

Central Banks and Climate Change

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Central banks are increasingly called upon to address climate change. Proposals for central bank action on climate change range from programs of “green” quantitative easing to increases in risk-based capital requirements meant to deter banks from lending to climate-unfriendly business. Politicians and academics alike have urged climate risk as both macroeconomic and financial stability risk. Relative to counterparts abroad, the U.S. central bank—the Federal Reserve—has been more measured in its response.

This Article offers a legal explanation why. It urges that, despite the substantive importance of climate change, the U.S. Federal Reserve presently has relatively limited legal authority to address that problem head-on. Drawing on insights from corporate finance and macroeconomics, the Article constructs a legal framework—stitching together a variety of Fed laws, regulations, and precedents of practice—to discern why many aspects of climate change sit outside the Fed’s legal remit today.

Ultimately, the Article tackles one of the most pressing rule-of-law questions facing the Fed today: What are the limits of the Fed’s mandates to address climate change and how far can the Fed press beyond those mandates to make the economy greener? In doing so, the Article prompts reflection on the ideal role of the Fed vis-à-vis the fiscal authority of the Treasury, the political actors in Congress, and the Chief Executive.

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INTRODUCTION

Climate change is widely perceived as one of the most pressing social and economic issues of the day. The potential macroeconomic impact of climate change has been drawn in particularly sharp relief. As the President of the Federal Reserve Bank of San Francisco stated, climate events “can destroy wealth, exacerbate existing income inequalities, and . . . displace people permanently.”¹ Still, not every economic problem falls within the purview of the central bank. This

1. Mary C. Daly, President & CEO, Fed. Rsrv. Bank of S.F., Speech at the Economics of Climate Change Conference: Why Climate Change Matters to Us 4 (Nov. 8, 2019), <https://www.frbsf.org/our-district/press/presidents-speeches/mary-c-daly/2019/november/why-climate-change-matters-to-us/> [https://perma.cc/N8EW-WUVA].

Article critically examines whether, and in what respects, the Federal Reserve (“Fed”) has the legal authority to address climate change.

To be sure, climate change is predicted to cause significant economic upheaval.² Some of the anticipated economic harms derive from the physical manifestations of climate change, such as heat waves, hurricanes, severe precipitation events, storm surges, and wildfires.³ While these kinds of physical risks result from short-term emergencies with a clear end point, in other cases the physical effects of climate change may progress gradually, as in the case of sea-level rise and ocean acidification.⁴

So-called transition risk, meanwhile, refers to economic disruption associated with regulatory and legal requirements that businesses reduce their use of fossil fuels.⁵ The concern is that these

2. See NETWORK FOR GREENING THE FIN. SYS., A CALL FOR ACTION: CLIMATE CHANGE AS A SOURCE OF FINANCIAL RISK 13–17 (Apr. 2019), https://www.ngfs.net/sites/default/files/medias/documents/ngfs_first_comprehensive_report_-_17042019_0.pdf [<https://perma.cc/Y9S7-PAG8>] [hereinafter NGFS REPORT]; Emanuele Campiglio, Yannis Dafermos, Pierre Monnin, Josh Ryan-Collins, Guido Schotten & Misa Tanaka, *Climate Change Challenges for Central Banks and Financial Regulators*, 8 NATURE CLIMATE CHANGE 462, 462 (2018).

3. These extreme weather events are increasing in both frequency and intensity. Iman Mallakpour & Gabriele Villarini, *The Changing Nature of Flooding Across the Central United States*, 5 NATURE CLIMATE CHANGE 250, 250–54 (2015) (noting the increasing nature of flooding events in the United States); Andreas F. Prein, Changhai Liu, Kyoko Ikeda, Stanley B. Trier, Roy M. Rasmussen, Greg J. Holland & Martyn P. Clark, *Increased Rainfall Volume from Future Convective Storms in the US*, 7 NATURE CLIMATE CHANGE 880, 880–84 (2017) (discussing increasing precipitation in storms in the United States); Katie K. Arkema, Greg Guannel, Gregory Verutes, Spencer A. Wood, Anne Guerry, Mary Ruckelshaus, Peter Kareiva, Martin Lacayo & Jessica M. Silver, *Coastal Habitats Shield People and Property from Sea-Level Rise and Storms*, 3 NATURE CLIMATE CHANGE 913, 913 (2013) (discussing projected increase in coastal flooding by 2100); Thomas R. Knutson, John L. McBride, Johnny Chan, Kerry Emanuel, Greg Holland, Chris Landsea, Isaac Held, James P. Kossin, A. K. Srivastava & Masato Sugi, *Tropical Cyclones and Climate Change*, 3 NATURE GEOSCIENCE 157, 160–61 (2010) (examining projected increases in hurricane intensity); Seung-Ki Min, Xuebin Zhang, Francis W. Ziers & Gabriele C. Hegerl, *Human Contribution to More-Intense Precipitation Extremes*, 470 NATURE 378, 378–80 (2011) (examining how rainfall events are becoming increasingly intense).

4. Lael Brainard, Member, Bd. of Governors of the Fed. Rsrv. Sys., Remarks at the Economics of Climate Change Conference: Why Climate Change Matters for Monetary Policy and Financial Stability (Nov. 8, 2019), <https://www.federalreserve.gov/newsevents/speech/files/brainard20191108a.pdf> [<https://perma.cc/4VET-C3XS>]; see also Sophie Quinton, *As Wildfire Risk Increases, Home Insurance Is Harder to Find*, PEW (Jan. 3, 2019), <https://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2019/01/03/as-wildfire-risk-increases-home-insurance-is-harder-to-find> [<https://perma.cc/NF6L-GLMV>].

5. Brainard, *supra* note 4; see also INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, SPECIAL REPORT: GLOBAL WARMING OF 1.5°C 323 (2018), https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_Low_Res.pdf [<https://perma.cc/6572-TSDN>] [hereinafter IPCC REPORT 2018] (noting that disruptive innovation can lead to assets, such as fossil fuels, being “stranded” and “unburnable”); NGFS REPORT, *supra* note 2, at 15; Campiglio et al., *supra* note 2, at 462.

kinds of future policy changes⁶ will reduce the value of assets associated with carbon-intensive sectors, such as oil, gas, and coal. Accordingly, should these transition policies come to pass, financial firms holding such assets (i.e., loans) on their balance sheets stand to suffer losses.⁷

Transition risks also imply new costs to businesses from adapting to a greener regime. The implementation of the Paris Climate Agreement illustrates that aspect of transition risk. The nations who are party to that Agreement have committed to “pursuing efforts” to limit temperature increases to below two degrees Celsius above preindustrial levels; and they aspire to a below-1.5 degrees goal.⁸ If policymakers were to pursue that more aggressive aim, they would have to enact legislation and regulation reducing global greenhouse gas emissions to net zero by around 2050.⁹ The magnitude of rules required to effect such substantial change would impact businesses across many sectors of the economy, such as transportation, energy production, and building and construction. Therefore, in regard to both physical and transition risk, there is considerable economic uncertainty.¹⁰

Politicians and the public have called on central banks to flex their tools and tackle climate change.¹¹ In the United States, some

6. See U.N. Framework Convention on Climate Change, Adoption of the Paris Agreement, art. 4, U.N. Doc. FCC/CP/2015/L.9/Rev.1 (Dec. 12, 2015); IPCC REPORT 2018, *supra* note 5, at 4–8.

7. Campiglio et al, *supra* note 2, at 462; see also Kyle Younker, *ESG Advent Leaves Coal Assets—and Investors—Stranded*, FORBES (Jan. 10, 2020), <https://www.forbes.com/sites/debtwire/2020/01/10/esg-advent-leaves-coal-assets—and-investors—stranded/#a07915a73764> [<https://perma.cc/PXW3-9UV8>]. Transition risk is not only implied from the actual adoption of new policies but also, possibly, from the expectation that policies will be adopted and resulting pressure from investors. See, e.g., Taylor Kuykendall, Ashleigh Cotting & Declan Harty, *Investment Giant BlackRock Marks a Major Milestone in Coal Divestment Movement*, S&P GLOB. MKT. INTEL. (Jan. 22, 2020), <https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/investment-giant-blackrock-marks-a-major-milestone-in-coal-divestment-movement-56669181> [<https://perma.cc/BUZ8-GD22>].

8. IPCC REPORT 2018, *supra* note 5, at 12. There are multiple potential pathways to achieve this net zero goal. See *id.* at 12–15. Reports have suggested that the 1.5-degree goal is essential to avoid the worst impacts of climate change. *Id.* at 4.

9. *Id.* at 12.

10. See *infra* notes 97, 108 and accompanying text.

11. See, e.g., Letter from Ceres to the Hon. Jerome H. Powell, Chairman, Bd. of Governors of the Fed. Rsrv. Sys. (July 21, 2020), <https://www.ceres.org/sites/default/files/Federal%20Regulators%20Letter.pdf> [<https://perma.cc/MF8V-F2F8>]; Simon Dikau & Ulrich Volz, *Central Bank Mandates, Sustainability Objectives and the Promotion of Green Finance* (SOAS Dep't of Econ., Univ. of London, Working Paper No. 232, 2020), <https://www.soas.ac.uk/economics/research/workingpapers/file145514.pdf> [<https://perma.cc/K39Y-4BU4>]; Patrick Honohan, *Should Monetary Policy Take Inequality and Climate Change Into Account?* (Peterson Inst. for Int'l Econ., Working Paper No. 19-18, 2019), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3478285 [<https://perma.cc/NB4H-JR2D>]; Paul Langley & John H. Morris, *Central Banks: Climate Governors of Last Resort?*, 52 ECON. &

Senators have asked the Fed to “prepare its supervised institutions for the risks associated with climate change.”¹² Treasury Secretary Janet Yellen has called for a “sprinting start” to addressing climate change which nods at a “whole of government” approach.¹³ Within the European Union (“EU”), the President of the European Central Bank (“ECB”), Christine Lagarde, has similarly been urged by her constituents to “act now on climate change” and “[w]ithout any further delay.”¹⁴ Governor of the Banque de France François Villeroy de Galhau appeared to endorse such sentiment in his September 2019 warning that global climate change could cause “stagflationary shock.”¹⁵

Several central bank leaders have responded favorably to this call to arms. Ms. Lagarde, at the forefront, confirmed that climate change is indeed “mission critical” for the ECB.¹⁶ Former Bank of England Governor Mark Carney was also front and center in the climate change debate. Under the leadership of Mr. Carney’s successor, Andrew J. Bailey, the Bank adopted the position that physical and transition risks “are relevant to [the Bank’s] mission to maintain monetary and financial stability.”¹⁷ With similar spirit, the President

SPACE 1471 (2020); Graham Steele, *Confronting the ‘Climate Lehman Moment’: The Case for Macroprudential Climate Regulation*, 30 CORNELL J.L. & PUB. POL’Y 109 (2020).

12. Letter from the Hon. Jerome H. Powell, Chairman, Bd. of Governors of the Fed. Rsrv. Sys., to the Hon. Brian Schatz, Sen., U.S. Senate (Apr. 18, 2019), <https://www.schatz.senate.gov/imo/media/doc/Chair%20Powell%20to%20Sen.%20Schatz%204.18.19.pdf> [https://perma.cc/5AHT-4JHJ].

13. Janet L. Yellen, Sec’y of the Treasury, U.S. Dep’t of the Treasury, Remarks at the Leaders Summit on Climate (Apr. 22, 2021), <https://home.treasury.gov/news/press-releases/jy0143> [https://perma.cc/M78N-99DW]; see also Fin. Stability Oversight Council, U.S. Dep’t of the Treasury, *First Principal Meeting* (Mar. 31, 2021), <https://treas.yorkcast.com/webcast/Play/a37bd8443e1a48589a66f08f3ab6b68c1d> [https://perma.cc/G78L-N78M]; ENV’T DEF. FUND, RECAPTURING U.S. LEADERSHIP ON CLIMATE (Mar. 2021), <https://www.edf.org/sites/default/files/documents/Recapturing%20U.S.%20Leadership%20on%20Climate.pdf> [https://perma.cc/V5A4-BMGC] (calling for a “whole-of-government effort”).

14. Open Letter to Christine Lagarde, President, Eur. Cent. Bank (Nov. 27, 2019), <http://www.positivemoney.eu/wp-content/uploads/2019/11/Open-Letter-to-Christine-Lagarde-on-climate-change.pdf> [https://perma.cc/G78L-N78M].

15. François Villeroy de Galhau, Governor, Banque de France, Keynote Address at the World Conference of Banking Institutes: The Role of Banking in a Sustainable Global Economy 6 (Sept. 17, 2019), https://www.banque-france.fr/sites/default/files/medias/documents/2019.09.17_wcbi_v7_cl.pdf [https://perma.cc/89EK-ZKLB]; see also François Villeroy de Galhau, Governor, Banque de France, Speech at the Banque de France: The Role of Central Banks in the Greening of the Economy (Feb. 11, 2021), <https://www.bis.org/review/r210211g.pdf> [https://perma.cc/GLJ2-WFYE].

16. Liz Alderman, *Lagarde Vows to Put Climate Change on the E.C.B.’s Agenda*, N.Y. TIMES (Sept. 4, 2019) (internal quotation marks omitted), <https://www.nytimes.com/2019/09/04/business/climate-change-ecb-lagarde.html> [https://perma.cc/P9XA-RKN8].

17. *Climate Change*, BANK OF ENG., <https://www.bankofengland.co.uk/climate-change> [https://perma.cc/YX3A-E8F7] (last visited Sept. 2, 2021).

of the Federal Reserve Bank of San Francisco has indicated that studying climate risk is “essential” to its mission of economic and financial stability.¹⁸

These central bankers are now taking action collectively at the global level.¹⁹ A group of eight central banks, including the Bank of England and Banque de France, formed the Network for Greening the Financial System (“NGFS”) in December 2017 as a voluntary organization devoted to examining what central banks can do to address climate change.²⁰ Membership has since grown to sixty-nine members and thirteen observers.²¹ In April 2019, the NGFS issued its first report, setting out physical and transition risks to financial stability, and offered six recommendations to be implemented to improve financial stability.²²

This desire to tackle climate change with central banking tools has been taken forward with a number of policy ideas and actions. Perhaps most aggressively, some central banks have deployed monetary policy tools—including their balance sheets—in an effort to

18. Daly, *supra* note 1, at 1. Jens Weidmann, Chair of the Board of Directors for the Bank of International Settlements, has also indicated that central banks “are being called upon to assume an active role in climate policy.” Jens Weidmann, Chair, Bd. of Dirs. of the Bank for Int’l Settlements, Remarks at the ILF Online-Conference, Green Banking and Green Central Banking: What Role Should Central Banks Play in Combating Climate Change? (Jan. 25, 2021), <https://www.bis.org/review/r210128a.pdf> [<https://perma.cc/LX79-DYDL>].

19. See, e.g., NETWORK FOR GREENING THE FIN. SYS., <https://www.ngfs.net/en/about-us/membership> (last visited July 16, 2021) [<https://perma.cc/8NZ3-AQJG>]; *About*, FIN. STABILITY BD. TASK FORCE ON CLIMATE-RELATED FIN. DISCLOSURES, <https://www.fsb-tcfd.org/about/> (last visited July 16, 2021) [<https://perma.cc/7BMQ-4DBC>]; Press Release, Fin. Stability. Bd., FSB Stocktake Considers Climate Risks and Financial Stability (July 22, 2020), <https://www.fsb.org/2020/07/fsb-stocktake-considers-climate-risks-and-financial-stability/> [<https://perma.cc/74D3-8Q89>].

20. *Origin and Purpose*, NETWORK FOR GREENING THE FIN. SYS., <https://www.ngfs.net/en/about-us/governance/origin-and-purpose> (last visited Sept. 14, 2021) [<https://perma.cc/8NZ3-AQJG>].

21. *Membership*, NETWORK FOR GREENING THE FIN. SYS., <https://www.ngfs.net/en/about-us/membership> (last visited Sept. 14, 2021) [<https://perma.cc/8W5D-DU56>].

22. NGFS REPORT, *supra* note 2. In June 2020, the NGFS issued additional reports and technical documents regarding climate change and monetary policy, scenario planning, and other subjects. *NGFS Climate Scenarios for Central Banks and Supervisors*, NETWORK FOR GREENING THE FIN. SYS. (June 2020), https://www.ngfs.net/sites/default/files/medias/documents/ngfs_climate_scenarios_final.pdf [<https://perma.cc/72KX-PKML>]; NETWORK FOR GREENING THE FIN. SYS., GUIDE TO CLIMATE SCENARIO ANALYSIS FOR CENTRAL BANKS AND SUPERVISORS (June 2020), https://www.ngfs.net/sites/default/files/medias/documents/ngfs_guide_scenario_analysis_final.pdf [<https://perma.cc/6QH8-W3VQ>]; NETWORK FOR GREENING THE FIN. SYS., CLIMATE CHANGE AND MONETARY POLICY: INITIAL TAKEAWAYS (June 2020) [hereinafter NGFS INITIAL TAKEAWAYS], https://www.ngfs.net/sites/default/files/medias/documents/climate_change_and_monetary_policy.pdf [<https://perma.cc/2K2G-29YR>]; NETWORK FOR GREENING THE FIN. SYS., THE MACROECONOMIC AND FINANCIAL STABILITY IMPACTS OF CLIMATE CHANGE: RESEARCH PRIORITIES (June 2020), https://www.ngfs.net/sites/default/files/medias/documents/ngfs_research_priorities_final.pdf [<https://perma.cc/9K7K-2GBF>].

achieve a greener world. As one example, the Swedish central bank offloaded from its balance sheet certain government bonds from the regions of Alberta, Canada, and Queensland, Australia due to high emissions in those areas.²³ Other versions of what is now called “green quantitative easing” have emerged: these policies encourage the central bank purchasing corporate bonds that have been designated “green.”²⁴ Relatedly, some central banks are considering whether to add green criteria in the determination of which types of collateral are eligible in exchange for central bank loans.²⁵

Others have suggested that regulation be used to provide incentives for banks to make their investments greener. Capital requirements have been a particular area of focus. Banks in the United States, and globally, are subject to a complex set of regulatory requirements regarding the minimum level of equity capital that must comprise their capital (i.e., funding) structure. Tweaking the capital charge associated with each of the bank’s assets could in theory provide incentives for greener investments or, on the flip side, disincentives for investment in climate-unfriendly assets.²⁶ Other regulatory proposals include setting higher margin requirements on securities or derivatives with climate or carbon exposure and directly capping the allowable amount of climate-change-related assets in a bank’s portfolio.²⁷

Finally, central bankers and central bank experts have put forward creative ideas about supervising banks for excessive climate risk-taking. As part of their job to ensure commercial banks are running safely, central banks routinely examine and assess these institutions along a number of dimensions. Incorporating climate change into a central bank’s supervisory role might involve, for example, an assessment of the bank’s risk management function as regards its

23. The Editorial Board, Opinion, *Bankers Aren’t Climate Scientists*, WALL ST. J. (Nov. 15, 2019), <https://www.wsj.com/articles/bankers-arent-climate-scientists-11573861841> [https://perma.cc/953Z-BMH2].

24. See, e.g., Campiglio et al., *supra* note 2; Benoît Cœuré, Member, Exec. Bd., Eur. Cent. Bank, Speech at Conference on Scaling Up Green Finance: Monetary Policy and Climate Change (Nov. 8, 2018), <https://www.bis.org/review/r181109f.pdf> [https://perma.cc/4NB6-XWSE].

25. See, e.g., sources cited *supra* note 24.

26. See GRAHAM STEELE, GREAT DEMOCRACY INITIATIVE, A REGULATORY GREEN LIGHT: HOW DODD-FRANK CAN ADDRESS WALL STREET’S ROLE IN THE CLIMATE CRISIS (Jan. 2020), https://greatdemocracyinitiative.org/wp-content/uploads/2020/01/Final_Greenlight_Steele.pdf [https://perma.cc/HD5N-FEZV]; Conny Olovsson, *Is Climate Change Relevant For Central Banks?*, SVERIGES RIKSBANK, ECON. COMMENTS., no. 13 (2018).

27. STEELE, *supra* note 26, at 18–19. For recent initiatives in this regard in the EU, see, for example, Commission Delegated Regulation 2021/59 of 14 Dec. 2020, art. 1, 2020 O.J. (L 127) 1 (EU) (appearing to give credit institutions and investment firms latitude to apply higher capital charges for certain “specialised lending exposure” which include those that include the “financ[ing] [of] the development or acquisition of . . . power plants, chemical processing plants, mines, transportation infrastructure, environment . . .”).

climate exposures; the efficacy of its environmental-social-governance (“ESG”) policies; and a view to whether a bank is adequately modeling scenarios where climate-related risks affect its balance sheet.²⁸

The Fed has been relatively more measured in its response. In 2019 testimony to Congress, Fed Chair Jerome Powell stated that while “climate change is an important issue,” it is “not principally for the Fed.”²⁹ To date, the Fed has committed to researching the risks that climate change might pose in ways relevant to the Fed, and has joined the NGFS, but has not yet agreed to more.³⁰ But against this rising tide of central bank activity, the Fed has been criticized for holding back on climate change by its foreign counterparts and academics alike.³¹ These commentators have suggested that the Fed is hamstrung by a pernicious political environment and beholden to carbon-hungry Wall Street.³² Yet it remains substantially unclear whether climate change is a policy problem that Congress has given the U.S. central bank the power to address.

This Article is the first to undertake a comprehensive and careful study of the Fed’s legal authority to address climate change. Specifically, the Article addresses three questions critical to the debate surrounding central banks and climate change:

28. See, e.g., Damian Carrington, *Firms Ignoring the Climate Crisis Will Go Bankrupt*, *Says Mark Carney*, *GUARDIAN* (Oct. 13, 2019, 7:00), <https://www.theguardian.com/environment/2019/oct/13/firms-ignoring-climate-crisis-bankrupt-mark-carney-bank-england-governor> [<https://perma.cc/67KN-6H7T>]; Brainard, *supra* note 4; STEELE, *supra* note 26; NGFS REPORT, *supra* note 2.

29. The Editorial Board, *supra* note 23 (internal quotation marks omitted).

30. The Fed joined the NGFS in December 2020 and established a new climate committee in January 2021. See Avery Ellfeldt, *‘Enormously Big Deal’: Fed Creates Climate Committee*, *E&E NEWS* (Jan. 26, 2021), <https://subscriber.politicopro.com/article/eenews/1063723523> [<https://perma.cc/AK4A-PC9T>]; Avery Ellfeldt, *Lawmakers Grill Fed Chair on Climate Change Risk*, *E&E NEWS* (Feb. 12, 2020), <https://www.eenews.net/climatewire/stories/1062326955> [<https://perma.cc/U4BZ-Q2B2>]; NETWORK FOR GREENING THE FIN. SYS., *supra* note 21.

31. Gregg Gelzinis & Graham Steele, *Climate Change Threatens the Stability of the Financial System*, *CTR. FOR AM. PROGRESS* (Nov. 21, 2019, 12:01 AM), <https://www.americanprogress.org/issues/economy/reports/2019/11/21/477190/climate-change-threatens-stability-financial-system/> [<https://perma.cc/MH5C-C22P>]; Adam Tooze, *Why Central Banks Need to Step Up on Global Warming*, *FOREIGN POLY* (July 20, 2019), <https://foreignpolicy.com/2019/07/20/why-central-banks-need-to-step-up-on-global-warming/> [<https://perma.cc/DB9G-ANVT>]; Robinson Meyer, *How Climate Change Could Trigger the Next Global Financial Crisis*, *ATLANTIC* (Aug. 1, 2019), <https://www.theatlantic.com/science/archive/2019/08/how-fed-could-fight-climate-change-adam-tooze/595084/> [<https://perma.cc/7PP3-H25S>].

