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Curator: Paul Niehaus

Question: How should central banks conduct stress tests of the financial system, taking climate change into account?

Stress-tests have become an important regulatory instrument in the wake of the 2007-2009 financial crisis, often being used to determine the reserve capital requirements imposed on banks (see for example the Federal Reserve Bank's [policy](#)). Because the prospect of climate change raises large new uncertainties about the future course of policy and the economy, how to incorporate this uncertainty into stress-testing exercises has become a live policy issue. It is also a broad question and, as we discuss below, much of the debate in the nascent literature has been about exactly which risks or contingencies to model.

Current state of knowledge (as of 16 August 2024): This is an active area of work, with recent contributions co-authored by (for example) staff at the the Federal Reserve Bank ([Hyeyoon, Engle and Berner, 2021](#)) and the International Monetary Fund ([Grippa and Mann, 2021](#)). [Cartellier \(2022\)](#) and [Reinders, Schoenmaker and van Dijk \(2023b\)](#) provide recent critical reviews; Cartellier also identifies a number of pilot stress-testing exercises that have been conducted by central banks themselves (but which, she says, have not yet been used as a basis for imposing new capital requirements on banks).

Cartellier argues that most existing work under-estimates how bad worst-case scenarios would be. Specifically, she argues that the predominant approach of testing against six scenarios developed and published by the Network of Central Banks and Supervisors for Greening the Financial System (NGFS) is inadequate because these scenarios are relatively long-term, and may miss risks that could arise during the transition to the long-term. She also argues for modeling climate policies and technology changes (i.e. “transition risks,” as opposed to direct “physical risks”) themselves as random, and for modeling the impact of asset allocation choices in the financial sector on the structure of the real economy.

Reinders, Schoenmaker and van Dijk classify existing work along two dimensions—the type(s) of shock considered, and the modeling approach used to predict the consequences of those shocks—and then critique it. They argue in particular (see Table 3) for

- (a) Including more comprehensive lists of possible shocks in the analysis. They emphasize in particular (i) “green swan” shocks, defined as “a sudden change in understanding of economic fundamentals” e.g. because the environment reaches a tipping point or new research suddenly changes expectations about the consequences of climate change, and (ii) “Minsky-type” shocks resulting from mispricing, “a disconnect between economic fundamentals and financial asset values that is suddenly corrected.”
- (b) A more granular approach to modeling the impact of shocks, e.g. as sector- and location-specific;
- (c) Models with richer feedback loops, e.g. effects of the financial sector on the real economy; and
- (d) Models that are more comprehensive in terms of “asset classes (e.g., loans, bonds, and equity)... relevant risk channels (e.g., changes in risk-free interest rates and/or risk premiums), and ... relevant financial institutions (e.g., banks, insurers, pension funds).” Here they say that the availability of data and sufficiently comprehensive models have been the constraints.

We have seen little work on low- and middle-income countries specifically, and it seems likely that the relevant risk and issues there will be different. The banking systems of developing countries are arguably less equipped to deal with climate-related risks, and the industrial mix may be quite different. For example, [Hyeyoon, Engle and Berner \(2021\)](#) and [Grippa and Mann \(2021\)](#) focus mainly on the effects of relatively sudden shocks such as regulatory changes, oil price shocks, or carbon price shocks on oil- and gas-related industries. This is useful for assessing risks in countries with a high concentration of credit in those specific industries, but may be less relevant to other industries facing more gradual transitions to climate change.

Decision relevance: Insights on this topic could change decisions made by central banks about the capital requirements they impose on banks, and the controls and regulations they impose on the financial sector more generally.

Timeline: n/a

Ideas & resources: n/a.