

CLIMATE AND FINANCIAL MARKETS

ACCT/BEPP 7640

Spring Semester 2023, Q4, Tu/Th 10:15-11:45 a.m., SHDH 211

Note: This syllabus may be updated throughout the quarter and as policy developments occur. Please check Canvas for the latest version before you do the readings for the next lecture.

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Course overview. Climate change might be the defining challenge of our times, with a wide range of effects on financial markets and the broader economy. At the same time, financial markets play an important role in financing the transition to a net-zero economy. This role, however, is shaped by the information that is available to market participants. In this course, we examine how climate risks—both physical and regulatory—affect firms, financial markets (including equity, bond, and carbon markets), and markets for energy and real estate. We examine the role that firms' disclosures and third-party information sources play. As climate change is high on the agenda of almost every company and government, this course will be valuable both for students with the ambition to pursue a career centered around sustainability and those who want to gain a better understanding of how climate issues affect more traditional roles in the financial sector, consulting, or non-profits.

The starting point for this course is that financial market participants increasingly realize that climate change represents an important investment risk. One central concern focuses on transition risks, and in particular on the effects that regulatory responses to climate change have on the business models of carbon-intensive companies. We discuss implications for how investors allocate their capital and exercise their oversight of firms. We start with studying carbon markets with a focus on pricing and discuss strategies to hedge climate risks through

financial instruments such as carbon credits and derivative contracts. Next, we study the price impacts of climate risks in equity, debt and real estate markets, including the role played by shareholder activism and engagement, divestment and portfolio alignment. We then explore how different firms in the global energy sector—ranging from oil & gas to renewable energy to electric utilities—have responded to climate-related pressures from their investors and other stakeholders. Because outsiders’ reactions depend on the information that they have, we investigate the impact of ESG reporting on financial markets and on the choices that managers make. Here, we also discuss the costs and benefits of regulating ESG reporting and the impact of greenwashing. We pay special attention to the impact of climate risk and reporting on decisions inside organizations, such as spin-offs, hedging, catastrophe insurance, and the structure of executive-compensation contracts.

Readings. The research in this field is rapidly advancing, as are policy and financial-market developments. Rather than one comprehensive textbook, we rely on a mix of academic papers, newspaper articles, and reports by industry groups, policy makers and regulators. Starred (*) readings are required. Non-starred readings are optional but we will often discuss them in class, and you are highly encouraged to read them if you want further background on a topic.

Course format. This is an experimental 0.5cu course. We encourage a lively class discussion. Attendance is mandatory. Please email the TA in advance if you have a good reason not to attend a particular session.

Guest lectures. The course has two guest lectures/panels by external experts. Attendance is mandatory and the content is fair game for questions on assignments and exams.

Assignments and grading. Two short graded multiple-choice Canvas quizzes (individual or as a group of up to three students) (30%), an exam (30%), two short case write-ups (as a group; up to three students; 10%) and class participation (30%). Your class participation grade will be based on the quality of your comments during class and Canvas prep-questions (graded based on completion only; 20%), and your participation in the experiments and the simulation (10%).

Cheating policy. It should not be necessary to say this – but for completeness: all students are expected to comply with the University of Pennsylvania’s [Code of Academic Integrity](#). It is the policy of the department, and this course, to immediately fail any student for the course who is in violation of the University’s Code of Academic Integrity. Additional sanctions may be imposed by the Office of Student Conduct.

Other details. The course is part of the MBA major in Business, Energy, Environment and Sustainability. Non-Wharton students are welcome and encouraged to contact the professors in advance to discuss prerequisites.

CLASS SCHEDULE

Required readings are marked with (*), additional readings that provide more in-depth insight are provided without the mark

Lecture 1 (Mar 14): **(Part 1) Course Introduction; (Part 2) Carbon Markets Intro**

Topics: climate change science and projections; impacts on real assets and financial markets; carbon markets basics.

- Video: The Science of Climate Change ([link](#))

The following reading and video are optional but useful if you want the economist's take on carbon markets:

- Lecture notes on the economics of cap-and-trade (on Canvas).
- Video: Cap-and-Trade (on Canvas)

If you want to get into the mood, here is a recent NYT article on socially responsible investing:

- Sommer, J., "On Wall St., 'Socially Responsible' Is Common Sense. In Congress, It's Political." *New York Times*, 3/4/23 ([link](#)).

