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Regulatory Innovation and Permission to Fail: The Case of Suptech

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REGULATORY INNOVATION AND PERMISSION TO FAIL: THE CASE OF SUPTECH

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The recent U.S. Supreme Court decision West Virginia v. EPA has cast a pall over the discretion of administrative agencies at a very inopportune time. The private sector is currently adopting new technologies at a rapid pace, and as regulated industries become more technologically complex, administrative agencies must innovate technological tools of their own in order to keep up. Agencies will increasingly struggle to do their jobs without that innovation, but the private sector is afforded something that is both critical to the innovation process, and often denied to administrative agencies: "permission to fail." Without some grace for the inevitable stumbles that come with developing new technological solutions, regulatory agencies will increasingly be unable to discharge their statutory mandates, resulting in failures of in-action that could harm the public interest.

To illustrate this point, this Article uses "suptech" case studies drawn from the world of financial regulation. After articulating both the necessity and pitfalls of suptech, this Article argues that we need to extend permission to fail to administrative agencies when similar failures are recognized as a necessary part of the private sector innovation process. This Article argues that "permission to fail" cannot be a purely legal construct, and so it seeks to spur an interdisciplinary debate about how to construct both law and public opinion in a way that allows the regulatory state to develop the technological tools it needs to respond to technological developments in regulated industries.

* Professor, American University Washington College of Law. Many thanks to Cary Coglianese, Cristie Ford, Jodi Short, and participants in the Wharton Financial Regulation Conference, Penn Regulatory Law and Policy Workshop, Seton Hall faculty workshop, and the American University Business Law Workshop for feedback on earlier drafts.

"[A] paramount dread of government officials is newsworthy failure. Old programs may be inadequate, but their familiarity insulates them from much media attention. [W]hen new initiatives fail, however—and inevitably a large percentage do – they become highly newsworthy, and the focus is typically: who is to blame?"

–Alan A. Altshuler[1]

Introduction

The technological sophistication of private industry is increasing at a rapid pace. As a result, private economic activity is often happening too quickly, and in ways that are too complicated, for traditional regulatory tools to address the harms of that activity. Regulatory agencies are increasingly finding that to fulfil their statutory mandates, they need to increase their own technological sophistication and that, sometimes, they will need to develop innovative technological tools of their own.[2] This Article argues that regulatory agencies' technological innovation is becoming a defensive necessity but will inevitably involve some failures. In the private sector, failure is seen as critical to the innovation process and is expected. Regulatory agencies also need to be extended this "permission to fail" in their innovation attempts or else they will be condemned to committing failures of inaction and the public will suffer the consequences.

To be sure, some technological innovation is already occurring in regulatory agencies. While these agencies are often caricatured as backward and stodgy, that caricature does not fully reflect the reality of what is occurring the administrative state. To give just a few examples:

> [T]he National Oceanic and Atmospheric Administration is using AI to refine high-impact weather tracking systems to improve decision-making in real-time. The Transportation Security Administration is exploring the use of image recognition to screen pas-

1. Alan A. Altshuler, Public Innovation and Political Incentives 1 (1997), https://ash.harvard.edu/files/ash/files/2595.pdf?m=1618943267.

2. "[A]gencies will find it harder to realize gains in accuracy and efficiency with less sophisticated tools. This result also underscores AI's potential to widen, not narrow, the public-private technology gap." David Freeman Engstrom et al., Government by Algorithm: Artificial Intelligence in Federal Administrative Agencies 7 (2020).

> senger luggage for explosive devices. The Centers for Medicare and Medicaid Services is developing AI-based tools to predict health care fraud. And the Department of Housing and Urban Development deployed a prototype chatbot to enable citizens to acquire information about rental assistance, agency programs, and civil rights complaint procedures.[3]

This Article will focus, in particular, on the technological innovations being developed by financial regulatory agencies in order to promote financial stability and to protect consumers and investors. These tools are collectively referred to as "suptech" (a portmanteau of "supervisory technology") and rely heavily on advances in artificial intelligence (including natural language processing and machine learning technologies). Financial regulators are also exploring the potential for suptech tools based on technologies like APIs, distributed ledgers, and cloud computing,[4] but as this Article will argue, more suptech tools are needed.

Within financial regulatory agencies, suptech innovation has sometimes received less attention than other new regulatory tools like "innovation hubs" and "regulatory sandboxes" (which are designed to nurture technological innovation by the private sector but are limited in their ability to promote core financial regulatory goals like financial stability and consumer protection).[5] In a world of scarce regulatory resources, the public would benefit if regulatory agencies focused their efforts on developing their own technologies to further their own regulatory goals, rather than hoping those goals will be incidentally advanced through private sector innovation.[6] Innovation hubs and regulatory sandboxes have become increasingly popular with financial regulatory agencies around the world, though—perhaps because they lend innovative cachet to the agency without requiring the agency to put too much on the line. Suptech innovation, conversely, entails significant potential for failure on the part of the agency.

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3. *Id.* at 16.

4. *See infra* Part II.

5. *See* Hilary J. Allen, *Experimental Strategies for Regulating FinTech*, 3 J.L. & INNOVATION 1, 25 (2020).

6. *Id.* at 26.

