EGU24-12339, updated on 20 May 2024
https://doi.org/10.5194/egusphere-egu24-12339
EGU General Assembly 2024

Physical climate risk, sovereign credit ratings, and the benefits of adaptation

Mark Bernhofen, Matt Burke, Nicola Ranger, and Gireesh Shrimali
University of Oxford, School of Geography and the Environment, Oxford, United Kingdom of Great Britain – England, Scotland, Wales (mark.bernhofen@smithschool.ox.ac.uk)

Climate change is a risk to the financial stability of countries. The economic impacts of rising temperatures, increasingly frequent and intense extreme events, as well as the costs of adapting to these risks have the potential to significantly strain government (sovereign) finances. Perceived national climate risk hotspots may also discourage investment, reduce economic growth, and increase global inequality. To gauge sovereign financial risk, investors rely on sovereign credit ratings that assess a nation's ability to repay its debt. A country's credit rating determines its borrowing costs, influences investor confidence, and has impacts on economic stability and growth.

Recent estimates show that climate-induced sovereign credit downgrades could materialize for nearly 60 countries by 2030 (Klusak et al, 2023) because of the labour productivity impacts of increasing temperatures (Kahn et al, 2021). These sovereign climate risk estimates are severe, yet likely still an underestimate, as they do not consider the materialization of extreme events (acute climate risk) (Stern, 2016).

In this study, we provide new estimates of climate-induced sovereign credit downgrades by combining the sovereign climate risk model developed by Klusak et al. (2023) with models of acute climate risk. We focus on countries in south-east Asia and calculate the extreme losses from river floods and tropical cyclones under different future warming scenarios and the implications for sovereign credit risk. We also explore different options to adapt to these risks nationally, their associated costs, and model the risk reduction benefits of their implementation.

There is a failure to integrate extreme climate risk into economic and financial assessments (Stern et al, 2022). Many of these risks are underestimated in the current financial assessment of climate change (Trust et al, 2023) and may support more credible assessments of short-term risk. Our findings add to the growing body of work highlighting the importance of considering acute climate risk in estimates of climate financial risk (Pittman et al, 2022). We also show that adaptation can significantly reduce future losses and resultant sovereign credit risk, which serves as evidence against divestment from risk-prone countries and for investment in adaptation. We conclude by exploring the fiscal policy implications of our analysis for Thailand.

Kahn, M. E., Mohaddes, K., Ng, R. N., Pesaran, M. H., Raissi, M., & Yang, J. C. (2021). Long-term macroeconomic effects of climate change: A cross-country analysis. *Energy Economics*

Klusak, P., Agarwala, M., Burke, M., Kraemer, M., Mohaddes, K. (2023). Rising Temperatures, Falling Ratings: The Effect of Climate Change on Sovereign Creditworthiness. *Management Science*.

Pitman, AJ., Fiedler, T., Ranger, N., Jakob, C., Ridder, N., Perkins-Kirpatrick, S., Wood, N., Abramowitz G. (2022). Acute climate risks in the financial system: examining the utility of climate model projections. *Environmental Research: Climate*.

Stern, N. (2016). Economics: Current climate models are grossly misleading. *Nature*

Stern, N., Stiglitz, J., & Taylor, C. (2022). The economics of immense risk, urgent action and radical change: towards new approaches to the economics of climate change. *Journal of Economic Methodology*

Trust, S., Joshi, S., Lenton, T., Oliver, J. (2023). The Emperor's New Climate Scenarios. Institute and Faculty of Actuaries and University of Exeter.