

# Master Seminar: Climate Risk

Prof. Dr. Marcel Prokopczuk & Prof. Dr. Judith C. Schneider

Institute for Finance and Commodity Markets & Institute for Risk and Insurance

Summer Term 2023

# Supervisors

- Kevin Seebonn, Institute for Finance and Commodity Markets, [seebonn@fcm.uni.hannover.de](mailto:seebonn@fcm.uni.hannover.de)
- Philipp Decke, Institute for Risk and Insurance, [philipp.decke@insurance.uni-hannover.de](mailto:philipp.decke@insurance.uni-hannover.de)

# Requirements

- Preparation of a seminar paper in groups of up to 3
- Scope: 16/20/24 pages (alone/group of two/group of three)
- Independently perform empirical/quantitative analysis
- Use of appropriate statistics software
- Pure literature research is not sufficient
- Presentation of seminar paper in block seminar
- Assessment: 60 % written work and 40 % presentation

# Procedure

- 16.01.2023, 17:00: Kick-off meeting at Institute for Risk and Insurance
- 20.01.2023, 23:59: Submission of the preference-form to Kevin Seebonn
- 25.01.2023: Allocation of topics (We will send you an email)
- 27.01.2023, 23:59: Submission of binding registration form to Kevin Seebonn
- 15.05.2023, 23:59: Term paper submission to supervisor
- End of May / Start of June: Presentation session

# 1) Dissecting Climate Risks

## Task:

- Climate risks can be disentangled into risk factors related to natural disasters, global warming, international summits, and U.S. climate policy. So into risk factors representing physical risks and transition risks.
- Faccini et al. (2022) show that only transition risks are priced within the universe of U.S. common stocks by doing portfolio sorts. Huynh & Xia (2021) show that climate news are also priced in U.S. corporate bonds.
- Replicate these findings on an U.S. Industry level and on other asset classes.

## Literature:

- Faccini, R., Matin, R., Skiadopoulos, G. (2022): Dissecting Climate Risks: Are they reflected in stock prices? *available at SSRN:*  
<https://ssrn.com/abstract=3795964>
- Hunyh, T., Xia, Y. (2021): Climate Change News Risks and Corporate Bond Returns. *Journal of Financial and Quantitative Analysis*, forthcoming

## 2) Physical Risks of Climate Change

### Task:

- While U.S. equity is only pricing the transitions risks of climate change, the physical risk of climate change is priced in long-dated state bonds.
- This is on one hand due to their inability to reallocate and on the other hand due to the longer maturity of the bonds.
- Empirical investigation of the physical effects of climate change on long-dated bonds.

### Literature:

- Dey, A. (2022): Surging Sovereign Spreads: The Impact of Coastal Flooding on Sovereign Risk, *Available at SSRN: <https://ssrn.com/abstract=4058301>*
- Goldsmith-Pinkham, P., Gustafson, M.T., Lewis, R.C., Schwert, M. (2022): Sea Level Rise Exposure and Municipal Bond Yields, *NBER working paper 30660*
- Painter, M. (2020): An inconvenient cost: The effects of climate change on municipal bonds, *Journal of Financial Economics*, 135 (2), 468-482

### 3) EU Emissions Trading Scheme

#### Task:

- To implement international climate protection agreements the EU introduced the EU Emissions Trading Scheme (EU-ETS). The assets on this market are Emission Allowances, as there are caps on how much emissions a company is allowed to expel.
- One allowance allows the emission of one tonne of carbon dioxide equivalent. The market has free pricing. The general idea is that companies can reduce their emissions and sell their unused allowances.
- Besides the allowances themselves there exist derivatives on them, namely Futures and Options.
- Your task is to explain the EU-ETS and analyze the market. Investigate what type of valuation/model has the best fit for options written on carbon index futures.

#### Literature:

- Isenegger, P., & von Wyss, R. (2009): The Valuation of Derivatives on Carbon Emission Certificates - A GARCH Approach, *Available at SSRN*: <https://ssrn.com/abstract=1343835>
- Uhrig-Homburg, M., & Wagner, M. (2009): Futures Price Dynamics of  $CO_2$  Emission Allowances: An Empirical Analysis of the Trial Period, *The Journal of Derivatives*, 17 (2), 73-88

## 4) ESG Performance and Firm Profitability

### Task:

- Pedersen et al. (2021) argue that investors can be interested in firms with high ESG performance because they believe these firms offer better profitability or because they have a taste for high ESG firms beyond of profitability considerations.
- Understanding the relationship between ESG performance and firm profitability is a prerequisite to better understand the empirical relationship between ESG performance and asset pricing.
- Pedersen et al. (2021) investigate the link between different proxies for ESG performance and firms' profitability.
- Replicate these analyses for European stocks.

### Literature:

- Halbritter, G., Dorfleitner, G. (2015): The wages of social responsibility – where are they? A critical review of ESG investing, *Review of Financial Economics*, 26, 25-35
- Pedersen, L. H., Fitzgibbons, S, Pomorski, L. (2021): Responsible investing: The ESG-efficient frontier, *Journal of Financial Economics*, 142 (2), 572-597

## 5) Performance of ESG Investing

### Task:

- Pedersen et al. (2021) argue that investors can be interested in firms with high ESG performance because they believe these firms offer better profitability or because they have a taste for high ESG firms beyond of profitability considerations.
- Understanding the relationship between ESG performance and firm profitability is a prerequisite to better understand the empirical relationship between ESG performance and asset pricing.
- Pedersen et al. (2021) investigate the returns of portfolios sorted on different proxies for ESG performance.
- Replicate these analyses for European stocks.

### Literature:

- Halbritter, G., Dorfleitner, G. (2015): The wages of social responsibility – where are they? A critical review of ESG investing, *Review of Financial Economics*, 26, 25-35
- Pedersen, L. H., Fitzgibbons, S, Pomorski, L. (2021): Responsible investing: The ESG-efficient frontier, *Journal of Financial Economics*, 142 (2), 572-597

## 6) ESG Performance and Climate Events in the Insurance Industry

### Task:

- ESG performance can affect risk, as shown by Ilhan et al. (2021) for protection against tail risk.
- Insurance firms' stocks are affected by weather or climatic events (e.g., hurricanes) and the market prices differences in exposure (Lamb, 1995).
- ESG performance could mitigate risk during crisis times, as shown by Broadstock et al. (2021) for the case of COVID-19.
- Analyze whether insurance companies' ESG performance affects the market reaction to climate or extreme weather events.

### Literature:

- Broadstock, D. C., Chan, K., Cheng, L. T., Wang, X. (2021): The role of ESG performance during times of financial crisis: Evidence from COVID-19 in China, *Finance research letters*, 38, 101716
- Ihan, E., Sautner, Z., Vilkov, G. (2021): Carbon tail risk, *The Review of Financial Studies*, 34 (3), 1540-1571
- Lamb, R. P. (1995): An exposure-based analysis of property-liability insurer stock values around Hurricane Andrew, *Journal of Risk and Insurance*, 62 (1), 111-123