In the private sector, there is a much higher tolerance for failure: venture capitalists, for example, expect the bulk of the investments in their portfolio to fail.[7] When it comes to the public sector, though, it is challenging to "persuade the media and the public that it is acceptable, in certain contexts and under certain conditions, to spend public money on things that turn out to be failures."[8] Researchers from the Bank for International Settlements have identified "concerns among financial authorities about the uncertain value and risks of suptech" as one of the primary impediments to suptech innovation.[9] A survey conducted by the Financial Stability Board on suptech innovation similarly found that "the risk reported to be of greatest concern was around resourcing, followed by concerns around cyber risk, reputational risk and data quality issues."[10] To enable financial regulatory agencies to better pursue public regulatory goals like consumer and investor protection and financial stability, they need more "permission to fail" to loosen constraints on their technological innovation. This permission to fail is only becoming more critical as the U.S. Supreme Court pushes in the other direction, embracing the "major questions doctrine" in a way that is likely to limit discretion in the administrative state.[11]

As this Article will explore, "permission to fail" is a multifaceted concept. First, a baseline understanding of the kinds of failures that are more or less tolerable is necessary. We then need to consider the types of permission structures that will permit the tolerable failures but punish the intolerable ones. Developing both the baseline understanding and the necessary permission structures will necessarily be an interdisciplinary effort: administrative law doctrines are relevant, but the law alone cannot construct and protect permission to fail. A broader interdisciplinary debate among lawyers, sociologists,

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7. Robert Rhee, Corporate Finance 647 (2016).

8. Christopher Pollitt, *Innovation in the Public Sector: An Introductory Overview*, *in* Innovation in the Public Sector 35, 39 (Victor Bekkers et al. eds., 2011).

9. Simone di Castri et al., Fin. Stability Inst., FSI Insights on Policy Implementation No. 19: The Suptech Generations 14 (2019).

10. Fin. Stability Bd., The Use of Supervisory and Regulatory Technology by Authorities and Regulated Institutions 1 (Oct. 9, 2020), https://www.fsb.org/wp-content/uploads/P091020.pdf.

11. *See infra* notes 297–300 and accompanying text.

political scientists, technology ethicists, and others is needed to flesh out permission to fail. This Article identifies such need and provides a starting point for the debate.

When it comes to legal reform, the most obvious administrative law change that needs to occur is to free regulatory innovation processes from having to comply with strict quantified cost-benefit analysis requirements. These kinds of requirements can render unacceptable the failures of efficiency and effectiveness that are necessary for innovation: trial and error, cost overruns, and abandoning failed projects are all hallmarks of the innovation process (whether conducted in the private or public sector).[12] However, some failures should not be so readily excused. While the law should not concern itself too much with suptech solutions that never go live, for those that do go live, scrutiny is needed to ensure that the technology has been consciously designed to avoid failures of equity, legitimacy, and credibility.

Recent administrative law literature has focused, in particular, on the equity, legitimacy, and credibility of machine learning algorithms used in the administrative state. These algorithms have been described as "black boxes" (in the sense that "even knowing the inputs and the algorithm's results, the algorithm's human creator cannot necessarily fully explain, especially in terms of cause and effect, how the algorithm reached those results")[13] and scholars are grappling with how administrative law can ensure that the use of machine learning conforms to our expectations of democratic accountability.[14] This Article will engage with this and other literature on how to make technology more accountable, but while these types of legal reforms will help shore up the legitimacy and credibility of regulatory agencies engaging in technological innovation,

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12. *See* Wouter van Acker, *An Introduction into Public Sector Innovation - Definitions, Typologies, and an Overview of the Literature 17* (KU Leuven Pub. Governance Inst., Working Paper, 2018).

13. Bernard W. Bell, *Replacing Bureaucrats with Automated Sorcerers?*, 150 DAEDALUS 89, 90 (2021).

14. *See, e.g., id.*; Cary Coglianese, *Administrative Law in the Automated State*, 150 DAEDALUS 104 (2021); Cary Coglianese & David Lehr, *Regulating by Robot: Administrative Decision Making in the Machine-Learning Era*, 105 GEO. L.J. 1147 (2017); Rory Van Loo, *Rise of the Digital Regulator*, 66 DUKE L.J. 1267 (2017); David Freeman Engstrom & Daniel E. Ho, *Algorithmic Accountability in the Administrative State*, 37 YALE J. ON REG. 800 (2020).

more affirmative messaging is also needed on the topic of regulatory innovation. Regulators need to publicize and celebrate their innovation processes, not just individual successes. They also need to stress that failures of inaction are also failures and that in some circumstances, regulators will not be able to discharge their regulatory mandates without developing technological tools of their own. These narratives can help create permission to fail.

The rest of this Article will proceed as follows. Part I will explore the need for regulatory innovation in more detail before engaging with literature on the constraints that could inhibit this kind of public sector innovation. As Part II will make clear, these constraints are not absolute: there are many examples of suptech innovation in progress but there are also areas where innovations are needed but not being pursued, potentially because of regulators' fear of failure. Part II therefore considers some ways in which suptech innovations could indeed go wrong, categorizing potential failures into failures of effectiveness, efficiency, equity, legitimacy, and credibility. Part III begins the conversation about which failures should and should not be excused and then considers the types of legal reforms and extra-legal strategies needed to excuse the excusable failures and hold agencies accountable for non-excusable failures. Notwithstanding its focus on financial regulation and suptech, this Article's discussion of regulatory innovation and permission to fail in Parts I and III should resonate with any regulatory agency that is struggling to oversee a technologically sophisticated industry.

