Climate Finance: An Economic and Financial Approach to Climate Change (FINC-UB 77)

Meeting Times: Room KMC 5-80, Tuesdays and Thursdays, 3.30-4.45pm

TA: Ammon Lam (asl664@stern.nyu.edu); Office hours by Zoom via Appointment

Office Hours: Tuesday, 5pm – 6pm, by Appointment (johannes.stroebel@nyu.edu) [KMC 9-98]

Course Description:

Climate change presents one of the central challenges of our generation, 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. In this class, we study the interaction between climate change and firms, financial markets, energy markets, regulators, and policy makers.

Given that climate change and sustainability issues more generally are affecting nearly every aspect of the corporate, regulatory, and non-profit worlds, the class will be valuable for students with a wide range of backgrounds and career goals, whether they are directly interested in climate and sustainability issues or primarily want to gain a better understanding of how these issues influence more traditional roles in the corporate and financial sector.

The class is very applied in its outlook—for example, a range of guest speakers from industry, regulators, and non-profits will visit the classroom—but we will frame the analysis through the lens of economic frameworks that help students think through the interactions between climate change and the broader economy in a systematic way. The objective is that the broad selection of topics and guest speakers will provide a variety of complementary perspectives on how climate change will shape economics and finance over the coming decades.

Class Topics

More specifically, in this class, we will:

i. Review the science behind climate change.
ii. Discuss the effects of climate risks (both physical and transition risks) on prices across various asset classes, including equities, fixed income, real estate, and mortgage-based assets.
iii. Explore the risks and opportunities from climate change for firms and financial institutions, including firms in the energy sector (both hydrocarbon and renewables);
iv. Understand how financial markets can help transfer and hedge climate risks as well as finance the transition to a net-zero economy.
v. Analyze the causes and effects of the growth of (and recent backlash to) sustainable/ESG investing.
vi. Explore the economic and financial foundations of various climate regulations, including emissions trading schemes and carbon taxes.
vii. Discuss approaches of constructing the Social Cost of Carbon, including an understanding of the appropriate discount rates.
viii. Understand the design and effects of a variety of regulatory efforts such as stress tests for banks by policy makers in the US, Europe, and beyond.
ix. Discuss how climate change affect energy markets and the price of electricity in the short-run and long-run
x. Analyze how climate risk interacts with other risks, such as the risk of future pandemics and geopolitical risks.
xi. Discuss how sustainable infrastructure investments as well as climate adaptation investments are important to combat and deal with climate change, in particular in urban settings.
xii. Explore risks associated with biodiversity loss as an emerging driver of investment risk.

Professor Johannes Stroebel

Johannes Stroebel is the David S. Loeb Professor of Finance at the New York University Stern School of Business. He conducts research in climate finance, household finance, social network analysis, macroeconomics, and real estate economics.

Professor Stroebel was awarded the 2023 Fischer Black Prize by the American Finance Association, given every two years to the top financial economist under the age of 40. He has won numerous other awards, including the AQR Asset Management Institute Young Researcher Prize and the Brattle Award for the best paper published in the Journal of Finance. He has also earned an Andrew Carnegie Fellowship and an Alfred P. Sloan Research Fellowship in Economics. Professor Stroebel is an Editor at the Journal of Finance: Insights and Perspectives. In the past, he was an Associate Editor at the Journal of Political Economy, the Review of Economic Studies, the Journal of Finance, and Econometrica.

Professor Stroebel teaches classes on climate finance at the undergraduate, MBA, and executive education levels. He regularly provides advice to governments and firms on managing their financial risks from climate change. Among other roles, he was a member of the Climate-Related Market Risk Subcommittee at the Commodities and Futures Trading Commission (CFTC), as well as a member of a Working Group on Extreme Weather and Financial Risks at the President's Council of Advisors on Science and Technology (PCAST). He is the Chair of the Academic Advisory Council of the Center on Regulation and Markets at the Brookings Institution.

Professor Stroebel read Philosophy, Politics, and Economics at Merton College, Oxford, where he won the Hicks and Webb Medley Prize for the best performance in Economics. In 2012, he earned a Ph.D. in Economics at Stanford University, where he held the Bradley and Kohlhagen Fellowships at the Stanford Institute for Economic Policy Research. Before joining NYU Stern in 2013, Professor Stroebel was the Neubauer Family Assistant Professor of Economics at the University of Chicago Booth School of Business.

