

Federal Reserve Bank of New York researchers publish stress test model for climate transition risk



Researchers find that climate change poses a significant risk to US financial institutions.

On September 24, 2021, several researchers affiliated with the Federal Bank Bank of New York (NY Fed), including the winner of the 2003 Nobel Prize in Economics¹, issued a staff report on a proposed stress testing model to test the resilience of large financial institutions to climate-related risks.² This is the first time a US regulator has published quantitative metrics to assess the systemic risk from climate change.

The NY Fed report provides insight into the current risk the financial system is facing from transition risk. The research could be an important step to inform thinking on a formal approach to addressing climate-related risks in the US financial sector, potentially placing US regulators on a path with their global counterparts,³ whose existing policies and procedures are being re-imagined to accelerate a transition to a sustainable, low-carbon economy.

Importantly, the NY Fed study indicates that climate change poses a significant risk to US financial institutions. This finding, along with actions taken by other global regulatory bodies, could help to accelerate the US regulatory response to address climate risks. In the next few years, global banks are likely to conduct these types of tests, either as required ultimately by the Federal Reserve Board (FRB) or proactively themselves.

Chairman Powell's and FRB Governor Brainard's recent comments indicate that the FRB is building a program around climate scenario analysis—and not yet stress testing—while the NY Fed research outlines a potential stress test model.

In a recent hearing before the House Financial Services Committee, FRB Chair Jerome Powell discussed scenario analysis, stress testing, and other tools that the Federal Reserve System has available to assess climate-related financial risks. Powell said the FRB's role "is to make sure that the financial institutions the Fed regulates and supervises can understand and manage their

risks, including the financial risks from climate change.”⁴ He continued, “scenario analysis is almost certainly going to be one of the principal tools for [assessing bank resiliency to the risks from climate change].” Additionally, FRB Governor Lael Brainard recently said that scenario analysis is emerging as “a potential key analytical tool” for considering the potential implications of climate-related risks, and she expects that supervisory guidance will be needed for financial institutions.⁵

Powell and Brainard’s recent comments indicate that the FRB is building a program around climate scenario analysis—not yet stress testing—while the NY Fed research outlines a potential stress test model. Moreover, the FRB is in its early days of developing climate-related scenarios to help financial institutions understand what their climate risks will be, how they will develop over time, and their primary transmission channels.⁶ While the impact of any scenario analysis is unclear from a supervisory standpoint, stress tests pose consequences for firms, including their capital distributions.

The climate stress test model in the report finds that while the impacts on individual banks varied, they were highly correlated, suggesting material risks are particularly concentrated in the energy sector.

The NY Fed study focused on the transition risks to a low-carbon economy rather than the physical risks from climate change.⁷ The researchers laid out a procedure to identify assets within a bank’s portfolio that are vulnerable to climate-related risks. The procedure then calculates the expected capital shortfall resulting from a stress event. The researchers applied this stress testing procedure to study the climate-related risk exposure of 27 large global banks, which account for 80% of loans to oil and gas firms worldwide, using the scenario of a collapse of fossil fuel prices in 2020. The authors found that while the impacts on individual banks varied, they were highly correlated.⁸ This finding suggests there are material risks particularly concentrated in the energy sector.

The research findings have no immediate policy or regulatory implications. It is also important to note that the NY Fed study did not tie in the Network for Greening the Financial System (NGFS) science-based scenarios.⁹ That body of work in the international climate risk space extensively looked at how the myriad of transition and climate-related scenarios present in different forms of regulatory guidance are coordinated. Still, the NY Fed’s research is an important step in the growing momentum by US financial regulators to incorporate climate risks into their regulatory and supervisory practices.¹⁰

Key insights and takeaways from the NY Fed’s research paper

The NY Fed’s climate-related stress testing research exercise was a multi-month project led by researchers affiliated with the NY Fed to assess climate stress from a risk perspective. However, it is important to note that the NY Fed’s approach is

not necessarily reflective of what the FRB’s or other financial regulator’s approach might be.

NY Fed’s approach shares similarities and critical differences with the ECB’s climate stress test effort.

In some ways the report is analogous to the European Central Bank (ECB) climate stress tests¹¹ with the ECB-led effort in 2021, followed by bank-led supervisory tests in 2022. Both the ECB and the FRB (on behalf of the Reserve Banks) are members of the NGFS, an international group exploring ways to build climate risk into bank management, supervision, and regulation.¹² The ECB and the NY Fed performed in-house stress tests to better understand the potential risks to financial institutions, the financial system, and the broader economy before introducing more formal regulation (ECB in 2021-22; FRB is to be determined). Both NY Fed and ECB consider similar macroeconomic factors such as energy prices and exchange-traded funds (ETFs) as a proxy for carbon-intensive sectors. Both central banks’ approaches are focused on evaluating the impact of financial risks that emanate from climate change and are conditional on the effective and timely transition to a sustainable, low-carbon economy.

