CLIMATE FINANCE: RESEARCH LEARNINGS AND NEEDS FOR 2022-2023

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Disclaimer: I am here today as an academic. What I say represents my views alone and not the views or policies of the United States Government or the Department of the Treasury.

OUTLINE

- Learning 1: Credit Risk (building off prior session)
- Learning 2: Input-Output
- Learning 3: ESG ≠ Emissions Reduction
- More Research Needed: Other providers of illiquid, structured, or private capital
  - Real Estate and SME Manufacturing/Buildings
  - Pathways Financing
  - Carbon Decommissioning
  - Public-Private Partnership Finance
  - Infrastructure
  - Carbon Leakage Finance
  - Innovation
  - Communities

LEARNING 1: CREDIT RISK: CLIMATE IS KNOWN AND PRICED

"Carbon Emissions and the Bank-Lending Channel"

Marcin T. Kacperczyk and José-Luis Peydró

Find:

- Banks that make SBTi commitments pull back financing to brown companies.
- Brown companies have lower debt and assets going forward.
- They do not, however, emit less carbon in reaction.
- Further, the price effects (changes in debt servicing costs) are very small.
- Authors' interpretation: the equilibrium is a cost-benefit balancing that resulting in brown firms being willing to be smaller in size but not scaling back in emissions.

LEARNING 1: CREDIT RISK: CLIMATE IS KNOWN AND PRICED

"Climate Risk and Capital Structure"

Ginglinger and Moreau

- Data: Measures of climate risk
  1. CRIS methodology: Break down the firm's activity into geographical and industrial segments
  2. Firm level score of operations, supply chain, and market climate risk from Four Twenty Seven
- Find:
  - Greater climate risk leads to lower leverage after the Paris Agreement.
  - Reduction in leverage related to climate risk is shared between a demand effect (the firm's optimal leverage decreases) and a supply effect (lenders increase the spreads when lending to firms with the greatest risk).

LEARNING 1: CREDIT RISK: CLIMATE IS KNOWN AND PRICED

"Is Carbon Risk Priced in the Cross-Section of Corporate Bond Returns?"

Duan, Li, and Wen,

Find:

- Bonds of more carbon-intensive firms earn significantly lower returns.
- Evidence is most consistent with investor underreaction to the predictability of carbon intensity for firm cash-flow news, creditworthiness, and environmental incidents.

"Being Stranded with Fossil Fuel Reserves? Climate Policy Risk and the Pricing of Bank Loans"

Delis, de Greiff, Iosifidi, and Ongena

- Question: Do banks price risk of stranded fossil fuel reserves?
- Data: Firm-year data on fossil fuel reserves from firms' annual reports, DealScan loans, Climate Change Performance Index (CCPI) by Germanwatch (Burck et al. (2018)) as climate policy stringency (at country level)
- Find:
  - Banks price climate policy exposure after 2015, especially for longer maturity loans
  - Effect heterogeneous by banks

LEARNING 1: CREDIT RISK: CLIMATE IS KNOWN AND PRICED

"Climate Regulatory Risks and Corporate Bonds"

Seltzer, Starks, and Zhu

- Data:
  - Environmental profile: Sustainalytics and CDP
  - Exposure to climate regulations: EPA compliance reporting data at state level, NETS data on local establishments to get exposure to regulatory stringency
- Find:
  - Firms with poor environmental profiles or high carbon footprints tend to have lower credit ratings and higher yield spreads, particularly when their facilities are located in states with stricter regulatory enforcement.
  - Using the Paris Agreement as a shock to expected climate risk regulations, we provide evidence that climate regulatory risks causally affect bond credit ratings and yield spreads.

LEARNING 1: CREDIT RISK: CLIMATE IS KNOWN AND PRICED

"Climate Change, Natural Disasters and Loan Pricing"

Correa, He, Moore Herpfer, and Lel

- Data: Granular measures of borrowers' exposure to natural disasters (SHELDUS database combined with locations of operations of companies in NETS data)
- Find
  - Following a climate change–related disaster, interest rate spreads on loans of at-risk, yet unaffected borrowers, spike both in the primary and secondary markets. … consistent with banks' internal assessments of higher probabilities of default for these borrowers.
  - No such effect from disasters that are not aggravated by climate change.

LEARNING 1: CREDIT RISK: CLIMATE IS KNOWN AND PRICED

"Climate Transition Risk in U.S. Loan Portfolios: Are All Banks The Same?"

Nguyen, Diaz-Rainey, Kuruppuarachchi, McCarten and Tan

- Data: Dealscan loan-level data; Emissions data from a prediction model
- Method: firm-level climate stress test based on the Merton probability of default model and transition pathways
- Find
  - Stress testing: median loss is 0.5% of US syndicated loans, representing a decrease in CET1 capital of 4.1%
  - May grow twice as large in the 1.5oC scenarios (1.4%-2.1% of loan value, 12%-16% of CET1 capital) compared to the 2oC target (0.6%-1.1% of loan value, 5%-9% of CET1 capital) with significant tail-end risk (7.7% of loan value, 62% of CET1 capital).