32. Kate Aronoff, *The Federal Reserve Is Accelerating the Climate Crisis*, *NEW REPUBLIC* (May 1, 2020), <https://newrepublic.com/article/157555/federal-reserve-accelerating-climate-crisis> [<https://perma.cc/W672-5KEP>] (noting that the Fed has “indulg[ed] the fossil fuel industry with handouts” and arguing that, by doing so, “the Fed isn’t stabilizing a warming world . . . [i]t’s heating it”).

- *First*, does climate change create risks that enter the Fed’s policy domain?
- *Second*, to the extent that it does, does the law authorize the Fed to address climate change through its powers in regard to monetary policy; to regulate and supervise banks; or to research and convene?
- *Third*, what are the normative implications of climate-change intervention for the Fed’s relative power in the U.S. legal system, its legitimacy, and its credibility as the mainstay of economic and financial stability?

To answer these questions, the Article proceeds in three parts.

Part I provides the foundation for conceptualizing how climate change might enter a central bank’s agenda. The Fed is not empowered to address all matters of economic or social problems. The first question should be whether climate change can present the kind of problem that would trigger a lawful central bank response.

Accordingly, Part I analyzes whether climate change can present firm-level or financial stability risks. It first considers how climate change could create shocks that would in turn disrupt the financial system’s ability to provide critical services (like payments). Then, Part I considers how physical or transition risks might impact the balance sheets of financial institutions within the Fed’s supervisory and regulatory jurisdiction. It critically examines claims that climate change events could create a situation of “contagion”—thereby prompting instability. Part I then considers climate as a macroeconomic risk. In that analysis, Part I discusses how classic macroeconomic indicators, like inflation, gross domestic product (“GDP”), and employment could be affected by climate change.³³

Part II translates climate-related policy problems articulated in Part I into legal questions. It evaluates the spectrum of the Fed’s formal legal authority along which it could possibly address climate risk.

33. Throughout, Part I considers whether these kinds of financial stability and economic risks are possible as a result of climate change, including from severe weather events, gradual physical climate changes like sea-level rise, or the more uncertain and longer-term economic risks arising from the transition to a low-carbon economy. It also tracks the now consensus framework, set out by the Basel Committee on Banking Supervision, regarding the risk categories into which climate falls (credit and related market and liquidity risk, arising from physical and transition risks). See BASEL COMM. ON BANKING SUPERVISION, CLIMATE-RELATED RISK DRIVERS AND THEIR TRANSMISSION CHANNELS 10 (Apr. 2021), <https://www.bis.org/bcbps/publ/d517.htm> [<https://perma.cc/WZ7H-P2AU>]:

[T]here is broad agreement that while climate risks have distinctive elements, they can be reflected through the traditional financial risk categories Based on a review of a broad set of examples of how climate risk drivers can impact banks, this report has not found any evidence that would suggest an additional risk category needs to be developed to address banks’ climate risks.

Specifically, Part II considers the Fed's existing monetary policy tools, its regulatory framework, and its supervisory system. It also considers the role of the regional Reserve Banks in addressing climate risk using their "lender of last resort" ("LOLR") role, as well as from a research and educational perspective.

Parts I and II conclude that the Fed has its strongest legal footing in the firm-level supervision of asset quality and exposure and of operational risks arising from physical risk. The Fed would also have a solid legal basis for responding to an exogenous climate shock with its LOLR authority. On the other hand, the Fed currently lacks legal authority to engage its monetary policy tools in pursuit of "offensive" programs like "green quantitative easing." Nor would the use of regulation or supervision to deter certain kinds of "brown lending" sit well within the Fed's existing legal framework.³⁴ Part III concludes with some suggestions for how the Fed should take forward an initiative on climate risk, which squares with Fed law and the rule of law more broadly.³⁵ These prescriptions are made with an eye to preserving the appropriate balance of power between the Fed, the Executive, and Congress.

Overall, this Article provides a novel framework for discussing the Fed's role and responsibility toward climate change, informed by law and principles of U.S. governance and administration. And ultimately, it should prompt further thought by Congress as to whether the Fed is presently the most suitable institutional actor to address the risks of climate change—and, in turn, the implications that follow for the private sector and other financial regulators.³⁶

I. WHEN IS CLIMATE CHANGE A POLICY PROBLEM FOR THE FED?

The U.S. Congress tasks the Federal Reserve, like all government agencies, with addressing a specific and finite universe of policy problems. The Fed has two main lines of duty. For one, the Fed protects the broad economy against unstable prices and low employment.³⁷ Additionally, the Fed is the safekeeper of the financial

34. Many fields of positive law—including prudential regulation in banking—already have significant implications for firm behavior with respect to the environment and the climate. Sarah E. Light, *The Law of the Corporation as Environmental Law*, 71 STAN. L. REV. 137 (2019).

35. NGFS INITIAL TAKEAWAYS, *supra* note 22 (the NGFS likewise recommends further research on monetary policy, and recognizes significant risks if the Fed acts in the monetary arena in light of substantial uncertainties).

36. See Sarah E. Light & Christina Parajon Skinner, *Banks and Climate Governance*, 122 COLUM. L. REV. (forthcoming Oct. 2021) (on file with author) (examining the role of banks in channeling savings to finance a greener economy).

37. Federal Reserve Act § 2A, 12 U.S.C. § 225a.

system. In this latter role, the Fed is responsible for the safety and soundness of the large financial institutions it oversees.³⁸ It also, relatedly, has a role monitoring and maintaining the stability of the U.S. financial system as a whole. This Part considers whether climate change presents risks that implicate any of these roles—first considering the Fed’s job as regulator and supervisor of firms; then examining the Fed’s role as a monetary policy authority.

A. Climate and the Financial System

While the bank holding companies (“BHCs”) that the Fed oversees may take voluntary action to mitigate climate change,³⁹ the Fed’s authority to address climate risks in these institutions depends on a nexus between climate change and these firms’ resilience.⁴⁰

1. Climate Risk as Operational Risk

One way in which climate change could feasibly impact a firm’s resilience is by disrupting its physical operations. Generally, operational risks implicate banks’ physical infrastructure, assets, and employee behavior.⁴¹ Extreme weather events are a classic example of operational risk: heavy damage to bank property, diminished operating capacity, and associated reputational risk could all impact the value of a shareholder’s investment in a bank.⁴²

Indeed, banks increasingly fold climate-related risks into their operational risk analyses. As JPMorgan Chase disclosed in its 2019 Annual 10-K report, “[I]f a catastrophic event occurs in an area in which a critical segment of JPMorgan Chase’s workforce, physical assets or systems and other support infrastructure is concentrated[,]” “[its]

38. The Fed oversees Bank Holding Companies, Financial Holding Companies, and firms designated systemically important by the Financial Stability Oversight Council (“FSOC”).

39. See Light & Skinner, *supra* note 36.

40. See BD. OF GOVERNORS OF THE FED. RESRV. SYS., SUPERVISION AND REGULATION REPORT 17–18 (May 2020), <https://www.federalreserve.gov/publications/files/202005-supervision-and-regulation-report.pdf> [<https://perma.cc/Q4NE-WMF3>] (discussing the Fed’s supervisory role at both the firm and system-wide levels).

41. “[O]perational risk is defined as the risk of loss resulting from inadequate or failed internal processes, people and systems, or external events.” Joshua Rosenberg, Exec. Vice President & Chief Risk Officer, Fed. Rsrv. Bank of N.Y., Remarks at the 18th Annual OpRisk North America 2016 Conference: Operational Risk Management at the Federal Reserve Bank of New York (Mar. 15, 2016), <https://www.newyorkfed.org/newsevents/speeches/2016/ros160315> [<https://perma.cc/68DM-3XBY>].

42. For that reason, the securities law requires a publicly listed bank to regularly disclose all manner of possible operational risks and the steps taken to address them. To the extent climate is sufficiently certain to pose such operational risk, one would expect banks to start disclosing it. Light, *supra* note 34, at 165–72 (discussing climate disclosures under securities regulations).

ability to respond effectively to a business interruption could be hampered.”⁴³ In particular, JPMorgan Chase noted, “[S]hould emergency or catastrophic events such as severe or abnormal weather conditions become more chronic, the disruptive effects of those events on JPMorgan Chase’s business and operations . . . could become more significant and long-lasting.”⁴⁴

This is relevant for the central bank.⁴⁵ Banks provide critical services to the economy—like processing payments and credit, and settling transactions—which requires their physical systems to remain functioning smoothly.⁴⁶ Aside from banks, other institutions, referred to as financial market infrastructures (“FMIs”), support the financial system’s plumbing in various ways.⁴⁷ Some FMIs provide payment systems like banks,⁴⁸ while others act as “central counterparties,” known as “CCPs”⁴⁹—firms that stand between two counterparties to a trade.⁵⁰ Many of these FMIs, though not formally BHCs, have been

43. JPMorgan Chase & Co., Annual Report (Form 10-K), at 20 (Feb. 25, 2020).

44. *Id.*

45. The Fed has long required banks to comply with operational risk capital surcharges. *See infra* note 46; *see also* Christina Parajon Skinner, *Misconduct Risk*, 84 FORDHAM L. REV. 1559 (2016) (arguing that prior to 2010, operational risk was largely viewed by central banks as problems of an idiosyncratic nature).

46. Principally, regulators address operational risk by requiring banks to hold an additional capital charge reflecting an estimated loss from an operational event which requires banks to use historical data and information about the bank’s business environment and control systems to assess themselves a capital surcharge. BASEL COMM. ON BANKING SUPERVISION, OPERATIONAL RISK—SUPERVISORY GUIDELINES FOR THE ADVANCED MEASUREMENT APPROACHES (2011), <http://www.bis.org/publ/bcbis196.pdf> [<https://perma.cc/Q697-BXDS>].

47. *Id.*

48. BANK OF ENG., SUPERVISION OF FINANCIAL MARKET INFRASTRUCTURES—ANNUAL REPORT (Feb. 2019), <https://www.bankofengland.co.uk/-/media/boe/files/annual-report/2019/supervision-of-financial-market-infrastructure-annual-report-2019.pdf> [<https://perma.cc/SP82-FKRR>] (noting that these systems “allow funds to be transferred between businesses and individuals and they are used for many day-to-day transactions . . . such as withdrawing cash from a cash machine, receiving salary payments or making online payments”).

49. Like CSDs, CCPs are essential to the smooth functioning of the securities trading markets. In today’s financial markets, the trading of securities takes place either on exchanges or in what is known as “over-the-counter” (“OTC”) markets. Morten Bech, Jenny Hancock, Tara Rice & Amber Wadsworth, *On the Future of Securities Settlement*, BIS Q. REV. 67, 68 (2020).

50. Post-2008 crisis reforms made central clearing a requirement for OTC transactions. Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, § 723, 124 Stat. 1376, 1675 (2010) (codified as amended at 15 U.S.C. § 78c-3); *see also* Paolo Saguato, *The Ownership of Clearinghouses: When “Skin in the Game” is Not Enough, the Remutualization of Clearinghouses*, 34 YALE J. ON REGUL. 601, 614–619, 630–632 (2017) (discussing the role of clearinghouses in the financial markets and their unique capital structure). Concentrating risk in the CCPs was a post-2008 crisis innovation, aimed toward stopping losses from spreading between counterparties in cases of economic shock and consolidating useful trading information. *See* Claude Lopez & Elham Saeidinezhad, *Central Counterparties Help, but Do Not Assure Financial Stability* 1 (Milken Inst., Working Paper No. 80358, 2017), https://mpr.ub.uni-muenchen.de/80358/1/MPRA_paper_80358.pdf [<https://perma.cc/XSX7-P2JU>] (noting that CCPs promote financial stability by providing multilateral netting and centralized default

determined to be so critical to economic life that the Fed has been made responsible for them as well.⁵¹

Given these institutions' importance to economic exchange and risk management, the Fed has an interest in all manner of operational risks they face—including “technology-based failures, cyber incidents, pandemic outbreaks, and natural disasters.”⁵² Just as the Fed has begun to consider the operational risk associated with cyberattacks, it would likewise have a strong financial-stability basis for considering the ways in which severe climate events could similarly disrupt the operational resilience of the banks and FMI firms that it oversees.⁵³

2. Climate Risk and the Balance Sheet

An impaired balance sheet can also impact a bank's resilience and, in turn, pose a financial stability risk. A growing body of literature

management); Paolo Saguato, *The Unfinished Business of Regulating Clearinghouses*, 2020 COLUM. BUS. L. REV. 449, 496–513 (analyzing the current regulatory framework for clearinghouses).

51. This determination is made by the FSOC. *Designations*, U.S. DEPT OF THE TREASURY, <https://home.treasury.gov/policy-issues/financial-markets-financial-institutions-and-fiscal-service/fsoc/designations> (last visited May 18, 2021) [<https://perma.cc/E7CC-CD44>]. Examples include The Clearing House Payments Company, LLC; CLS Bank International; The Depository Trust Company; and the ICE Clear Credit. *Designated Financial Market Utilities*, BD. OF GOVERNORS OF THE FED. RSRV. SYS., https://www.federalreserve.gov/paymentsystems/designated_fmu_about.htm (last updated Jan. 29, 2015) [<https://perma.cc/R8HG-FBVM>]. It is important to note that each of these FMUs has a different regulator—such as the Securities and Exchange Commission (“SEC”) or Commodity Futures Trading Commission (“CFTC”)—as its primary regulator; the Fed oversees these institutions for financial stability reasons only. *See Supervision & Oversight of Financial Market Infrastructures*, BD. OF GOVERNORS OF THE FED. RSRV. SYS., https://www.federalreserve.gov/paymentsystems/over_about.htm (last updated Sept. 2, 2009) [<https://perma.cc/8KDC-E89K>].

52. *Supervisory Policy and Guidance Topics, Information Technology Guidance*, BD. OF GOVERNORS OF THE FED. RSRV. SYS., <https://www.federalreserve.gov/supervisionreg/topics/information-technology-guidance.htm> (last updated May 14, 2021) [<https://perma.cc/B3XD-2865>]; *see also Building Operational Resilience: Impact Tolerances for Important Business Services*, BANK OF ENG. & FIN. CONDUCT AUTH. (Dec. 5, 2019), <https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/consultation-paper/2019/building-operational-resilience-impact-tolerances-for-important-business-services.pdf> [<https://perma.cc/LCU6-TVNM>] (discussing regulatory frameworks that promote operational resilience in financial markets).

53. Much work has been done in addressing cyber risk in the past three years. *See, e.g.*, COMM. ON PAYMENTS & MKT. INFRASTRUCTURES, BANK FOR INT'L SETTLEMENTS & INT'L ORG. OF SECS. COMM'NS, GUIDANCE ON CYBER RESILIENCE FOR FINANCIAL MARKET INFRASTRUCTURES (June 2016), <https://www.bis.org/cpmi/publ/d146.pdf> [<https://perma.cc/SKQ8-J6MR>] (addressing cyberattack detection, response, and recovery); THOMAS M. EISENBACH, ANNA KOVNER & MICHAEL JUNHO LEE, CYBER RISK AND THE U.S. FINANCIAL SYSTEM: A PRE-MORTEM ANALYSIS (2020), https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr909.pdf [<https://perma.cc/8MNC-NF86>] (discussing risks). Relatively less has been done about climate.

discusses climate risk in this respect.⁵⁴ Corporate and household borrowers who are unable to repay their loans due to climate change can cause banks to suffer losses on those credit assets.⁵⁵ On a large enough scale, the manifestation of such credit risk could, in theory, become a financial stability problem. However, the Fed has responsibility over a firm's credit risk only insofar as it implicates an issue of firm "safety and soundness" or the financial stability of the system overall.⁵⁶

i. Climate Risk as Credit Risk

The Fed's responsibility to ensure firms remain safe and sound refers to its "microprudential" role.⁵⁷ Although safety and soundness can have a number of specific meanings,⁵⁸ generally an accumulation of credit risks that could threaten a bank's solvency would be considered unsafe, and a widescale decline in asset quality would be deemed an unsound banking practice.⁵⁹ Presently, climate change does not appear to present a safety and soundness issue for the largest U.S. banks.

An accounting and corporate finance analysis of bank balance sheets illustrates why. First, one must consider how bank losses come about. A bank's credit assets (i.e., its investments) lose value only to the extent they become "impaired" (an accounting, and in turn regulatory,

54. As Fed Board member Lael Brainard remarked at the end of 2019, although substantial uncertainty remains, "we can begin to identify the factors that could propagate losses from natural disasters, energy disruptions, and sudden shifts in the value of climate-exposed properties." Brainard, *supra* note 4, at 4–5.

55. *Id.*

56. There are a number of institutional actors that have an interest in heading off this problem. Shareholders, for one, seek to protect the quality of their investment. A bank's managers and directors, who are accountable to those investors, will thus likely seek to act in ways that protect their leadership positions within the firm (and their reputations). As far as regulators go, the SEC, as the regulator of publicly listed companies, will want to protect the markets from abuse or inefficiency by ensuring that banks disclose all "material" risks they face. These are items 303 and 305 of Regulation S-K, respectively. 17 C.F.R. §§ 229.303, .305 (2021).

57. THOMAS EISENBACH, ANDREW HAUGHWOUT, BEVERLY HIRTLE, ANNA KOVNER, DAVID LUCCA & MATTHEW PLOSSER, SUPERVISING LARGE, COMPLEX FINANCIAL INSTITUTIONS: WHAT DO SUPERVISORS DO? 4 (2015), https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr729.pdf [<https://perma.cc/S96J-4T77>].

58. *See infra* Part II.A.3.

59. *See* David Bholat, Rosa M. Lastra, Sheri M. Markose, Andrea Miglionico & Kallol Sen, *Non-performing Loans at the Dawn of IFRS 9: Regulatory and Accounting Treatment of Asset Quality*, 19 J. BANKING REGUL. 33 (2018) (discussing the relationship between asset quality and sound banking). As the Basel Committee noted, "Climate risk drivers can impact household, corporate, or sovereign income and/or wealth." BASEL COMM. ON BANKING SUPERVISION, *supra* note 33, at 11. This Article focuses on credit risk to the extent it impacts corporate lending.

term of art). Loans—which are a particular type of credit asset—are impaired if and when they “nonperform” (a finance term of art).⁶⁰

Under the Fed’s required accounting treatment, impairment is said to occur when a bank determines “it is probable that not all principal and/or interest will be collected” from a borrower.⁶¹ Banks can exercise some judgment in making that determination. One common method, also followed globally, is to consider a loan as nonperforming if the borrower has made zero payments on principal or interest for ninety days.⁶²

However, U.S. banks do not have to follow that practice. Instead, banks in the Federal Reserve System are permitted to consider a variety of factors in deciding whether a loan has become impaired. These factors include:

- (1) whether “the occurrence of significant changes in the borrower’s financial position . . . indicate that the borrower may not be able to repay the obligation, in whole or part,”
- (2) whether the collateral will be sufficient to pay the loan,
- (3) “historical experience with similar loans,” and
- (4) “whether the Banks have exhausted all commercially reasonable means of recovering the loan balance.”⁶³

In short, there are quite a number of ways that U.S. banks can save a loan from devaluation from a balance sheet perspective.

If and only if the bank concludes that it is unlikely that a loan will be repaid, in view of all those factors, will the asset be “impaired.”⁶⁴ The bank would then proceed to calculate the appropriate allowance for

60. See BD. OF GOVERNORS OF THE FED. RSRV. SYS., FINANCIAL ACCOUNTING MANUAL FOR FEDERAL RESERVE BANKS ¶ 81.03 (rev. Feb. 17, 2017), <https://www.federalreserve.gov/federal-reserve-banks/fam/chapter-8-special-topics.htm#xsubsection-15-8327f811> [<https://perma.cc/H763-P5GY>] (discussing methods for measuring loan impairment).

61. *Id.*

62. PATRIZIA BAUDINO, JACOPO ORLANDI & RAIHAN ZAMIL, FIN. STABILITY INST., THE IDENTIFICATION AND MEASUREMENT OF NON-PERFORMING ASSETS: A CROSS-COUNTRY COMPARISON 11 (Apr. 2018), <https://www.bis.org/fsi/publ/insights7.pdf> [<https://perma.cc/YRV3-LLVU>]; *What Is a Non-Performing Loan (NPL)?*, CORP. FIN. INST., <https://corporatefinanceinstitute.com/resources/knowledge/finance/non-performing-loan-npl/> (last visited July 17, 2021) [<https://perma.cc/DG6P-RMDL>].

63. BD. OF GOVERNORS OF THE FED. RSRV. SYS., *supra* note 60.

64. In climate change terms, a borrower could become unable to repay (or collateral impaired) as a result of physical destruction of a plant or other property for example, or as a result of a “stranded asset problem.” Part of the stranded asset problem refers to the possibility that certain physical assets (e.g., coal) will no longer be permitted to be removed from the ground; and yet, businesses will have already factored their harvesting into balance sheet (and profit) projections. Ultimately, the nature of the risk to the bank is the same—a climate-related impediment that may cause a business borrower to be unable to repay a bank loan in whole or part.

loan losses to record on its balance sheet.⁶⁵ In such case, those credit assets (or securitizations backed by pools of loans to those companies) could lose value.

But there are a number of existing checks in the underwriting process to prevent loan impairment that result from borrower defaults. For one, bank lenders adhere to certain ratios—loan-to-cost (“LTC”), for construction loans, or loan-to-value (“LTV”), for real estate loans—which set limits on the riskiness of any loan they make.⁶⁶ These ratios ensure prudence in two different ways. For the bank, the ratio effectively limits the extent to which a bank is financing a project or investment with debt. For the borrower, the ratio forces it to demonstrate sufficient equity or collateral; this will act as a buffer available for use in repaying the bank’s loan in the event of unforeseen setbacks and losses.

On average, large BHCs lend at around fifty percent (or lower) LTC/LTV.⁶⁷ This means that a big bank’s loan is very unlikely to become impaired unless the borrower’s cost of doing business increases by fifty percent (where the LTC measure was used) or the value of its collateral declines by fifty percent (where the LTV measure was used). Accordingly, a corporate or home borrower would have to realize losses of fifty percent or more due to physical or transition risks in order for

65. See BD. OF GOVERNORS OF THE FED. RESRV. SYS., *supra* note 60, ¶ 81.02, <https://www.federalreserve.gov/federal-reserve-banks/fam/chapter-8-special-topics.htm#xsubsection-15-8327f811> [<https://perma.cc/H763-P5GY>].

66. “Cost” refers to the cost of building a commercial project, whereas “value” refers to a home or other property collateralizing a mortgage.