I.
Regulatory Innovation

A. *The Need for Regulatory Innovation*

Regulatory agencies face many challenges—and, to be clear from the outset, not all of these challenges can be addressed by technological tools. In some contexts, choosing to regulate through non-technological means will be more effective[15] (for example, in some situations, the best response may be for the regulator to adopt rules that limit or even ban the

15. *See* Deirdre K. Mulligan & Kenneth A. Bamberger, *Saving Governance-By-Design*, 106 Calif. L. Rev. 697, 745 (2018).

use of the industry's new technology). However, technology can sometimes be an important part of the regulator's response; indeed, sometimes technology *must* be part of that response.[16] Regulators' resources are inevitably limited, and technological tools are often pursued for their ability to allow regulators to do more with less (there is particular interest in automating the more mundane aspects of regulatory tasks, allowing regulators to spend more time on the more judgment-based aspects of their agency's work).[17] More critically, though, if a regulated industry is developing its own new technologies at a rapid pace, regulators who fail to innovate in response may ultimately find that their lack of technological capacity has caused them to lose control of that industry, unable to ever catch up.[18] As one regulator from the UK's Financial Conduct Authority recently put it, "We realized that if we held still, we would be accelerating backwards."[19]

For example, if an industry wants to use technology to speed something up to the point where human intervention is impossible, the relevant regulatory agency will need technology of its own if it wants to retain the power to intervene. Or if industry participants start using machine learning algorithms that make decisions after being trained on huge datasets, regulators will often want to scrutinize those datasets—but regulators may not be able to do this in any meaningful way unless they develop their own machine learning tools capable of processing that much data.[20] Ultimately, given the increasing

16. *See* JO ANN BAREFOOT, THE CASE FOR PLACING AI AT THE HEART OF DIGITALLY ROBUST FINANCIAL REGULATION, CTR. ON REGUL. & MKTS. AT BROOKINGS (May 24, 2022), https://www.brookings.edu/research/the-case-for-placing-ai-at-the-heart-of-digitally-robust-financial-regulation/ (arguing that some regulatory functions can no longer be discharged without new technology and suggesting some creative ideas about the types of suptech tools that are needed).

17. *See* Carol A. Heimer & Elsinore Kuo, *Subterranean Successes: Durable Regulation and Regulatory Endowments*, 15 REGUL. & GOVERNANCE S63, S64–65 (2021).

18. *See* JO ANN BAREFOOT, A REGTECH MANIFESTO: REDESIGNING FINANCIAL REGULATION FOR THE DIGITAL AGE 9–10 (2020), https://regulationinnovation.org/regtech-manifesto.

19. *Id.*

20. Coglianese & Lehr, *supra* note 14, at 1,153 ("[W]ith the private sector increasingly relying on algorithms to make faster, more precise decisions, the increased speed and complexity of economic activity in the machine-learning era surely demands that government agencies keep pace and make

technological sophistication of the financial industry, trying to regulate without *any* technological tools will be the regulatory equivalent of bringing a knife to a gun fight—regulatory innovation may become a defensive necessity. A regulatory agency's failure to innovate as the industry innovates around it could ultimately become an irremediable failure of inaction, permanently compromising the public goals of the regulatory state. Time is therefore of the essence in developing those technological tools. Time is also of the essence because regulators' technological tools will be more impactful (and have fewer unintended consequences) if they are developed alongside the technologies the industry is developing, rather than trying to influence and integrate with technologies that are already "fully-baked."[21]

Before going any further, it is helpful to clarify how the terms "innovation," "regulation," and "regulatory innovation" will be used in this Article, as all are susceptible to multiple meanings. When trying to define innovation, people often default to discussions of whether a particular innovation is "disruptive", in the sense of being a "process by which a product or service takes root initially in simple applications at the bottom of a market and then relentlessly moves up market, eventually displacing established competitors"[22] (this approach to defining innovation relies heavily on economist Joseph Schumpeter's work on innovation as a force of "creative destruction" that propels economic growth).[23] However, this approach to defining innovation has its limitations—for example, it largely elides the possibility of rent-seeking innovations by incumbents.[24] More relevantly to this Article, this definitional approach is particularly inadequate when we are dealing with innovations by the public sector.

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use of the same analytic tools in order to regulate the private sector more effectively.").

21. *See* HILARY J. ALLEN, DRIVERLESS FINANCE: FINTECH'S IMPACT ON FINANCIAL STABILITY 161 (2022).

22. *Key Concepts: Disruptive Innovation,* CLAYTON CHRISTENSEN, http://claytonchristensen.com/key-concepts.

23. JOSEPH SCHUMPETER, CAPITALISM, SOCIALISM AND DEMOCRACY (Taylor & Francis 2010) (1942).

24. *See* Dan Awrey, *Complexity, Innovation and the Regulation of Modern Markets,* 2 HARV. BUS. L. REV. 235, 263–65 (2012).