LEARNING 1 : CREDIT RISK: CLIMATE IS KNOWN AND PRICED

- Look back across the prior slides: many different dimensions of climate risk that are already priced
  - Physical disasters, regulation exposure, scoring of dependence, fossil fuel assets
- Why does it matter that Climate is Known and Priced in Credit Risk? How does this fit into conversations about stability and prudential regulation?

More Research Needed :

- More resolution on sources of climate risk
- Not all financial institutions are the same: commercial lending vs real estate; structured debt/investment banking vs lending asset classes;
- How do those sources fit or not fit into conversations of prudential regulation?
- How does the data already being priced fit into conversations?
- Note research by Oehmke and Opp , 2022

LEARNING 2: INPUT-OUTPUT CONNECTIONS MATTER FOR TRACING CARBON RISK

"Cascading Effects of Carbon Price through the Value Chain: Impact on Firm's Valuation"

Adenot, Briere, Counathe, Jouanneau, Le Berthe, and Le Guenedal, 2022

- Input-Output: Simulate varying carbon price effects through input-output tables to income statements
- Find: Broader reach of carbon pricing effects than Energy, Utilities and Materials to less carbon-intensive sectors, such as Industrials, Consumer Staples, Consumer Discretionary and Information Technology
  - Focus on scope 1 & 2 primarily

"Are SRI funds financing carbon emissions? An Input-Output Life Cycle Assessment of investment funds"

Popescu, Gibon, Hitaj, Rubin, and Benetto

- Input-Output: Track GHG to Scope 3 inference at company level through input-output tables
- Find: Inference for extent to greenness of SRI mutual funds (24% worse in emissions that broad index fund)

LEARNING III: ESG ≠ EMISSIONS REDUCTION

"Limits to Private Climate Change Mitigation"

Elmalt, Igan and Kirti (IMF)

- Context: A very few companies account for a large percent of emissions
  - "96 firms located upstream in production chains reliant on carbon emissions (largely fossil fuel producers) have accounted for 70 percent of global carbon emissions since 1850 (Heede 2014a, Heede 2014b)."
- Data: Panel covering 52 firms in 20 countries accounting for 30% of global emissions since 2002
- Find: For these high emitters, within firm ESG ratings are not predictive of emissions reductions
- Implication: ESG investing is not enough to mitigate climate damaging operations of firms

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MORE RESEARCH NEEDED: REAL ESTATE AND SME MANUFACTURING/BUILDINGS

- Picture: Ideally I would be wrong....Very little finance globally interested in financing transformation of structures, supply chain, production in private establishments
- Anything research can do to draw light to opportunities for investment & partnership models would be helpful

"Green Mortgages, EU Taxonomy and Environment Risk Weighted Assets"

Esposito, Mastromatteo, Molocchi, Brambilla, Carvalho, Girardi, Marmiroli, and Mela

- Example of a tool to enable banks to stress test real estate risk
- Not advocating for or against this proposition, but rather that we need more ideas on such topics like this paper

MORE RESEARCH NEEDED: INFRASTRUCTURE

- What to do about (e.g.) building roads, laying pipes ?
  - Generally do not qualify for green criteria
  - Still want most climate-compatible materials, EV access, bike lanes, etc.
- Issues
  - National or sub-national decision making
  - Legislation, regulation : easier in some places than others
  - Private market & getting incentives right
  - Financial economists generally stay away from structured finance topics, but need financial lenses into solutions
    - This point applies to carbon decommissioning, public-private partnerships, etc

MORE RESEARCH NEEDED: CARBON LEAKAGE FINANCE

- Broad Context: Shifting of fossil fuel assets from public to private ownership
- Context 2: Stay focused on mitigation.
- Can the "finance" side matter?
- What about the innovation side?
- Note paper on oil companies and innovation: (Quote from HBS article of Lauren Cohen) =~ confusing times
  - "Faced with mounting concerns about climate change, oil companies are diversifying their businesses, putting money toward renewable energy sources and green technology. While sustainable funds shun fossil fuel producers, which contribute half of the world's greenhouse gases, Cohen's study suggests that these companies could also play a key role in stemming the damage.
  - "They are investing about three times more than the average firm in climate change mitigation technology," says Cohen, the L.E. Simmons Professor of Business Administration at Harvard Business School. "This is technology that's going to help us to abate these issues around energy and climate, and it's the best technology in that space."

MORE RESEARCH NEEDED: INNOVATION

- I mention the word Innovation in the climate context every time I am in Europe
- Getting the financing right matters
- Ashby Monk on innovation finance for climate
- Laura Esserman I-SPY cancer trials
- Venture Debt
  - Davis, Morse, and Wang paper, among others
  - Mechanism to use equity-supporting funding in public-private partnerships with good incentive and additionality properties

MORE RESEARCH NEEDED: COMMUNITIES

- FLEC Report: "How Climate Challenges American Household Finances"
  - Verticals: Employment & income , essential expenses, home equity, housing expenses, housing availability, insurance, financial assets, liquidity & cash, proprietor income ~ small business and farm income
  - 24 agencies of US government
- In doing this, very aware of breadth of exposure of economy as a whole to systematic risk coming from communities

THANKS

A lot more to do.

Thanks for your time. As always, it is an honor to be part of this EC event.