67. See *Commercial Real Estate Lending*, OFF. OF THE COMPTROLLER OF THE CURRENCY 10 (Jan. 27, 2017), <https://www.occ.gov/publications-and-resources/publications/comptrollers-handbook/files/commercial-real-estate-lending/pub-ch-commercial-real-estate.pdf> [<https://perma.cc/GL7N-RPL3>] (discussing banks’ authority to establish their own LTV limits); *Presale: Bank 2021-BNK34*, S&P GLOBAL RATINGS 14–15 (June 9, 2021), https://www.spglobal.com/_assets/documents/ratings/research/11989266.pdf [<https://perma.cc/LR6A-PCPB>] (showing that the majority of loans rated have LTVs of fifty percent or less).

climate change to have reduced the quality of asset values on a bank's balance sheet.⁶⁸ More on this to follow.⁶⁹

Perhaps most squarely to the point, it appears that banks may not presently hold sufficient concentration of carbon-intensive credit assets for physical or transition risks to threaten their solvency.⁷⁰ Consider a snapshot based on existing data. These big bank balance sheets are geographically and sectorally diversified.⁷¹ Consider recent data from the balance sheets of the largest, most systemically

68. The stranded asset problem seems even more remote where securitization is concerned. Again, understanding underwriting is important. By virtue of that process, banks are likely to have very few incentives (let alone approvals from their risk committees) to securitize pools of loans to, for example, coal companies (or from analogously carbon-concentrated pools). To do so would defy the very purpose of securitization—risk and geographic diversification. For that reason, it seems equally improbable that a bond would be rated investment grade, thereby limiting demand for such a product. Moreover, given the growing investor-driven consensus that financial institutions should step away from carbon-facing assets, demand will likely be quite small. See Christopher Flavelle, *Climate Change Poses 'Systemic Threat' to the Economy, Big Investors Warn*, N.Y. TIMES (July 21, 2020), <https://www.nytimes.com/2020/07/21/climate/investors-climate-threat-regulators.html?referringSource=articleShare> [<https://perma.cc/23S5-5TQN>].

69. Some researchers have claimed that that “[w]hile accurately-priced risk and returns are part of the typical formula for financial portfolio composition, the mispricing of mortgage risk, carried onto securitizers’ balance sheets, can be a source of unhedged and unanticipated systemic risk.” Amine Ouazad & Matthew E. Kahn, *Mortgage Finance in the Face of Rising Climate Risk* 7 (Nat’l Bureau of Econ. Rsch., Working Paper No. 26322, 2019) (citation omitted), https://www.nber.org/system/files/working_papers/w26322/w26322.pdf [<https://perma.cc/L8AV-3U8U>]. However, securitization is subject to much more robust underwriting now as well. Banks are now much more incentivized than they were before 2008 to conduct due diligence on the loans that they packaged in securities. Specifically, post-2008 crisis reforms now require banks to retain a five percent first-loss or ‘vertical’ piece of any securitized bond that they sell. This forces banks to keep some “skin in the game,” by ensuring their diligence and underwriting practices are robust to any and all manners of risk associated with the loans that form the basis for a securitization.

70. There are, to be clear, methodological limitations to this assessment, which I acknowledge. This snapshot does not capture loans to industries that while not necessarily carbon emitters may be first impacted by physical risk (as opposed to transition risk). It also omits consideration of banks’ climate exposure from non-C&I loans, and does not attempt to assess other sectors that could be affected by climate change secondarily. As such, this assessment is presented as a snapshot but does not purport to represent banks’ aggregate climate exposure. A fulsome assessment of banks’ aggregate climate exposure is best undertaken by institutions with access to more granular data, such as bank managers and bank supervisors.

71. While the Fed also oversees small regional and community banks, because their failure is not generally viewed as a risk to financial stability—and prudential regulation is significantly less onerous—I do not consider them as the primary example in this Article. Stated another way, there are not high social costs to the failure or unsound practices of a small regional or community bank. Congress has acknowledged this in exempting these organizations from some of the heightened prudential and supervisory requirements imposed by the Dodd-Frank Act. See Economic Growth, Regulatory Relief, and Consumer Protection Act, Pub. L. No. 115-174, 132 Stat. 1296 (2018) (codified at scattered sections of 12, 15, 20, 38, 42, 50 U.S.C.). Relatedly, there is a rich scholarly and policy debate regarding the extent to which size versus activities is the best proxy for systemic risk; still, it is generally accepted and embedded in our regulatory framework that the largest bank holding companies pose the greatest systemic risk. See, e.g., Joseph Haubrich & Charlotte DeKoning, *Sizing Up Systemic Risk*, FED. RSRV. BANK OF CLEVELAND (Aug. 23, 2017), <https://www.clevelandfed.org/~media/content/newsroom%20and%20events/publications/economic%20commentary/2017/ec%20201713/2017-13.pdf> [<https://perma.cc/W4W5-M6N8>].

important banks. For example, at year end 2019, JPMorgan Chase had \$41,570 million in wholesale credit exposures in its oil and gas portfolio.⁷² While that number seems enormous, it is 4.6 percent of that bank's total credit exposure. (That number decreased to \$37,516 million by the end of 2020.⁷³)

At the highest range is Citigroup, whose credit exposure in the energy and commodities industry constitutes around seven percent of its total credit exposure for its corporate credit portfolio.⁷⁴ Yet other globally systemically important banks such as Wells Fargo, BNY Mellon, and Barclays fall at the lower end of the four to seven percent exposure range in their portfolios (when looking at their exposure to the oil and gas industry respectively).⁷⁵ Meanwhile, the amount of equity capital available to absorb loan losses is triple or quadruple credit exposure at all of these big banks.⁷⁶

Taking automotive industry loans into account changes these banks' exposure slightly, but not significantly.⁷⁷ For example, JPMorgan's and Wells Fargo's wholesale credit exposure increases by less than four percent each, while Citigroup's credit exposure increases by 6.86 percent.⁷⁸ This remains true even when panning out wider to account for loans across the entire transportation industry. Including transportation increases JPMorgan's credit exposure by less than two percent, Citigroup's by less than four percent, Wells Fargo's by around 2.5 percent, and Barclays's around one percent.⁷⁹ Banks are otherwise diversified across a range of sectors: real estate, consumer and retail, technology, industrials, asset managers, banks and financial

72. JPMorgan Chase & Co., *supra* note 43, at 110.

73. JPMorgan Chase & Co., Annual Report (Form 10-K), at 127 (Feb. 23, 2021).

74. Citigroup Inc., Quarterly Report (Form 10-Q), at 55 (Aug. 4, 2020) [hereinafter Citigroup Quarterly Report]. Like JPMorgan, Citigroup's exposures in some of these carbon-facing industries are declining. For example, its energy and commodities exposure in relation to total exposures decreased from 6.71 percent in 2019 to 6.31 percent in 2020. Citigroup Inc., Annual Report (Form 10-K), at 78, 80 (Feb. 26, 2021) [hereinafter Citigroup Annual Report].

75. HSBC USA Inc., Quarterly Report (Form 10-Q), at 123 (Aug. 3, 2020); Bank of Am. Corp., Quarterly Report (Form 10-Q), at 42 (July 30, 2020); Goldman Sachs Grp., Inc., Quarterly Report (Form 10-Q), at 155 (Aug. 6, 2020); Wells Fargo & Co., Quarterly Report (Form 10-Q), at 27 (Aug. 4, 2020); Bank of N.Y. Mellon Corp., Quarterly Report (Form 10-Q), at 27 (Aug. 6, 2020); Morgan Stanley, Quarterly Report (Form 10-Q), at 37 (Aug. 4, 2020).

76. See Citigroup Quarterly Report, *supra* note 74, at 103; HSBC, *supra* note 75, at 5; Bank of Am. Corp., *supra* note 75, at 53; Goldman Sachs Grp., Inc., *supra* note 75, at 2; Wells Fargo & Co., *supra* note 75, at 65; Bank of N.Y. Mellon Corp., *supra* note 75 at 52; Morgan Stanley, *supra* note 75, at 46.

77. This paragraph draws on disclosures in the banks' 2020 SEC Form 10-K.

78. JPMorgan Chase & Co., *supra* note 73, at 124–25; Citigroup Annual Report, *supra* note 74, at 78–80; Wells Fargo & Co., Annual Report (Form 10-K), at 66 (Feb. 23, 2021).

79. JPMorgan Chase & Co., *supra* note 73, at 124–25; Citigroup Annual Report, *supra* note 74, at 78–80; Wells Fargo, *supra* note 78, at 66; Barclays PLC, Annual Report (Form 20-F), at 117 (Feb. 18, 2021).

companies, healthcare, utilities, state and municipal governments, automotive, chemicals and plastics, metals and mining, central governments, transportation, insurance, securities firms, and financial market infrastructures.⁸⁰

Events of 2020 lend support to the narrative suggested by the balance sheet data discussed above. Specifically, in spring of 2020, large banks faced historic declines in oil prices (which fell below zero dollars) thanks to COVID-related shelter-in-place orders.⁸¹ While banks suffered some losses on their wholesale credit portfolios connected to the oil and gas industry,⁸² their soundness or solvency did not come into question.⁸³ Indeed, the Fed's own data shows no statistically significant increase in nonperforming loans between Q4 2019 and Q1 2020 for the largest banks⁸⁴—for further context, while nonperforming loans were at about one percent of these banks' balance sheets after these events of 2020, shortly after the financial crisis of 2008 they hovered around 3.5 percent.⁸⁵ These recent events—and banks' balance sheet reactions—suggest that even significant exogenous climate-related shocks cannot so drastically impair asset quality so as to push banks toward insolvency.⁸⁶ The lesson here is that where banks remained resilient, in accordance with Basel III requirements, they have been able to withstand significant exogenous shocks.

It is also unclear whether transition risk will undermine bank soundness. Well-managed banks continuously adjust for changing

80. JPMorgan's exposure to oil and gas decreased from 2019 to 2020, from 4.12 percent of total wholesale loans to 3.47 percent. JPMorgan Chase & Co., *supra* note 73, at 124–25. As a percentage of all loans (wholesale and consumer), oil and gas is 1.7 percent of the balance sheet. *Id.*

81. Ryan Dezember, *U.S. Oil Costs Less Than Zero After a Sharp Monday Selloff*, WALL ST. J., <https://www.wsj.com/articles/why-oil-is-11-a-barrel-now-but-three-times-that-in-autumn-11587392745> (last updated Apr. 21, 2020, 12:49) [<https://perma.cc/HSX7-EC7J>].

82. *See, e.g.*, JPMorgan Chase & Co., Quarterly Report (Form 10-Q) at 56 (May 7, 2020) (noting losses related to the COVID-19 pandemic).

83. The results of the 2020 stress test—conducted amid the COVID-19 pandemic—show that “[t]he banking system has been a source of strength during this crisis . . . and the results of [the Fed’s] sensitivity analyses show that [U.S.] banks can remain strong in the face of even the harshest shocks.” Press Release, Bd. of Governors of the Fed. Rsrv. Sys., Federal Reserve Board Releases Results of Stress Tests for 2020 and Additional Sensitivity Analyses Conducted in Light of the Coronavirus Event (June 25, 2020) (internal quotation marks omitted), <https://www.federalreserve.gov/newsevents/pressreleases/bcreg20200625c.htm> [<https://perma.cc/3QDG-J4A9>].

84. These are institutions with assets between \$100 billion and \$300 billion.

85. *Nonperforming Loans (Past Due 90+ Days Plus Nonaccrual) to Total Loans for U.S. Banks with Average Assets Between \$100M and \$300M*, FED. RSRV. BANK OF ST. LOUIS, <https://fred.stlouisfed.org/series/US13NPTL> (last visited May 19, 2021) [<https://perma.cc/ZU5W-4GFD?type=image>].

86. It is also worth noting none of these banks approached insolvency following previous “billion-dollar” natural disasters that occurred between 2004 and 2012, including Hurricanes Katrina, Irma, and Sandy. Ouazad & Kahn, *supra* note 69, at 4.

credit and market conditions, and thus generally prepare for a certain amount of credit losses in a given year.⁸⁷ Climate-related risks are likely to be no exception. Indeed, several large banks have already begun to factor climate-related risks into their underwriting process. As Citigroup explains in a 2019 quarterly report, it “has incorporated environmental factors like climate risk assessments and reporting criteria for certain obligors Factors evaluated include consideration of climate risk to an obligor’s business and physical assets and, when relevant, consideration of cost-effective options to reduce greenhouse gas emissions.”⁸⁸

This all suggests that banks are already in the process of adapting their behavior to announced—and thus anticipated—transition policies by, for example, deleveraging where existing carbon assets are concerned, or including prepayment obligations for newly made assets that might be similarly affected.⁸⁹ Accordingly, in order for transition policies to impair asset quality in the future, those policies would need to be adopted and implemented suddenly and in completely unforeseen ways. Additionally, any such climate-related policy changes would need to be globally adopted. If not, at least some carbon-related businesses could likely shift in region, allowing relocated production to modulate negative price or demand shocks. Such regulatory arbitrage would not be possible for all kinds of carbon-unfriendly assets, but to the extent it were, such agility would further mute the brunt of the cumulative credit risk.

In summary, the abilities to diversify and plan prudently appear as market-driven checks against bank vulnerability to climate risk, at least right now. The implications that follow for the Fed’s macroprudential supervisory role are considered next.

ii. Climate Risk and Financial Stability

The Fed also has a “macroprudential” role to monitor risks to the stability of the banking system as a whole. Historically, financial systems (not just institutions) have been destabilized by a classic-type scenario: a panic that precipitates a run. Accordingly, in this macroprudential role, the Fed considers the potential triggers of a panic and conditions conducive to a run as problems that could be within its policy bounds.

87. See, e.g., JPMorgan Chase & Co., *supra* note 43, at 116 (noting an allowance for credit losses).

88. Citigroup Inc., Quarterly Report (Form 10-Q), at 42 (Aug. 1, 2019).

89. See Light & Skinner, *supra* note 36, at 39–44, 56–57; *infra* note 99 and accompanying text (discussing market movement away from climate-related credit risk).

Consider a paradigmatic panic-and-run example surrounding an asset-bubble popping.⁹⁰ Euphoria or mistake (or fraud) can lead to overvaluation and overconcentration of a particular asset class. When the true value of the asset becomes manifest,⁹¹ uncertainty rules the day and motivates panicked behavior (What is the true value of these assets? Will my counterparties still pay?), which is propagated by additional uncertainty regarding how much value has been lost and by whom. This uncertainty about true asset values—and who holds what—prompts financial system players to pull back, fearful of further unknown losses. The result is that short-term funding seizes,⁹² asset values drop,⁹³ and widespread instability ensues.⁹⁴ Insofar as the Fed is now expected to play a role in supporting short-term funding markets and to act as lender of last resort to banks,⁹⁵ this kind of cycle will likely always be a problem for the Fed.

Some predict that climate risk is precisely such an unknown risk lurking on bank balance sheets.⁹⁶ Presently, however, there are reasons

90. See Campiglio et al., *supra* note 2, at 462 (discussing cascading financial effects following asset valuation diminishment); JAMES LEATON, CARBON TRACKER INITIATIVE, UNBURNABLE CARBON: ARE THE WORLD'S FINANCIAL MARKETS CARRYING A CARBON BUBBLE? 18–20 (2011), <https://carbontracker.org/reports/carbon-bubble/> [<https://perma.cc/HN8W-TXRZ>] (discussing asset valuation and impairment related to the carbon bubble).

91. These endogenous shocks result in eponymous “Minsky moments” as the market realizes a substantial amount of underappreciated risk that that has built up in the sector. See Hyman P. Minsky, *The Financial Instability Hypothesis* (Jerome Levy Econ. Inst. of Bard Coll., Working Paper No. 74, 1992).

92. In situations of market panic, lenders of short-term financing (usually repurchase agreement or repo financing) are stuck holding collateral that appears to have lost some value. In response, these lenders will issue margin calls to their borrowers, requiring borrowers to post additional collateral or cash to bring their contract back in balance. See, e.g., *Statement Regarding Treasury Reserve Management Purchases and Repurchase Operations*, FED. RSRV. BANK OF N.Y. (Mar. 12, 2020), https://www.newyorkfed.org/markets/opolicy/operating_policy_200312a [<https://perma.cc/2SHC-B2Z4>] (discussing repo operation changes resulting from COVID-19 disruptions to financial markets).

93. Where borrowers do not have the additional funds to meet their margin calls, they must sell assets into a falling market for a lower-than-market price. Where tainted assets flood the market, and supply comes up too short, the price of the asset becomes dislodged from its fundamental value. The asset price dislocations that result from these “fire sales” can fuel market panic and even prompt lenders to refuse to renew (“rollover”) any more short-term debt.

94. The theory that endogenous forces in capitalist economies push and pull the financial cycle, resulting in periods of upturn, peak, downturn, and trough—and largely thanks to the overconsumption of debt assets in good economic times—is largely credited to economist Hyman Minsky and his “Financial Instability Hypothesis.” See Hyman P. Minsky, *The Financial-Instability Hypothesis: Capitalist Processes and the Behavior of the Economy*, in FINANCIAL CRISES: THEORY, HISTORY, AND POLICY 13–39 (Charles P. Kindleberger & Jean-Pierre Laffargue eds., 1982).

95. If there are not enough liquid assets to sell to satisfy the liability side of the balance sheet and the capital cushion is absorbed in full, a bank can become insolvent.

96. Mark Carney, *Fifty Shades of Green*, FIN. & DEV. 12 (Dec. 2019), <https://www.imf.org/external/chinese/pubs/ft/fandd/2019/12/pdf/a-new-sustainable-financial->

to think a climate-contagion scenario relatively unlikely.⁹⁷ For one, there is the factual question of how much exposure to such assets really does exist on banks' balance sheets. As just discussed, a review of big banks' balance sheets shows that they are not, in fact, heavily exposed to "carbon-intensive" assets, like oil and gas or auto company loans.⁹⁸ And evidence gathered by the Basel Committee indicates the market is already increasingly pricing in climate risk.⁹⁹

Securitization, for its part, also seems relatively well buffered from climate risk. The majority of assets pooled into securitized products are mortgages and auto loans.¹⁰⁰ Mortgages, on their own, may be exposed to climate change, but when pooled together perhaps less so. By design, mortgage bonds are constructed from pools of mortgages assembled from a highly diverse set of geographic regions. Absent some physical change that reduces home values across all geographic regions, the highly rated (e.g., AAA) tranches of the securities would not be affected. Auto loans might well be a different story. But again, auto-loan securitizations are unlikely to decline that

system-to-stop-climate-change-carney.pdf [https://perma.cc/X2U7-3E3M]. See generally Gary B. Gorton, *Some Reflections on the Recent Financial Crisis* (Nat'l Bureau of Econ. Rsch., Working Paper No. 18397, 2012), <https://www.nber.org/papers/w18397.pdf> [https://perma.cc/7FG3-K7SS] (explaining the concept of a "financial crisis").

97. The Article does, however, acknowledge the role of uncertainty that could well change this analysis in future periods if new information is discovered. In regard to climate risk, known sources of uncertainty include "assumptions around future emissions pathways and the impact that these have on physical hazards, interactions between natural systems, future paths of policy, technological advances, and consumer and market sentiment." BASEL COMM. ON BANKING SUPERVISION, *supra* note 33, at 9. Of course, there is always also the possibility of Knightian uncertainty: the unknown unknown; or, as Mervyn King and John Kay refer to it, "radical uncertainty." See JOHN KAY & MERVYN KING, *RADICAL UNCERTAINTY: DECISION-MAKING BEYOND THE NUMBERS* (2020) ("When we describe radical uncertainty . . . [w]e are emphasising the vast range of possibilities that lie between the world of unlikely events which can nevertheless be described with the aid of probability distributions, and the world of the unimaginable.").

98. See *supra* notes 69–82 and accompanying discussion.

99. As the Basel Committee notes, there are a number of data points suggesting that the market is moving away from climate-related credit risk, even in the absence of more forward-leaning central bank interventions; this evidence includes, for example, that "financial markets may be beginning to price in transition risks for corporates," "investors may already be demanding compensation" via a "carbon premium" for certain assets, and "flood risks and rises in sea levels may already be partially priced into selected residential real estate valuations." BASEL COMM. ON BANKING SUPERVISION, *supra* note 33, at 17. Further evidence suggests that "banks reduce exposures to climate-sensitive assets once identified," "that some banks improve their capital positions following repeated natural disasters," and "that banks are starting to mitigate their exposure to transition risk drivers." *Id.* at 29. The U.S. banking system is further buffered from climate-related credit risk thanks to the depth of its capital markets which afford banks' options for securitization, hedging and derivatives products, which enables them to spread out their exposure to climate risk. See *id.* at 27–31. This is seen by the Basel Committee as a helpful "[m]itigant[]" to climate risk. *Id.* at 27–28.

100. US *Asset Backed Securities*, SIFMA (July 2, 2021), <https://www.sifma.org/resources/research/us-asset-backed-securities-statistics/> [https://perma.cc/44XX-W6WQ] (follow link to downloadable spreadsheet).

far in value, absent sudden transition policies that make the existing stock of cars (which collateralize car loans) drop precipitously in value. While it does seem very likely that future governments will enact policies requiring cars to run on clean energy, those policies would presumably take some time and allow for a grandfathered transition.

Thus, while the Fed's macroprudential role in monitoring market-wide risks would imply a responsibility related to climate change if it had the potential to trigger a panic-and-run situation, the market's current orientation suggests that climate change does not presently pose such a risk.¹⁰¹

B. Climate Change and the Macroeconomy

Climate change is also predicted to impact the broad economy adversely, thus implicating the Fed's monetary policy role.¹⁰² Physical climate changes could trigger demand shocks, for example. Heat waves that stifle workers in areas without steady air conditioning, or floods that overrun roads along which they drive to work, could reduce labor productivity. As basic macroeconomics teaches, lower productivity leads to lower output overall. Lower output translates to lower profit for a business. With less revenue, businesses may be forced to reduce demand for labor, thereby lowering the national employment rate. The cycle can repeat. Fewer jobs means less income, and in turn reduced demand for goods and services. If people cannot work, they cannot spend; and extreme weather events caused by climate change can prevent them from working, going out, and spending, which has a direct impact on demand for consumer goods and services.

One can also imagine price stability implications. Extreme weather events—and high temperatures in particular—could in theory impact the production of certain agricultural products and commodities like cereals, dairy, meat, coffee, and sugar.¹⁰³ And as production

101. *See supra* note 99 and accompanying text.

102. One way the economy could suffer from climate change is via spillovers from the financial system. The problem is simple enough to explain: where the financial system seizes up, it cannot keep on lending. When businesses and households are starved of credit, spending and investment will slow down. In turn, output and GDP decline and employment often falls. As economist and former Fed Chair Ben Bernanke has long theorized, the consequences of financial crises are “real.” Ben S. Bernanke, *The Real Effects of Disrupted Credit: Evidence from the Global Financial Crisis*, in BROOKINGS PAPERS ON ECON. ACTIVITY 251 (Janice C. Eberly & James H. Stock eds., 2018). The possibility of a climate-induced crisis has been discussed above.

103. Dina Fine Maron, *Extreme Weather Events Helps Drive Food Prices to New Highs*, SCI. AM. (Jan. 6, 2011), <https://www.scientificamerican.com/article/extreme-weather-helps-drive-food/> [<https://perma.cc/4VMM-69NE>]; Emiko Terazono, *Climate Extremes Inflate Food Prices*, FIN. TIMES (Apr. 10, 2014), <https://www.ft.com/content/5c4500fc-a518-11e3-8988-00144feab7de>

fluctuates, so too would the pricing of those commodities and the markets in which they trade.¹⁰⁴ Indeed, consultants at Oliver Wyman remarked in 2014 that “[a]gricultural prices have entered an new age of volatility” because of extreme weather events.¹⁰⁵ This kind of price instability invites the possibility of supply shocks and “stagflation.”¹⁰⁶ Initially, a reduction in the supply of goods or services drives prices much higher.¹⁰⁷ As policymakers learned from their experience with oil supply shocks in the 1970s and 1980s, movement in the price of certain goods and services that are central to economic life—like oil or food—can pave the way for inflation as central banks become accommodative to counteract accompanying output dips.¹⁰⁸

But these scenarios are still hypotheticals, not present or imminent events. And monetary policy responds to real, observed changes in the economy and to shocks—generally, it does not move to anticipate these things ahead of their fruition.¹⁰⁹

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[<https://perma.cc/A94H-T4DU>]; see also Cœuré, Speech, *supra* note 24, at 2 (noting that weather events impact harvests and put pressure on food prices).

