Dissecting Climate Risks: Are they Reflected in Stock Prices?

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Motivation

- Market-wide risks from climate change are multifaceted: Physical & Transition risks
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- **Do stock prices reflect these risks? The answer is not obvious**
  - (-) Survey studies (Krüger et al., 2020)
  - (-) Decarbonizing portfolios $\Rightarrow \uparrow$ transaction costs (Bessembinder, 2017)
  - (?) Does decarbonisation pay off? (Pedersen et al. 2020)
  - (+) Investors may be sensitive to short-term effects
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- **Is it physical or transition risks which are priced?**
  - Policy makers’ perspective: Climate change risks threaten financial stability
  - If physical risks are not priced & transition risks are priced ⇒ Need for government’s intervention
First time evidence on what types of market-wide climate risks are reflected in U.S. stock prices
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2. We dissect market-wide climate risks by textual analysis (LDA)
   - **Novel measures** of market-wide physical & transition climate risks
   - **Intensity of news coverage** of a given climate change risk on that day
This paper: Contributions

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   - **Novel measures** of market-wide physical & transition climate risks
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3. **Provide and validate** a possible explanation for the results
First time evidence on what types of market-wide climate risks are reflected in U.S. stock prices.

We dissect market-wide climate risks by textual analysis (LDA):
- Novel measures of market-wide physical & transition climate risks
- Intensity of news coverage of a given climate change risk on that day

Provide and validate a possible explanation for the results.

Document which firms are the most exposed to these risks.
Dataset

  - More than 13 million articles from Refinitiv News Archive
  - Screening & looking for "climate change" or "global warming" → ≈34,000 articles
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- U.S. common stocks returns & characteristics (daily data, CRSP, Compustat)

- Equity risk factors from authors’ websites

- ’E’ score from Refinitiv.
### Alphas (Decile portfolios), 1st January 2000-31st December 2018

<table>
<thead>
<tr>
<th>Natural Disasters</th>
<th>Global Warming</th>
<th>Int. Summits</th>
<th>U.S. Climate</th>
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</thead>
<tbody>
<tr>
<td><strong>Panel A: Market model</strong></td>
<td></td>
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<tr>
<td>0.14 (0.3)</td>
<td>-0.0 (-0.2)</td>
<td>0.12 (0.42)</td>
<td>0.96*** (2.91)</td>
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<tr>
<td><strong>Panel B: FF 3F model</strong></td>
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<tr>
<td>0.07 (0.24)</td>
<td>0.20 (0.67)</td>
<td>0.53* (1.73)</td>
<td>0.65** (2.34)</td>
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<tr>
<td><strong>Panel C: FFC model</strong></td>
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<tr>
<td>-0.07 (-0.24)</td>
<td>0.03 (0.10)</td>
<td>-0.49 (1.65)</td>
<td>0.46* (1.66)</td>
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<tr>
<td><strong>Panel D: FF 5F model</strong></td>
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<tr>
<td>0.03 (0.0)</td>
<td>0.05 (0.19)</td>
<td>-0.66** (-2.5)</td>
<td>0.2*** (2.75)</td>
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<tr>
<td><strong>Panel E: FF 5F + momentum</strong></td>
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<tr>
<td>0.27 (0.9)</td>
<td>-0.09 (-0.34)</td>
<td>-0.76*** (-2.63)</td>
<td>0.61** (2.25)</td>
</tr>
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</table>
Do increases in the factor signal an increase in risks? Not clear

*Possible explanation for documented risk premium*: **Intertemporal hedging**

We confirm by (1) Subsample analysis & (2) Constructing narrative factors
By construction, decreases in the factor signal good news for the economy.
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- **Risk premium of the U.S. CP narrative factor**: It should be negative under the hedging argument.
  - *Investors would buy (short sell) stocks with positive (negative) textual climate betas*
## Asset pricing tests: Narrative CP factor (Decile)

<table>
<thead>
<tr>
<th></th>
<th>2000-2018</th>
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<td>-0.64*</td>
<td>-0.52</td>
<td>-1.01**</td>
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<td></td>
<td>(-1.86)</td>
<td>(-1.13)</td>
<td>(-2.43)</td>
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<td>(0.00)</td>
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Conclusions

- First-time evidence on which types of market-wide climate risk are priced in U.S. stocks

Findings:

We identify four market-wide textual factors with a clear interpretation. Only U.S. climate policy is priced; driven by post-2012 era. Investors use brown firms which improve environmentally to hedge risks.

Implications:

1. It is the government's intervention and not physical risks.
2. Under policy makers' view, their intervention can be justified by our scientific evidence.
3. Regulators should not penalize all brown firms.

Future research: Why are not all risks priced? Investors' short-termism and/or lack of information, or not systemic.
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Thank you for your attention and time!


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