Lecture 2 (Mar 16): **Trading in Carbon Markets**

Guest speaker: Casey Dwyer, Partner at Andurand Capital Management

Topics: participants in carbon markets; financial carbon instruments; fundamental analysis for trading insights; EU ETS market design and risks; impacts of carbon markets on corporate strategy.

- (*) Lewis, M., "Deep Decarbonization", *BNP Asset Management*, 10/20 ([link](#)).

Lecture 3 (Mar 21): **Climate Impact on Asset Prices**

Topics: equity pricing; derivation of the CAPM; pricing of cash flows and risks; systematic risk of climate change; physical vs. transition risk; climate change impact on cash flows; future regulatory impact on cash flows; physical vs. transition risks.

- (*) Ramani, V., "Addressing Climate as a Systemic Risk: A Call to Action for Financial Regulators", *Harvard Law School Forum on Corporate Governance*, 6/28/20 ([link](#)).

- (*) Taylor, L., “Why Green Assets May Not Continue to Outperform”, *Knowledge at Wharton*, 6/29/21 ([link](#)).
- Lambert, R., C. Leuz, and R.E. Verrecchia, 2007. “Accounting Information, Disclosure, and the Cost of Capital.” *Journal of Accounting Research* 45 ([link](#)).

In-class experiment

- “Climate-Impact Preferences of Investors.” This experiment is based on Bonnefon, J.-F., A. Landier, P.R. Sastry, and D. Thesmar, 2022. “The Moral Preferences of Investors: Experimental Evidence.” NBER Working Paper 29647.

Lecture 4 (Mar 23): **ESG Investing and Green Returns**

Topics: warm glow/preferences for “green investments”; greenium.

- (*) King, A. and B. Pucker, “ESG and Alpha: Sales or Substance?”, *Institutional Investor*, 2/25/22 ([link](#)).
- (*) Henisz, W., “ESG in the Cross Hairs: Don't Give Up on Economics for the Sake of Ideology”, *LinkedIn*, 7/21/22 ([link](#)).
- (*) Pastor, L., R.F. Stambaugh and L.A. Taylor, 2022. “Dissecting Green Returns.” *Journal of Financial Economics* 146: 403-424 ([link](#)).
- Pastor, L., R.F. Stambaugh and L.A. Taylor, 2021. “Sustainable Investing in Equilibrium.” *Journal of Financial Economics* 142: 550-571 ([link](#)).

Lecture 5 (Mar 28): **Climate Risk in Equity, Debt, and Real Estate Markets**

Topics: green bonds; public debt; private equity; shareholder activism; housing and mortgage markets.

- (*) Flammer, C., 2021. “Corporate Green Bonds.” *Journal of Financial Economics* 142: 499-516 ([link](#)). Just read the introduction on pages 499-501.
- (*) Flavelle, C., “Florida Sees Signals of a Climate-Driven Housing Crisis”, *New York Times*, 10/12/20 ([link](#)).
- Keys, B., “Why Mispricing the Risks of Sea Level Rise Could Prove Costly”, *Knowledge at Wharton*, 11/3/20 ([link](#)).
- Phillips, M., “Exxon’s Board Defeat Signals the Rise of Social-Good Activists.” *New York Times*, 6/9/21 ([link](#)).

Lecture 6 (Mar 30): **ESG Ratings and ESG Disclosure**

Topics: climate information and market efficiency; measuring and aggregating ESG performance; rating agencies.

Case

- (*) Does Sustainability Pay? Barry Callebaut's Sustainability Improvement Loan ([link](#)). Case discussion questions will be provided via Canvas.

Lecture 7 (Apr 4): **ESG Reporting**

Topics: impact of ESG reporting in financial markets; standardized ESG reporting; scope 1, 2 and 3 emissions; greenwashing; corporate incentives for change.

- (*) Ernst & Young, “Technical Line - How the Climate-Related Disclosure Proposals from the SEC, EFRAG and ISSB Compare”, 2/1/23 ([link](#)).
- Mandyck, J. 2022. “What If Banks Had to Disclose the Climate Impact of Their Investments?” ([link](#)).

Lecture 8 (Apr 6): **Climate Risks and Energy Markets**

Topics: climate risks for energy firms; effects on strategies and investments by oil & gas, renewables, electric utilities and electric-vehicle companies; regulatory carbon and renewable-energy credits.