MATERIALS

Since this is a very fast-moving area that is not traditionally taught in business, there is no required textbook for this course. Instead, I will be posting required and optional readings ahead of every class on NYU Brightspace. These will include newspaper articles, academic research papers and reports by industry groups, policy makers, and regulators.

EVALUATION

The class will have a midterm and final exam, which can cover all material discussed in class, including from the guest lectures. There will one graded final project. A participation grade will also be awarded, with strong weight on active participation such as asking questions during the guest speaker visits (see below). The relative weighting of the components of the grade is:

Final Project	25%
Participation	25%
Midterm Exam	25%
Final Exam	25%

While the class will generally be recorded, the expectation is that students will attend the in-person sections.

CLASS SCHEDULE

Date		**Topic**
Tuesday, Sept 5	Class 1	Introductions; Summary of Class; Why climate finance?
Thursday, Sept 9	Class 2	Science of Climate Change
Tuesday, Sept 12	Class 3	Climate Risk and Asset Prices
Thursday, Sept 14	Class 4	Climate Risk and Asset Prices
Tuesday, Sept 19	Class 5	Climate Risk and Asset Prices
Thursday, Sept 21	Class 6	**Guest Lecture:** Martina Cheung (S&P Global)
Tuesday, Sept 26	Class 7	Approaches to Hedging Climate Risk
Thursday, Sept 28	Class 8	Sustainable Investing / ESG Investing
Tuesday, Oct 3	Class 9	Exit vs. Voice
Thursday, Oct 5	Class 10	**Guest Lecture**: Eugenie Schwob (BlackRock)
Tuesday, Oct 10	NO CLASS	
Thursday, Oct 12	Class 11	Climate Risk -- Real Estate & Mortgage Markets I
Tuesday, Oct 17	Class 12	Climate Risk -- Real Estate & Mortgage Markets II
Thursday, Oct 19	Class 13	**Guest Lecture**: Jake Carr (Moody's)
Tuesday, Oct 24	Class 14	***Midterm Exam***
Thursday, Oct 26	Class 15	**Guest Lecture**: Michael Yamoah (Federated Hermes)
Tuesday, Oct 31	Class 16	Cost Benefit Analysis, Discounting Review, Risk as Covariance
Thursday, Nov 2	Class 17	Very long-run discount rates, Social Cost of Carbon
Tuesday, Nov 7	Class 18	Regulation: Prices vs. Quantities; Emission Trading Schemes
Thursday, Nov 9	Class 19	Voluntary Carbon Markets
Tuesday, Nov 14	Class 20	Climate Risk and Financial Stability; Stress Testing; Central Banks
Thursday, Nov 16	Class 21	**Guest Lecture**: Hyeyoon Jung (New York Fed)
Tuesday, Nov 21	Class 22	Climate risk and the energy sector
Thursday, Nov 23	NO CLASS	
Tuesday, Nov 28	Class 23	Climate Change: Cities and Green Infrastructure
Thursday, Nov 30	Class 24	Climate risks and other risks (Pandemic / Migration / Geopol)
Tuesday, Dec 5	Class 25	CLASS OFF TO LISTEN TO OTHER SPEAKERS
Thursday, Dec 7	Class 26	Biodiversity Risk
Tuesday, Dec 12	Class 27	**Guest Lecture**: Matthias Pitkowitz (EQX Biome)
Thursday, Dec 14	Class 28	Review Class

GUEST SPEAKERS

This class will feature a variety of guest speakers from industry, academia, non-profits, and regulatory agencies (including several Stern alumni). The bios confirmed guest speakers are listed below.

Guest speakers will visit either the MBA section or the UG section, and students are required to attend presentations from speakers visiting the UG section.

You are also invited to attend presentations from speakers in the MBA section (see schedule below). Please email me ahead of time if you're planning on attending a guest speaker visit in the other section.

To maximize the usefulness of guest speaker visits, I want every student to think of two questions for each speaker ahead of the visit. Please submit your questions at https://forms.gle/uDJejnWdpEySf8TFA.

Please be prepared to ask the speaker during the visit. Submitting questions ahead of the speaker visit counts towards your participation score (in addition to active participation during the actual visit and other class sessions).

There may be opportunities to attend dinner with me and the guest speaker after the presentation. For those speakers who will participate in the dinner, I will send an email around an email to solicit interest.