104. Thomas Chatzopoulos, Ignacio Pérez Domínguez, Matteo Zampieri & Andrea Toreti, *Extreme Weather and Global Agricultural Markets: Experimental Analysis of the Impacts of Heat Waves on Wheat Markets*, 2017 INT’L J. ON FOOD SYS. DYNAMICS 448, 448.

105. MICHAEL DENTON, MARK ROBSON & ALEX WITTENBERG, OLIVER WYMAN, SEPARATING THE WHEAT FROM THE CHAFF 2 (Sept. 2010), https://www.oliverwyman.com/content/dam/oliverwyman/global/en/files/archive/2010/OW_EN_PUBL_GRT_2011_Wheat_From_Chaff.pdf [<https://perma.cc/AR97-WQW7>].

106. See Wing Thye Woo, Opinion, *Inflation Amidst Recession: Policy Prescriptions for Sustaining Stable Growth*, BROOKINGS (May 14, 2008), <https://www.brookings.edu/opinions/inflation-amidst-recession-policy-prescriptions-for-sustaining-stable-growth/> [<https://perma.cc/B7A7-FG5V>].

107. Edward M. Gramlich, Member, Bd. of Governors of the Fed. Rsrv. Sys., Remarks at the Annual Economic Luncheon at the Federal Reserve Bank of Kansas City (Sept. 16, 2004), <https://www.federalreserve.gov/boarddocs/speeches/2004/20040916/default.htm> [<https://perma.cc/V2NK-L9LN>].

108. *Id.* It is classic macroeconomic theory that an adverse supply shock shifts the short-run aggregate supply curve left, leading to lower output and higher inflation. *What Are the Possible Causes and Consequences of Higher Oil Prices on the Overall Economy?*, FED. RSRV. BANK OF S.F. (Nov. 2007), <https://www.frbsf.org/education/publications/doctor-econ/2007/november/oil-prices-impact-economy/> [<https://perma.cc/867N-HG8T>]. Oil price changes can impact the macroeconomy more broadly because of the large number of products made with petroleum, thereby shifting up the supply curve more generally for a larger basket of goods. *Id.* Oil prices could also impact demand for other goods because they reduce wealth and increase uncertainty about the future. *Id.*

109. See Christopher J. Waller, Governor, Bd. of Governors of the Fed. Rsrv. Sys., Speech at the Peterson Institute for International Economics: Treasury–Federal Reserve Cooperation and the Importance of Central Bank Independence (Mar. 29, 2021), <https://www.federalreserve.gov/newsevents/speech/waller20210329a.htm> [<https://perma.cc/BT85-ZC8L>].

To summarize: Part I has engaged the growing chorus of scholars and policymakers who have urged climate risk as a financial risk. In doing so, it has placed some factual parameters around the question, to be considered in Part II, of which policy tools are lawfully available to the Fed in addressing climate risks.

II. THE LAW OF THE FED AND CLIMATE CHANGE

The Federal Reserve, like all other independent agencies, has responsibilities mandated by statute and powers delimited in law. To be sure, the legal framework that governs the Fed is complex and multifaceted; after all, the Fed wears many hats. In regard to the economy, the Fed has legal power to set and pursue monetary policy. Against the policy-oriented backdrop of Part I, this Part considers the myriad formal sources of legal authority that empower the Fed to act as monetary authority, firm regulator and supervisor, and research- and data-gatherer. It examines the extent to which any of the Fed's powers allow it to take action to tackle climate risk.

A. Board of Governors Powers

In the Fed's decentralized system of central banking, the Board of Governors holds most of the legal power. The Fed Board, together with the Federal Open Market Committee ("FOMC"), is responsible for monetary policymaking. It also sets supervisory and regulatory policy, while leaning on the Reserve Banks for day-to-day supervision and policy support. There is a collection of well-established legal frameworks that construe the Fed's mandates, and its powers, in each of these three areas.

1. Monetary Policy

The Federal Reserve Act clearly defines the Fed's mandate as regards its monetary policy. Section 2A of that Act establishes these objectives as "promot[ing] effectively the goals of maximum employment, stable prices, and moderate long-term interest rates."¹¹⁰

Conventionally, most central banks—the Fed included—pursue their statutory objective of price stability (often targeting somewhere around two percent inflation¹¹¹) and employment (if applicable) by

110. Federal Reserve Act § 2A, 12 U.S.C. § 225a.

111. *Statement on Longer-Run Goals and Monetary Policy Strategy*, BD. OF GOVERNORS OF THE FED. RSRV. SYS. 1 (Jan. 26, 2021),

setting short-term interest rates.¹¹² The Fed affects market interest rates by targeting the federal funds rate, which is the rate banks charge one another when they lend their Federal Reserve Bank reserves to each other, usually on a short-term basis.¹¹³ The targeted federal funds rate is periodically decided by the FOMC.¹¹⁴ The Fed can steer the fed funds rate toward the FOMC's target by buying or selling securities (usually, U.S. treasuries) in the open market ("open market operations"), thereby affecting the supply of reserves within the system and banks' incentives to lend them to each other. Since 2008, however, the Fed has principally used adjustments to the interest rate it offers banks on their reserves ("IOR") to accomplish the target rate.¹¹⁵

The FOMC meets eight times throughout the year and evaluates the status of the economy. It considers a range of macroeconomic indicators regarding the strength of the labor market, the pace of

https://www.federalreserve.gov/monetarypolicy/files/FOMC_LongerRunGoals.pdf
[<https://perma.cc/H9EW-RKLS>].

112. COMM. ON THE GLOB. FIN. SYS., BANK FOR INT'L SETTLEMENTS, UNCONVENTIONAL MONETARY POLICY TOOLS: A CROSS-COUNTRY ANALYSIS 8 (Oct. 2019), <https://www.bis.org/publ/cgfs63.pdf> [<https://perma.cc/3QHW-DRUT>] [hereinafter UNCONVENTIONAL MONETARY POLICY].

113. *Effective Federal Funds Rate*, FED. RSRV. BANK OF ST. LOUIS: FRED ECON. RSCH., <https://fred.stlouisfed.org/series/FEDFUNDS> (last visited July 18, 2021) [<https://perma.cc/C6V9-CR3Z>].

114. The FOMC has a separate legal existence from the Board of Governors. *See* Federal Reserve Act § 12A, 12 U.S.C. § 263(c) (creating and authorizing the FOMC); *Id.* § 14, 12 U.S.C. § 355 (empowering Reserve Banks to conduct open market operations). For a more detailed explanation of how the FOMC conducts monetary policy, see BD. OF GOVERNORS OF THE FED. RSRV. SYS., *Conducting Monetary Policy*, in THE FEDERAL RESERVE SYSTEM PURPOSES & FUNCTIONS 20 (10th ed. 2016).

115. Post-2008, the Fed adjusts the interest rate that banks earn on their reserves ("IOR")—which is an administered rate—in order to "nudge" the market-determined federal funds rate. This is because, today, the Fed opts to remain in an "ample" reserve environment thus rendering slightly moot its prior efforts to affect the amount of reserves as a means of influencing the money supply. *See* Jane Ihrig & Scott Wolla, *How Does the Fed Influence Interest Rates Using Its New Tools*, FED. RSRV. BANK OF ST. LOUIS (Aug. 5, 2020), <https://www.stlouisfed.org/open-vault/2020/august/how-does-fed-influence-interest-rates-using-new-tools> [<https://perma.cc/K4BE-VDSJ>] (explaining these frameworks); *see also* Laura Hopper, *What Are Open Market Operations? Monetary Policy Tools, Explained*, FED. RSRV. BANK OF ST. LOUIS (Aug. 21, 2019), <https://www.stlouisfed.org/open-vault/2019/august/open-market-operations-monetary-policy-tools-explained> [<https://perma.cc/JG5B-95JY>]; John R. Walter & Renee Courtois, *The Effect of Interest on Reserves on Monetary Policy*, FED. RSRV. BANK OF RICHMOND 2 (Dec. 2009). In recent years, the interest rate on excess reserves policy has been necessary to supplement OMO in achieving the FOMC's target rate because

[w]hen banks have excess liquidity or reserves [as they do today], they can choose whether to lend those reserves to other banks (at the federal funds rate) or deposit them at the Fed (and earn the IOER). Banks aren't willing to lend to each other if the federal funds rate is substantially lower than the IOER, and so the two rates move closely together.

Paying Interest on Excess Reserves, FRED: THE FRED BLOG (June 18, 2018), <https://fredblog.stlouisfed.org/2018/06/paying-interest-on-excess-reserves/> [<https://perma.cc/Q37L-PBGU>].

economic activity, job growth, household spending, and inflation.¹¹⁶ If economic indicators suggest the economy could be overheating, the FOMC might raise the target federal funds rate to lean against the winds.¹¹⁷ Conversely, if the FOMC perceives a need to support a foundering economy, it will act in the reverse and lower the target interest rate. To the extent climate change had a demonstrable and proven impact on any of these factors,¹¹⁸ it would be well within the FOMC's policy authority to adjust, as necessary, the target federal funds rate. But such economic impact would be more likely the result of some exogenous shock to the economy precipitated by sudden climate changes or severe weather events rather than the result of gradual, physical changes.¹¹⁹

There is considerably less legal support, however, for the Fed's use of its so-called unconventional monetary policy tools to proactively mitigate climate change.¹²⁰ Unconventional monetary policies were innovated by central banks around the world after the 2008 crisis, which exposed the limits of what conventional monetary policy tools could do to boost a spiraled economy.¹²¹ Having lowered the interest

116. See, e.g., *Minutes of the Federal Open Market Committee*, BD. OF GOVERNORS OF THE FED. RSRV. SYS. (Jan. 28–29, 2020), <https://www.federalreserve.gov/monetarypolicy/files/fomcminutes20200129.pdf> [<https://perma.cc/N558-4L2Z>] (reproducing the FOMC's wide-ranging discussion from one of its eight yearly meetings).

117. The FOMC does this by buying and selling government securities in the open market. *Id.* at 4, 19. It can increase money in circulation—i.e., liquidity—by buying bonds; this will decrease the federal funds rate. *Id.* at 14. Conversely, if the FOMC sells bonds, it laps up liquidity from the market, which should cause the federal funds rate to increase. *Id.* at 13–14.

118. See *supra* Part I.B (discussing climate change and the macroeconomy).

119. The Fed cut the targeted federal funds rate in response to the COVID-19 pandemic, just as it had in response to unexpected exogenous shocks and economic disturbances in decades past. Press Release, Bd. of Governors of the Fed. Rsr. Sys., Federal Reserve Issues FOMC Statement (Mar. 15, 2020), <https://www.federalreserve.gov/newsevents/pressreleases/monetary20200315a.htm> [<https://perma.cc/6439-VP67>].

120. Unconventional monetary policy is not aimed at short-term interest rates. UNCONVENTIONAL MONETARY POLICY, *supra* note 112, at 10. Rather, unconventional monetary policy is intended to influence long-term risk-free rates, restore liquidity in markets, narrow widened credit spreads, and steady wobbling asset values. *Id.* Tools fell in two camps: some that directly purchased assets, by passing the usual money market channels; others that directly affected credit conditions by supplying plentiful liquidity to banks. *Id.*

121. See *id.* at 6 (“The recovery from the [2008] recession was also uncharacteristically slow . . . and pushed central banks to resort to actions that departed from their established policy frameworks.”); see also Mark Carlson & Burcu Duygan-Bump, “Unconventional” Monetary Policy as Conventional Monetary Policy: A Perspective from the U.S. in the 1920s, FED. RSRV. BD. (Jan. 25, 2018), <https://www.federalreserve.gov/econres/feds/files/2018019pap.pdf> [<https://perma.cc/7RTH-ELAM>] (providing a historical perspective on the Fed's monetary policy tools).

rate to its lowest bound—zero percent—there was nowhere left for central banks to go to stimulate conditions.¹²²

Unconventional tools were thus developed to spur the economy upward in different kinds of ways. Perhaps the most famous of these tools harnesses the balance sheet of the central bank. The tool, now known as “quantitative easing,” involves large-scale purchases of certain kinds of debt assets, like mortgage-backed securities (“MBS”) or government debt (i.e., Treasuries).¹²³ The mechanics are as follows: by purchasing debt assets, the central bank increases demand for the asset, thereby increasing its price. The price and yield (i.e., interest rate) of debt securities are inversely related; therefore, as price goes up, the rates on these instruments go down.¹²⁴ Lower interest rates generally tend to ignite economic activity as businesses are better able to finance new investments and then able to hire more employees and provide them with income—their income then translates into additional spending and investment.¹²⁵

The quantitative easing (“QE”) that followed the 2008 crisis¹²⁶ aimed to increase the flow of credit in private markets by supporting the mortgage housing market.¹²⁷ To that end, the Fed purchased \$200 billion in federal agency debt and \$1.25 trillion in MBS. Further, to lower interest rates generally, the Fed bought \$300 billion in long-term Treasury securities.¹²⁸ Over a decade later, the Fed initiated another round of asset purchases in March 2020, in response to the market

122. In monetary economics, this is referred to as the “effective lower bound” (“ELB”). UNCONVENTIONAL MONETARY POLICY, *supra* note 112, at 9–10. It seemed that over the years preceding the crisis, consumers and financial institutions had become too practiced at bracing for changes in the short-term interest rates. *Id.* at 8–9.

123. See Lowell R. Ricketts, *Quantitative Easing Explained*, FED. RSRV. BANK OF ST. LOUIS: LIBER8 ECON. INFO. NEWSL. (Apr. 2011), <https://files.stlouisfed.org/files/htdocs/pageone-economics/uploads/newsletter/2011/201104.pdf> [https://perma.cc/6G9T-ZF45]; Stephen Williamson, *Quantitative Easing: How Well Does This Tool Work?*, FED. RSRV. BANK OF ST. LOUIS (Aug. 18, 2017), <https://www.stlouisfed.org/publications/regional-economist/third-quarter-2017/quantitative-easing-how-well-does-this-tool-work> [https://perma.cc/ML3T-K4KH].

124. Ricketts, *supra* note 123, at 1.

125. *Id.* at 2. Quantitative easing aims at medium-term (not short-term) interest rates, so is distinct from other monetary policy tools in that regard. Brett W. Fawley & Luciana Juvenal, *Quantitative Easing: Lessons We’ve Learned*, FED. RSRV. BANK OF ST. LOUIS (July 1, 2012), <https://www.stlouisfed.org/publications/regional-economist/july-2012/quantitative-easing-lessons-weve-learned> [https://perma.cc/B2J9-TUT2].

126. This round of QE began in March 2009 and ended in March 2010. Ricketts, *supra* note 123, at 2. Apparently, QE was not unique to the 2008 crisis; it had been used in the 1930s. Richard G. Anderson, *The First U.S. Quantitative Easing: The 1930s*, FED. RSRV. BANK OF ST. LOUIS: ECON. SYNOPSIS (June 30, 2010), <https://files.stlouisfed.org/files/htdocs/publications/es/10/ES1017.pdf> [https://perma.cc/A6HF-Y4C9].

127. Ricketts, *supra* note 123, at 2.

128. *Id.* at 1–2.

fallout that accompanied the COVID-19 pandemic.¹²⁹ As before, the FOMC purchased Treasury securities and mortgage-backed securities from the government sponsored entities.¹³⁰

Various central banks in Europe—most notably the European Central Bank (“ECB”)—now favor a new breed of QE that is addressed toward mitigating climate change.¹³¹ The initiative to pursue “green QE” essentially involves the ECB adjusting its asset holdings to increase its portfolio of so-called green bonds.¹³² As the name suggests, a green bond is a debt security whose proceeds finance green investment projects or those with some positive environmental impact.¹³³ Described by the ECB, “these debt instruments are increasingly used by companies, governments and financial institutions to finance the adoption of more energy-efficient technologies, reduce carbon emissions and reorient business models towards sustainable economic activities.”¹³⁴ By purchasing green bonds, the ECB believes it will be successful in promoting the growth of green financial

129. On March 15, 2020, the FOMC committed to increase the Fed’s holdings of Treasury securities and agency MBS “in the amounts needed to support smooth market functioning and effective transmission of monetary policy to broader financial conditions,” without an explicit limit. Press Release, Bd. of Governors of the Fed. Rsrv. Sys., *Federal Reserve Announces Extensive New Measures to Support the Economy* (Mar. 23, 2020), <https://www.federalreserve.gov/newsevents/pressreleases/monetary20200323b.htm> [https://perma.cc/3RLW-K7S8] [hereinafter Press Release, New Measures]. The FOMC also expanded open-market purchases to include agency CMBS. Press Release, Bd. of Governors of the Fed. Rsrv. Sys., *Federal Reserve Issues FOMC Statement* (Mar. 23, 2020), <https://www.federalreserve.gov/newsevents/pressreleases/monetary20200323a.htm> [https://perma.cc/N4KR-N5KV].

130. Press Release, New Measures, *supra* note 129.

131. See, e.g., *Corporate Sector Purchase Programme*, EUR. CENT. BANK, <https://www.ecb.europa.eu/mopo/implement/app/html/index.en.html#cspp> (last visited May 22, 2021) [https://perma.cc/AH6B-QPJK]; *Public Sector Purchase Programme*, EUR. CENT. BANK, <https://www.ecb.europa.eu/mopo/implement/omt/html/index.en.html#pspp> (last visited May 22, 2021) [https://perma.cc/GQ67-HDHH].

132. Roberto A. De Santis, Katja Hettler, Madelaine Roos & Fabio Tamburrini, *Purchases of Green Bonds Under the Eurosystem’s Asset Purchase Programme*, EUR. CENT. BANK: ECON. BULL., https://www.ecb.europa.eu/pub/economic-bulletin/focus/2018/html/ecb.ebbox201807_01.en.html (last visited July 18, 2021) [https://perma.cc/U33V-N32X]. Hungary is also considering such a program. Press Release, Magyar Nemzeti Bank, *Magyar Nemzeti Bank Among the First Central Banks to Create a Dedicated Green Bond Portfolio Within Foreign Exchange Reserves* (June 20, 2019), <https://www.mnb.hu/en/pressroom/press-releases/press-releases-2019/magyar-nemzeti-bank-among-the-first-central-banks-to-create-a-dedicated-green-bond-portfolio-within-foreign-exchange-reserves> [https://perma.cc/42YA-RDCA].

133. EUR. CENT. BANK, *THE INTERNATIONAL ROLE OF THE EURO 20* (June 2020), <https://www.ecb.europa.eu/pub/pdf/ire/ecb.ire202006~81495c263a.en.pdf> [https://perma.cc/UD2N-HXP7].

134. *Id.*

investments and generally lowering the cost of capital for those companies that invest in clean energy.¹³⁵

The ECB has now been purchasing green bonds under various asset purchase programs for several years.¹³⁶ It is fair to say that the ECB is the largest single buyer of the green bonds in the European markets. By 2018, the ECB had purchased twenty-four percent of the €48 billion pool of eligible green public sector bonds and twenty percent of the €31 billion pool of eligible green corporate bonds.¹³⁷ By the ECB's standards, its green asset purchases seem to have had their intended effect of incentivizing more green debt. EU residents are the largest issuers of green bonds; in 2019, over half of the global issuance of green bonds was denominated in euros.¹³⁸

However, the green version of QE does not sit well with U.S. law.¹³⁹ On its face, the text of section 14 of the Federal Reserve Act does not endorse purchases of private bonds.¹⁴⁰ That provision provides a list of the debt securities that the Fed "shall have power" to buy.¹⁴¹ It includes gold, Treasury bonds, bonds guaranteed by a government agency (i.e., MBS from the government-sponsored enterprises

135. *Id.* In 2018, the ECB stated that, while its asset purchase program did buy green bonds, that program did not cater to an "explicit environmental target." De Santis et al., *supra* note 132. However, in January 2021, the ECB shifted to a policy of using its "own funds portfolio to invest in [a] euro-denominated green bond investment fund" thereby "contribut[ing], within its mandate, to global efforts to promote environmental objectives." Press Release, ECB to Invest in Bank for International Settlement's Green Bond Fund, Jan. 25, 2021, <https://www.ecb.europa.eu/press/pr/date/2021/html/ecb.pr210125~715adb4e2b.en.html>.

136. De Santis et al., *supra* note 132.

137. Tommy Stubbington & Martin Arnold, *Pushback and Practicalities Limit Hopes for 'Green QE' from ECB*, FIN. TIMES (Nov. 4, 2019), <https://www.ft.com/content/d3f52ba6-fef2-11e9-b7bc-f3fa4e77dd47> [<https://perma.cc/4PG8-KBFW>].

138. *Id.*; EUR. CENT. BANK, *supra* note 133, at 20.

139. This is not to say that green QE is clearly legal as a matter of EU law. To be sure, even within the ECB, green QE has its critics. See Piotr Skolimowski & Yuko Takeo, *Weidmann Warns Green QE Could Overburden ECB Monetary Policy*, BLOOMBERG (Oct. 29, 2019), <https://www.bloomberg.com/news/articles/2019-10-29/ecb-s-weidmann-warns-green-qe-could-overburden-monetary-policy> [<https://perma.cc/Y4CD-Q34T>] (detailing the position of the Bundesbank CEO).

140. More specifically, section 14 empowers the Fed to buy assets in the open market as a means of influencing interest rates and the amount of money (and credit) in circulation. Federal Reserve Act § 14, 12 U.S.C. § 355. Although section 14 allocates power to the Reserve banks to buy and sell assets in the open market, because unconventional monetary policy is a Board-prescribed policy directed to the Reserve banks to orchestrate, it is considered in this Part II.A in connection with Board powers. Granted, however, because section 14(2) gives the Fed the authority to purchase state and municipal bonds, the Fed theoretically could buy bonds issued by these localities to finance a transition. 12 U.S.C. § 355.

141. 12 U.S.C. § 355; see also Glenn D. Rudebusch, *Climate Change and the Federal Reserve*, FED. RESRV. BANK OF S.F.: ECON. LETTER (Mar. 25, 2019), <https://www.frbsf.org/economic-research/publications/economic-letter/2019/march/climate-change-and-federal-reserve/> [<https://perma.cc/4PWJ-C3ZY>] (discussing the impacts that climate change will have on the Fed's duty to provide macroeconomic and financial stability).

(“GSEs”)), municipal bonds, and bonds issued by the now defunct Home Owners’ Loan Corporation.¹⁴² There is no mention of bonds issued from private sector businesses.¹⁴³

Admittedly, the Fed purchased private corporate bonds in 2020 while fighting the economic crisis spurred by the COVID-19 pandemic. But the 2020 asset purchases were not part of QE—rather, they were structured as emergency liquidity assistance under the Fed’s LOLR authority, derived from section 13(3) of the Federal Reserve Act.¹⁴⁴ Decidedly, green QE could not be authorized under section 13(3).¹⁴⁵ A proactive plan to use bond-buying to make the financial system greener is not by definition an action aimed to provide “liquidity to the financial system,”¹⁴⁶ nor is it a financial crisis-fighting measure.

Not only does the text of sections 13(3) and 14 seem to preclude green QE, so too does the Fed’s monetary policy mandate. Section 2A of the Federal Reserve Act broadly specifies the Fed’s monetary policy objectives.¹⁴⁷ The Fed must pursue price stability and maximum employment, with a view to “accommodating commerce and business.”¹⁴⁸ There is no mention of additional green goals.

