

Climate Risks and Financial Markets

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NGFS workshop

Outline

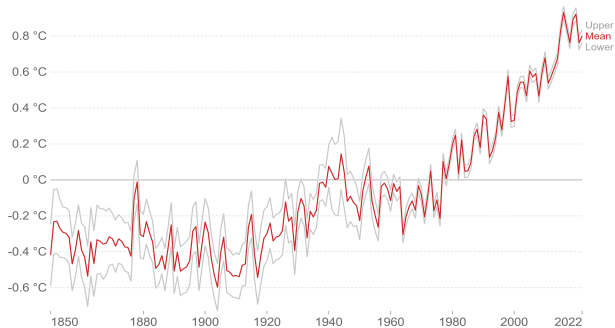
- 1 Investors' and Academic View on Climate Risks
- 2 Evidence on the Pricing of Climate Risks
 - The Pricing of Physical Risks
 - The Pricing of Transition Risks
- 3 Conclusion

Background

Average temperature anomaly, Global

Global average land-sea temperature anomaly relative to the 1961-1990 average temperature.

Our World
in Data



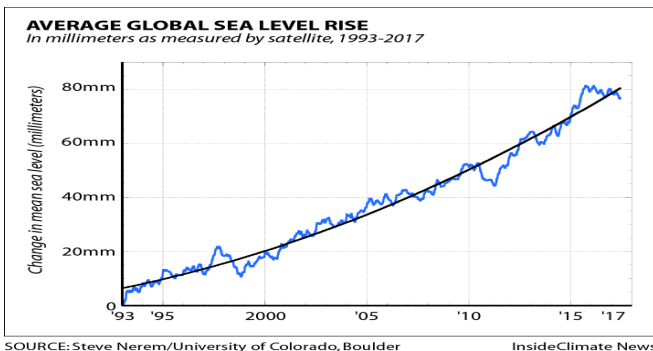
Source: Met Office Hadley Centre (HadCRUT5)

OurWorldInData.org/co2-and-greenhouse-gas-emissions • CC BY

Note: The gray lines represent the upper and lower bounds of the 95% confidence intervals.

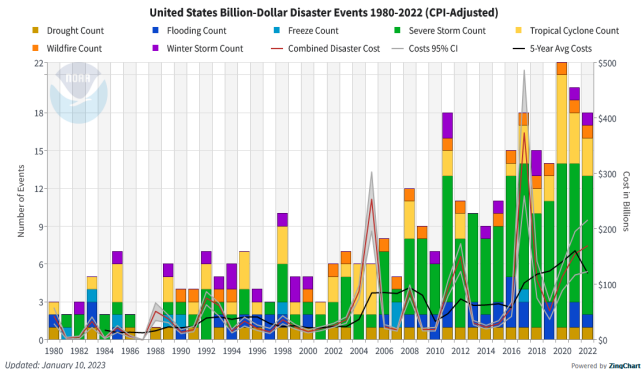
- Global temperature has been rising since 1970s

Background (cont'd)



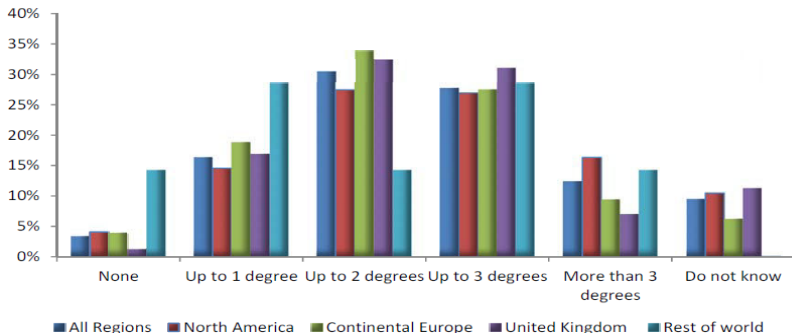
- Along with the rising temperature is sea level rise and more frequent natural disasters and extreme weather events

Background (cont'd)



Institutional Investors' Views on Climate Risks

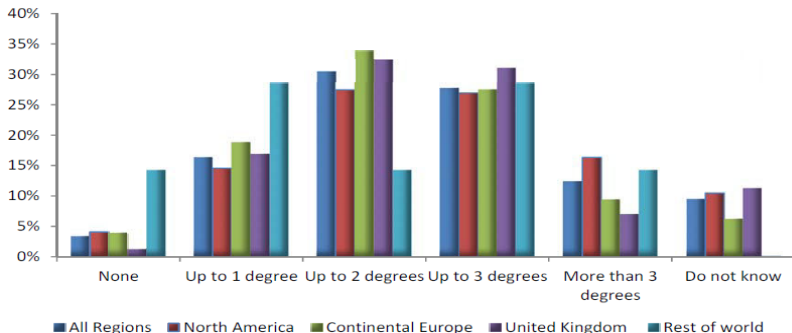
Figure 1A: Climate-change expectations (N=378)



- 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

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

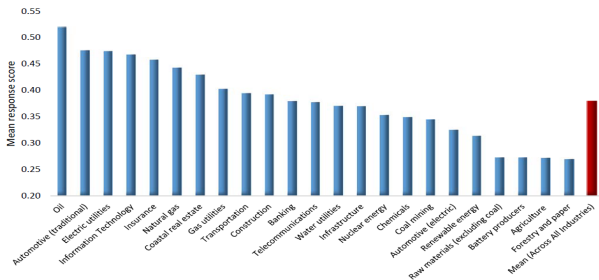


- Krüger, Sautner, and Starks (RFS 2020; 2023): a global survey of 439 institutional investors and their views on climate risks
- Most investors expect a rise in global temperature by the end of this century, and four in ten even predict an increase that exceeds the Paris two-degree target

Climate Risk Mispricing?