MBA SPEAKER SCHEDULE

Here is the schedule of guest speakers in the MBA class; these will generally be on Tuesdays at some point in the 6-9pm slot. Please email me if you're interested in attending one of those lectures.

Tue, Oct 17	**Guest Lecture**: Lukasz Pomorski (AQR)
Tue, Oct 24	**Guest Lecture**: Chavon Sutton (Cambridge Associates)
Tue, Oct 31	**Guest Lecture:** Scott Corwin (Deloitte)
Tue, Nov 21	**Guest Lecture:** Alex Inkster (Kimmeridge Partners)
Tue, Dec 12	**Guest Lecture:** Lia Cairone (NYC Mayor's office, Remote Presentation)

FINAL PROJECT

Each student is asked to turn in one individual final project. The final project consists of three parts and should not exceed 3 pages of text in total (Times New Roman, Minimum Font 11). Given the space constraints, focus on communicating your views in an efficient way!

> **PART I:** Pick a firm from the list below. In a 1-page memo, please describe which of the climate risks discussed in class are particularly relevant for that firm, which risks are not particularly relevant, and why?
>
> **PART II:** Pick a separate firm from the list below. In a 1-page memo, please describe what the firm is already doing to manage its climate risk exposure, and what you view as promising areas for further improvement.
>
> **PART III:** In a 1-page memo, please summarize one insight each from two of our guest speakers that you found particularly interesting.
>
> ***List of firms:*** Caterpillar, Boeing, Salesforce, General Electric, Walmart, Pfizer, Verizon, Ford Motor Company, Merck & Co, Bank of America

The final project is due by midnight on Wednesday, December 13, but you should feel free to submit it earlier. Please email the project to Ammon Lam at asl664@stern.nyu.edu.

Jake Carr

Director of Research, Moody's Analytics

Jake joined Moody's Analytics in 2017 and has been engaged in quantitative spatial research applied to the commercial real estate (CRE) sector. He currently leads efforts focused on understanding the impact of climate change and environmental events on CRE performance.

He previously conducted urban and regional economic research while serving as an Economic Analyst at the Federal Reserve Bank of Philadelphia. Jake holds a B.A. in Economics from SUNY Oswego and jointly earned an M.A. in Mathematics and M.S. in Financial Economics from SUNY Buffalo. He also concurrently completed a Master's in Applied Statistics while obtaining his Ph.D. in Geography from The Ohio State University.

Lia Cairone

New York City Office of Management and Budget

Lia Cairone serves as Director of Sustainability & Resiliency at the New York City Office of Management and Budget where she built and oversees the budget office's first Environmental Sustainability & Resiliency Taskforce. The taskforce is actively supporting the formulation, management, tracking, and evaluation of sustainability and resiliency policies and investments across the city, transforming budgetary decision-making to integrate and prioritize climate considerations, and promoting greater transparency, accountability, and impact.

Lia was previously Deputy Director for North America at C40 Cities Climate Leadership Group, where she partnered with and supported major cities leading on ambitious climate action. Before joining C40, Lia worked at the New York City Mayor's Office of Sustainability where she led the development and advancement of green building policies to further New York City's climate objectives. In this role, Lia spearheaded the development and passage of Local Law 97 of the Climate Mobilization Act, which requires large buildings to dramatically reduce their greenhouse gas emissions and oversaw the initial phases of NYC's carbon trading study. Lia was the chief architect of the 1.5°C: Aligning New York City with the Paris Climate Agreement climate action plan and supported the development of NYC's 80 x 50 roadmap.

She has worked in the private sector in technology, marketing, film, and media, and as an advocate for sustainable development, climate action, and gender equality. Lia received her Master of International Affairs from Columbia University's School of International and Public Affairs with a focus in climate and energy policy and Bachelor of Science from New York University's Leonard N. Stern School of Business.

Martina L. Cheung

President, S&P Global Ratings

Martina L. Cheung is President of S&P Global Ratings. She has ultimate responsibility for all aspects of the business, including commercial, analytical, control, and operations functions.

S&P Global Ratings is regulated in many of the countries in which it operates, and Martina is a director of three of its largest legal entities, S&P Global Ratings Europe Limited, S&P Global Ratings UK Limited and Standard & Poor's Financial Services LLC. Ms. Cheung also serves as the Executive Lead of S&P Global Sustainable1, supporting to drive the enterprise-wide growth strategy for ESG.