However, the climate stress testing methodology the NY Fed developed is for transition risks; and it does not include physical risk like in the ECB stress test, which covers both physical and transition risks (and their interactions). Additionally, the ECB stress scenario considers carbon taxes, oil price shocks, and the frequency and magnitude of natural catastrophes. In contrast, the NY Fed stress scenario considers a 50% drop in the return on a stranded asset portfolio (e.g., 27 large global banks, whose aggregate oil and gas loan market share exceeds 80%) over six months.¹³

Despite the variety of methodologies and approaches used by the ECB and NY Fed, there is a clear movement toward the convergence of common reporting standards. The impact of climate-related shocks on the financial sector is frequently reported as an increase in credit and market risks for banks (e.g., impact on the probability of default (PD), loss given default (LGD), risk-weighted assets (RWAs), revaluation of the trading book, or capital shortfalls), or a revaluation of equity and corporate bond holdings for insurance companies and investment funds.

NY Fed introduces a systemic climate risk measure (CRISK) to identify the expected capital shortfall.

The NY Fed introduced a measure called CRISK (systemic climate risk), which is the expected capital shortfall of a financial institution in a climate stress scenario.¹⁴ CRISK could potentially serve as an indicator for a climate-related capital charge in the future. Per the research conducted, the measured CRISKS for some of the banks were found to be economically substantial.¹⁵ Since CRISK is a capital metric, it

could perhaps lend credibility and legitimacy to the idea of a climate-specific capital charge more formally down the road.

The early stages of climate risk implementation are unlikely to produce any legally binding capital requirements. Some experience with a climate stress test (for example, quantitative impact studies) and public consultation will likely be required before binding requirements are implemented. Based on that experience, it will be decided whether capital requirements are an appropriate tool for managing climate-related risk. Currently, the lack of historical experience with climate risks, and complexity of climate risk measures limits the usability of the capital requirement as an appropriate tool.

NY Fed's methodology assesses the statistical relationship between banks and their stranded assets portfolio returns.

The NY Fed's methodology is fairly high level, though, and more detailed approaches may be expected in future exercises as material risks are particularly concentrated in the energy sector. Stranded asset portfolio returns are used as a proxy to measure the transition risks from climate change. The portfolio comprises assets such as coal, oil, and natural gas, which would become less valuable in the scenario and would reduce the valuation of the companies holding these assets as economies transition to a lower-carbon economy, thus providing a conservative capital charge.¹⁶

The methodology uses a simplistic top-down approach by assessing the statistical relationship between the banks and the stranded assets portfolio returns. There is a positive relationship observed between banks' climate beta (e.g., its sensitivity towards transition risk) and their exposure to oil and gas loans. However, as the climate beta estimates move closer to zero, it could indicate a non-linearity in climate beta as a function of return on a stranded asset portfolio. Thus, the values of bank stocks are expected to be relatively insensitive to fluctuations in the stock prices of oil and gas firms if they are sufficiently far from default.¹⁷

The stress scenario applied in the NY Fed approach is based on a simplifying assumption of a 50% drop in the return on stranded asset portfolio over six months as opposed to the NGFS scenarios,¹⁸ which—as noted—includes both physical and transition risks. NGFS explores a set of science-based scenarios¹⁹ such as orderly scenarios (e.g., gradual tightening of climate policies), disorderly scenarios (e.g., higher transition risk), and hot house world scenarios (e.g., insufficient global efforts).²⁰

The NGFS scenarios highlight important metrics, including rapid decarbonization of the electricity sector, increasing electrification, more efficient uses of resources, and introductions of new technologies to tackle remaining hard-to-abate emissions.²¹ A more rigorous climate stress test or scenario analysis approach in the future for the NY Fed would likely use NGFS science-based scenarios as a basis.

Future NY Fed stress test models may be enhanced to measure climate-related physical risks.

The NY Fed report notes several enhancements to potential future studies, such as including physical risks into the methodology, incorporating loan-level data and cross-sectoral analysis, and using alternate approaches (e.g., historical changes in the climate-related policies across countries). These enhancements would also help inform the aggregation of bank-level CRISK to country-level CRISK.

The proposed framework allows banks and financial institutions to understand their expected capital shortfall in a climate stress scenario. But it is also important to note that this is an opportunity to improve resiliency so that institutions are flexible enough to handle worst-case climate stress scenarios.

What's Next?

In response to the White House's executive order on climate-related financial risks from May 2021²², members of the Financial Stability Oversight Council (FSOC), including the FRB, are expected to issue a report by late October or early November 2021 on how they intend to incorporate these risks in their regulatory and supervisory practices.²³

NY Fed researchers are responding to observed changes in the marketplace as they continue to keep pace with innovation, including experimenting with how applications of climate-related data could be deployed to carry out their supervisory missions and improve reporting efficiencies. This type of rulemaking can take significant time, and the climate-stress testing research process may continue to remain high-level, with more granular details developing over the next two to three years.

Bridging the gap between real-time data reporting, liquidity analysis, and risk management will be essential for how financial institutions and their regulators operate together, both in times of crises and beyond.



