

Dissecting Climate Risks: Are they Reflected in Stock Prices?

Renato Faccini¹, Rastin Matin², George Skiadopoulos^{3,4}

¹Danmarks Nationalbank

²PFA Asset Management

³School of Economics and Finance, Queen Mary University of London

⁴Department of Banking and Financial Management, University of Piraeus

10th Financial Stability Conference
Cleveland Fed & Office of Financial Research

17 November, 2022

Motivation

- Market-wide risks from climate change are multifaceted: Physical & Transition risks

- Market-wide risks from climate change are multifaceted: Physical & Transition risks
- **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

- Market-wide risks from climate change are multifaceted: Physical & Transition risks
- **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
- **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 \Rightarrow Need for government's intervention

This paper: Contributions

- ① **First time evidence** on what types of **market-wide** climate risks are reflected in U.S. stock prices

This paper: Contributions

- 1 **First time evidence** on what types of **market-wide** climate risks are reflected in U.S. stock prices
- 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

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

This paper: Contributions

- 1 **First time evidence** on what types of **market-wide** climate risks are reflected in U.S. stock prices
- 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
- 3 **Provide and validate** a possible explanation for the results
- 4 **Document** which firms are the most exposed to these risks.

- Reuters news: 1st Jan. 2000 - 31st Dec.2018
 - More than 13 million articles from Refinitiv News Archive
 - Screening & looking for "*climate change*" or "*global warming*" →
≈34,000 articles

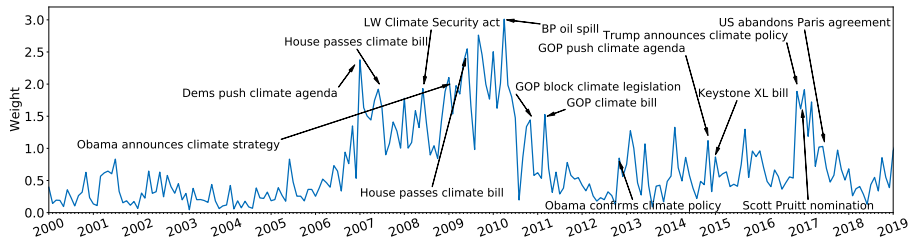
- Reuters news: 1st Jan. 2000 - 31st Dec.2018
 - More than 13 million articles from Refinitiv News Archive
 - Screening & looking for "*climate change*" or "*global warming*" →
≈34,000 articles
- U.S. common stocks returns & characteristics (daily data, CRSP, Compustat)
- Equity risk factors from authors' websites
- 'E' score from Refinitiv.

Are factors priced? Jan 2000 - Dec 2018 (Deciles)

Alphas (Decile portfolios), 1st January 2000- 31st December 2018

Natural Disasters	Global Warming	Int. Summits	U.S. Climate
Panel A: Market model			
0.14 (0.3)	-0.0 (-0.2)	0.12 (0.42)	0.96*** (2.91)
Panel B: FF 3F model			
0.07 (0.24)	0.20 (0.67)	0.53* (1.73)	0.65** (2.34)
Panel C: FFC model			
-0.07 (-0.24)	0.03 (0.10)	-0.49 (1.65)	0.46* (1.66)
Panel D: FF 5F model			
0.03 (0.0)	0.05 (0.19)	-0.66** (-2.5)	0.2*** (2.75)
Panel E: FF 5F + momentum			
0.27 (0.9)	-0.09 (-0.34)	-0.76*** (-2.63)	0.61** (2.25)

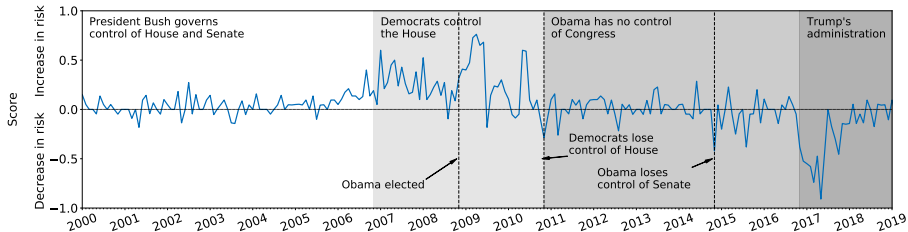
U.S. climate policy (CP) factor



- 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

U.S. CP narrative factor

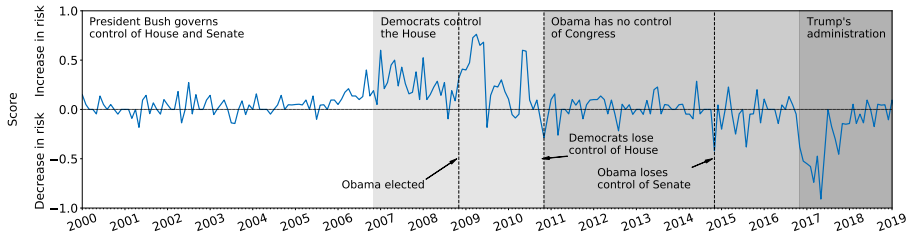
Sign of the risk premium under hedging hypothesis



- By construction, decreases in the factor signal good news for the economy

U.S. CP narrative factor

Sign of the risk premium under hedging hypothesis



- By construction, decreases in the factor signal good news for the economy
- ⇒ **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)

2000-2018	2000-2012	2012-2018
Panel A: Market model		
-0.64* (-1.86)	-0.52 (-1.13)	-1.01** (-2.43)
Panel B: FF 3F model		
-1.03*** (-3.56)	0.77** (-2.37)	-1.39*** (-4.30)
Panel C: FFC model		
-0.85*** (-2.76)	-0.59* (-1.66)	-1.37*** (-3.61)
Panel D: FF 5F model		
-0.65** (-1.97)	-0.62 (-1.43)	-0.84*** (-2.97)
Panel E: FF 5F + momentum		
-0.31 (-1.07)	0.00 (0.00)	-0.93*** (-3.40)

Conclusions

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

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

- 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

- 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*

- 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

- 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.

Thank you for your attention and time !

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3795964

gskiado@unipi.gr, g.skiadopoulos@qmul.ac.uk