Climate Risks and Financial Markets

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NGFS workshop
Outline

1. Investors' and Academic View on Climate Risks

2. Evidence on the Pricing of Climate Risks
   - The Pricing of Physical Risks
   - The Pricing of Transition Risks

3. Conclusion
Background

Global temperature has been rising since 1970s

![Average temperature anomaly, Global](source)

Source: Met Office Hadley Centre (HadCRUT5) and OurWorldInData.org/co2-and-greenhouse-gas-emissions • CC BY

Note: The gray lines represent the upper and lower bounds of the 95% confidence intervals.
Along with the rising temperature is sea level rise and more frequent natural disasters and extreme weather events.
Background (cont’d)

United States Billion-Dollar Disaster Events 1980-2022 (CPI-Adjusted)

- Drought Count
- Flooding Count
- Freeze Count
- Severe Storm Count
- Tropical Cyclone Count
- Wildfire Count
- Winter Storm Count
- Combined Disaster Cost
- Costs 95% CI
- 5-Year Avg Costs

Updated: January 10, 2023
Institutional Investors’ Views on Climate Risks

Figure 1A: Climate-change expectations (N=378)

- Krüger, Sautner, and Starks (RFS 2020; 2023): a global survey of 439 institutional investors and their views on climate risks
Institutional Investors’ Views on Climate Risks

Krüger, Sautner, and Starks (RFS 2020; 2023): a global survey of 439 institutional investors and their views on climate risks

Most investors expect a rise in global temperature by the end of this century, and four in ten even predict an increase that exceeds the Paris two-degree target
Climate Risk Mispricing?

The oil sector is considered as the most overvalued sector overall, followed by traditional car manufacturers and electric utilities.
Majority of investors believe climate risk reporting to be as important as traditional financial reporting.
Disclosure of Climate Risks

Current climate-risk disclosures are not very informative
Standardized and mandatory climate risk reporting is necessary

Table 2
Survey responses on climate risk disclosure

A. Respondents’ views on current climate risk disclosure practices

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree (%)</th>
<th>Disagree (%)</th>
<th>Neither agree nor disagree (%)</th>
<th>Agree (%)</th>
<th>Strongly agree (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management discussions on climate risk are not sufficiently precise.</td>
<td>1</td>
<td>9</td>
<td>22</td>
<td>47</td>
<td>21</td>
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<tr>
<td>Firm-level quantitative information on climate risk is not sufficiently</td>
<td>1</td>
<td>7</td>
<td>24</td>
<td>48</td>
<td>19</td>
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<tr>
<td>precise.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standardized and mandatory reporting on climate risk is necessary.</td>
<td>2</td>
<td>5</td>
<td>20</td>
<td>46</td>
<td>27</td>
</tr>
<tr>
<td>There should be more standardization across markets in climate-related</td>
<td>2</td>
<td>7</td>
<td>16</td>
<td>48</td>
<td>27</td>
</tr>
<tr>
<td>financial disclosure.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standardized disclosure tools and guidelines are currently not available.</td>
<td>3</td>
<td>12</td>
<td>24</td>
<td>40</td>
<td>21</td>
</tr>
<tr>
<td>Mandatory disclosure forms are not sufficiently informative regarding</td>
<td>3</td>
<td>6</td>
<td>28</td>
<td>46</td>
<td>18</td>
</tr>
<tr>
<td>climate risk.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investors should demand that portfolio firms disclose their exposure to</td>
<td>2</td>
<td>6</td>
<td>18</td>
<td>46</td>
<td>28</td>
</tr>
<tr>
<td>climate risk.</td>
<td></td>
<td></td>
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</table>
Academic View on the Pricing of Climate Risks

- Stroebel and Wurgler (JFE 2021) survey 861 finance academics, professionals, and public sector regulators and policy economists about climate finance topics.
- Most respondents believe that asset prices **underestimate** climate risks.
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**Table 3**

Current pricing of climate risks in asset markets

Participants were asked: “In the X most familiar to you, how do prices currently reflect climate-risk factors?” were ordered as below.

