Banks, Climate Risk and Financial Stability

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The views expressed here are those of the author and do not necessarily represent those of Bank of Spain or the euro system.
Outline:

• Why is climate change relevant to central banks?
  ✓ Should Central Banks care about climate change and environmental challenges?

• Types of climate risk: The financial perspective

• Loan exposure to elevated climate risk sectors of the banking system

• Policy approaches and tools

• Conclusions
Why?

Société Générale, BNP, BBVA announced that it would stop financing coal-powered electricity, oil and natural gas and increase its support for renewable energy projects.
Stylized net global CO2 emissions pathways
(Billion tonnes per year – Gt CO2- Yr-)
Should Central Banks care?

• To the extent that it is consistent with the central bank mandate

Mandates of Central Banks

Direct or Indirect sustainability mandate 41%
No Direct or Indirect sustainability mandate 59%

Source: Dikau and Voltz (2018)
Should Central Banks care?

- CBs with “explicit” and “implicit” sustainability mandate

Mandates of Central Banks

- Explicit Sustainability Mandate
- Subject to not Impeding the CB’s Price Stability

Czech Republic, Fiji, Gambia, Georgia, Hungary, Iraq, Malaysia, Nepal, Philippines, Russian Federation, South Africa, Tanzania, Ukraine, Zimbabwe & West African Monetary Union (WAMU)

To the extent that there is no conflict with the price stability mandate ... increasing awareness of the potential impact on financial stability

Source: Dikau and Voltz (2018)
Sustainability is a public good: Components

It provides: **non-excludable and non-rival benefits.**

- Climate Change
- Loss of biodiversity
- Pollution
- Reduction of the ozone layer
- Ocean acidification
- Land System Change
- Freshwater use
- Other: chemical pollution

Source: Nieto (2020)
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Types

• Physical

✓ Direct impact of natural disasters related to climate change
Types

- Transition (*Climate Policy Risk*)
  - Financial risks, which could result from the transition to a low-carbon economy: *climate policy risk*
  - Transition risk affects more to industries that are large emitters of CO2
  - Policy actions: Ideally, time consistent and forward looking
    - Technology standards
    - Emission taxes as per unit of pollutant (prices)
    - Quotas or transferable permits
Types

• Liability risk

Parties who have suffered loss or damage from the effects of climate change seek compensation from those they hold responsible

PG&E is facing liabilities that could potentially exceed USD 30 billion because of the possibility that its equipment was involved in starting the devastating wildfires in California in 2017 and 2018. According to PG&E, the 2017 wildfires spurred lawsuits from some 3,800 individual plaintiffs.
Transition Scenarios

✓ “Transition scenarios” help to analyse how the world might achieve the Tº C

✓ Assume a specific link between CO2 emissions and climate impacts -> GDP

✓ Illustrate connection and dependencies across technologies, policies, geographies => No forecast

✓ Two widely referenced sources:
  • IEA World Energy Outlook
  • Integrated Assessment Models (IAM)

Source: DeNetherlandscheBank (2018)
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Country Share in Total %
Syndicated loans and excluding bilateral loans

Source: Nieto (2018)
Quantifying Banks´ direct exposures to transition risks: Largest exposures

<table>
<thead>
<tr>
<th>Banks´ highest exposures to high environmental risk sectors by region</th>
<th>EU</th>
<th>US</th>
<th>Japan</th>
<th>China</th>
<th>Switzerland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil and Gas</td>
<td>(1)</td>
<td>(2)</td>
<td>(1)</td>
<td>(2)</td>
<td>(1)</td>
</tr>
<tr>
<td>Power Generation</td>
<td>(2)</td>
<td>(1)</td>
<td>(2)</td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Automobile manufacturing</td>
<td>(3)</td>
<td>(3)</td>
<td>(3)</td>
<td>(3)</td>
<td>(3)</td>
</tr>
</tbody>
</table>

Source: Nieto (2017)
EU Banks

Bank Exposure by Sector (%)

- Automobile Manufacturers
- Mining-metals and other excl. coal
- Steel
- Chemicals-commodity
- Building Materials
- Oil and gas: refining and marketing
- Power generation
- Unregulated Utilities and Power co.
- Mining:coal

Source: Nieto (2019)
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Approaches and Tools

✓ Harmonized taxonomy ("green" vs "brown")


Sets performance thresholds (technical screening criteria) for economic activities, which:

- Climate change mitigation
- Climate change adaptation
- Protection of water and marine resources
- Transition to a circular economy
- Pollution prevention & control
- Protection & restoration of biodiversity & ecosystems

- OECD Guidelines on Multinational Enterprises
- UN Guiding Principles on Business and Human Rights
Approaches and Tools

✓ Call reports that make full use of the existing international statistical framework (NACE Rev 2 (4 digits) ISIC of United Nations (4 digits)) <-> Adapting to green taxonomies

### Call Reports Limits: An example

<table>
<thead>
<tr>
<th>NACE Rev 2 Sector and Industry</th>
<th>NACE Rev 2 (code)</th>
<th>FINREP (Code)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining of Iron Ores</td>
<td>0710</td>
<td></td>
</tr>
<tr>
<td>Extraction of Crude Petroleum</td>
<td>610</td>
<td>Single Code</td>
</tr>
<tr>
<td>Extraction of natural Gas</td>
<td>620</td>
<td></td>
</tr>
</tbody>
</table>

Source: Nieto (2019)
Approaches and Tools

✓ Effective disclosure: Key role in improving governance by improving transparency

• EU Commission Action Plan: Financing Sustainable Growth: Legislative initiatives
  • A proposal for a regulation on disclosures relating to sustainable investments and sustainability risks and amending Directive (EU)2016/2341.