Ms. Cheung is a member of the Council on Foreign Relations, the Economic Club of New York, and served on the U.S. Commodity Futures Trading Commission's (CFTC) subcommittee on Climate-Related Market Risk. Ms. Cheung has spoken on key industry topics covering ESG, cyber security, technology and diversity in the workforce across public forums that include the World Economic Forum at Davos, the Institute for International Finance membership meeting, and Politico Women Rule, among others.

Ms. Cheung joined S&P Global in 2010 as Vice President of Operations and went on to serve as S&P Global's Chief Strategy Officer, where she was responsible for the execution and measurement of S&P Global's continuing expansion of its global footprint. She also served as Head of Risk Services in S&P Global Market Intelligence, where she leveraged S&P Global's significant risk intellectual property to serve clients in managing complex risk challenges. She most recently served as President of S&P Global Market Intelligence and Ms. Cheung formally served on the Board of CRISIL.

Ms. Cheung is the Executive Sponsor for the Women's Initiative for Networking Success (WINS). She also has active involvement in other S&P Global People Resource Groups (PRGs) including Women in Technology (WIT) and S&P Global's LGBTQ+ & Friends PRG (Spectrum). Ms. Cheung's philanthropic efforts include support for organizations such as Upwardly Global and YWCA.

Prior to joining S&P Global, she worked in the consulting industry, first in Accenture's Financial Services Strategy group and later as a Partner at Mitchell Madison Consulting. She holds a bachelor's degree in Commerce and a master's degree in Business Studies from National University of Ireland, Galway.

Scott Corwin

Senior Managing Director, US Leader for Sustainability & Climate Change, Deloitte

Scott is responsible for the strategy and commercialization of Deloitte's US Accounting & Assurance, Advisory, Consulting and Tax businesses work with public, private and not-for-profit sector clients to transition to a low carbon and equitable future.

Over his 30+ year distinguished career in consulting, Scott has worked closely with senior leaders and boards of global organizations to successfully undertake strategy-based transformations to address disruptive change in their sectors, markets, and communities. He has worked with clients across a broad range of sectors address a wide span of issues. Prior to assuming his current role, Scott led Deloitte's Future of Mobility Practice. Under his leadership, Deloitte has been working to actively shape the emergence of the mobility ecosystem and advance the adoption of seamless integrated transportation to enable moving people and goods faster, safer, cleaner, cheaper and with greater accessibility, inclusivity and equity.

Scott has authored numerous publications around sustainability and climate change including Leading a Low Carbon Future, Systems Change for a Sustainable Future and US Turning Point report and is the principal author of scores of FoM publications featured in Deloitte's Future of Mobility collection. Scott is a frequent keynote speaker at global conferences including CES, World Economic Forum/Davos, The Council on Foreign Relations, The Vatican's Pontifical Academy of Science, Fortune's BrainTech, WBCSD, and at numerous Universities.

Scott earned his BA from Brandeis University and his MBA from New York University Stern School of Business. He serves on the Advisory Board for NYU Stern's Fubon Center for Technology, Business & Innovation.

Alex Inkster

Partner, Kimmeridge

Alex Inkster is a Partner at Kimmeridge, a private equity firm based in New York and Denver focused on the development of low-cost unconventional oil and gas assets in the US upstream energy sector. At Kimmeridge, Mr. Inkster is responsible for the firm's direct investments.

Prior to this, Mr. Inkster worked as a Senior Equity Research Associate for Global Integrated Oils at Sanford C. Bernstein, covering 18 of the largest integrated oil companies and refiners. Before joining Sanford C. Bernstein, Mr. Inkster worked at General Electric, completing the company's financial management program and working in the Energy and Oil & Gas divisions.

Mr. Inkster holds a first class honors degree in Economics from University College London and is a CFA Charterholder.

Hyeyoon Jung
Federal Reserve Bank of New York

Hyeyoon Jung is a financial research economist in Climate Risk Studies within the Financial Intermediation Policy Research Division. Her research interests lie in international finance, financial intermediation, asset pricing, and climate finance. She holds a Ph.D. in Finance from NYU Stern, a B.S. in Economics from UPenn Wharton, and a B.AS from UPenn School of Engineering and Applied Science. Prior to graduate school, she worked as an FX & Rates trader at J.P. Morgan.

Matthias Pitkowitz

Founder & CEO, EQX Biome

Matthias is Founder & CEO of EQX Biome, the world's first biodiversity fintech -- focused on mobilizing financial markets and technology to protect the world's remaining biodiversity hotspots, worth some $150 trillion per year but apparently on their way off the map.