Figure 2: Climate Risk Mispricing

This figure reports investors' beliefs about whether current equity valuations in different sectors correctly reflect the risks and opportunities related to climate change (Question D1). Responses for each sector could vary between plus two (valuations much too high) and minus two (valuations much too low). The figure reports the mean response scores per sector. The data are based on the responses of 439 individuals that participated in our survey.



- The oil sector is considered as the most overvalued sector overall, followed by traditional car manufacturers and electric utilities

Disclosure of Climate Risks

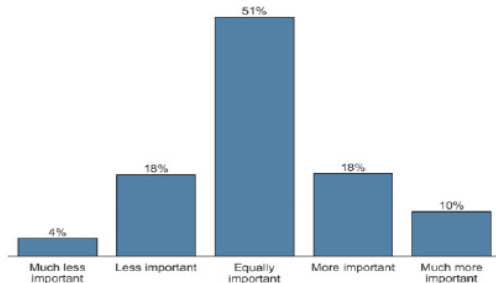


Figure 1
Importance of climate risk disclosure

This figure illustrates how important investors consider reporting by portfolio firms on climate risks compared to reporting on financial information (question B1 from the survey). Of the 439 individuals that participated in our survey, 416 responded to this question. [Internet Appendix B3](#) provides the actual survey question.

- Majority of investors believe climate risk reporting to be as important as traditional financial reporting

Disclosure of Climate Risks

Table 2

Survey responses on climate risk disclosure

A. Respondents' views on current climate risk disclosure practices

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

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

Academic View on the Pricing of Climate Risks

- Stroebe 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-rel were ordered as below.

	Pooled	Role		
		Faculty	Public Sector	Private Sector
Pricing Stock Markets (% picked)				
Too Much	3	3	0	4
Correct	21	26	19	13
Not enough	60	51	64	73
No opinion	16	20	17	10
Pricing Real Estate Markets (%)				
Too Much	1	0	0	1
Correct	17	21	12	13
Not enough	67	61	78	75
No opinion	15	18	10	12
Pricing Insurance Markets (%)				
Too Much	2	2	0	3
Correct	25	25	19	26
Not enough	42	37	57	47
No opinion	30	35	25	23

Figure: Stroebel and Wurgler (JFE 2021)

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 - 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

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- **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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- Why is this question important?
 - Pricing climate risks properly today reduces the possibility of wealth transfers between uninformed and sophisticated investors
 - and the likelihood of extreme price movements in future
- 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)

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 - **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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- Real Estates markets
 - **Real estates** in coastal areas sell at a discount due to sea-level rise (Bernstein et al., RFS 2020; Baldauf et al., RFS 2020)

What is Transition Risks?

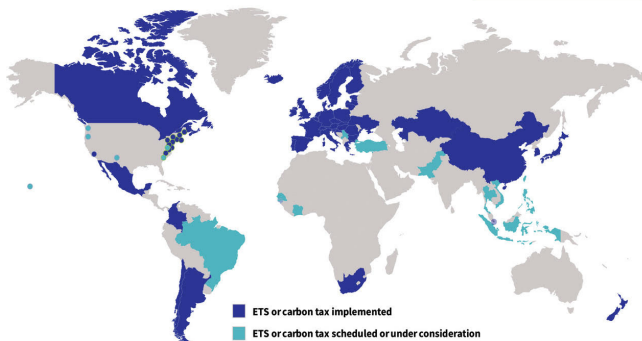
- As climate change is mostly caused by accumulations of greenhouse gases (GHG) in earth's atmosphere, any regulation will have to target at significantly curbing firms' carbon emissions
- The most effective way to reduce GHG emission is to put a price on carbon emissions and internalize the externalities associated with emissions

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Global carbon pricing coverage

Climate Bonds INITIATIVE



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

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Pricing of Transition Risks in Equity and Option Markets

- The effect of more stringent governmental regulations is likely to be heterogeneous and most relevant for carbon-intensive firms

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- Bolton and Kacperczyk (JFE 2021, JF 2022): higher stock returns associated with higher levels and growth rates of carbon emissions in both US and around the world
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- These studies suggest that investors are already demanding compensation for their exposure to carbon risk, supporting the "Carbon Risk Premium" hypothesis

Do Corporate Bonds Price in Transition Risks?

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 - The "low carbon alpha" cannot be explained by a comprehensive list of systematic risks and bond characteristics
- We test several explanations and find investors' underreaction to the predictability of carbon intensity for firm fundamentals and creditworthiness most likely explain this finding

Cumulative Return for the L/S Portfolio Sorted on CEI



- The "low carbon alpha" disappeared since 2016, which corresponds to Paris agreement being signed in December 2015

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 - Mandatory climate-risk disclosure by financial institutions leads to reduced financing of fossil energy companies
- 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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 - Research consistently finds markets are getting better at pricing climate change over time, especially after Paris Agreement

Conclusion

- Institutional investors and policymakers are increasingly concerned about the impacts of climate change on asset values and financial stability
- The question of whether financial markets recognize climate risks depends on the salience of the risk and investor beliefs
 - Research consistently finds markets are getting better at pricing climate change over time, especially after Paris Agreement
- Regulators can promote efficient pricing of climate risks and resource allocation by requiring climate-risk disclosure to be standardized and mandatory