A point of comparison here is useful. Consider the monetary policy mandate of ECB, which explicitly requires due consideration be given to the environment in executing monetary policy. The formative treaty of the ECB—the Treaty on the Functioning of the European Union—sets out its monetary policy objectives:

142. 12 U.S.C. §§ 354–55.

143. Regulation putting flesh on section 14 does stretch the purpose of the provision somewhat, by stipulating that Reserve Banks are “authorized and directed to engage in such other operations as the Committee may from time to time determine to be reasonably necessary to the effective conduct of open market operations and the effectuation of open market policies.” 12 C.F.R. § 270.4(d) (2021).

144. 12 U.S.C. § 343. As part of these 2020 facilities, the Fed purchased corporate bonds and corporate bond ETFs—assets not specifically listed in section 14. Press Release, Bd. of Governors of the Fed. Rsrv. Sys., Primary Market Corporate Credit Facility (June 29, 2020), <https://www.federalreserve.gov/newsevents/pressreleases/files/monetary20200629a1.pdf> [<https://perma.cc/P85S-F62P>]; Press Release, Bd. of Governors of the Fed. Rsrv. Sys., Federal Reserve Board Announces Updates to Secondary Market Corporate Credit Facility (SMCCF), Which Will Begin Buying a Broad and Diversified Portfolio of Corporate Bonds to Support Market Liquidity and the Availability of Credit for Large Employers (June 15, 2020), <https://www.federalreserve.gov/newsevents/pressreleases/monetary20200615a.htm> [<https://perma.cc/E8J7-G3EW>].

145. This assumes that it would be lawful for the Fed to seek to interpret its statutory power beyond what is set out explicitly in the text of section 14. *See* *Chevron, U.S.A., Inc. v. Nat. Res. Def. Council, Inc.*, 467 U.S. 837 (1984).

146. 12 U.S.C. § 343; *see also* Christina Parajon Skinner, *Central Bank Activism*, 71 DUKE L.J. (forthcoming 2021) (on file with author).

147. 12 U.S.C. § 225(a).

148. *Id.* §§ 225(a), 357.

The primary objective of the European System of Central Banks . . . shall be to maintain price stability. Without prejudice to the objective of price stability, the ESCB shall *support the general economic policies in the Union* with a view to contributing to the achievement of the objectives of the Union as laid down in Article 3 of the Treaty on European Union.¹⁴⁹

Elsewhere in the Treaty, Article 11 makes plain that environmental protection is one of the “general economic policies” of the Union that must be factored in and “contributed to” through the use of monetary policy tools. It provides that

[e]nvironmental protection requirements must be integrated into the definition and implementation of the Union’s policies and activities, in particular with a view to promoting sustainable development.¹⁵⁰

It is common for European central banks to include reference to governmental objectives in their statutory objectives.¹⁵¹

The Bank of England is similarly mandated. The Bank’s monetary policy mandate is set out in the Bank of England Act 1998 and has a secondary objective of “supporting the economic policy of Her Majesty’s Government, including its objectives for growth and employment.”¹⁵² The Act provides for a Monetary Policy Remit between HM Treasury (“HMT”) and the Bank and that is where HMT sets out what its economic policy is. Indeed, in the 2021 Remit letter, HMT specified that the MPC should take sustainability considerations in view in fashioning monetary policy.¹⁵³

But not so under U.S. law. The Federal Reserve Act does not include such secondary objectives. In the absence of such instruction to “have regard” to the government’s social or economic policy, it is likely too strained to interpret section 14 of the Federal Reserve Act to allow green asset purchases in the open market, or the use of section 13 to legitimize those purchases indirectly in the interest of emergency liquidity assistance.

149. Consolidated Version of the Treaty on the Functioning of the European Union, art. 127, 2012 O.J. (C 326) 47, 102 (emphasis added).

150. *Id.* at art. 11.

151. See Rosa Maria Lastra & Kern Alexander, Pol’y Dep’t for Econ., Sci. & Quality of Life Policies, Eur. Parliament, *The ECB Mandate: Perspectives on Sustainability and Solidarity* (June 2020), [https://www.europarl.europa.eu/RegData/etudes/IDAN/2020/648813/IPOL_IDA\(2020\)648813_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/IDAN/2020/648813/IPOL_IDA(2020)648813_EN.pdf) [<https://perma.cc/R78Y-PNEZ>].

152. The Bank of England Act, for example, mandates the Financial Policy Committee. Bank of England Act 1998, c. 11, pt. 1A, § 9C (UK). Its monetary policy objectives are similarly worded. *Id.* § 11.

153. Letter from Rishi Sunak to Andrew Bailey, Governor, Bank of Eng. (Mar. 3, 2021).

2. Regulation

The Fed is the primary prudential regulator for a number of large financial institutions. These include bank holding companies and financial holding companies, as well as any nonbank financial institution that has been designated by the Financial Stability Oversight Council as systemically important.¹⁵⁴ The Fed's legal authority to regulate these financial institutions comes from a wide range of statutes, and results in a large body of banking regulation, impossible to canvas here. Nevertheless, one body of bank regulation sits closest to the conversation surrounding climate risk as credit risk: risk-based capital requirements.¹⁵⁵

All federally insured depository institutions are subject to some kind of capital requirements.¹⁵⁶ The principal rationale for requiring minimum capital charges is anchored in resilience—namely, so that banks can “continue lending to creditworthy households and businesses even after unforeseen losses and during severe economic downturns.”¹⁵⁷

Capital requirements pertain to the composition of a bank's sources of funding. In particular, they require banks to maintain a certain amount of funding that is fully loss-absorbing, like shareholder equity and retained earnings (in the first instance), and then other kinds of additional capital instruments that could absorb losses after a bank passes the point of nonviability.¹⁵⁸

This is to say that equity sits in the first-loss position of the capital stack. Higher up the capital stack is short-term unsecured debt, longer-term and secured debt of various priorities, and—for a deposit-taking bank—current accounts (i.e., deposits). As an accounting matter, these sources of funding represent the liability side of a bank balance sheet (though equity is technically not a liability). Minimum capital

154. BD. OF GOVERNORS OF THE FED. RSRV. SYS., *Supervising and Regulating Financial Institutions and Activities*, in THE FEDERAL RESERVE SYSTEM PURPOSES & FUNCTIONS, *supra* note 114, at 72, 74–75.

155. The other primary categories of bank regulation concern liquidity, leverage, and the nature of proprietary trading; but they are not relevant to climate change and credit risk.

156. *Regulatory Capital*, FED. DEPOSIT INS. CORP., <https://www.fdic.gov/regulations/capital/capital/index.html> (last visited May 23, 2021) [<https://perma.cc/F5TW-85SZ>].

157. Press Release, Bd. of Governors of the Fed. Rsrv. Sys., Federal Reserve Board Invites Comment on Three Proposed Rules Intended to Help Ensure Banks Maintain Strong Capital Positions (June 7, 2012), <https://www.federalreserve.gov/newsevents/pressreleases/bcreg20120607a.htm> [<https://perma.cc/N4KM-EMYL>].

158. Fin. Stability Inst., *Definition of Capital in Basel III – Executive Summary*, BANK FOR INT'L SETTLEMENTS, https://www.bis.org/fsi/fsisummaries/defcap_b3.pdf (last visited July 18, 2021) [<https://perma.cc/2AX2-2JNU>].

requirements therefore exist to ensure that banks maintain a cushion of equity that is sufficient to absorb asset-value losses before the bank approaches insolvency. Stated another way, a bank can remain solvent so long as its debt liabilities do not exceed its assets.

The largest financial institutions are subject to the most stringent set of these rules, which are agreed on an international level by a committee of the world's central banks. This committee, known as the Basel Committee on Banking Supervision,¹⁵⁹ gathers periodically to discuss a variety of banking standards designed to ensure the safety and soundness of internationally active banks. Its workstreams focus on a number of regulatory, supervisory, and governance issues, but its most significant contribution is a global capital regime. The Basel Committee also agrees what those risk weights should be—that is, the factor by which each category of asset or exposure is multiplied in order to determine the capital charge. Risk-based capital ratios are thus equal to the amount of regulatory capital that is held (in the numerator) divided by the amount of risk-weighted assets (“RWAs”) (in the denominator).¹⁶⁰ The latest of these Accords—Basel III—was agreed to in 2010 and formed in reaction to the 2008 financial crisis. Basel III significantly increased Core Equity Tier (“CET”) 1 equity capital requirements to 4.5 percent of a bank's risk-weighted assets.¹⁶¹

Each central bank is then responsible for implementing the agreed standards through the proper domestic law channels. For the U.S. bank regulators, this means that Basel rules can only be formally implemented as domestic regulation through the notice-and-comment rulemaking procedure that the Administrative Procedure Act (“APA”) requires.¹⁶² Basel III coincided nicely with Dodd-Frank reforms, which required the Fed to reconsider its capital rules in order to make them more stringent for certain large financial institutions. Specifically, section 171 of Dodd-Frank required the federal banking agencies (including the Fed) to establish minimum capital requirements for certain banking institutions. It provides:

159. *Basel III: International Regulatory Framework for Banks*, BANK FOR INT'L SETTLEMENTS, <https://www.bis.org/bcbs/basel3.htm> (last visited July 26, 2020) [<https://perma.cc/H436-Q6AQ>].

160. See DAVID ZARING, *THE GLOBALIZED GOVERNANCE OF FINANCE* (2020). For a helpful illustration of the operationalization of the Basel regime, see *U.S. Basel III Final Rule: Standardized Risk Weights Tool*, DAVIS POLK & WARDWELL LLP, <http://usbaseliii.com/tool/index.html> (last visited Sept. 14, 2021) [<https://perma.cc/J3DT-8NG5>].

161. Basel standards are minima. See BANK FOR INT'L SETTLEMENTS, *supra* note 159.

162. 5 U.S.C. § 533; see, e.g., 12 C.F.R. pts. 208, 217, 225 (2021) (notice-and-comment rules revising regulatory capital requirements and implementing Basel III); see *Basel Regulatory Framework: U.S. Implementation of the Basel Accords*, BD. OF GOVERNORS OF THE FED. RESRV. SYS., <https://www.federalreserve.gov/supervisionreg/basel/USImplementation.htm> (last updated March 8, 2020) [<https://perma.cc/VGN6-TSLY>] (tracking U.S. implementation).

The appropriate Federal banking agencies shall establish minimum risk-based capital requirements on a consolidated basis for insured depository institutions, depository institution holding companies, and nonbank financial companies supervised by the Board of Governors. The minimum risk-based capital requirements established under this paragraph shall not be less than the generally applicable risk-based capital requirements, which shall serve as a floor for any capital requirements that the agency may require, nor quantitatively lower than the generally applicable risk-based capital requirements that were in effect for insured depository institutions as of the date of enactment of this Act.¹⁶³

The final Fed Board rule fulfilling that mandate, and also implementing Basel III, is known as Regulation Q.¹⁶⁴

Inevitably, capital requirements create incentives that influence a bank's investment decisions. As a basic matter of corporate finance, it is relatively more efficient for banks to fund their investments with debt than with equity.¹⁶⁵ Thus, all things equal, banks will seek to hold the minimum level of capital that is permissible and populate the remainder of their capital stack with short- and long-term debt. Accordingly, regulators can alter firm behavior by adjusting the ratio of capital to RWA required, or by adjusting the risk weights attached to certain categories of assets. If certain asset categories become relatively more costly than others, all else being equal, such regulatory changes can incentivize banks to move away from those investments and toward others with lower capital charge requirements.¹⁶⁶

As such, some policymakers have proposed altering the capital regime to reduce bank's appetite for climate-related assets. For example, the EU Commission has considered whether to ease capital requirements for banks that provide climate-friendly loans. Policymakers in various jurisdictions have also discussed increased risk weights for loans to companies that are determined to have a heavy carbon footprint (or vice versa, to reduce risk weights for loans to companies with green footprints).¹⁶⁷

163. Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, § 171(b)(2), 124 Stat. 1376, 1436 (2010) (codified at 12 U.S.C. § 5371(b)(2)).

164. 12 C.F.R. pt. 217 (2021) (Regulation Q). Title 12 of the *United States Code* provides the Fed with a number of other statutory bases of authority for setting capital rules. *See, e.g.*, 12 U.S.C. § 248(d) (authorizing the Fed to "supervise and regulate" the issuance and retirement of notes).

165. Because equity holders can lose the entirety of their investment, whereas debtholders are legally entitled to repayment, the buyers of equity demand a premium on their investment. The interest paid on debt is also tax deductible. There are also a range of negative market signals associated with equity raising, which generally imply some weakness at the bank. *But see* Franco Modigliani & Merton H. Miller, *The Cost of Capital, Corporation Finance and the Theory of Investment*, 48 AM. ECON. REV. 261 (1958) (setting out the now famous theory which posits that corporations should be indifferent between funding themselves with debt versus equity).

166. Martin Sandbu, *Lagarde's Green Push in Monetary Policy Would Be Huge Step*, FIN. TIMES (Dec. 2, 2019), <https://www.ft.com/content/89f5f412-12bc-11ea-a225-db2f231cfeae> [<https://perma.cc/D53P-FM5C>].

167. It bears noting that there is a considerable amount of international work taking place in this space. This includes the International Association of Insurance Supervisors (IAIS) activities

Any of these options are technically possible as a matter of law. The Fed, like any other agency, can change its rules (including capital rules) by going through a notice-and-comment rulemaking process. But there could be some practical obstacles in the way. For one, any decision to increase capital charges would need to be reasonable and based on evidence. The APA creates a process by which rules may be set aside if “arbitrary” and “capricious.”¹⁶⁸ Pursuant to that standard, a federal court may reverse an agency rule if it has “relied on factors Congress did not intend it to consider” or “offered an explanation [for its decision] that runs counter to the evidence before the agency.”¹⁶⁹ Accordingly, to survive, any such change in capital rules would need to be based on firm data evidencing the increased relative riskiness of climate-related assets. And that evidence could not be abstract or subjectively interpreted. This may be challenging to do at present.

Additionally, on the arbitrary side of the ledger, altering risk weights vis-à-vis some corporate loans would appear in tension with other legislation that indicates Congress’s desire to prevent distinctions among corporate exposures.¹⁷⁰ Finally, the nature of risk-based capital requirements naturally re-weights assets when their value changes: if a borrower’s creditworthiness or collateral declines during the lifetime of a loan, the LTV ratio of that loan increases, thereby increasing the risk weight of the loan and commensurate capital charges. Piling on to this effect may well seem capricious.

with the Sustainable Insurance Forum, the Basel Committee’s Task Force on Climate Related Financial Risks, the FSB’s Task Force on Climate Related Financial Disclosures, and IOSCO and the Sustainable Finance Network. See Joint SIF-IAIS Issues Paper on Climate Change Risks to the Insurance Sector Released for Public Consultation, SUSTAINABLE INS. F. (Apr. 6, 2018), <https://www.sustainableinsuranceforum.org/joint-sif-iais-issues-paper-on-climate-change-risks-to-the-insurance-sector-released-for-public-consultation/> [<https://perma.cc/PF64-P23T>]; BASEL COMM. ON BANKING SUPERVISION, BANK FOR INT’L SETTLEMENTS, CLIMATE-RELATED FINANCIAL RISKS: A SURVEY ON CURRENT INITIATIVES (Apr. 2020), <https://www.bis.org/bcbs/publ/d502.pdf> [<https://perma.cc/G6MQ-V7X8>]; TASK FORCE ON CLIMATE-RELATED FIN. DISCLOSURES, FIN. STABILITY BD., RECOMMENDATIONS OF THE TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES (June 2017), <https://assets.bbhub.io/company/sites/60/2020/10/FINAL-2017-TCFD-Report-11052018.pdf> [<https://perma.cc/V68A-CBGT>]; INT’L ORG. OF SECS. COMM’NS, SUSTAINABLE FINANCE AND THE ROLE OF SECURITIES REGULATORS AND IOSCO (Apr. 2020), <https://www.iosco.org/library/pubdocs/pdf/IOSCOPD652.pdf> [<https://perma.cc/M83W-G3QQ>].

168. 5 U.S.C. § 706(2)(A).

169. *E.g.*, *Greater Yellowstone Coal. v. Lewis*, 628 F.3d 1143, 1148 (9th Cir. 2010) (internal quotation marks omitted).

170. Dodd-Frank section 939 prohibits banking agencies from using credit ratings in bank capital rules, thereby ensuring that the United States applies a uniform risk weight to all corporate credit exposures. See Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, § 939A, 124 Stat. 1376, 1887 (2010).

3. Supervision

The Fed also has a role in supervising financial institutions that is separate and distinct from its role as a regulator. It has both a microprudential role to supervise firms individually for their safety and soundness, and a macroprudential role to supervise firms more collectively to monitor financial system stability.¹⁷¹

i. Microprudential Supervision

The basis of the Fed's microprudential role is the Bank Holding Company ("BHC") Act of 1956.¹⁷² Section 5 of that Act empowers the Board to "make examinations of each bank holding company and each subsidiary thereof."¹⁷³ That provision further empowers the Board to "issue such regulations and orders as may be necessary to enable it to administer and carry out the purposes of this Act and prevent evasions thereof."¹⁷⁴ Over the years, the Fed's mandate for firm-level supervision has been framed in terms of "safety and soundness."¹⁷⁵ This language comes both from the BHC Act, which states as one of its purposes the "safe" operation of bank holding companies, as well as the Federal Deposit Insurance Corporation Improvement ("FDI") Act. The FDI Act specifies a mandate for the Fed to supervise financial institutions to ensure that they are safe and sound.¹⁷⁶ As such, "the Federal Reserve is responsible for supervising and regulating certain segments of the financial industry to ensure they employ safe and sound business practices and comply with all applicable laws and regulations."¹⁷⁷

171. The Fed has had a supervisory mandate since its inception. The original text of the 1913 Federal Reserve Act made plain that Congress contemplated the central bank to supervise banking in the United States. *See* H.R. 7837, 63d Cong. (1913).

172. Bank Holding Company Act of 1956, Pub. L. No. 84-511, 70 Stat. 133; *see also* EISENBACH ET AL., *supra* note 57, at 3.

173. Bank Holding Company Act § 5.

174. *Id.* § 5(b).

175. *See supra* Part I.A.2.

176. Federal Deposit Insurance Act, Pub. L. No. 81-797, § 39(a), 64 Stat. 882 (1950) (codified as amended at 12 U.S.C. § 1831p-1)

177. BD. OF GOVERNORS OF THE FED. RSRV. SYS., *Supervising and Regulating Financial Institutions and Activities*, *supra* note 154, at 74; *see also* Federal Institutions Supervisory and Insurance Act of 1966, Pub. L. 89-695, 80 Stat. 1028, 1029 (giving the Board, for the first time, legal authority to pre-emptively take action against banks "about to engage . . . in an unsafe or unsound practice"); Federal Deposit Insurance Corporate Improvement Act of 1991, Pub. L. 102-242, § 121, 105 Stat. 2250 (outlining how federal regulators, including the Board, must take "prompt corrective action" should bank capital positions deteriorate); EUR. CENT. BANK, *supra* note 133, at 20; Lev Menand, *Too Big to Supervise: The Rise of Financial Conglomerates and the Decline of Discretionary Oversight in Banking*, 103 CORNELL L. REV. 1527, 1542, 1557 (2018).

To fulfill these safety-and-soundness mandates, the Fed routinely examines these financial institutions to assess their condition along a number of pertinent dimensions.¹⁷⁸ (Notably, Reserve Banks perform the bulk of day-to-day supervision, acting on authority delegated from the Board.¹⁷⁹) The Gramm-Leach-Bliley (“GLB”) Act provides specific parameters to guide the exams. As paraphrased by the Federal Reserve, GLB suggests inspections should be conducted to

Inform the board of the nature of the operations and financial condition of each BHC and its subsidiaries, including—

[T]he financial and operational risks within the holding company system that may pose a threat to the safety and soundness of any depository institution (DI) subsidiary of such bank holding company, and

[T]he systems for monitoring and controlling such financial and operational risks; and

[M]onitor compliance by any entity with the provisions of the BHC Act or any other federal law that the Board has specific jurisdiction to enforce against the entity, and to monitor compliance with any provisions of federal law governing transactions and relationships between any DI subsidiary of a BHC and its affiliates.¹⁸⁰

The Fed’s supervisory staff has authority under the BHC Act to “review *all* books and records of a banking organization” under its purview.¹⁸¹

The Fed Board has interpreted these statutory “safety and soundness” mandates, and the powers they afford, and set out guidance for on-the-ground examiners in published supervisory manuals. According to these documents, supervisors must evaluate bank holding companies rigorously surrounding their loan administration. They must, for example, consider the bank’s lending standards and practices (including credit policies and processes for assessing borrower’s financial capacity). Supervisors are also told to evaluate a bank’s risk management framework generally and the way in which it undertakes credit analysis. Along these lines, there are a number of “inspection objectives” the manual sets out, including, for example:

To determine if the parent’s loan policies are adequate in relation to the responsibilities it has for the supervision of its credit-extending subsidiaries and whether those policies are consistent with safe and sound lending practices. . . .

178. See DIV. OF SUPERVISION & REGUL., BD. OF GOVERNORS OF THE FED. RSRV. SYS., BANK HOLDING COMPANY SUPERVISION MANUAL (Feb. 2020), https://www.federalreserve.gov/publications/supervision_bhc.htm [https://perma.cc/T92D-UBQV] [hereinafter BHC SUPERVISION MANUAL]. The *BHC Supervision Manual* is voluminous.

179. *Supervision*, FED. RSRV. BANK OF N.Y., https://www.newyorkfed.org/aboutthefed/org_banksup.html (last visited July 18, 2021) [https://perma.cc/YR55-69B3] (noting that while the Board establishes supervisory policies, it delegates day-to-day supervision to the Reserve Banks).

180. BHC SUPERVISION MANUAL, *supra* note 178, § 1040.0.

181. *Id.* § 1040.0.1.1.

To establish whether the loan policy ensures sound assessments of the value of real estate and other collateral.¹⁸²

For commercial loans specifically, supervisors are instructed

To determine whether the bank holding company has formal credit policies that (1) provide clear guidance on its appetite for credit risk and (2) support sound lending decisions. . . .

To be alert to indications of insufficiently rigorous risk assessment at banking organizations, particularly inadequate stress testing and excessive reliance on strong economic conditions and robust financial markets to support a borrower's capacity to service its debts.

To be attentive in reviewing a banking organization's assessment and monitoring of credit risk to ensure that undue reliance on favorable conditions does not lead to delayed recognition of emerging weaknesses in some loans.¹⁸³

As such, bank supervisors expect that bank managers are considering "all relevant risk[s]" in their underwriting practices.¹⁸⁴

Credit risk is not the only risk that supervisors mind. Supervisors are instructed to assess the BHCs along the "entire spectrum of risks facing an institution," including "*operational risk*, which arises from the potential that inadequate information systems, operational problems, . . . or unforeseen catastrophes will result in unexpected losses."¹⁸⁵ The spectrum also necessarily includes "*market risk*," which is described as "the risk to an institution's financial condition resulting from adverse movements in market rates or prices"¹⁸⁶

Additionally, Fed supervisors have scope where the largest financial institutions are concerned.¹⁸⁷ Since 2015, the Fed has employed a special supervisory system for this category of BHCs with

182. *Id.* § 2010.2.8 ("Inspection Objectives").