- (*) van Benthem, A.A., E. Crooks, S. Giglio, E. Schwob, and J.C. Stroebe, 2022. “The Effect of Climate Risks on the Interactions between Financial Markets and Energy Companies.” *Nature Energy* 7: 690-697.

Case

- (*) Ørsted’s Transformation from a Fossil into a Renewable-Energy Company. Case and discussion questions will be provided via Canvas.
- (*) “Ørsted’s Renewable-Energy Transformation”, McKinsey & Company, 7/10/20 ([link](#)).
- (*) “Sustainable Business Transformation - The Ørsted Case”, The Conference Board, 6/17/20 ([link](#)). (This is a podcast.)
- Anthony, S., A. Trotter, and E. Schwartz, “The Top 20 Business Transformations of the Last Decade,” *Harvard Business Review*, 9/24/19, ([link](#)).

Lecture 9 (Apr 11): **Long-Run Discount Rates**

Topics: theory of long-run discounting; empirical evidence for long-run discount rates; the social cost of carbon.

- (*) Lecture notes on climate change mitigation and discount rates (on Canvas).
- (*) The Economist, “Weighing the Future”, 5/19/14 ([link](#)).
- (*) The Economist, “Not So Impatient”, 4/16/15 ([link](#)).

Pre-class experiment

- “Very Long-Run Discount Rates” in which students decide how much to pay to (i) buy a property; (ii) lease it for time periods of varying length; based on Giglio, S. and J.C. Stroebel, 2015. “Very Long-Run Discount Rates.” *Quarterly Journal of Economics* 130(1): 1-53.

Lecture 10 (Apr 13): **Panel Discussion on Climate Risk and Investment**

Guest speakers: Jeffrey Hales, Board Member of the International Sustainability Standards Board; Carolyn Cross, Co-Head of Investment Stewardship, Americas at Vanguard; Andreas Bork, Vice President ESG, Investor Relations at Shell

Topics: effect of climate risk on portfolio selection; the need for standardized ESG reporting; industry responses to climate risk as well as investor and regulatory pressures.

Note: This lecture will take place in a different classroom: JMHH 260.

Lecture 11 (Apr 18): **Carbon-Trading Simulation**

Topics: carbon market trading; market design; the effect of uncertainty on carbon markets.

In-class experiment

- Students participate in a simulated carbon market “CarbonSim”, where they develop and implement a carbon portfolio management strategy and learn the importance of market design ([link](#)).
- (*) Instructions for the carbon-trading experiment. See “CarbonSim Flyer and Cheat Sheet” on Canvas under Files -> CarbonSim files.

- If you want to get a head start and increase your chances of winning a prize, feel free to have a look at the CarbonSim preparation materials and watch the [overview video](#) and the [open hand round video](#).

Note: This simulation will take place in a different classroom: JMHH F95. The session will run from 8:30-11:45 a.m. Unless you have a class conflict, please arrive at 8:30 a.m. If you have a class in the 8:30-10 a.m. time slot, we will make sure you can meaningfully join at the usual start time of 10:15 a.m. This will not be held against you for participation grading.

Lecture 12 (Apr 20): **Climate Information and Decisions inside Organizations**

Topics: firms' investment decisions; hedging climate risks; spinoffs vs. integrated companies; catastrophe insurance; the role of executive compensation contracts in investment and hedging decisions.

- (*) Riz, R.A., 2022. "Linking Executive Compensation to Climate Performance." *California Management Review* 64(3): 124–140 ([link](#)). Only the first 4 pages (up to, not including "Principles for Incentive Design" on page 128).

DUE DATES

Quizzes

Quiz 1: posted on Monday Apr 3 at 6 p.m., due by midnight (any 30-minute window).

Quiz 2: posted on Wednesday April 19 at 6 p.m., due by midnight (any 30-minute window).

Short case write-ups

Case 1 (Does Sustainability Pay? Barry Callebaut's Sustainability Improvement Loan): due on Thursday Mar 30 by 10:15 a.m.

Case 2 (Ørsted's Transformation from a Fossil into a Renewable-Energy Company): due on Thursday Apr 6 by 10:15 a.m.

Class participation

Short pre-lecture prep questions are due before the start of each lecture (Tu/Th 10:15 a.m.).

Exam

The exam will be on Tuesday Apr 25 from 10:15-11:45 a.m. in JMHH F95 and SHDH 211 (based on last name).