach

Climate data

Trade data

Company data

Natural resources data

Socio-economic data

Financial data

Climate Analytics

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Financial Climate Analytics

Risk Screening and Value at Risk

Market intelligence, data, analytics to enable investors to integrate climate risk into portfolio management and investment decisions.

- Portfolio climate risk screening/scoring:
  - Art. 173 and TCFD-compliant climate risk screening and reporting
  - Bonds and equity markets

- Due diligence:
  - Hotspot analysis and risk assessment for real assets: infrastructure, real estate
  - Impact of climate change on DCF, VaR

- Climate data feed:
  - Custom-built data feed for client products, indices and internal risk tools
  - Includes technical support and training
## Case Study: Real Estate Portfolio

- Screening of a real estate portfolio with 200+ assets in France
- Exposure to heat stress, rainfall intensity, water stress, sea-level rise
- Identify hotspots, value-at-risk, timeframe for increased exposure

### Climate Risk Score

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>City</th>
<th>Energy Demand</th>
<th>Heat Stress</th>
<th>Rainfall Intensity</th>
<th>Water Stress</th>
<th>SLR Exposure</th>
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</table>
Case Study: Equity Portfolio

- Sample of 6 companies from emerging markets in Asia
- mMx of manufacturing, energy, logistics, and real estate across 186 sites
- Roughly 80% of production in Asia, but global exposure from multinational companies’ assets
## Equity portfolio: Location & Sector Risk

### Company Rankings

#### 1. Location Risk

<table>
<thead>
<tr>
<th>Company</th>
<th>Location risk score</th>
<th>Energy Demand</th>
<th>Extreme temperature</th>
<th>Extreme heat days</th>
<th>Drought length</th>
<th>Water stress</th>
<th>Rainfall intensity</th>
<th>Sea level rise*</th>
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<tbody>
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<td>LG Chem</td>
<td>42.50</td>
<td>34.94</td>
<td>31.89</td>
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<td>42.44</td>
<td>40.33</td>
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<td>Shenhua Energy</td>
<td>39.27</td>
<td>38.93</td>
<td>40.92</td>
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<td>CK Hutchinson</td>
<td>36.16</td>
<td>8.47</td>
<td>15.83</td>
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<td>35.22</td>
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<td>Hyundai</td>
<td>33.50</td>
<td>28.36</td>
<td>27.34</td>
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<td>32.93</td>
<td>51.75</td>
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</table>

#### 2. Sector Risk

<table>
<thead>
<tr>
<th>Company</th>
<th>Sector risk score**</th>
<th>Country of origin score</th>
<th>Resource efficiency score</th>
<th>Sales volatility score</th>
</tr>
</thead>
<tbody>
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<td>76.36</td>
<td>74.22</td>
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<td>Hyundai</td>
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<tr>
<td>CK Hutchinson</td>
<td>32.39</td>
<td>0.00</td>
<td>64.78</td>
<td>71.6</td>
</tr>
</tbody>
</table>

**Notes:**
- *only scored where applicable
- **revenue weighted
Correlated Risk across Portfolio

1. Location Risk

2. Sector Risk

Each site and sector is scored on a scale of 0-100 with 100 for the highest exposure.
# Trends across portfolio

<table>
<thead>
<tr>
<th>Climate change risk</th>
<th>Forecasted change across portfolio (2030)</th>
<th>Potential business Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>More intense rainfall events</td>
<td>12% rise in the intensity of 5-day wet spells</td>
<td>○ Property and building damage</td>
</tr>
<tr>
<td>Heightened storm surge, augmented by sea level rise</td>
<td>68% of ports exposed to likely sea level rise (&lt;0.5 meters)</td>
<td>○ Compromised infrastructure</td>
</tr>
<tr>
<td>Prolonged droughts</td>
<td>4% increase in length of dry spells</td>
<td>○ Flash flooding</td>
</tr>
<tr>
<td>Increase in water stress</td>
<td>34% increase in water stress</td>
<td>○ Reduced water supply</td>
</tr>
<tr>
<td>Increase in warm days</td>
<td>57% increase in warm days</td>
<td>○ Increased energy costs</td>
</tr>
<tr>
<td>Increased maximum temperatures</td>
<td>7% increase in annual maximum temperature</td>
<td>○ Heightened risk of brownouts/power outages</td>
</tr>
<tr>
<td></td>
<td></td>
<td>○ Stress on human health/labor force</td>
</tr>
</tbody>
</table>

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Climate Risk Analytics: Features

- Identify hotspots across portfolio of assets
- Benchmark across facilities, suppliers and distributors
- Predict magnitude of relative risks
- Provides detailed projections of impacts
- Run scenarios to compare outcomes under different assumptions and perform stress tests.
Climate change is already affecting our economy. Together, we can build resilience.

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