183. *Id.*

184. DIV. OF BANKING SUPERVISION & REGUL., BD. OF GOVERNORS OF THE FED. RSRV. SYS., SR 96-36, GUIDANCE ON EVALUATING ACTIVITIES UNDER THE RESPONSIBILITY OF U.S. BRANCH, AGENCIES AND NONBANK SUBSIDIARIES OF FOREIGN BANKING ORGANIZATIONS (FBOS) (Dec. 19, 1996); *see also* 12 C.F.R. pt. 208, app. D-1 ("Interagency Guidelines Establishing Standards for Safety and Soundness"); Uniform Financial Institutions Rating System, 62 Fed. Reg. 752 (Jan. 6, 1997).

185. BHC SUPERVISION MANUAL, *supra* note 178, § 2124.01.6 ("Assessing the Institution's Risk").

186. *Id.*

187. "Large Institution Supervision Coordinating Committee (LISCC) firms: the largest, most complex U.S. and foreign financial organizations subject to consolidated supervision by the Federal Reserve. Nonbank financial companies designated by the Financial Stability Oversight Council (FSOC) for supervision by the Federal Reserve are included in the LISCC portfolio. LISCC firms are considered to pose the greatest systemic risk to the U.S. economy." DIV. OF BANKING SUPERVISION & REGUL., BD. OF GOVERNORS OF THE FED. RSRV. SYS., SR 12-17, CONSOLIDATED SUPERVISION FRAMEWORK FOR LARGE FINANCIAL INSTITUTIONS (Dec. 17, 2012).

over \$100 billion in assets.¹⁸⁸ This set of large financial institutions (“LFIs”) includes Bank of America, BNY Mellon, Citigroup, Goldman Sachs, JPMorgan Chase, Morgan Stanley, State Street, and Wells Fargo.¹⁸⁹ From November 2018, these LFIs have been subject to a specific rating system adopted to determine, via supervisory evaluations, whether the institution “possesses sufficient financial and operational strength and resilience to maintain safe-and-sound operations through a range of conditions, including stressful ones.”¹⁹⁰ The LFI rating system comprises three components: capital planning and positions; liquidity risk management and positions; and governance and controls.¹⁹¹

Supervisors thus have a good deal of lawful discretion in risk *assessment*.¹⁹² In theory, supervisors have latitude to consider whether banks are adequately considering all manner of credit risk—including climate risk. And Supervisors have similar latitude to decide what consequences follow from a deficiency they identify. Most penalties take the shape of informal actions, “in the sense that the Federal Reserve’s authority to impose these actions is based on supervisory practice as described in various SR Letters.”¹⁹³ These are referred to as letters, dubbed “matters requiring attention,” or “MRAs”; or with slightly more seriousness, “matters requiring immediate attention,” or “MRIAs.” As their names suggest, these letters pinpoint issues that are important to the Fed and which the Fed expects the bank to address.¹⁹⁴

But the discretion for such supervisory *enforcement* actions related to banks’ exposure to climate assets is, in practice, narrower. In particular, the Fed’s interpretive guidance on the use of MRAs would seem to preclude these letters from applying to situations of banks’ climate risk exposure. MRAs (and MRIAs) must be related to “matters that have the potential to pose significant risks to the safety and soundness of the banking organization” or matters that violate the

188. DIV. OF BANKING SUPERVISION & REGUL., BD. OF GOVERNORS OF THE FED. RESRV. SYS., SR 15-7, GOVERNANCE STRUCTURE OF THE LARGE INSTITUTION SUPERVISION COORDINATING COMMITTEE (LISCC) SUPERVISORY PROGRAM (Apr. 17, 2015).

189. *Large Institution Supervision Coordinating Committee*, BD. OF GOVERNORS OF THE FED. RESRV. SYS., <https://www.federalreserve.gov/supervisionreg/large-institution-supervision.htm> (last updated Dec. 18, 2020) [<https://perma.cc/D745-N5LT>].

190. BHC SUPERVISION MANUAL, *supra* note 178, § 1060.1. The terms “financial strength and resilience” and “operational strength and resilience” are defined in footnote three of section 1060.01 of the *BHC Supervision Manual*, *id.*

191. *Id.*

192. 12 C.F.R. § 337 (2021) (outlining the FDIC’s authority to assess “unsafe and unsound banking practices”).

193. EISENBACH ET AL., *supra* note 57, at 29–30.

194. *Id.*

law.¹⁹⁵ As Fed Vice Chair for Supervision Randall Quarles has described them,

MRAs are supervisory communications that identify areas where banks are out of compliance with applicable legal standards or otherwise are engaged in practices that create substantial safety and soundness risks. MRAs identify the source of the compliance failure, deficiency, or safety and soundness weakness and generally include an expected timeframe for remediation. MRAs are not legally binding and are not enforcement actions.¹⁹⁶

That standard is likely to become much stricter. As Quarles proposed in January 2020, MRAs may soon be limited to “violations of law, violations of regulation, and material safety and soundness issues.”¹⁹⁷ For the reasons set out in Part I, banks’ exposure to physical and transition risks does not presently appear to implicate “material safety and soundness issues.”¹⁹⁸

There are also formal actions—like cease and desist orders—that the Fed could use to discipline banks on climate.¹⁹⁹ But standards for applying those are higher than those for MRAs or MRIAs. Formal enforcement actions are publicly disclosed documents that must stipulate verifiable facts about a firm; generally, these actions address demonstrable violations of banking law or regulation.²⁰⁰ Accordingly, absent future legislative or regulatory prohibitions on banks from investing in certain climate-unfriendly assets, formal enforcement actions from the Fed seem inapposite.

ii. Macroprudential Supervision

As earlier discussed, the Fed also has responsibility to supervise the banking system as a whole in the interest of financial stability.²⁰¹ The Dodd-Frank Act of 2010 “explicitly direct[ed] the Federal Reserve

195. *Id.* at 30.

196. Randal K. Quarles, Vice Chair for Supervision, Bd. of Governors of the Fed. Rsrv. Sys., Speech at the American Bar Association Banking Law Committee Meeting 2020: Transparency, Accountability, and Fairness in Bank Supervision (Jan. 17, 2020), <https://www.federalreserve.gov/newsevents/speech/quarles20200117a.htm> [<https://perma.cc/N33M-WFP2>].

197. *Id.*; see also *Supervisory Policy and Guidance Topics*, BD. OF GOVERNORS OF THE FED. RSRV. SYS. <https://www.federalreserve.gov/supervisionreg/topics/enforcement.htm> (last updated Feb. 23, 2021) [<https://perma.cc/HNV6-6KDU>].

198. See *supra* notes 72–90.

199. See, e.g., Press Release, Bd. of Governors of the Fed. Rsrv. Sys., Cease and Desist Order in the Matter of Agricultural Bank of China (Sept. 28, 2016), <https://www.federalreserve.gov/newsevents/pressreleases/files/enf20160929a1.pdf> [<https://perma.cc/G838-WTTY>].

200. *Enforcement Actions & Legal Developments*, BD. OF GOVERNORS OF THE FED. RSRV. SYS., <https://www.federalreserve.gov/supervisionreg/legal-developments.htm> (last visited June 6, 2021) [<https://perma.cc/NAQ9-8XGL>].

201. See *supra* Part II.A.4.

to routinely factor macroprudential considerations into its supervisory and regulatory activities.”²⁰² In particular, the Dodd-Frank Act mandated a new form of supervision, which was designed to probe the resilience of the financial system overall.

The innovation is known as supervisory stress testing. The aim of the supervisory stress test centers around capital and capital planning. As explained in the Fed’s first paper setting out its process and rationale for supervisory stress testing, “a large BHC’s processes for managing and allocating its capital resources are critical not only to its individual health and performance, but also to the stability and effective functioning of the U.S. financial system.”²⁰³

Stress testing is a scenario-based exercise which is conducted every year on large banks with over \$100 billion in consolidated assets (and every other year for medium-size BHCs).²⁰⁴ The tests require banks to provide information about their balance sheets in response to a set of scenarios involving some kind of unexpected, drastic economic shock.²⁰⁵ Scenarios on the test vary year to year. In 2018, for example, the Board applied a severely adverse scenario “characterized by a severe global recession in which the U.S. unemployment rate rises almost 6 percentage points to 10 percent, accompanied by a steepening Treasury yield curve.”²⁰⁶

Each scenario includes 28 variables--such as gross domestic product, unemployment rate, stock market prices, and interest rates--encompassing domestic and international economic activity. Along with the variables, the Board is publishing a narrative that describes the general economic conditions in the scenarios and changes in the scenarios from the previous year.²⁰⁷

In 2020, the “severely adverse scenario . . . feature[d] a severe global recession in which the U.S. unemployment rate rises by 6.5 percentage points to 10 percent, and elevated stress in corporate debt

202. BD. OF GOVERNORS OF THE FED. RSRV. SYS., *Supervising and Regulating Financial Institutions and Activities*, *supra* note 154, at 98.

203. BD. OF GOVERNORS OF THE FED. RSRV. SYS., CAPITAL PLANNING AT LARGE BANK HOLDING COMPANIES: SUPERVISORY EXPECTATIONS AND RANGE OF CURRENT PRACTICE 1 (Aug. 2013), <https://www.federalreserve.gov/bankinfo/bcreg20130819a1.pdf> [<https://perma.cc/WW2W-89T6>].

204. Firms with over \$250 billion consolidated assets have to take the test every year. *See* BD. OF GOVERNORS OF THE FED. RSRV. SYS., DODD-FRANK ACT STRESS TEST 2020: SUPERVISORY STRESS TEST RESULTS 1 (June 2020), <https://www.federalreserve.gov/publications/files/2020-dfast-results-20200625.pdf> [<https://perma.cc/XK5R-9ASD>].

205. For methodology, see *id.*

206. Press Release, Bd. of Governors of the Fed. Rsr. Sys., Federal Reserve Board Releases Scenarios for 2018 Comprehensive Capital Analysis and Review (CCAR) and Dodd-Frank Act Stress Test Exercises and Issues Instructions to Firms Participating in CCAR (Feb. 1, 2018), <https://www.federalreserve.gov/newsevents/pressreleases/bcreg20180201a.htm> [<https://perma.cc/QN7B-9859>].

207. *Id.*

markets and commercial real estate.”²⁰⁸ Banks with large trading operations were also “required to factor in a global market shock component as part of their scenarios.”²⁰⁹ The aim of the 2020 scenarios was to give the Fed an idea of “how large banks perform during a severe recession” and to give the Board “increased information on how leveraged loans and collateralized loan obligations may respond to a recession.”²¹⁰

The Fed then uses its own models²¹¹ to determine the effect of the shock on the regulatory capital ratios of the firms; importantly, stress testing assumes a dynamic balance sheet—that is, it models the impact of a shock on banks’ balance sheets over a nine quarter time horizon.²¹² With those projections, the Fed gets a picture (more like a short film) of how each institution in the banking system would react to the economic shock.²¹³ In addition to the scenario responses, some BHCs also submit a capital plan to the Fed, describing their capital planning processes and governance and a capital plan describing their decisions about dividend distributions.²¹⁴ If a bank “fails” its stress test, it may not make capital distributions (pay dividends) unless and until the Fed approves.²¹⁵

The legal authority for the stress tests is two-fold. Formally, the Fed runs two simultaneous stress tests. One of those, known as the DFAST, is required by section 165 of the Dodd-Frank Act. That provision mandates that

208. Press Release, Bd. of Governors of the Fed. Rsrv. Sys., Federal Reserve Board Releases Hypothetical Scenarios for Its 2020 Stress Test Exercises (Feb. 6, 2020), <https://www.federalreserve.gov/newsevents/pressreleases/bcreg20200206a.htm> [<https://perma.cc/NEE7-TALP>].

209. *Id.*

210. *Id.* (internal quotation marks omitted).

211. Model independence is critical to the credibility of the test. As the Fed noted in its policy statement on supervisory stress testing, “Supervisory models provide an independent check on firm risk management, and the use of consistent supervisory models in both the DFAST assessment and CCAR quantitative assessments is critical to ensuring that resulting capital requirements are based on a comparable assessment.” Stress Testing Policy Statement, 84 Fed. Reg. 6664, 6665 (Feb. 28, 2019).

212. *See* BD. OF GOVERNORS OF THE FED. RSRV. SYS., *supra* note 204, at 11.

213. Stress tests also have some salutary value. The results of stress tests are released to the public. *Id.* at ix. When banks pass, they reassure the market; this can be especially valuable during times of economic uncertainty or recent crisis. Even in benign market conditions, the information released from the Fed stress tests is believed to prompt markets to react. *See* MARK FLANNERY, BEVERLY HIRTLE & ANNA KOVNER, FED. RSRV. BANK OF N.Y., STAFF REP. NO. 744, EVALUATING THE INFORMATION IN THE FEDERAL RESERVE STRESS TESTS 26 (rev. Aug. 2016), https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr744.pdf [<https://perma.cc/5GR6-2AF8>] (finding that “stress testing disclosures continue to inform the market, with statistically significant abnormal volumes and returns”).

214. FLANNERY ET AL., *supra* note 213, at 6.

215. *Id.*

The Board of Governors, in coordination with the appropriate primary financial regulatory agencies . . . shall conduct annual analyses in which nonbank financial companies supervised by the Board of Governors and bank holding companies . . . are subject to evaluation of whether such companies have the capital, on a total consolidated basis, necessary to absorb losses as a result of adverse economic conditions.²¹⁶

That provision further provides that the Board “may develop and apply such other analytic techniques as are necessary to identify, measure, and monitor risks to the financial stability of the United States.”²¹⁷

Meanwhile, the second stress test—the Comprehensive Capital Analysis and Review (“CCAR”)—was developed by the Fed as adjunct to its capital planning rule, which it promulgates pursuant to the Bank Holding Company Act.²¹⁸ The Capital Plan Rule “requires all U.S.-domiciled, top-tier BHCs with total consolidated assets of \$50 billion or more to develop and maintain a capital plan supported by a robust process for assessing their capital adequacy.”²¹⁹ CCAR is used to evaluate the “plans of all BHCs subject to the Capital Plan Rule . . . in a single, unified process.”²²⁰

Accordingly, with stress testing, the Fed could lawfully incorporate climate change in some ways, but not others. Climate-related scenarios appear to be fair game. The Fed has the regulatory latitude to develop the stress test scenarios each year, with input from experts in economic fields.²²¹ The parameters are as follows:

In general, the baseline scenario will reflect the most recently available consensus views of the macroeconomic outlook expressed by professional forecasters, government agencies, and other public-sector organizations as of the beginning of the stress-test cycle. The severely adverse scenario will consist of a set of economic and financial conditions that reflect the conditions of post-war U.S. recessions.²²²

There are no other legal or regulatory restrictions that would prevent the Fed from devising a scenario that featured climate change,

216. Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, § 165, 124 Stat. 1376, 1430 (2010) (codified at 12 U.S.C. § 5365).

217. *Id.*

218. BD. OF GOVERNORS OF THE FED. RSRV. SYS., *supra* note 203, at 1.

219. *Id.*

220. *Id.* at 1 n.3. The DFAST and the CCAR are run simultaneously, pursuant to the same macroeconomic scenarios, and with the same inputs provided by the banks. The main difference between the two regards their assumptions—CCAR models bank balance sheets based on what the bank has said they plan to do in their capital plan regarding dividend, share repurchase, and other capital actions; meanwhile, DFAST assumes a standard plan for all banks in those regards.

221. As discussed, for the scenario to actually dent bank balance sheets it would have to be analogous to a recession or “retrenchment in housing prices.” Bora Durdu, Rochelle Edge & Daniel Schwindt, *Measuring the Severity of Stress-Test Scenarios*, BD. OF GOVERNORS OF THE FED. RSRV. SYS. (May 5, 2017), <https://www.federalreserve.gov/econres/notes/feds-notes/measuring-the-severity-of-stress-test-scenarios-20170505.htm> [<https://perma.cc/99HU-SNPW>]. For rules regarding how the Fed designs its scenarios, see 12 C.F.R. § 252, app. A (2021).

222. 12 C.F.R. § 252, app. A § 4(b) (2021).

provided it were designed to meet the above-mentioned requirements for severity.²²³

There are, however, legal limits to the lines along which the Fed can evaluate the banks during the stress test. Both the DFAST and CCAR are statutorily linked to capital and the capital planning process. So while the Fed could hypothesize a recession precipitated by climate change, its evaluations would necessarily focus on the extent to which bank balance sheets have capacity to remain resilient over some period of time during a recession-type scenario.

The Fed could not use stress testing as a way to scrutinize the nature of bank lending, divorced from concrete risk. This limit could make it difficult to capture concerns that are predicted along a much longer time horizon. For example, CCAR and DFAST stress testing cannot, as designed, address the more gradual risks envisioned with climate change. Those tests do not allow the Fed to probe banks' capital position in reaction to more gradual macroeconomic events—like rising sea levels or phased-in transition policies. Nor could stress tests be lawfully used as tools for supervisors to pass value judgments on the kinds of loans and other credit investments BHCs are making.²²⁴

In recognition of these limits inherent in traditional stress tests, the Bank of England (“the BOE”) consulted on a proposal to develop a new stress test that considers climate risks. In 2019, the BOE asked for public input on a new biennial exploratory scenario (“BES”) “to explore the financial risks posed by climate change.”²²⁵ “The BES is the part of the Bank’s stress testing framework used to explore less well-understood risks that are not neatly linked to the financial cycle.”²²⁶ The stated objectives of the BES are different from those of the BOE’s standard, capital-focused stress test. In particular, the BES will

223. See Daniel K. Tarullo, Member, Bd. of Governors of the Fed. Rsrv. Sys., Remarks at the Federal Reserve Bank of Chicago Annual Risk Conference: Developing Tools for Dynamic Capital Supervision (Apr. 10, 2012), <https://www.federalreserve.gov/newsevents/speech/files/tarullo20120410a.pdf> [<https://perma.cc/EC7L-WY5X>].

224. As described in an early paper on stress testing, “quantitative metrics have a role to play in this view of supervision, but examiners are not directed to come to an independent view of a firm’s creditworthiness in a stress scenario.” BEVERLY HIRTLE & ANDREAS LEHNERT, FED. RSRV. BANK OF N.Y., STAFF REP. NO. 696, SUPERVISORY STRESS TESTS 3 (Nov. 2014), https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr696.pdf [<https://perma.cc/MG43-QCNE>].

225. *The 2021 Biennial Exploratory Scenario on the Financial Risks from Climate Change*, BANK OF ENG. 1 (Dec. 2019), <https://www.bankofengland.co.uk/-/media/boe/files/paper/2019/the-2021-biennial-exploratory-scenario-on-the-financial-risks-from-climate-change.pdf> [<https://perma.cc/5EBH-CVSE>].

226. *Id.*

focus on sizing risks, rather than testing firms' capital adequacy or setting capital requirements. It will also allow the Bank to examine how major financial firms expect to adjust their business models, and what the collective impact of these responses on the wider economy might be. Finally, the BES will provide a vehicle for financial firms to identify and address data gaps and to develop cutting-edge risk management approaches.²²⁷

This addition to the BOE's stress testing framework is well justified under its expansive and explicit statutory objectives for financial stability. The Banking Act 2009 states as one of the Bank's primary objectives "to protect and enhance the stability of the financial system of the United Kingdom."²²⁸ Additionally, the Bank of England Act 1998, as amended by the Financial Services Act 2012, added a financial stability strategy to be pursued by the Bank's Court of Directors: it shall "determine the Bank's strategy in relation to the Financial Stability Objective."²²⁹ Critically, Parliament intended for that strategy to be dynamic, providing that the BOE Court should "from time to time review, and if necessary revise, the strategy."²³⁰

Thirdly, the Financial Services Act also created the Financial Policy Committee ("FPC") within the BOE. The FPC is a body charged primarily with the "identification of, monitoring for, and taking action to remove or reduce, systemic risks with a view to protecting and enhancing the resilience of the UK financial system."²³¹ The FPC has statutory power to introduce regulations and guidelines to meet that mandate—and this is the flexible power it uses to recommend and design new changes for BOE stress tests.²³² It also has a secondary objective to support the UK government's economic policy, and so would have a role to play "in seeking to support the government's Green Finance Strategy, which aims to ensure that the financial system is able

227. *Id.* The Dutch Central Bank is exploring something similar. See ROBERT VERMEULEN, EDO SCHETS, MELANIE LOHUIS, BARBARA KÖLBL, DAVID-JAN JANSEN & WILLEM HEERINGA, DE NEDERLANDSCHE BANK N.V., AN ENERGY TRANSITION RISK STRESS TEST FOR THE FINANCIAL SYSTEM OF THE NETHERLANDS, 16-7 OCCASIONAL STUD. (2018) (studying the effect of a carbon tax on bank borrowers and bank balance sheets). The ECB is as well. See Luis de Guindos, *Shining a Light on Climate Risks: The ECB's Economy-Wide Climate Stress Test*, EUR. CENT. BANK: THE ECB BLOG (Mar. 18, 2021), <https://www.ecb.europa.eu/press/blog/date/2021/html/ecb.blog210318~3bbc68ffc5.en.html> [<https://perma.cc/N3LW-ES8Z>] ("The ECB climate stress test examines the resilience of companies and banks to a range of climate scenarios.").

228. Banking Act 2009, c. 1, pt. 1, § 4(4) (UK).

229. Bank of England Act 1998, c. 11, pt. 1A, § 9A(1)(a) (UK).

230. *Id.* § 9A(1)(b).

231. *Id.* § 9C(2).

232. *Id.* § 9H(1).

to act to facilitate finance to support the delivery of the UK's carbon targets and clean growth.”²³³

The Fed's legal authority to pursue financial stability objectives is a different shade altogether. As a matter of explicit text, the Fed's “financial stability” mandate is weaker than the BOE's.²³⁴ The Fed's authority over financial stability is somewhat implicit, conferred by virtue of its historic role as lender of last resort under section 10B of the Federal Reserve Act.²³⁵ And it has consolidated that position via its power under Title I of the Dodd-Frank Act to supervise and regulate systemically important financial institutions and nonbank financial institutions on a special basis.²³⁶ But Congress has not legislated for the Fed a broad-based financial stability objective, nor given it a general rulemaking power to pursue any range of financial stability aims like the UK Parliament did with the BOE. Tellingly, Congress chose to put the United States' analog to the FPC—the Financial Stability Oversight Council—under the Treasury's aegis, further confirming that lawmakers intended for the government, not the Fed, to be responsible for creating new financial stability-serving tools.²³⁷

B. Reserve Bank Powers

The twelve regional Reserve Banks—spread across the nation—are a unique fixture in the U.S. central banking system. This decentralized nature of the Fed System was the result of a Wilsonian compromise, struck as a grand bargain necessary to achieve the passage of the Federal Reserve Act of 1913.²³⁸ The compromise was designed by

233. Letter from Rishi Sunak, HM Treasury, to Mark Carney, Governor, Bank of England, Remit and Recommendations for the Financial Policy Committee (Mar. 11, 2020), <https://www.bankofengland.co.uk/-/media/boe/files/letter/2020/chancellor-letter-11032020-fpc.pdf> [<https://perma.cc/7BGC-Q5QF>] (suggesting the FPC has a role to play in regard to the consideration of climate risk).

234. Interestingly, the ECB does not have an explicit financial stability mandate. Yves Mersch, Member, Exec. Bd. of the Eur. Cent. Bank, Speech at the ESCB Legal Conference: Financial Stability and the ECB (Sept. 6, 2018), <https://www.ecb.europa.eu/press/key/date/2018/html/ecb.sp180906.en.html> [<https://perma.cc/3GS6-JXE9>].