• A proposal for a regulation amending the benchmark regulation. The proposed amendment will create a new category of benchmarks comprising low-carbon and positive carbon impact benchmarks, which will provide investors with better information on the carbon footprint of their investments.
Approaches and Tools

✓ **Climate stress testing based on scenario analysis**

• The assessment of the impact of climate change on financial stability risks is less canonical than the traditional system wide financial stress testing.

  *For example, climate change and the policies to mitigate it, will over many, many years*

• For the assessment of the credit impact of climate risk,

  *Transition scenario outputs need to be financially interpreted in terms of corporate financial terms in order to bridge the gap between scenarios and financial risk assessment*
Scenario analysis: Integration climate risk variables and macroeconomic and financial variables for climate risk assessment

- **Physical** scenario variables
  - Increases in temperature
  - Increases frequency / severity of weather events

  - **Transition** scenario variables
    - CO2 Price
    - CO2 Emissions
    - Commodity prices (electricity, fossil fuels)

  - Common Assumptions on Gov’t Action and consumer preferences:
    - Taxes / Price CO2 emissions
    - Technological changes

- **Climate Models** (e.g. IAMs)

- **Macroeconomic** Variables
  - GDP
  - Labour productivity
  - RE Prices
  - Household Income
  - Capital formation

- **Financial** Variables
  - Government bond yield
  - Corporate bonds yield
  - Equity Index

- **Long time horizons** (2100) w/ flexibility shorter terms

- Outputs from reference scenarios for credit, market and liquidity “Climate Risk Assessment” of FIs
Scenarios of the NGFS

Disorderly Transition

Orderly Transition

Met

Climate Targets

Not met

Disorderly:
Sudden and unanticipated response is disruptive even if sufficient to meet climate goals

Too Little too late:
We do not do enough to meet climate goals, the presence of physical risks spurs a disorderly transition

Orderly:
Emissions reduction is compatible with T°C objectives

Hot House World:
Emissions continue to increase, doing very little if anything to avert physical risks

Disruptive 1.5 °C by 2050
(technology limitations for CO2 removal)

No gov’t action (Lowest Price of Carbon )

2 °C by 2050 Immediate action

Price of Carbon
(assuming objective T °C 2050)
Alternative approches to the NGFS scenario analysis

• Battiston et al 2017 (and Roncoroni et al 2019)

A micro-level approach that considers individual investors’ exposure to climate risk and its propagation: Climate VaR

*Forward-looking and return-based valuation assessment to measure climate related risks and opportunities in an investment portfolio.*

Quantitative results of the simulations of *lots of climate transition scenarios* provided by several IAMs → fundamental to assess how wrong we could be in computing the *climate VaR* on individual portfolios.
Adjusting PD for corporate borrowers using scenario based climate transition risk analysis

Reference scenarios for climate risk assessment → Integrated Assessment Model (IAM) → IAM outputs:
- Energy mix by fuel source and technology
- Energy and commodity prices → Corporate financials:
  • Revenue
  • Costs
  • Capital Expenditure
  ... and management response
  → Scenario adjusted corporate financials
  → Credit Risk Model → Climate Risk Scenario Based PD
Example: Adjusting PD for “power generation utilities”

Borrower Characteristics
(energy mix, fuel costs, target energy mix ...)

Scenario Adjusted Financials

- **Revenue**
  - Demand coal fueled vs Renewables

- **Costs**
  - CO2 taxes, permits to pollute

- **Capital Expenditure**
  - Mix coal fueled vs Renewables

Scenario Adjusted Performance Metrics (e.g. cash flow, EBITDA)

Scenario Implied PD

Source: UNEPFI (April, 2018)
PD: Climate Risk Scenario Adjusted

Source: UNEPFI (April, 2018)
Approaches and Tools

New prudential regulatory requirements?

- Is climate risk a stand-alone risk which could generate economic losses?
  - Yes
  - No

- Do climate risks have a permanent impact over the business cycle?
  - Yes
  - No

- Capital Requirements
  - Brown penalizing Factor
  - Green Supporting Factor

- Limits to Large Exposures

- Climate risk as part of the assessment of credit risk (e.g. provisioning, capital requirements)

- Transparency Requirements
  - Type of climate Risk
  - Processes to determine the risks are material (stress test?) and risk parameters
  - Significant concentrations of credit exposures to “carbon related assets”
  - Report Green Assets
  - Governance: Role of Board
Approaches and Tools

• What is a “Green supporting factor”? $\beta < 1$

- Solar
- Bioenergy
- Hydropower
- Land use
- Waste Mgt
- Geothermal
- Marine renewable energy

(www.climatebonds.net/standards)
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✓ Central banks and financial regulators have increasingly recognized the potential impacts of climate change on individual and systemic financial stability

✓ Climate stress testing based on scenario analysis is gaining momentum
  
  • Need to draw scenarios on Physical and Transition Risks with common assumptions
  • Generally IAMs with the flexibility to use shorter time horizons and granularity by region and (ideally) sector
  • Expert judgment because scenario outputs need to be financially interpreted in terms of corporate financial terms in order to bridge the gap between scenarios and financial risk assessment
Thank you!!