Prior to EQX, Matthias was a sixth year corporate lawyer at Cravath, Swaine & Moore LLP, consistently ranked as the top US law firm for M&A and capital markets matters.

Matthias has executed more than $72bn worth of M&A and capital markets transactions for clients including Dell, IBM, Ferrari, Mylan, INEOS, Johnson & Johnson, American Express, J.P. Morgan, Goldman Sachs, Morgan Stanley, Credit Suisse, among others.

He is a respected author and speaker on long-termism, sustainability and capital markets, and has addressed audiences at the Aspen Institute, FCLT's Conference on Long-Termism; Columbia University, Fordham Business School, and others. He holds a Master of Laws from Columbia Law School, a PhD in corporate law from the University of Vienna, and a JD degree from the University of Vienna, each with Honors.

Lukasz Pomorski

Managing Director and Head of ESG Research – AQR Capital Management

Lukasz Pomorski is the Head of ESG Research and a Managing Director at AQR Capital Management. He is responsible for the planning and oversight of the firm's responsible investment research efforts across all asset classes.

Lukasz frequently publishes on ESG topics, serves on industry committees and speaks at conferences globally. He is a member of the United Nations Principles for Responsible Investment Hedge Fund Advisory Committee and was previously the chair of UN PRI's Equity Hedge Fund Working Group. Prior to AQR, Lukasz was an Assistant Director for Research at the Bank of Canada and an Assistant Professor of Finance at the University of Toronto. Lukasz earned a B.A. and M.A. in economics at the Warsaw School of Economics, an M.A. in finance at Tilburg University, and a Ph.D. in finance at the University of Chicago.

Eugenie Schwob

Sustainability Risk Manager, BlackRock

Eugenie Schwob is a Sustainability Risk Manager at BlackRock. Her team acts as a central cross-asset class expert team within the Risk & Quantitative Analysis (RQA) group. They provide independent oversight of BlackRock's investment and enterprise risks to protect the firm and its clients. They also participate in firmwide tactical projects, such as consultation on methodologies, climate models' developments, Sustainable Finance Disclosure Regulation (SFDR) in Europe or definition of Transition Products governance.

Eugenie earned a Master's degree in Finance from MIT and a Master's degree in Engineering from Ecole Polytechnique in France. She is a holder of GARP Sustainability and Climate Risk certification.

Chavon Sutton

Senior Investment Director, Cambridge Associates

Chavon is a member of Cambridge Associates' Sustainable & Impact Investing team, where she is responsible for conducting manager research across asset classes and working with institutional clients to build sustainability- and impact-focused portfolios.

Prior to joining Cambridge Associates, Chavon was the City of New York's inaugural Director of Emerging Manager Strategy for NYC's Bureau of Asset Management, the investment advisor to each of the city's five retirement systems. There, she led the Bureau's growth strategy for investment in small, diverse, and women-owned managers across all asset classes, created its first blueprint for the integration of diversity factors in its investment process, and supported the investment staff's sourcing and due diligence efforts.

Previously, Chavon was a Vice President at J.P. Morgan where she constructed and managed portfolios for families, endowments, and foundations. She began her career in corporate finance roles at Bank of America and RBC, underwriting debt transactions for Fortune 100 financial institutions.

Chavon earned her MBA in Finance and MA in Journalism from New York University. She earned her BA in Economics, cum laude, from the University of Pennsylvania.

Michael Yamoah

Director, EOS, Federated Hermes

Michael Benedict Yamoah engages in North America with a focus on mining & materials, oil & gas, technology software and transportation.

Prior to joining the EOS team, Michael worked as a senior sustainability consultant and US climate strategy lead for Quantis International advising top organisations on how to adopt science-based climate strategy with robust metrics, tools, and outcomes. He has held various corporate roles, including acting climate and sustainability research lead at Aramco (US), and sustainability and analytics manager at Bechtel Corporation. Michael's other previous roles include consulting for the World Bank Group and the Asian Development Bank, and international climate programme support at the Natural Resource Defense Council.

His academic background includes University College London BSEER (PhD Candidate), NYU Stern (MBA + certificate in corporate sustainability), George Washington University ESIA (MA, International Development), Carroll College (BA, International Relations and Business Administration) and KNUST (BA Coursework, Geography and Sociology).