235. See *infra* note 247 and accompanying text.

236. Section 165 of the Dodd-Frank Act requires the Fed to establish prudential standards for nonbank financial institutions and BHCs with at least \$250 billion in assets that are “more stringent than the standards and requirements” applicable to other institutions. Dodd-Frank Act § 165, 12 U.S.C. § 5365(a)(1).

237. See 12 U.S.C. § 5321(b)(1)(A) (making the Secretary of the Treasury the chairperson of the Financial Stability Oversight Council).

238. See generally *Structure of the Federal Reserve System*, BD. OF GOVERNORS OF THE FED. RESRV. SYS., <https://www.federalreserve.gov/aboutthefed/structure-federal-reserve-system.htm> (last updated Mar. 3, 2017) [<https://perma.cc/W5EX-QRET>] (overviewing the Fed's decentralized nature and philosophy).

those, like Virginia Representative Carter Glass, who were wary of concentrating too much government power over the nation's money in Wall Street or Washington (a view reminiscent of the popular antipathy toward the First and Second Banks of the United States in the mid- and late-nineteenth century).²³⁹

Apropos of that compromise, the Reserve Banks have both public and private elements. Structurally, the Reserve Banks are hybrid. The Federal Reserve Act stipulates that each of the Reserve Banks be organized and capitalized like a private banking corporation—the private banks in the district are its stockholders, and each Reserve Bank is run by a board of directors that “shall perform the duties usually appertaining to the office of directors of banking associations and all such duties as are prescribed by law.”²⁴⁰ The Federal Reserve Act also authorizes the Reserve Banks to establish their own bylaws, as most other corporations do.²⁴¹

The Reserve Banks' role (and image), meanwhile, is largely public. In legislative discussions of the Reserve Banks' role during the 1913 founding of the Fed, Congress was clear that

these great public utility banks are not intended to be merely money-making banks, but that they are guardians of the public welfare, primarily safeguarding the member banks, protecting their reserves, safeguarding their credit, protecting them from panic or financial stringency, and being always prepared to furnish them with accommodation at a reasonable rate of interest.²⁴²

That sentiment is reflected in current text of the Federal Reserve Act as well, which gives the Reserve Banks various powers to support the Fed Board and FOMC in the conduct of monetary policy (and, as noted,²⁴³ the execution of day-to-day bank supervision).²⁴⁴

239. See Carter Glass, FED. RSRV. HIST., https://www.federalreservehistory.org/people/carter_glass (last visited May 30, 2021) [<https://perma.cc/G2TS-86Z5>].

240. Federal Reserve Act § 4(7), 12 U.S.C. § 301; *id.* § 2, 12 U.S.C. § 222.

241. *Id.* § 4(4), 12 U.S.C. § 341.

242. ROBERT LATHAM OWEN, BANKING AND CURRENCY, S. REP. NO. 63-133, pt. 2, at 10 (1913).

243. See *supra* notes 179–180.

244. Regarding monetary policy, reserve banks are authorized and expected to extend loans (and set the rate of discount) and other kinds of accommodation to the banks within their district. Federal Reserve Act § 4(8). The Reserve Bank presidents also participate on the FOMC, and the New York Fed is deputized to execute open-market operations to implement the FOMC's monetary policy. Federal Reserve Act § 12A, 12 U.S.C. § 263. The text of section 4(8) provides that the Reserve Banks

may, subject to the provisions of law and the orders of the Board of Governors of the Federal Reserve System, extend to each member bank such discounts, advancements, and accommodations as may be safely and reasonably made with due regard for the claims and demands of other member banks, the maintenance of sound credit conditions, and the accommodation of commerce, industry, and agriculture.

Id. § 4(8), 12 U.S.C. § 301.

Perhaps the most significant monetary policy role the Reserve Banks play is lending to depository institutions through the discount window, under section 10B of the Federal Reserve Act,²⁴⁵ and to nonbank institutions in times of emergency, under section 13(3) of the Act.²⁴⁶ The Reserve Banks' authority to provide liquidity to banks and nonbank corporations (and individuals) is often referred to as the LOLR role of the central bank.²⁴⁷

Generally speaking, the Reserve Banks act as LOLRs for a number of different reasons relating to exogenous macro shocks. As just noted, the New York Fed implemented special, ad hoc liquidity facilities for its primary dealers during the 2008 mortgage and 2020 COVID-19 crises.²⁴⁸ The Fed also used its power under section 13(3) of the Federal Reserve Act to enable the New York Reserve Bank to extend standing loan facilities to institutions that it does not directly oversee, given the "unusual and exigent" circumstances of these crises, in creating the

245. Federal Reserve Act § 10B, 12 U.S.C. § 347b(a); *see also Policy Tools: The Discount Window and Discount Rate*, BD. OF GOVERNORS OF THE FED. RSRV. SYS., <https://www.federalreserve.gov/monetarypolicy/discountrate.htm> (last updated May 25, 2021) [<https://perma.cc/4KMR-UCJG>] ("[T]he discount window supports the smooth flow of credit to households and businesses."). Managing the discount window is a joint effort between the Board and the reserve banks—these loans are billed as monetary policy tools but are extended by the regional Reserve Banks (usually, the New York Fed). The Board has the legal authority to determine whether a bank's offered collateral is acceptable, but the Reserve Bank sets the discount rate on loans offered through its lending facilities, subject to review by the Board. *See* Federal Reserve Act § 13(2), 12 U.S.C. § 343 (establishing that the Board shall create policies and procedures requiring reserve banks to assign a lendable value to all collateral); *id.* § 14(2)(d), 12 U.S.C. § 357 (granting reserve banks the authority to set discount rates on loans). The Board also has to agree by affirmative vote to the extension of the discount window to nonbank companies in "unusual and exigent circumstances." *Id.* § 13(3), 12 U.S.C. § 343(3)(A); *see also* Press Release, Bd. of Governors of the Fed. Rsr. Sys., Discount and Advance Rates (May 18, 2020), <https://www.federalreserve.gov/newsevents/pressreleases/files/monetary20200707a1.pdf> [<https://perma.cc/3LZU-ZE46>].

246. Federal Reserve Act § 13(3).

247. While 10B loans are not only, technically, for emergencies, banks generally only approach the Fed for access to the discount window if they are experiencing temporary liquidity problems for reasons related to a market panic and have sufficiently valuable collateral to offer as security for the loan. This is referred to as "Bagehot's dictum." *See* Ben S. Bernanke, *Fed Emergency Lending*, BROOKINGS (Dec. 3, 2015), <https://www.brookings.edu/blog/ben-bernanke/2015/12/03/fed-emergency-lending/> [<https://perma.cc/8XMG-S776>] (discussing robust LOLR capabilities to ward off financial crises); Brian F. Madigan, Dir., Div. of Monetary Affs., Speech at the Federal Reserve Bank of Kansas City's Annual Economic Symposium: Formulating and Implementing Policies to Combat the Financial Crisis (Aug. 21, 2009), <https://www.federalreserve.gov/newsevents/speech/madigan20090821a.htm> [<https://perma.cc/4A98-ESN6>] (discussing how Bagehot's dictum underlays various emergency lending programs launched during Global Financial Crisis).

248. *Term Sheet for Primary Dealer Credit Facility (PDCF)*, BD. OF GOVERNORS OF THE FED. RSRV. SYS., <https://www.federalreserve.gov/newsevents/pressreleases/files/monetary20200317b1.pdf> (last visited May 30, 2021) [<https://perma.cc/3BJY-TENK>]; *Primary Dealer Credit Facility*, FED. RSRV. BANK OF N.Y., <https://www.newyorkfed.org/markets/primary-dealer-credit-facility> (last visited May 28, 2021) [<https://perma.cc/EY57-87PP>].

facility known as “TALF.”²⁴⁹ The Board also created facilities for money markets, commercial paper markets, and municipalities as well—most of which the New York Reserve Bank orchestrated.²⁵⁰

In regard to the Board’s decisions to create a LOLR-style facility, the Fed is agnostic to the reason behind the market turmoil. Whereas in 2008 the shock resulted from an asset bubble bursting, in 2020, the Fed faced off against a global health pandemic. So indeed, there would be little question of the Fed’s legal authority to extend (or possibly create new) emergency facilities should any sudden climate shock—like a series of catastrophic storms—send the market into free fall.

But there are also a number of different ways that the Reserve Banks could use their specific LOLR powers in sections 10B and 13(3) offensively, to make the financial system greener. The Reserve Banks have considerable discretion regarding the collateral they deem acceptable in exchange for LOLR loan assistance. Indeed, both sections 10B and 13(3) merely require that the loans be “secured to the satisfaction” of Federal Reserve banks.²⁵¹ In theory, then, this gives the Reserve banks considerable latitude to condition LOLR assistance on a

249. “TALF is a credit facility . . . intended to help meet the credit needs of consumers and businesses by facilitating the issuance of asset-backed securities (“ABS”) and improving the market conditions for ABS more generally.” *Term Asset-Backed Securities Loan Facility*, BD. OF GOVERNORS OF THE FED. RSRV. SYS., <https://www.federalreserve.gov/monetarypolicy/files/monetary20200723a2.pdf> (last visited July 19, 2021) [<https://perma.cc/UF69-RWBB>]. It serves as a funding backstop to facilitate ABS issuance. *Id.*

250. In 2020, the Fed also used its § 13(3) powers to create a commercial paper funding facility. *Commercial Paper Funding Facility 2020: Program Terms and Conditions*, BD. OF GOVERNORS OF THE FED. RSRV. SYS., <https://www.federalreserve.gov/newsevents/pressreleases/files/monetary20200317a1.pdf> (last visited May 30, 2021) [<https://perma.cc/8PD5-88KA>]; *Money Market Mutual Fund Liquidity Facility*, BD. OF GOVERNORS OF THE FED. RSRV. SYS., <https://www.federalreserve.gov/newsevents/pressreleases/files/monetary20200318a1.pdf> (last visited May 30, 2021) [<https://perma.cc/65RR-FUJL>]; Regulatory Capital Rule: Money Market Mutual Fund Liquidity Facility, 85 Fed. Reg. 16232, 16234 (Mar. 23, 2020). This facility, operated by the Federal Reserve Bank of Boston, is making loans to eligible borrowers (like banks) and accepts as collateral assets purchased from money market mutual funds (including Treasuries, GSE securities, and certain types of commercial paper). *Municipal Liquidity Facility*, BD. OF GOVERNORS OF THE FED. RSRV. SYS., <https://www.federalreserve.gov/newsevents/pressreleases/files/monetary20200409a3.pdf> (last visited May 30, 2021) [<https://perma.cc/8CRP-WS5E>]; see also Heather Hennerich, *The Fed’s Emergency Lending Powers Explained*, FED. RSRV. BANK OF ST. LOUIS: OPEN VAULT BLOG (March 31, 2021), <https://www.stlouisfed.org/open-vault/2021/march/fed-emergency-lending-powers-explained> [<https://perma.cc/7LDC-R7A8>].

251. Federal Reserve Act § 10B, 12 U.S.C. § 347b; *id.* § 13(3), 12 U.S.C. § 343. In similar fashion, the Reserve Banks have some discretion in regard to the conduct of open-market operations; § 14(2)(b), for instance, gives them authority to buy municipal debt and discretion to choose which localities’ bonds to buy. *Id.* § 14(2)(b), 12 U.S.C. § 355. One could also see how open-market operations could be conducted in a way to favor those municipalities committed to green policies. That would directly channel dollars to certain geographies, rewarding them for green behavior.

particular kind of collateral—deciding, for example, only green collateral would be eligible for rediscount for 13(3) assistance.²⁵² Doing so would, of course, all but require banks—and a large swath of nonbank financial institutions—to load up on green collateral and possibly offload some brown assets.

Historically, similar experiments were not successful. At various points in the 1920s, Reserve Banks experimented with the “use [of] discount policy” to “selectively curb the use of bank credit for certain purposes” or “as a means of influencing final use of bank credit.”²⁵³

First, in 1920, the Board leaned on the Reserve Banks to directly pressure banks to stop or reduce lending for speculation through discount policy.²⁵⁴ “According to this view, Reserve Bank officials should keep informed on member bank lending and investing policies and deny access to the discount window to those extending credit for speculative and other nonessential uses.”²⁵⁵ While Reserve Bank officials tried for a time, the practice was soon abandoned: “There was considerable sentiment that it was impractical to try to distinguish between essential and nonessential uses of bank credit in peacetime.”²⁵⁶ Interest in Reserve Bank measures to “influence allocation of member bank credit” reemerged later in the decade.²⁵⁷

In 1928, voices within and outside the system suggested the use of penalty rates again to deter banks from lending for speculative purposes, and/or preferential rates to sustain or encourage lending for commerce and agriculture.²⁵⁸ The idea was proposed, but rejected, by the Reserve Bank Governors in the Open Market Investment Committee (“OMIC”).²⁵⁹ One academic, Professor O.N.W. Sprague, suggested a legislative fix. In his words, the idea would be to include “a simple provision to the Federal Reserve act, authorizing, or perhaps

252. There are variations on this policy theme. The Fed could also provide a more favorable discount rate for green collateral. Or, going a U.K. route, the Fed could require firms to pre-position collateral—that is, provide evidence of certain kinds of collateral on the balance sheet to ensure a smooth transition if and when access to the discount window arises. *See* BANK OF ENG., LOAN COLLATERAL: GUIDANCE FOR PARTICIPANTS IN THE STERLING MONETARY FRAMEWORK 6 (2020), <https://www.bankofengland.co.uk/-/media/boe/files/markets/eligible-collateral/loan-repositioning-guide> [<https://perma.cc/5E54-MKV3>].

253. CLAY J. ANDERSON, FED. RSRV. BANK OF PHILA., FUNDAMENTAL REAPPRAISAL OF THE DISCOUNT MECHANISM: EVOLUTION OF THE ROLE AND FUNCTIONING OF THE DISCOUNT MECHANISM 4, 10, 31 (Nov. 1966), https://fraser.stlouisfed.org/files/docs/historical/federal%20reserve%20history/discountmech/evolve_ander.pdf [<https://perma.cc/TX6S-X5WG>] (internal quotation marks omitted).

254. *Id.* at 25.

255. *Id.*

256. *Id.* at 26.

257. *Id.* at 27.

258. *Id.* at 24.

259. *Id.*

directing, the Reserve banks to impose a rate 1 per cent higher than the call renewal rate upon rediscounts for member banks that are lending on the Exchange at the time the accommodation is secured.”²⁶⁰ But “[s]erious objections” followed on the ground that “it would be difficult to implement such discretionary power wisely. . . . It would not be easy to determine when securities loans were excessive.”²⁶¹

Other objections to “trying to use administration of the discount window as a tool of selective bank credit control” generally focused on the fact that such action could not prevent other financial institutions from making such loans and that the “Federal Reserve Act does not give either the Federal Reserve Board or a Reserve Bank control over the loan policy of a member bank” and “cannot compel a member bank to make a loan which it does not desire to make nor restrain a member bank from making a loan which it wishes to make.”²⁶²

In regard to section 13(3), politicization of nonbank emergency lending has likewise been unpopular. Between the 1970s and 2008, the Reserve Banks had, on multiple occasions, lent selectively through 13(3) on what appeared to be a winner-take-all basis. Whether it was contemplating an indirect rescue of New York City in 1975, or the Penn Central Corporation in 1970, each incident appeared to violate the convention that 13(3) lending should be limited to solvent but illiquid companies or individuals—instead, it looked more like politically pressured patronage.²⁶³ Finally, the apparently selective nonbank bailouts of 2008 prompted Congress to revise section 13(3) to avoid such discretionary lending in the future. The Dodd-Frank Act of 2010 made it impossible for the Reserve Banks to use 13(3) selectively—going forward, the Reserve Banks would only be able to extend 13(3) facilities that have “broad-based eligibility.”²⁶⁴

Based on this history, it seems unlikely that either Congress or the Fed Board would approve of a Reserve Bank collateral policy—or

260. *Id.*

261. *Id.* at 24–25.

262. *Id.* at 28–29.

263. See Charles W. Calomiris, *Is the Discount Window Necessary? A Penn Central Perspective*, 76 FED. RSRV. BANK ST. LOUIS REV. 31, 37–38 (1994) (detailing the Nixon Administration’s attempts to force a bailout to save Penn Central); Anna J. Schwartz, *The Misuse of the Fed’s Discount Window*, 74 FED. RSRV. BANK ST. LOUIS REV. 58, 62–65 (1992) (“Discount window accommodation to insolvent institutions, whether banks or nonbanks, misallocates resources. Political decisions substitute for market decisions.”).

264. Press Release, Bd. of Governors of the Fed. Rsrv. Sys., Federal Reserve Board Approves Final Rule Specifying Its Procedures for Emergency Lending Under Section 13(3) of the Federal Reserve Act (Nov. 30, 2015), <https://www.federalreserve.gov/newsevents/pressreleases/bcreg20151130a.htm> [<https://perma.cc/NK99-BNUL>].

other selective use of its power under section 10B or 13(3)—that is designed to motivate banks to be greener (or less brown).

III. ASSESSING FED ACTION ON CLIMATE CHANGE

Until this point, the Article has considered the policy and legal bases for various forms of Fed intervention regarding climate change. The balance of the Article turns to the normative question of whether, where possible, the Fed should exercise discretion or restraint in pushing its existing legal boundaries. Part III.A sets out some normative criteria for answering this question. Part III.B concludes with some preliminary suggestions as to where the Fed could exercise discretion without damage to these norms.

A. Discretion or Restraint

In weighing whether the Fed should seize upon discretion, or exercise restraint, there are three factors to consider: the legitimacy of the activity, which bears on Fed authority; the ability to maintain credibility in implementing a new policy, which bears on Fed effectiveness; and the impact on Fed independence from developing and exercising expanded power.

1. Rule of Law

There are a few basic things that the Fed cannot legitimately do. Most fundamentally, perhaps, the Fed may not exceed the limits of the law as set out by Congress.²⁶⁵ Among the institutional actors in the U.S. government, the Fed has not been designated (by the legislature, the federal courts, or the Executive) as an arbiter of which problems its central banking tools should address. This is a sensible allocation of power between the various branches of the government. After all, the Fed is not directly accountable to the public in the way that Congress and the President are. According to these principles, the Fed may not legitimately substitute its judgment for that of Congress's.²⁶⁶ For these reasons, the legitimacy question is a gating one.²⁶⁷

265. This is a conception of legal legitimacy.

266. This notion of democratic legitimacy builds on the principle of legal legitimacy. For a full treatment of the legitimacy of central banking power, see PAUL TUCKER, *UNELECTED POWER: THE QUEST FOR LEGITIMACY IN CENTRAL BANKING AND THE REGULATORY STATE* (2018).

267. Carola C. Binder & Christina Parajon Skinner, *The Legitimacy of the Federal Reserve* (unpublished manuscript) (on file with author).

To date, the U.S. Congress has not legislated a climate mandate for the Fed, or adopted policies requiring that businesses abandon carbon-rich activities. So it could very well be costly to democratic values were the Fed to sidestep the legislative process with measures to deter the banks that it oversees from lending to brown businesses or households. Such action could be perceived as state action toward picking winners and losers with regulation.²⁶⁸

Thus, on one side of the legitimacy ledger are actions that have very weak or no basis in the law: monetary policy that proactively seeks green outcomes (like green QE); supervision used to deter lending to certain classes of companies absent clear credit risk; and the use of capital requirements to deter lending to certain sectors of the economy. To make that kind of action legitimate, Congress would likely need to expand the Fed's mandate to explicitly direct it to pursue such objectives.²⁶⁹ That would empower the central bank vis-à-vis the political branches and the fiscal authority vested in the Treasury. But on the other side of the legitimacy ledger are those actions whereby the Fed defensively reacts to potential problems posed by climate change: the use of the LOLR power in response to climate-related shocks; supervision of operational risk and asset quality measures; stress test scenarios; and Reserve Bank research programs.

2. Technical Credibility

The second factor to consider is credibility. Former Fed Vice Chairman Alan Blinder once remarked, "central bankers . . . take it as axiomatic that their credibility affects the linkages from policy changes (or policy pronouncements) to, say, long-term interest rates and exchange rates."²⁷⁰ Also, the Fed must be credible in the eyes of the banks it supervises in order to be effective as a supervisor and regulator.²⁷¹ Because the efficacy of central banks' pronouncements

268. Such firm-specific regulation is impermissible under British public law principles. Indeed, this is arguably why the SIFI designation system of the FSOC largely failed. See Christina Parajon Skinner, *Regulating Nonbanks: A Plan for SIFI Lite*, 105 GEO. L.J. 1379 (2017).

269. See Skinner, *supra* note 146.

270. Alan S. Blinder, *Central Bank Credibility: Why Do We Care? How Do We Build It?* 1 (Nat'l Bureau of Econ. Rsch., Working Paper No. 7161, 1999), <https://www.nber.org/papers/w7161.pdf> [<https://perma.cc/C62B-34P3>]; Ricketts, *supra* note 123 ("If the public trusts that the increase in the monetary base QE creates is only temporary, then they will *not* expect rapid inflation in the near future."). See generally Lena Dräger, Michael J. Lamla & Damjan Pfajfar, *The Hidden Heterogeneity of Inflation Expectations and Its Implications* (Bd. of Governors of the Fed. Rsrv. Sys., Working Paper No. 2020-054, 2020) (discussing how consumers form expectations about inflation, which in turn impacts the transmission channel of monetary policy).

271. Ben S. Bernanke, Chairman, Bd. of Governors of the Fed. Rsrv. Sys., Speech at the Allied Social Science Association Annual Meeting: Central Banking and Bank Supervision in the United

hinges on their credibility, if a policy cannot be undertaken credibly, it should not be undertaken at all.

There are a few key things that keep the Fed's credibility intact. Evidence-based decisionmaking, for one, is critical. The Fed—like all other technocratic bodies—is a fact-based decisionmaker. The public expects and assumes that the Fed's judgments about the economy are guided by data, just as its judgments about the financial system must be informed by sound models, metrics, and projections. If decisions about economic forecasts or firms' exposure to risk appear too hypothetical or subjective, they may not be considered credible. Credibility requires accuracy. Missteps and errors by the Fed can undermine the public's confidence in its ability to expertly manage financial and economic crises.

As such, the transparency of the Fed's decisionmaking is also paramount.²⁷² Opacity may be perceived to shroud inaccuracy or a lack of factual basis. This is precisely why transparency is especially critical for credibility in areas where the Fed has significant discretion.²⁷³ The Fed has taken important strides toward transparent decisionmaking over the past few decades. It now publishes a good deal of information about its FOMC meetings and decisionmaking process,²⁷⁴ its methodology for evaluating firms during stress tests, and the bases for adoption of formal rules.²⁷⁵ But supervision, for instance, has lagged behind, drawing criticism from legal and scholarly quarters.²⁷⁶ For these reasons, Fed Vice Chair for Supervision Randall Quarles has

States (Jan. 5, 2007), <https://www.federalreserve.gov/newsevents/speech/bernanke20070105a.htm> [<https://perma.cc/4ND9-GR4L>].

272. Quarles, *supra* note 196.

273. Peter Conti-Brown, *The Curse of Confidential Supervisory Information*, BROOKINGS (Dec. 20, 2019), <https://www.brookings.edu/research/the-curse-of-confidential-supervisory-information/> [<https://perma.cc/27P5-DD44>].

274. James Bullard, *President's Message: Recent Actions Increase the Fed's Transparency*, FED. RSRV. BANK OF ST. LOUIS (Apr. 1, 2012), <https://www.stlouisfed.org/publications/regional-economist/april-2012/recent-actions-increase-the-feds-transparency> [<https://perma.cc/3QHH-QR9K>].