Often, public sector innovations aren't trying to increase profits or displace private sector competitors—the creations or changes involved in public sector innovation may be pursued with the intention of promoting public goals.[25] A more goal-neutral description of innovation as a "dynamic process through which problems and challenges are defined, new and creative ideas are developed, and new solutions are selected and implemented"[26] would do a better job of encompassing public sector innovation. This kind of definition covers breakthroughs like DARPA and the internet, but it is also broad enough to encompass public sector innovations designed to improve how the state regulates private sector activity. But of course, "regulation" can also mean different things in different contexts. In this Article, I use the term "regulation" to describe the rule-making, supervisory, and enforcement functions of public regulatory agencies (although regulation can certainly be defined much more expansively than that, to incorporate rules and norms enforced by other bodies).[27]

Given how many interpretations there are of "regulation" and "innovation", it should not be surprising that the composite term "regulatory innovation" is also susceptible to many different meanings.[28] I use the term in a reasonably narrow and novel way, to refer to the development of new and creative technologies—either by regulatory agencies or by third-party vendors acting at the behest of those agencies—in order to respond to evolving challenges in their rule-making, supervi-

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25. *See* van Acker, *supra* note 12, at 5.

26. Eva Sørensen & Jacob Torfing, *Introduction: Collaborative Innovation in the Public Sector*, 17 INNOVATION J.: PUB. SECTOR INNOVATION J. 1, 4 (2012).

27. *See generally* Matthew D. Adler, *Regulatory Theory, in* A COMPANION TO PHILOSOPHY OF LAW AND LEGAL THEORY 590, 591–92 (Dennis Patterson ed., 2d ed. 2010) (providing an overview of what can be construed as "regulation").

28. *See generally* REGULATORY INNOVATION: A COMPARATIVE ANALYSIS (Julia Black, Martin Lodge & Mark Thatcher eds., 2005). The term "regulatory innovation" is sometimes used to describe innovations in regulatory administration. These kinds of innovations (which would include regulatory sandboxes and innovation hubs) utilize existing regulatory tools like informal guidance and rule-making – often to accommodate the industry they regulate. *Id.* Cristie Ford observes that "sometimes we are left with the sense that "regulatory innovations" have been aimed primarily at making regulation more flexible, less burdensome, cheaper, and more efficient, not for everyone's sake but the sake of certain private sector actors and their innovative efforts." CRISTIE FORD, INNOVATION AND THE STATE 2 (2017).

sory, and enforcement functions. This kind of regulatory innovation faces many constraints, though, including: "lack of competition, risk-avoidance, short-termism, rule-obsession," its overall "publicness," and the resource constraints that public sector bodies often face (which make public innovation harder even as they make efficiency-enhancing innovation more necessary).[29] The next Part will elaborate on these constraints.

B. *Constraints on Regulatory Information*

1. *Lack of Competition*

Public sector bodies are often assumed to occupy a monopoly position, and to therefore lack the pressures to innovate that can arise in competitive markets.[30] It is interesting to consider this assumption in the context of US financial regulatory agencies, given that there is in fact a long history of competition between some of these agencies.

Because the United States provides banks with the option of choosing either a state or a federal bank charter, banks can effectively choose their own federal regulator from among the OCC (which oversees nationally chartered banks), the FDIC (which oversees state-chartered banks that don't choose to become members of the Federal Reserve System), and the Federal Reserve (which oversees state-chartered banks that do).[31] And that doesn't even include the option to become a credit union instead of a bank (which results in supervision by the NCUA).[32] There is also a degree of regulatory competition between these banking agencies and other financial regulators, with financial institutions sometimes structuring their product offerings to fit into the regulatory regimes administered by the SEC or CFTC, even though those products are the functional equivalents of banking products.[33] The SEC and the CFTC also have their own history of turf wars.[34]

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29. van Acker, *supra* note 12, at 16.

30. *See id.*

31. *See* Richard Scott Carnell et al., The Law Of Financial Institutions 86–91 (7th ed. 2021).

32. *Id.* at 87.

33. Michael S. Barr et al., Financial Regulation: Law And Policy 23 (1st ed. 2016).

34. For background on historic turf wars between the agencies, see John D. Benson, *Ending the Turf Wars: Support for a CFTC/SEC Consolidation*, 36

This fractured system of regulatory supervision has many critics, but when defenses are mustered in favor of the U.S. system, they often fall under the banner of "regulatory competition."[35] The essence of this line of defense is that by allowing financial institutions to choose their regulator, all regulators are forced to be more efficient and to refrain from implementing unduly burdensome regulation.[36] Detractors of regulatory competition, however, criticize it as a "race to the bottom," where agencies compete to be the most lax in order to attract private sector "clients."[37] This dynamic may be manifesting in the various regulatory sandboxes and innovation hubs adopted by fintech-specific units of financial regulators in recent years.[38] These regulatory programs seem to focus primarily on facilitating private sector innovation. While this could ultimately further an agency's core regulatory goals, it is a very indirect and incomplete way to do so.[39]