<table>
<thead>
<tr>
<th>Role</th>
<th>Pooled</th>
<th>Faculty</th>
<th>Public Sector</th>
<th>Private Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pricing Stock Markets (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Too Much</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Correct</td>
<td>21</td>
<td>26</td>
<td>19</td>
<td>13</td>
</tr>
<tr>
<td>Not enough</td>
<td>60</td>
<td>51</td>
<td>64</td>
<td>73</td>
</tr>
<tr>
<td>No opinion</td>
<td>16</td>
<td>20</td>
<td>17</td>
<td>10</td>
</tr>
<tr>
<td>Pricing Real Estate Markets (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Too Much</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Correct</td>
<td>17</td>
<td>21</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>Not enough</td>
<td>67</td>
<td>61</td>
<td>78</td>
<td>75</td>
</tr>
<tr>
<td>No opinion</td>
<td>15</td>
<td>18</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Pricing Insurance Markets (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Too Much</td>
<td>2</td>
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<td>47</td>
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<td>30</td>
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**Figure:** Stroebel and Wurgler (JFE 2021)
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3. Conclusion
Climate change affects asset prices mainly in two distinct ways:

- **Physical risks**: direct costs result from the adverse effects of climate change on economic activity (extreme weather events, sea-level rises, etc.)
  - E.g., insurance companies' exposures to higher losses from insured properties in coastal areas and food producers' exposures to sustained drought spells.

- **Transition risks**: costs imposed on firms from policies and regulations implemented to combat climate change and transition towards a low-carbon economy.
  - E.g., fossil-fuel companies can be adversely affected by carbon taxes or limits on carbon emissions, technological innovations accelerated by climate policies could threaten the business models of firms that operate in traditional industries.

- **Rational models**: assets with higher exposure to climate risks should earn higher average returns.
- **Behavioral models**: assets with higher exposure to climate risks could earn lower (higher) future returns if investors underreact (overreact) to the economic impacts of climate risks.
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The Impacts of Climate Risks on Asset Prices: Channels

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- The short answer: it depends!
  - Type of climate risks (physical vs. transition; short-term vs. long-term)
  - Asset class
  - Investor attention
  - Investor beliefs
Is Physical Risk Priced?

- Studies have documented both underreaction and overreaction to (physical) climate risks in financial markets

- Stock markets
  - **Agricultural firms’ stock prices** underreact to prolonged drought risks (Hong, Li, and Xu, 2019)
  - Mutual fund managers overreact to large climatic disasters by underweighting disaster zone stocks (Alok, Kumar, and Wermers, RFS 2020)

- Bond markets
  - Municipal bonds issued by counties exposed to sea-level rise have higher yields (Painter, JFE 2020)
  - Corporate bonds that can better hedge against climate change news risk earn lower average returns (Huynh and Xia, JFQA 2021)
  - Projected climate change damage affects yields for sovereign bonds with long maturities (Barnett and Yannelis, 2021)

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- As climate change is mostly caused by accumulations of greenhouse gases (GHG) in earth's atmosphere, any regulation will have to target at significantly curbing firms’ carbon emissions.
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Global carbon pricing coverage

Source: Data from the World Bank, updated 1 April 2021, https://carbonpricingsheet.worldbank.org/

© Climate Bonds Initiative 2021
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- Carbon risk premia are greater for firms located in countries with lower economic development, larger energy sectors, and less inclusive political systems.

Ilhan, Sautner, and Vilkov (RFS 2020): Climate policy uncertainty is reflected in the option market.

Cost of protection against downside tail risks is larger for more carbon-intensive sectors.

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Pricing of Transition Risks in Equity and Option Markets

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- The "low carbon alpha" cannot be explained by a comprehensive list of systematic risks and bond characteristics.
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We test several explanations and find investors’ underreaction to the predictability of carbon intensity for firm fundamentals and creditworthiness most likely explain this finding.
The "low carbon alpha" disappeared since 2016, which corresponds to Paris agreement being signed in December 2015
The Role of Climate Risk Disclosure

- Academic studies have consistently shown that better climate-related disclosure can promote efficient climate risk pricing and facilitate the transition to low-carbon economy.
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- Not surprisingly, many policies and initiatives are revolved about improving financial institutions’ climate-related disclosure
  - Task Force on Climate-Related Financial Disclosures
  - SEC recently proposed rules to enhance and standardize climate-related disclosures for investors
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The question of whether financial markets recognize climate risks depends on the salience of the risk and investor beliefs.

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Regulators can promote efficient pricing of climate risks and resource allocation by requiring climate-risk disclosure to be standardized and mandatory.