Additional Deloitte perspective on climate risks

For additional insight, please see our ongoing series on how climate risks are shaping US financial regulatory initiatives and the impact these developments may have on the financial services industry and the broader economy:

- [***Deloitte US: "Creating a climate of change digest" – A closer look at the regulatory trends shaping the management of climate change risks in financial services in the US, now and in the coming decade***](#)

Endnotes

1. The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2003 [was awarded to Robert F. Engle III](#), assessed on September 24, 2021.
2. Federal Reserve Bank of New York (New York Fed), "[Staff Report: Climate Stress Testing](#)," assessed on September 24, 2021.
3. Financial regulators and central banks like the European Central Bank (ECB), the Bank of England, the Bank of Japan, among others, are actively working to repurpose instruments like stress tests, living wills, and risk-based capital standards all within their existing mandates.
4. House Financial Services Committee (HFSC), "[Oversight of the Treasury Department's and Federal Reserve's Pandemic Response](#)," accessed on September 30, 2021.
5. FRB Governor Brainard, "[Building Climate Scenario Analysis on the Foundations of Economic Research](#)," October 7, 2021, accessed on October 7, 2021.
6. Federal Reserve Bank of San Francisco (FRBSF), "[FRBSF Economic Letter: Climate Change Is a Source of Financial Risk](#)," accessed on September 30, 2021.
7. New York Fed, "[Staff Report: Climate Stress Testing](#)," assessed on September 24, 2021.
8. The New York Fed studied the climate risks of large global banks in the US, UK, Canada, Japan, and France in the collapse in fossil fuel prices in 2020.
9. Network for Greening the Financial System (NGFS), "[Guide for Supervisors: Integrating climate-related and environmental risks into prudential supervision](#)," May 2020, assessed on September 24, 2021.
10. For more information on US regulatory developments and their implications, please see Deloitte's monthly newsletter, "[Creating a climate of change digest](#)."
11. ECB, "[Climate-related risk and financial stability](#)," July 2021.
12. NGFS, "[Membership](#)," assessed on September 24, 2021.
13. New York Fed, "[Staff Report: Climate Stress Testing](#)," assessed on September 24, 2021.
14. Ibid.
15. Ibid.
16. Ibid.
17. Ibid.
18. Network for Greening the Financial System (NGFS), "[Guide to climate scenario analysis for central banks and supervisors](#)," June 2020
19. These scenarios are deemed "science-based" as they align to the temperature forecasts including the < 2-degree Paris Agreement.
20. Ibid.
21. Ibid.
22. The White House, "[Executive Order on Climate-Related Financial Risks](#)," May 20, 2021, assessed on September 24, 2021.
23. HFSC, "[Oversight of the Treasury Department's and Federal Reserve's Pandemic Response](#)," accessed on September 30, 2021

Contacts

Ricardo Martinez

Principal | Deloitte Risk & Financial Advisory
Deloitte & Touche LLP
rimartinez@deloitte.com

Corey Goldblum

Principal | Deloitte Risk & Financial Advisory
Deloitte & Touche LLP
cgoldblum@deloitte.com

Simon Fisher

Partner | Deloitte Risk & Financial Advisory
Deloitte & Touche LLP
sifisher@deloitte.com

Michael Monaco

Senior manager | Deloitte Risk & Financial Advisory
Deloitte & Touche LLP
mimonaco@deloitte.com

Marla Pourrabbani

Senior manager | Climate Data Scientist
Deloitte & Touche LLP
mpourrabbani@deloitte.com

Austin Tuell

Manager | Sustainability & ESG
Deloitte & Touche LLP
atuell@deloitte.com

Ken Lamar

Independent Senior Advisor to Deloitte & Touche LLP

Tracy Basinger

Independent Senior Advisor to Deloitte & Touche LLP

Deloitte Center for Regulatory Strategy

Irena Gecas-McCarthy

FSI director, Deloitte Center for Regulatory Strategy, Americas
Principal | Deloitte Risk & Financial Advisory
Deloitte & Touche LLP
igecasmccarthy@deloitte.com



This publication contains general information only and Deloitte is not, by means of this publication, rendering accounting, business, financial, investment, legal, tax, or other professional advice or services. This publication is not a substitute for such professional advice or services, nor should it be used as a basis for any decision or action that may affect your business. Before making any decision or taking any action that may affect your business, you should consult a qualified professional adviser. Deloitte shall not be responsible for any loss sustained by any person who relies on this publication.

About Deloitte

Deloitte refers to one or more of Deloitte Touche Tohmatsu Limited, a UK private company limited by guarantee ("DTTL"), its network of member firms, and their related entities. DTTL and each of its member firms are legally separate and independent entities. DTTL (also referred to as "Deloitte Global") does not provide services to clients. In the United States, Deloitte refers to one or more of the US member firms of DTTL, their related entities that operate using the "Deloitte" name in the United States, and their respective affiliates. Certain services may not be available to attest clients under the rules and regulations of public accounting. Please see www.deloitte.com/about to learn more about our global network of member firms.

Copyright © 2021 Deloitte Development LLC. All rights reserved.