In short, while U.S. financial regulatory agencies do face some competition, such competition may have led them to innovate in ways not directly linked to furthering their mandates. It is therefore worth considering whether competition is really needed to inspire public sector innovation—the rich history of public sector innovation suggests that competition is not the only driver of innovation.[40] As one innovation scholar put it, "it is important to qualify the unrestrained priority some studies give to commercial contexts and to the false belief that only competitive markets can fuel innovation . . . . There is no reason for public servants to feel any sense of inferiority when considering the record of public sector innovation."[41] Com-

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VILL. L. REV. 1175 (1991). A new turf war also seems to be erupting over jurisdiction over crypto. Nikhilesh De, *State of Crypto: SEC vs. CFTC*, COINDESK (Aug. 31, 2021, 10:31 AM), https://www.coindesk.com/policy/2021/08/31/state-of-crypto-sec-vs-cftc.

35. CARNELL ET AL., *supra* note 31, at 93.

36. *Id.* at 97.

37. Hilary J. Allen, *Sandbox Boundaries*, 2 VAND. J. ENT. & TECH. L. 299, 309 (2020).

38. *Id.* at 312; *see also* Hilary J. Allen, *Experimental Strategies for Regulating Fintech*, 3 J. L. & INNOVATION 1, 25 (2020).

39. Allen, *Experimental Strategies for Regulating Fintech*, *supra* note 38, at 26.

40. For more on the successes of public sector innovation, see MARIANA MAZZUCATO, THE ENTREPRENEURIAL STATE: DEBUNKING PUBLIC VS. PRIVATE SECTOR MYTHS (2013).

41. Pollitt, supra note 8, at 38.

petitive pressures may often be the driver of innovation when the only goal is increased profit, but different public-minded goals can also inspire innovation. While government agencies can get into a rut,[42] that rut can be disrupted by finding ways to generate excitement about, and a passionate commitment to, regulatory goals.[43]

2. *Publicness and Short-Termism*

Lack of competition may not significantly constrain suptech innovation, but other constraints may have more bite. One challenge that financial regulatory agencies face is that they typically have multiple statutory mandates, chosen from the following menu of public ends: consumer protection, investor protection, market efficiency, financial stability, competition, and the prevention of crime.[44] Agencies therefore have to balance multiple goals, each of which is individually more difficult and multi-faceted than the profit motive that drives most private sector innovation, while at the same time upholding democratic values of equity, legitimacy, and credibility.[45] Coglianese has described this predicament as an instruction to "surf the crest of a treacherous wave, but then leaving it up to the regulator how to stand up on the surfboard and do all the balancing and adjusting needed to stay afloat."[46]

Without a single quantifiable yardstick like profitability, it can be hard to measure the success of public sector innovation.[47] Some suptech innovations seem to be "win-wins"—particularly the use of big data analytics to track fraud and money laundering, which improve efficiency for the financial industry while, at the same time, enabling regulators to crack down on financial crimes and improve market integrity.[48] Often, though, suptech innovations designed to protect consumers, investors, or the stability of the financial system will have the

42. ALTSHULER, supra note 1, at 1.

43. Hilary J. Allen, *Resurrecting the OFR*, 47 J. CORP. L. 1, 45 (2021).

44. JOHN ARMOUR ET AL., PRINCIPLES OF FINANCIAL REGULATION, 62–69 (2016).

45. For a discussion of the private and public sector values that inform the innovation process, see van Acker, *supra* note 12, at 16.

46. Cary Coglianese, *The Challenge of Regulatory Excellence*, *in* ACHIEVING REGULATORY EXCELLENCE 1, 6 (Cary Coglianese ed., 2017).

47. ALTSHULER, *supra* note 1, at 1.

48. ALLEN, *supra* note 21, at 160.

potential to make the delivery of financial services less efficient, or create regulatory barriers to entry for new market participants. Conflicting mandates can make it hard to measure the success of innovation and, yet, public sector bodies are often asked to demonstrate the success of their innovations.

Many public sector bodies must answer to the electorate every few years which makes it difficult to engage in long-term projects that may not deliver results for several years. This regularly scheduled public scrutiny can discourage the type of risk-taking that could only pay off in the long term.[49] Fortunately, financial regulatory agencies (particularly the banking agencies) tend to have a degree of insulation from this short-termist scrutiny. In the United States, structures that promote this independence include, for example, limitations on the President's ability to remove agency leadership, or a funding source that is not dependent on legislative approval.[50] Outside of the United States, different kinds of structures have been adopted to promote agency independence, but they all share the aim to "reduce the influence of the executive" in the hope that the agencies "would be less vulnerable to the influence of interest groups than politicians, who seek these groups' support in order to secure reelection."[51]

This independence can lessen constraints on innovation posed both by short-termism and by disagreements on how to prioritize public goals, but financial regulatory agencies are not completely insulated from public scrutiny (nor should they be in a democratic society).[52] Even the most independent regulatory agencies need to regularly report to and publicly

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49. van Acker, *supra* note 12, at 17.

