Pilot Project on Environmental Stress Testing
Putting environmental scenario analysis into practice

Emerging Markets Dialogue on Finance, Yannick Motz
Mexico City, 10/04/2018
Folsom Lake, California, 2004

Folsom Lake, California, 2014
Goals of Pilot Project *Environmental Stress Testing*

**Integration of environmental indicators into financial decision-making processes of banks**

**Develop and test analytical framework and model that allows banks to assess the potential impact of droughts on the performance of their corporate lending portfolio.**

- Which loans/companies and sectors are particularly susceptible to drought conditions?
- Appropriate interest rate for a loan given to a company operating in a water stressed area?
- What are potential capital requirements caused by a drought?
Partner Structure

Implementation Partners

Expert Council

Partner Banks
Components of the Tool

- 5 Drought Scenario per country
- Drought hazard
  - Indirect vulnerability
  - Direct vulnerability
- Direct / indirect impact
- Company financial data
  - Loan default probability
  - Loan portfolio loss
- Macro economic model
- Company location data
- Macro economic impact

Step 1: 5 Drought Scenario per country
Step 2: Drought hazard
  - Indirect vulnerability
  - Direct vulnerability
  - Direct / indirect impact
  - Company location data
- Company financial data
  - Loan default probability
  - Loan portfolio loss
- Macro economic impact

Step 3 & 4: Macro economic model

Change in Revenues and Expenses
Output: Updated Financial Statement

Updated CR & PD => Expected Losses
Results in China, Brazil and USA

- 2,500 companies from 11 different sectors tested
- 10%-20% downgraded
- SMEs more affected vs. large companies
- Industrial concentration
- Conclusion: Geographical concentration key driver for risks

- 2 portfolios tested
- 60-90% of companies downgraded
- Significant impact: Expected losses 4-9 times higher in droughts
- Biggest losses in crop production
- Conclusion: Reliance on hydropower and geographical concentration

- 2 portfolios tested
- 4 out of 5 scenarios little impact due to high ratings and gov’t support => low default risk
- 60%-100% downgraded, portfolio losses up ten-fold (but from low baseline default rate)
- Conclusion: Portfolios less vulnerable to droughts
Results in Mexico

• 2 portfolios tested

• Portfolio 1:
  • 90-100% downgraded, but small increases in probability of default
  • Biggest losses in oil & gas, food manufacturing

• Portfolio 2
  • 65-90% of companies downgraded
  • Portfolio losses increased up to 150%
  • Mexican Gulf most affected area

Mexico affected more seriously by droughts due to its geographical layout.
Key take-aways

(1) Development Process:
• Starting Point
• Standardisation
• Adaptability

(2) Role of Data:
• Precondition
• Availability
• Integration

(3) Geographical Concentration:
• Natural hazard
• Industrial/production areas
• Diversification

Outlook

Framework improved financial institutions‘ analytical capacity
Roll out: Webinars on Environmental Stress Testing envisaged
Further development of the framework for additional hazards, financial institutions and countries
Thank you for your kind attention.

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Appendix
The five drought scenarios

<table>
<thead>
<tr>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
<th>Scenario 4</th>
<th>Scenario 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>The most severe, this drought might be expected once every 200 years, lasting for five years.</td>
<td>This also lasts five years, but is less severe and classed as a once-in-100-years event.</td>
<td>A five-year drought that might be expected once every 50 years.</td>
<td>This is also a once-in-200-years event, but lasting for two years.</td>
<td>A once-in-100-years event, with a duration of two years.</td>
</tr>
</tbody>
</table>
Expected Loss Calculation

We have:

\[ EL_t = DP_t \times exp_t \times LGD_t \]

Given that we will know the exposure, we need to find the default probability and the loss given default.

Output of the vulnerability model

Updated Financial Statements

First output of stress-testing module

Updated Credit Rating

Second output of stress-testing module

Probability of Default and Loss Given Default
Vulnerability Model

- Direct vulnerability:
  - Industry class
  - Location
  - Water dependency
  - Relative use of water
  - Mitigation measures

- Indirect vulnerability:
  - Water supply
  - Power supply

Company data:
- Loss of functionality
- Revenue impact
- Increased cost
- Operating cost impact

Sectoral impact