

## Pricing climate-related risks into sovereign bonds

July 2023

*The physical and transition risks posed by climate change are slowly being incorporated in asset prices, albeit to varying degrees. Even as the uncertainty and non-linearities associated with climate phenomena preclude a complete mapping of these risks into prices of financial assets, there is widespread consensus that even a partial incorporation of climate risks can play a vital role in informing investors and asset holders about the magnitude of these risks. This can in turn facilitate a smooth transition towards net-zero by driving finance away from high-carbon assets and into low-carbon ones. Given the significance of sovereign bonds both as an important asset class held by investors and as an important tool for governments to raise public financing for climate mitigation goals, the cost at which this financing is available is of paramount importance for countries in enhancing their climate preparedness. Several recent papers have sought to examine the extent to which markets and investors are incorporating climate-related risks into bond prices, thereby affecting the cost of accessing public finance for sovereigns.*

**Ruijie Cheng et al.** (2023), in “[Do green financial policies offset the climate transition risk penalty imposed on long-term sovereign bond yields?](#)”, find that the yields on long-term sovereign bonds issued by countries which are more exposed to transition risks, captured by higher CO<sub>2</sub> emissions and a lower sustainable development score, are systematically higher than faced by those countries which are confronted with lower transition risks. Moreover, they report that the green financial and regulatory policies imposed by central banks and financial supervisors in these countries to mitigate climate-related financial risks appears to offset this climate transition risk premium, suggesting a positive/consequential role for financial policies in reducing the cost of sovereign financing for countries.

**Hannes Boehm**(2022), in “[Physical climate change and the sovereign risk of emerg-](#)

Curated by:

**Bhavya Gupta**  
(National University of Singapore)  
and **Ramkishan S. Rajan**  
(National University of Singapore)

ing economies”, assesses the impact of rising temperatures on the sovereign bond performance of 54 emerging economies. Using monthly data on the long-term temperature deviations of countries from 1994 to 2018, he finds that greater temperature anomalies are consistently associated with higher sovereign risk, suggesting that warmer countries are confronted with higher sovereign borrowing costs in a continuously warming world. However, he also finds an offsetting role of institutional strength – proxied by the rule of law, corruption, democratic strength, and sector-specific adaptive capacity to cope with climate risks – in lowering the marginal effect of physical risks on sovereign creditworthiness.

**John Beirne et al.** (2021), in “Feeling the heat: Climate risks and the cost of sovereign borrowing”, empirically examine the impact of climate vulnerability and climate resilience on bond yields for 40 advanced and emerging economies using quarterly data from 2002 to 2018. They deploy a two-way fixed effects estimation strategy complemented with structural VAR models (to simulate climate shocks and model impulse response functions on bond yields) to demonstrate that highly climate vulnerable countries are associated with higher sovereign bond yields, whereas the effect runs in the opposite direction for greater climate resilience. More significantly, their findings suggest that the direct positive effect of climate vulnerability is larger than the offsetting negative effect of climate resilience on bond yields, thereby leading to an overall higher cost of financing for these countries.

**Iustina Alina Boitan and Kamilla Marchewka-Bartkowiak** (2022), in “Climate Change and the Pricing of Sovereign Debt: Insights from European Markets”, focus on EU countries’ sovereign bonds and how they are impacted by an augmented set of five climate change proxies. They find that from 2000-2020, European countries which are confronted with higher physical risks tend to face a higher risk premium on their sovereign debt vis-à-vis others. Their novel contribution arises from their use of a composite five-indicator proxy to measure climate change. They use exposure to extreme-weather events and vulnerability to climate change to proxy for physical risks, whereas climate mitigation capabilities are proxied by their readiness to respond to climate risks, climate-related policies, and climate liabilities based on a country’s CO<sub>2</sub> emissions and its ensuing carbon costs.

**Michael Donadelli et al.** (2019), in “Understanding Macro and Asset Price Dynamics During the Climate Transition”, develop a macro asset pricing model for the climate transition based on increasing levels of a carbon tax imposed to match the socially optimal cost of carbon. They then calculate – what they refer to as – the climate policy risk premia imposed on the clean and dirty sectors as a result of climate regulatory shocks and find this premium to be negative for fossil fuel firms.



---

© E-axes Forum, Inc. All rights reserved.

The E-axes Forum is an independent nonprofit, nonpartisan research organization on macroeconomic policies and sustainability. The Forum is dedicated to aggregating knowledge from around the globe with the aim to catalyze the engagement of economists and decision makers who are working on policies towards achieving a sustainable economy.

[www.e-axes.org](http://www.e-axes.org)  
228 Park Ave S., PMB 35845, New York, NY 10003