50. Stavros Gadinis, *From Independence to Politics in Financial Regulation*, 101 CALIF. L. REV. 327, 337 (2013).

51. *Id.*

52. Furthermore, the preference for financial regulatory agency independence is not as strong as it once was. As Gadinis has observed, "[t]he financial crisis of 2007–08 prompted policy makers worldwide to establish new regulatory mechanisms designed to monitor financial institutions more thoroughly and to facilitate intervention in case of emergency . . . . Instead of independent banking regulators, postcrisis reformers assigned the new powers to politically controlled officials, typically high-ranking executive officers such as treasury secretaries and finance ministers." *Id.* at 332.

testify before elected government officials.[53] Some, like the SEC and the CFTC, must regularly request funding from elected government officials.[54] The constraints of short-termism and publicness, therefore, apply to financial regulatory agencies too, at least to some degree.

3. *Rule-Obsession and Risk-Aversion*

Regulatory agencies are often described as rule-obsessed and risk-averse (which fits with the caricature of government as a stodgy Kafkaesque bureaucracy),[55] and these traits make some sense in the face of significant public scrutiny. Innovation requires a high tolerance for experimentation, uncertainty, and failure, though. If "rules and procedures become ends in themselves"[56] in an effort to avoid affirmatively taking risks, then innovation will be stymied, and failures of inaction are likely to increase.

Strategies developed in the private sector that embrace the risks inherent in the innovation process (like the use of techsprints and agile workflows) can and have been adapted for use by financial regulatory agencies, creating an avenue for departing from normal procedures.[57] For example, in France, the financial regulator ACPR established an "intrapreneurship" program that "aims to encourage staff members to suggest or lead innovative projects to improve ACPR's tools and processes. . . . Bank of France's 'Le Lab' leads the design of

53. For a discussion of the accountability mechanisms in place for one independent agency, the Federal Reserve, see *Is the Federal Reserve Accountable to Anyone?*, BD. OF GOVERNORS OF THE FED. RSRV. SYS., https://www.federalreserve.gov/faqs/about_12798.htm Sep. 4. 2019).

54. For an illustration of how the SEC and the CFTC funding process can be politicized, see *Systemic Risk Council, Prompt, Full Funding of the SEC and CFTC Is Essential to Reducing Systemic Risk*, PEW, (Dec. 7, 2012), https://www.pewtrusts.org/en/about/news-room/press-releases-and-statements/2012/12/07/prompt-full-funding-of-the-sec-and-cftc-is-essential-to-reducing-systemic-risk.

55. "Given the prevailing "CYA" attitude of most government workers (who have decades of *not* being rewarded for creativity), innovation will not come easily." Daniel C. Esty, *Regulatory Excellence: Lessons from Theory and Practice*, *in* ACHIEVING REGULATORY EXCELLENCE, *supra* note 46, at 141.

56. van Acker, *supra* note 12, at 18.

57. *See* DI CASTRI ET AL., *supra* note 9, at 8; *see also* FIN. STABILITY BD., *supra* note 10, at 11 (providing another example of private sector innovations being adapted by financial regulatory agencies).

selected projects, and brings on board a dedicated sponsor, an external coach and IT support."[58] The European Central Bank has also pursued suptech experimentation, with a Suptech Virtual Lab. The United States has few dedicated suptech incubators (programs like LabCFTC at the CFTC are primarily designed to assist the development of private sector fintech innovations, rather than promoting suptech experimentation)[59] but the FDIC has sought to collaborate with the financial industry on developing new reporting technologies.[60]

Adopting these kinds of strategies are not a panacea, but they can start to erode the barriers to innovation that can be found in rule-obsessed and risk-averse agency cultures. These strategies can also make it easier to hire innovative minds: people with an innovative streak may be more attracted to a workplace that prioritizes and facilitates experimentation.[61] This can alleviate some of the resource constraints limiting innovation within regulatory agencies, which this Article discusses next.

4. *Resource Constraints*

Limitations on resources (by which I mean time, money, and personnel) can also limit innovation and significantly impede suptech experimentation.[62] Limitations on resources can also limit innovation more indirectly: when resources are scarce, expending those resources on innovative projects takes on a greater degree of risk and the fear of wasting scarce resources on innovation may result in those resources being allocated for other purposes. A survey conducted by the Financial Stability Board on suptech innovation found that "the risk reported to be of greatest concern was around resourcing."[63]

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58. *See* FIN. STABILITY BD., *supra* note 10, at 13.

59. Hilary J. Allen, *Experimental Strategies for Regulating FinTech*, 3 J.L. & INNOVATION 1, 22, 26 (2020).

60. *See* FIN. STABILITY BD., *supra* note 10, at 14.

61. *See* Colleen M. Baker, *Entrepreneurial Regulatory Legal Strategy: The Case of Cannabis*, 57 AM. BUS. L.J. 913, 947 (2020).

62. Resource constraints and the "limited product offering for suptech solutions from a small pool of specialised technology vendors" were identified by researchers from the Bank for International Settlements as problems for suptech innovation. DI CASTRI ET AL., *supra* note 9, at 14.