275. BD. OF GOVERNORS OF THE FED. RSRV. SYS., DODD-FRANK ACT STRESS TEST 2020: SUPERVISORY STRESS TEST METHODOLOGY (Mar. 2020), <https://www.federalreserve.gov/publications/files/2020-march-supervisory-stress-test-methodology.pdf> [<https://perma.cc/Z25K-AL3H>].

276. See, e.g., Peter Conti-Brown, Yair Listokin & Nicholas R. Parrillo, *Towards an Administrative Law of Central Banking*, 38 YALE J. ON REGUL. 1 (2021); *Guidance, Supervisory Expectations, and the Rule of Law: How Do the Banking Agencies Regulate and Supervise Institutions?: Hearing Before the S. Comm. on Banking, Hous., & Urb. Affs.*, 116th Cong. (2019) (statement of Margaret E. Tahyar, Partner, Davis Polk & Wardell LLP), <https://www.banking.senate.gov/imo/media/doc/Tahyar%20Testimony%204-30-19.pdf> [<https://perma.cc/ZM5R-M9KR>] ("There has long been an uneasy truce between the transparency and accountability required by the rule of law and the secrecy and discretion of [financial sector] supervision. That uneasy truce has become untenable.").

recently pressed forward initiatives to increase transparency where supervisory judgments are concerned.²⁷⁷

Credibility could present challenges for the Fed where climate risk is concerned. On the one hand, based on current information, it would be difficult for the Fed to credibly increase regulation or take supervisory enforcement actions concerning climate-related credit risk. As Part I examined, the existing data do not appear to support a finding that banks' exposure to these assets present safety and soundness or financial stability threats.²⁷⁸ On the other hand, failing to acknowledge climate risk at all could also damage Fed credibility.²⁷⁹ The public could become equally incredulous of the Fed's commitment to anticipating economic shocks should the Fed refuse to consider ways in which some of its functions might be impacted by climate risk. The Fed's willingness to engage with leading academic and industry efforts to develop methods of forecasting more difficult-to-capture risks—like shifts in consumer preferences, migration patterns, and business formation²⁸⁰—appears key here. It would be important for the Fed to engage these new methodologies in whatever path it might take.²⁸¹

Apart from the evidentiary issue, attempting to push banks away from brown assets or toward green ones with supervisory or regulatory incentives could have unintended consequences. Some of them could be financial. Fed action along such lines could drive a migration of financial activity outside of the banking sector and into nonbanks. Increasing capital requirements surrounding brown assets might not extinguish those investments; that lending activity could shift to other areas of the financial system.²⁸² That happened following the postcrisis increase in capital requirements that followed Basel III,

277. Pete Schroeder, *Fed's Quarles Vows More Transparency Around Stress Tests to Come*, REUTERS (July 9, 2019, 1:14 PM), <https://www.reuters.com/article/us-usa-fed-quarles/feds-quarles-vows-more-transparency-around-stress-tests-to-come-idUSKCN1U4288> [https://perma.cc/896R-AAGQ].

278. See *supra* Part I.

279. As the 2019 NGFS report discusses, “[c]entral banks can reduce reputational risks by acknowledging financial risks related to the transition towards a carbon-neutral economy and by addressing these risks proactively in their own (risk) frameworks.” NGFS REPORT, *supra* note 2, at 28.

280. For one such method, see VERMEULEN ET AL., *supra* note 227.

281. See *supra* notes 97, 108 and accompanying text (discussing the macroeconomic policy decisionmaking in uncertainty). While a legal scholar may not be able to answer definitively the economic question asked here, she can suggest what factual circumstances are necessary to trigger legal authorities.

282. Though this may become increasingly unlikely as investors push asset managers toward greener investments as well. See, e.g., Jennifer Thompson, *Big Investors' Sustainability Push Drives Demand for Environmental Expertise*, FIN. TIMES (Feb. 23, 2020), <https://www.ft.com/content/362fdc36-3b97-11ea-b84f-a62c46f39bc2> [https://perma.cc/5WWR-UFH9].

prompting considerable concern over the “shadow banking” sector. As a result, the Fed now has less oversight over certain credit investments as they move from bank to nonbank balance sheets.

Moreover, there is the question of sorting between green and brown. In this regard, other questions arise. For one, as other commentators have pointed out, “green” does not necessarily “mean risk-free.”²⁸³ Assets determined to be green at one point in time could import other kinds of market or credit risk at a later one. By incentivizing banks to increase their holdings of green investments, the Fed could theoretically increase the riskiness of big bank balance sheets along other dimensions.²⁸⁴ In addition, ambiguity continues to exist around the categories of activities and assets that should be deemed green (or sustainable) versus brown. The lack of such standardization may well prompt concern about the central bank’s expertise in assessing assets along those dimensions—including, in the extreme, accidental sponsorship of greenwashing.²⁸⁵

Other unexpected consequences could be environmental. Many so-called brown companies are highly incentivized to develop clean energy innovations.²⁸⁶ To the extent regulation requires banks to stop or drastically reduce lending to certain companies (or creates incentives with the same result), companies may well reduce or abandon the financing of their green R&D. Inadvertently exacerbating climate risk or financial instability in any of these ways could also be damaging to the Fed’s credibility as an expert macroprudential regulator.

This all suggests that the credibility of the Fed’s actions depends on the stance adopted: using existing policy tools to create a greener financial system seems a difficult move to make on the basis of existing information, but using supervisory tools to ensure that banks are appropriately attentive to the changing nature of their credit risk might strengthen its credibility as an agile central bank.

283. Sam Fleming & Jim Brunsten, *Brussels Eyes Easing Bank Rules to Spur Green Lending*, FIN. TIMES (Nov. 26, 2019), <https://www.ft.com/content/bddc3850-1054-11ea-a7e6-62bf4f9e548a> [https://perma.cc/WT75-7SGQ].

284. “The real danger is that, by favoring green investments, central bankers will misallocate capital or distort valuations. We saw what happened when central banks gave a low risk weight to mortgage securities, which encouraged banks to pile into housing.” The Editorial Board, *supra* note 23.

285. *Id.*; Stubbington & Arnold, *supra* note 137; see also NGFS INITIAL TAKEAWAYS, *supra* note 22, at 3–5; De Santis et al., *supra* note 132. There are, however, standards in the EU that set out criteria against which an activity will be measured in order to qualify as sustainable. See Council Regulation 2020/852 of June 18, 2020, 2020 O.J. (L 198) 13 (EU).

286. See, e.g., Matthias J. Pickl, *The Renewable Energy Strategies of Oil Majors—From Oil to Energy*, 26 ENERGY STRATEGY REVS. (2019).

3. Institutional Independence

Lastly, engaging in climate change initiatives seems to carry a high likelihood of compromising independence. Formally and conventionally, the Fed has a high degree of institutional independence.²⁸⁷ “This is the idea that there are legal safeguards for central banks as institutions that enable them to carry out their tasks without interference or instruction from the executive branch of government (or any other body).”²⁸⁸

Institutional independence is valued for several reasons. For monetary policymaking, freedom from political pressure is essential for price stability. Politicians often have short-term interests in accommodative monetary policies which please the electorate but can damage the economy (i.e., by creating conditions for excess inflation) over the medium and longer terms.²⁸⁹ It is for this reason that former Fed Chair Bill McChesney Martin famously remarked that the Fed’s job is like that of a “chaperone who has ordered the punch bowl removed just when the party was really warming up.”²⁹⁰ Independence is important for the Fed’s role in supervision and regulation as well. Again, freedom from political pressure is key to ensuring that decisions about the risks facing firms are made only with objective data and technical criteria in mind.

Whether independence is threatened from Fed initiatives on climate change would again vary depending on the posture of action(s) taken. As noted, there are two postures that the Fed could assume. The Fed can take a defensive position toward climate change—using existing tools to respond to climate change if and when required. If

287. See generally TUCKER, *supra* note 266 (expositing theories of central bank independence).

288. See Michael Salib & Christina Parajon Skinner, *Executive Override of Central Banks: A Comparison of the Legal Frameworks in the United States and the United Kingdom*, 108 GEO. L.J. 905, 911 (2020).

289. This is referred to as the “time inconsistency” problem, a theory developed by economists Finn E. Kydland and Edward C. Prescott, for which they won the Nobel Prize in 2004. See *Finn Kydland and Edward Prescott’s Contribution to Dynamic Macroeconomics: The Time Consistency of Economic Policy and the Driving Forces Behind Business Cycles*, ROYAL SWEDISH ACAD. SCI. (Oct. 11, 2004), <https://www.nobelprize.org/uploads/2018/06/advanced-economicsciences2004.pdf> [<https://perma.cc/VRL8-CYSM>]. That problem generally refers to the fact that a government may wish to keep inflation low, but expectations make this difficult. And once the public expects low inflation, there are some political benefits to generating “bursts” of higher-than-expected growth because they will reduce the real value of debt and increase real income and output in the short-term.

290. William McChesney Martin, Jr., Chairman, Bd. of Governors of the Fed. Rsrv. Sys., Address Before the New York Group of the Investment Bankers Association of America 12 (Oct. 19, 1955), https://fraser.stlouisfed.org/title/statements-speeches-william-mcchesney-martin-jr-448/address-new-york-group-investment-bankers-association-america-7800?start_page=13 [<https://perma.cc/M96B-Q5HU>]; see also PETER CONTI-BROWN, THE POWER AND INDEPENDENCE OF THE FEDERAL RESERVE 2–3 (2016).

climate changes cause major macroeconomic shocks, for instance, the Fed would deploy its crisis-fighting tools to aid the financial system. On the financial side, if certain portfolios of loans appeared at imminent risk of defaulting, and those exposures become much larger, then the Fed supervisors might consider taking a position on bank soundness. To the extent climate change does materialize in ways that become visible to the Fed, as such, responding with its existing policy tools would be appropriate. Indeed, intervention in those circumstances would demonstrate an exercise of technocratic judgment that could actually bolster Fed independence.

On the other hand, Fed independence would likely be eroded by climate-related mission creep.²⁹¹ Fed independence tends to suffer when it strays beyond its legal mandate at the behest of political leaders or their constituents' demands.²⁹² Accordingly, to the extent the Fed were to stretch its mandate to pursue a greener financial system in connection with its monetary, supervisory, or regulatory roles, such policy actions could be costly to Fed independence, particularly if viewed as measures adopted in reaction to political pressure.²⁹³ The adoption of a green QE program would exemplify such a position. But so too would an effort to use capital charges or informal supervisory actions to penalize or dissuade certain kinds of lending.²⁹⁴

The problem with losing independence is a slippery slope—once subjective judgments are introduced and influenced by politics or popular pressure, there are few limits remaining on the extent to which the Fed may one day manage, direct, or control the flow of credit.

The following table summarizes the arguable scope of the Fed's authority to address climate change in various of its policy areas.

291. See Skinner, *supra* note 146.

292. *The Independence of Central Banks Is Under Threat from Politics*, ECONOMIST (Apr. 13, 2019), <https://www.economist.com/leaders/2019/04/13/the-independence-of-central-banks-is-under-threat-from-politics> [https://perma.cc/UFV4-5K2D].

293. See Charles Goodhart & Rosa Lastra, *Populism and Central Bank Independence*, 29 OPEN ECONOMIES REV. 49, 58 (2018) ("Attacks on central banks or central bankers exceeding their mandate . . . are often disguised attacks on central bank independence. This can undermine their credibility."); *How Not to Weaken Central Banks' Independence*, ECONOMIST (Apr. 13, 2019), <https://www.economist.com/finance-and-economics/2019/04/13/how-not-to-weaken-central-banks-independence> [https://perma.cc/F78M-GY7D] (discussing the link between populism and erosion of central bank independence).

294. See *supra* Part I.B. A Fed pressed into political or popular pursuits, absent legislative direction, could yet "become a political weapon, [risking] that America will move closer to becoming a nation where the welfare of the ruling party trumps that of the country as a whole." *How Not to Weaken Central Banks' Independence*, *supra* note 293.

TABLE 1: STRENGTH OF FED AUTHORITY TO ADDRESS CLIMATE CHANGE

	Policy Authority	Legal Authority	Normative Authority
Operational Risk	strong	strong (supervision)	strong (supervision)
Credit Risk	moderate to weak	moderate/strong (supervision of asset quality) moderate (stress test scenario) weak (capital regulation)	strong (data-gathering) moderate/strong (supervision of asset quality modeling) weak (pseudo-regulation; punitive supervisory action)
Macroeconomic Risk	strong (shock response) weak (greening)	strong (LOLR responses) weak (LOLR collateral conditions) weak (QE)	strong (shock response) weak (proactive policy, i.e., greening)

B. A Path Forward

So, what next for the Fed as it wrestles with mounting pressure on the one hand and legal and normative constraints on the other? Given the law and norms at stake, the Fed is best positioned to address climate change through microprudential supervision and research.

1. Supervision

Regarding supervision, there are several actions the Fed might reasonably take. First, on a microprudential level, the Fed might consider how it converses with firms regarding their approach to monitoring asset quality through modeling. In particular, supervisors might strategize with firms for how best to anticipate scientific projections and incorporate those projections into financial models. Concretely, the Fed may do the following:

Set supervisory expectations. The Fed could explain to firms that it expects them to be thinking about climate risk. Some big banks

already do; but many perhaps may not. The Prudential Regulatory Authority (“PRA”)—the Bank of England’s supervisory arm—sets out this expectation in its supervisory statements:

2.41 The PRA expects firms to understand the financial risks from climate change and how they will affect their business model. Firms should use scenario analysis and stress testing to inform the risk identification process and to understand the short- and long-term financial risks to their business model from climate change.²⁹⁵

Setting the expectation for firms would give Fed supervisors some basis for discussing firms’ medium- and long-term planning, and how that planning is ready to evolve in line with changing global circumstances.

This supervisory expectation would also give supervisors a basis for discussing operational risk and business continuity planning vis-à-vis physical risks. Concretely, the Bank Holding Company Supervision Manual might be modified to direct examiners to consider asking:

As a matter of business continuity, how is your bank ensuring operations remain resilient to warming over time?

How do your equity position and LTV ratios account for possible transition risks?

Lastly, how does your bank manage its business on a global scale to ensure continuity of operation in light of the milieu of national approaches to climate risk?

Identify necessary firm data. In addition, supervisors should be sure they have sufficient information about bank exposures.²⁹⁶ Presently, supervisors rely on a variety of data from external sources, public data providers, and ad hoc requests to institutions.²⁹⁷ Supervisors may need to do further work in identifying which kinds of information they still require from supervised institutions to better inform their own evaluations. In fact, the Fed and Reserve Banks may wish to engage the international central banking community at the Financial Stability Board (“FSB”) to develop standards for managing supervisory disclosures.

More specifically, there are fact-patterns surrounding exposures that the microprudential supervisor should be watching.²⁹⁸ Different asset categories have some overlap when it comes to climate change. If,

295. PRUDENTIAL REGUL. AUTH., BANK ENG., SUPERVISORY STATEMENT 31/15: THE INTERNAL CAPITAL ADEQUACY ASSESSMENT PROCESS (ICAAP) AND THE SUPERVISORY REVIEW AND EVALUATION PROCESS (SREP) 13 (Apr. 2021), <https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/supervisory-statement/2021/ss3115-update-april-2021.pdf?la=en&hash=1814D2147811DCD96C937C5DEE2674F021628A4B> [https://perma.cc/G2HY-KHKX].

296. As discussed above, the Bank Holding Company Act gives the Fed this authority. See *supra* Part II.A.3.

297. BASEL COMM. ON BANKING SUPERVISION, *supra* note 167.

298. As of this writing, public disclosure of climate risk is not mandatory—while JPMorgan discloses its exposure breakdown, Bank of America does not. So, market discipline cannot yet substitute for supervision where some banks are concerned.

for instance, storms coincided with oil price shocks, it is conceivable that losses to real estate, insurance, and oil and gas could happen simultaneously. Moreover, credit exposure is not the only possible source of losses. Banking entities are also exposed to commodities—some of which are “brown”—and derivative products that can amplify exposure. In short, snapshots are just that—the picture of a bank’s carbon-related exposure can always change or be partially misleading. One wonders whether it would make good prudential sense to develop new exposure and trade data repositories specific to carbon-heavy assets. Ideally, to the extent the central bank is involved, its efforts focus on institutions’ own risk management incentives.²⁹⁹

Discuss model design. Relatedly, supervisors can discuss model design with supervised banks. To the extent the impact of climate on asset portfolios remains uncertain, banks are likely best placed to develop models that can input data from climate scientists to understand how balance sheets might be impacted in the medium- and longer-terms. Those models can reveal to supervisors the likelihood—or not—of losses that might warrant further Board attention. Either way, that model-driven information is important.

2. Research and the Reserve Banks

In addition to supervision, the Reserve Banks—each equipped with their own research functions—may well have a role in plugging data gaps with research.³⁰⁰ Good data and analysis is, after all, the precondition to credible and legitimate Fed policymaking.³⁰¹

299. This sort of model would resemble one European approach that focuses more so on supervision than regulation. The ECB approach appears to place the onus on the banks to “safely and prudently manage climate-related and environmental risks and disclose such risks transparently.” Press Release, Eur. Cent. Bank, ECB Launches Public Consultation on Its Guide on Climate-Related and Environmental Risks (May 20, 2020), <https://www.bankingsupervision.europa.eu/press/pr/date/2020/html/ssm.pr200520~0795c47d73.en.html> [<https://perma.cc/BP2B-XHLM>].

300. Honohan, *supra* note 11, at 4:

One big contribution that central banks can make is in understanding and measuring the systemic dynamics of distribution and climate change as they interact with the financial system. With their formidable access to data and research expertise, needed to deliver on their primary mandate, central banks are exceptionally well placed to improve understanding of these issues and to advise on the design and scale of potential governmental measures in financial and macroeconomic policy most effective in delivering societal goals along these dimensions.

301. As a former director of the Fed’s Consumer and Community Affairs division aptly noted, “The Federal Reserve is a data-driven organization, which is a good thing. Unfortunately, data often lag the issues. By the time an issue becomes evident in the data, it may be too late for an effective policy response.” *The Federal Reserve’s Role in Community Development—An Interview with Sandra Braunstein*, CASCADE, Winter 2014, at 3, 13, https://www.philadelphiafed.org/-/media/frbp/assets/community-development/articles/cascade/84/cascade_no-84.pdf

As articulated throughout this Article, there exists considerable uncertainty surrounding the impact of climate change on financial assets and, in turn, price and financial stability.³⁰² Understanding the shape of macroeconomic relationships vis-à-vis climate change (even as those projections evolve alongside changes in human behavior), and how they might impact transmission mechanisms, is a key first step in identifying if and when climate change triggers the Fed's responsibility to maintain stable prices. In this vein, a firmer grasp on how asset values stand to be impacted by climate change—or the expectation of climate change—is also necessary to fine-tuning an assessment of the relationship between climate change and financial stability. Developing these kinds of novel economic models would be necessary to inform an evolving understanding of whether any of the myriad legal authorities discussed above might one day be triggered.³⁰³

Still, whether the Reserve Banks can or should consider climate change through their formal research functions is a question that remains unsettled. On the one hand, sections 4 and 11 give Reserve Banks and the Board, respectively, broad discretionary authority to conduct research necessary for the “business of banking” (for Reserve Banks) and the “business of the board” (for the Board). Moreover, throughout the past one hundred years, the Fed effectively used these

[<https://perma.cc/5ZJP-ZRFW>]. The ECB has also recently taken steps in this direction by joining the NGFS and creating a climate committee to research climate risks and their potential impact. See Christine Lagarde, President, Eur. Cent. Bank, Keynote Speech at the ILF Conference on Green Banking and Green Central Banking: Climate Change and Central Banking (Jan. 25, 2021), <https://www.bis.org/review/r210127d.pdf> [<https://perma.cc/F4CY-2QDBJ>].

302. With that said, some central bankers are willing to trade off certainty for what they predict to be stability gains from offensively tackling tail climate events, or “green swans.” See THIERRY PHILIPPONNAT, BREAKING THE CLIMATE-FINANCE DOOM LOOP, FIN. WATCH (2020), https://www.finance-watch.org/wp-content/uploads/2020/06/Breaking-the-climate-finance-doom-loop_Finance-Watch-report.pdf [<https://perma.cc/2ZKS-XRNU>].

303. There is a substantial economics literature on uncertainty and decisionmaking under uncertainty, some of which intersects with central banking policy. See, e.g., Alan Greenspan, *Risk and Uncertainty in Monetary Policy*, 94 AM. ECON. REV. 33 (2004). In regard to how monetary policy should advance in the face of uncertainty, there are now two schools of thought. One, which follows the so-called “Brainard conservatism principle,” adheres to the view that “in a dark room you take tiny steps”—monetary policy should proceed with caution in the face of uncertainty. William Brainard, *Uncertainty and the Effectiveness of Policy*, 57 AM. ECON. REV. 411 (1967); Giuseppe Ferrero, Mario Pietrunti & Andre Tiseno, *Monetary Policy in Times of Uncertainty: A Reappraisal of the Brainard Principle*, VOXEU, (Mar. 21, 2019), <https://voxeu.org/article/monetary-policy-times-uncertainty> [<https://perma.cc/ZK4W-755D>]. Other literature favors a more aggressive or precautionary approach. See, e.g., Giuseppe Ferrero, Mario Pietrunti & Andre Tiseno, *Benefits of Gradualism or Costs of Inaction? Monetary Policy in Times of Uncertainty* (Bank of It., Working Paper No. 1205, 2019). Recent economics literature attempts to better understand the macroeconomic consequences of climate change and draw out implications for policymaking. See Michael Barnett, William Brock & Lars Peter Hansen, *Pricing Uncertainty Induced by Climate Change*, 33 REV. FIN. STUD. 1024 (2020). From a legal perspective, one may well be inclined to settle the debate normatively, based on assessment of how significant a presence the central bank should play in directing the economy.

legal authorities to develop expertise on monetary, supervisory, and regulatory policy.³⁰⁴

Yet the manner in which Reserve banks research economic problems for which the Fed Board lacks legal authority to confront is a grey—and thorny—issue. There could be political and reputational costs to the system involved,³⁰⁵ insofar as research agendas send signals to, nudge, and exert moral suasion on banks and markets contrary to administrative law principles holding that regulation should not happen through these kinds of back doors. How this tension should be resolved is an open question that motivates future research.³⁰⁶

CONCLUSION

There are legal limits to what policy actions central banks can take, and the Fed is no exception. In a society based on the rule of law, the Fed is bound to stay within the lanes of its statutory mandates—to maintain a stable economy and financial system, and to avert unsafe practices among the banks it oversees. While climate change may be a significant economic problem or concern, the Fed’s present authority in this space remains limited. Just as other areas of tremendous economic importance—trade and immigration, just to name a few—sit outside the Fed’s arena, so, too, with climate change. As American economist Lloyd Mints wrote in a famed 1950 work: “[M]onetary action is not appropriate as a remedial measure for the economic ills of specific areas, industries, or groups of consumers or producers.”³⁰⁷ Society may well wish to look to government for wide-ranging solutions to climate change, but not necessarily to the Fed.

304. Carola C. Binder & Christina Parajon Skinner, *Laboratories of Central Banking* (2021) (unpublished manuscript) (on file with author) (studying the research function of the Reserve banks from a legal history and contemporary empirical standpoint).

305. *See id.*

306. *See id.*

307. *See* LLOYD MINTS, *MONETARY POLICY FOR A COMPETITIVE SOCIETY* 117–18 (1950).