Hedging climate risks through funding climate solutions

Galina Hale, University of California Santa Cruz, NBER, CEPR

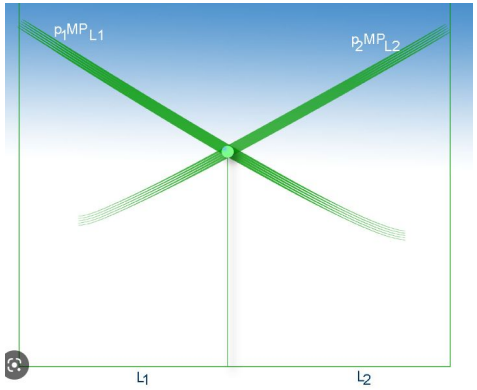
Remarks prepared for the 2023 NGFS conference

Modifying macro models

For climate stress testing and policy analysis

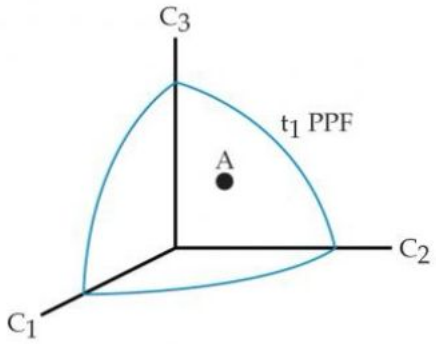
Modifying macroeconomic climate transition models

- Current mainstream set-up:
  - Two sectors: brown and green
  - Green defined as “not brown”
  - Green has 0 beta with respect to carbon tax
  - Implication: carbon tax reduces total investment and therefore growth
  - No room for hedging risks or investment in climate solutions



Modifying macroeconomic climate transition models

- More appropriate set-up
  - Three sectors: brown, neutral and green
  - Green defined as climate solutions
  - Green has negative beta with respect to carbon tax
  - Implication: carbon tax moves investment from brown to green, overall growth effect could be positive if (e.g.) green industry has IRS
  - Financial institutions can hedge transition risk through exposure to green and not just divestment from brown: *implemented as carbon credits*
  - Climate solutions are funded privately



Modifying macroeconomic models with **physical climate risk**

- Add hedging opportunities
  - Physical risks are generally non-diversifiable
  - Physical risks can be reduced for a given amount of GHG concentration through investment in adaptation
  - Financial institutions can hedge physical risk through exposure to adaptation projects
  - Climate solutions are funded privately
  - *Need adaptation credits analogous to carbon credits*

Modifying macroeconomic models : adding agricultural/food sector

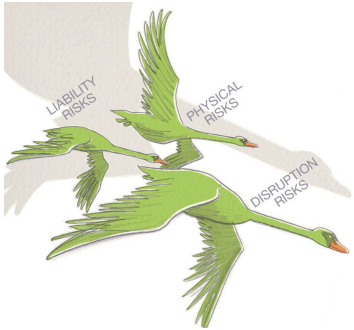
- Global food supply chains are a major factor in deforestation
- Ag sector is the most vulnerable to climate risks
- Major adaptation in terms of ag production composition will have to happen to mitigate food sector emissions and reduce food supply fragility
- Most macro models do not include ag/food sector
- There is small literature on integrating agriculture in IAM framework

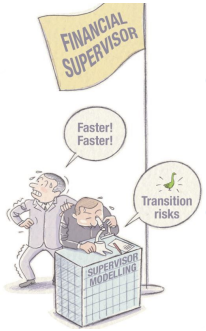
Role of central banks

Measure and incentivize investment in climate solutions

Definition, measure, enforcement

- 6 trillion annual investment into climate solutions is not feasible without private financial market
- Private sector needs incentives regulators can provide
  - Coordinated definitions of “green” activities (e.g. EU Taxonomy) **globally**, not forgetting food industry
  - Reporting requirements for exposure to transition and physical risks and **related hedging activities**
  - Active **rapid progress** on addressing “greenwashing” before scepticism fully sets in
  - Incentivize smaller local banks to invest in **adaptation investment projects** (e.g. US CRA)



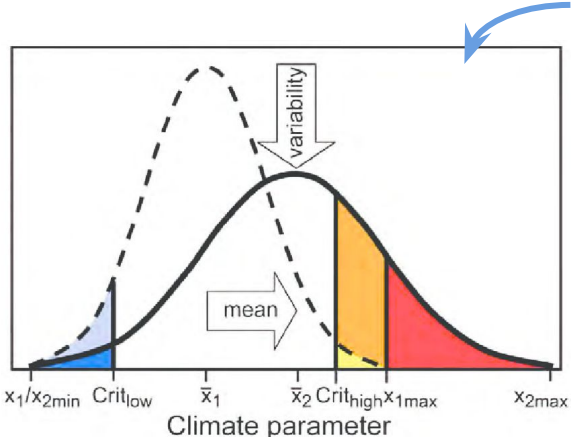


Limits to economic models of climate events

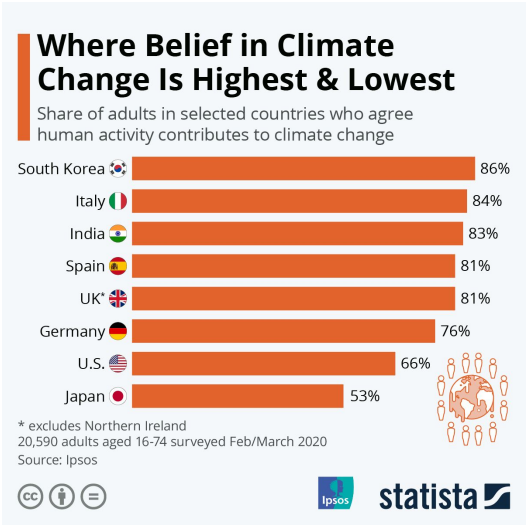
No limits but complexities and uncertainties that may limit model usability and tractability

Fundamental uncertainty

- Double CO2 concentration => warming [2 - 4.5] C - that's a wide range!
- Global temperature rise leads to fatter tails in local temperatures and precipitation
- "Optimal" policy or path are not well defined -> "Robust" policy is a more reasonable approach



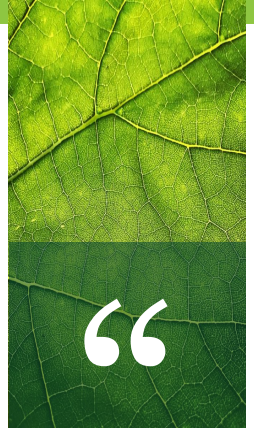
Behavioral uncertainty



- Beliefs about climate risks are not uniform
  - Across financial markets/asset classes
  - Across geographies
  - Across cultural/political backgrounds
- Beliefs about climate risks are not well documented
- Beliefs about climate risks are evolving
- Almost no macro models incorporate belief formation: unknown implications

Technological uncertainty

- Important source of transition risk - may rapidly lead to stranded assets
- Innovation can be manifested as major non-linearities and structural changes
- Very high degree of uncertainty in terms of sector, timing, impact



Summary

- Model climate solutions explicitly
- Climate solutions are a hedge for both types of climate risk
- Need adaptation credits
- Still need definition-disclosure-enforcement
- Uncertainty modeling vs. tractability in macro models