63. FIN. STABILITY BD., *supra* note 10, at 1.

One of the challenges of suptech innovation is that it requires expertise beyond that which is typically possessed by financial regulatory agencies. Financial regulatory agencies are predominantly staffed with lawyers, economists, and accountants, rather than software engineers or data scientists.[64] Developing suptech solutions in-house will remain challenging unless the agencies make a concerted effort to hire a broader cross-section of personnel. Innovative employees may be discouraged from joining a regulatory body with a stodgy, bureaucratic reputation so the constraints of rule-obsession and risk-aversion may contribute to resource constraints as well (a possible Catch-22 for regulatory innovation). These problems are not intractable: for example, financial regulatory agencies around the world are building more data science capacity to assist with internal suptech development and deployment.[65] Nonetheless, the expertise deficit will not be fixed quickly, and so regulators may need to enlist outside help to develop suptech solutions in the near-term.

Outsourcing the development of suptech is only an option, though, if there is someone to outsource to. Currently, very few commercial technology vendors specialize in suptech solutions, and so many regulators are keeping their suptech development in-house.[66] Even when a suitable third-party vendor is identified, the quality of the technology developed depends on the regulator's budget and its ability to monitor the vendor's programming process, the latter of which still requires some in-house technological expertise. The possibility that technology vendors could facilitate regulatory arbitrage also remains a concern: to maximize profits, vendors may leverage their suptech work by providing related tools to private firms who can pay more, possibly even skewing the suptech tools in a way that favors the vendor's private sector clients.[67]

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64. Saule T. Omarova, *Technology vs Technocracy: FinTech as a Regulatory Challenge*, 6 J. FIN. REGUL. 75, 101 (2020). Regarding the limited data science skills of banking supervisors more specifically, see KENTON BEERMAN ET AL., FIN. STABILITY INST., FSI INSIGHTS ON POLICY IMPLEMENTATION NO. 37: SUPTECH TOOLS FOR PRUDENTIAL SUPERVISION AND THEIR USE DURING THE PANDEMIC 2 (2021).

65. *See* BEERMAN ET AL., *supra* note 64, at 12.

66. *See* FIN. STABILITY BD., *supra* note 10, at 15.

67. *See* Luca Enriques, *Financial Supervisors and RegTech: Four Roles and Four Challenges*, 53 REVUE TRIMESTRIELLE DE DROIT FINANCIER (2017) (Fr.).

Arbitrage concerns will be reduced if a regulatory agency outsources to or partners with an academic institution (rather than a for-profit business), but regulatory personnel still need enough expertise to monitor the development of the tool to ensure that it is fit for its intended purpose.

Limited resources are not just constraints on the initial development of suptech tools; they also constrain the ongoing use of those tools. On the one hand, suptech tools will fail if the frontline staff at the regulatory agency do not possess the skills needed to use the tools at all.[68] At the opposite end of the spectrum, overuse (in the sense of too much deference to these tools) can also prove problematic: without the resources needed to properly interrogate the technology behind the suptech tools, there is a greater risk that so-called "automation bias" will lead to bad outcomes. Automation bias refers to the demonstrated tendency of humans to defer unquestioningly to technologically generated outputs, which are often viewed as more correct and legitimate than any output a human could produce.[69] Those without technological expertise of their own may be more likely to defer to suptech—many regulatory bodies are aware of this possibility and have raised concerns about overreliance on suptech tools.[70] The balance between overreliance and underuse can be managed to some degree with "explicit policies that acknowledge the tensions between, and outline the respective roles of, supervisory judgment and suptech tool outputs,"[71] but mistakes are still likely to be made.

Another resource constraint that suptech innovation faces is "the inertia inherent in legacy IT systems."[72] Many regulatory agencies may find it costly to start from scratch with digitally native systems, and thus resort to building new suptech technologies atop of old legacy systems (that will, in turn, interact with regulated entities' legacy systems).[73] Unfortunately,

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68. *See* FIN. STABILITY BD., *supra* note 10, at 12.

69. For a discussion of automation bias, see Linda J. Skitka et al., *Accountability and Automation Bias,* 52 INT'L J. HUM.–COMPUTER STUD. 701 (2000).

70. FIN. STABILITY BD., *supra* note 10, at 2.

71. BEERMAN ET AL., *supra* note 64, at 2.

72. DI CASTRI ET AL., *supra* note 9, at 14.

73. *See* JUAN CARLOS CRISANTO ET AL., FIN. STABILITY INST., FSI INSIGHTS ON POLICY IMPLEMENTATION NO. 29: FROM DATA REPORTING TO DATA-SHARING: HOW FAR CAN SUPTECH AND OTHER INNOVATIONS CHALLENGE THE STATUS QUO OF REGULATORY REPORTING? 18 (2020).

building new tech on top of legacy systems is particularly likely to produce glitches,[74] the fear of which might discourage suptech innovation.

Ultimately, many of the constraints discussed in this Part boil down to fear of failure and while such fear does not prevent regulatory innovation outright, it can hinder and complicate innovation. The next Part will use case studies drawn from the world of financial regulation to highlight areas where agencies are engaging in suptech innovation and suggest areas where more suptech innovation is needed.

II.
The Beginnings of Suptech Innovation

This Part will look at a number of real-world examples of innovation by financial regulators (as well as where there is room to do more).[75] These kinds of innovations are often described by the catch-all phrase "suptech"—"the use of technology for regulatory, supervisory and oversight purposes."[76] Just like the term "fintech" that inspired it, suptech is an umbrella term for many different innovations and technologies, rather than a unified or coherent phenomenon.[77] It encompasses tools that rely on technologies like APIs, cloud computing, and distributed ledgers—but advances in artificial intelligence technologies have been the primary driving force behind suptech experimentation so far.[78]

A recent report submitted to the Administrative Conference of the United States sought to catalogue the use of artificial intelligence technologies by federal administrative agen-

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74. Samuel Arbesman, Overcomplicated: Technology at the Limits of Comprehension 39–40 (2016).

75. Many of the case studies used in this article involve suptech innovations being developed in the United States, but where international financial regulatory bodies have pursued suptech strategies more aggressively, I will sometimes talk about foreign suptech.

76. *BIS Innovation Hub Work on Suptech and Regtech*, Bank for Int'l Settlements, https://www.bis.org/about/bisih/topics/suptech_regtech.htm (last visited Dec. 28, 2022).

77. For a discussion of the definitional issues associated with "fintech," see Allen, *supra* note 21, at 8.

78. Fin. Stability Bd., supra note 10, at 1 ("Artificial intelligence applications were the most commonly deployed SupTech tool and were expected to remain so into the future.").

cies.[79] Through research conducted in 2019, the report concluded that nearly half of all non-military federal regulatory agencies had planned, trialed, or adopted some kind of artificial intelligence application,[80] and that over half of those applications were being or had been designed in-house.[81] The report identified financial regulation as one of the top three policy areas for agency use of artificial intelligence.[82]

In 2019, suptech innovation really began to take off among financial regulators globally,[83] with a particular focus on machine learning. "Machine learning" describes a type of artificial intelligence where a computer algorithm is trained to devise its own decision-making rules from the correlations it observes in the data sets provided to it; the algorithm can then follow those rules in executing an assigned task.[84] Machine learning technology can be roughly divided into supervised and unsupervised forms, with the latter being asked to find patterns among data that have not been previously classified or labeled, whereas supervised algorithms are trained to answer a predetermined question by looking at data prepared by a data scientist.[85] Once a machine learning algorithm is trained, the humans who use the algorithm must determine how much deference to give it. Humans can remain "in the loop," where "human oversight is active and involved, with the human retaining full control and the artificial intelligence only providing recommendations or input."[86] Alternatively, humans can delegate more control to the machine learning algorithm: where humans are "out of the loop" they cannot override the algorithm's decision-making, and when humans

79. ENGSTROM ET AL., *supra* note 2.

80. *Id.* at 16.

81. *Id.* at 18.

82. *Id.* at 17.

83. DI CASTRI ET AL., *supra* note 9, at 1.

84. For background on machine learning, see David Lehr & Paul Ohm, *Playing with the Data: What Legal Scholars Should Learn about Machine Learning*, 51 U.C. DAVIS L. REV. 653 (2017).

85. Bell, *supra* note 13, at 90.

86. Infocomm Media Development Authority (IMDA) & Personal Data Protection Commission Singapore (PDPC), MODEL ARTIFICIAL INTELLIGENCE GOVERNANCE FRAMEWORK 30 (2d ed. 2020), https://www.pdpc.gov.sg/-/media/files/pdpc/pdf-files/resource-for-organisation/ai/sgmodelaigovframework2.pdf.

are "over the loop" they allow the algorithm to operate on its own but retain the ability to override the algorithm.[87]

An important subset of machine learning-type artificial intelligence is natural language processing, or "NLP." Computers are not well equipped to process text written by and for humans, but "NLP endeavors to bridge this divide by enabling a computer to analyze what a user *said* . . . and process what the user *meant*."[88] As with other forms of machine learning, the NLP algorithm seeks to find patterns or correlations in data (in this case, the data takes the form of written text).[89] Armed with these patterns, the NLP algorithm can be used "to comb through an astonishing array of materials to quickly find, summari[z]e, classify and present relevant information for further review,"[90] which has obvious appeal for regulators.

There is also interest in suptech applications enabled by application programming interfaces ("APIs"), cloud computing, and distributed ledger technology.[91] APIs allow different types of software to communicate with one another, facilitating increased interoperability.[92] Cloud computing technologies could allow agencies to store more data more cheaply (on a network of servers) than they could on their own local servers.[93] Cloud computing could also provide protective redundancy to data storage: if one server in the network fails, data will continue to be available so long as the other servers in the cloud can pick up the slack. Distributed ledger technology also allows data to be stored in multiple places, creating some redundancies (a distributed ledger is essentially a database that is hosted by multiple computers or "nodes," and its integrity is maintained by some form of consensus mechanism among the nodes that governs when changes to the ledger can be

87. *Id.*

88. Peng Lai "Perry" Li, *Natural Language Processing*, 1 GEO. L. TECH. REV. 98, 98 (2016)*; see also* DIRK BROEDERS & JERMY PRENIO, FIN. STABILITY INST., FSI INSIGHTS ON POLICY IMPLEMENTATION NO. 9: INNOVATIVE TECHNOLOGY IN FINANCIAL SUPERVISION (SUPTECH) — THE EXPERIENCE OF EARLY USERS 25–26 (2018).

89. Li, *supra* note 88, at 99.

90. BEERMAN ET AL., *supra* note 64, at 2.

91. FIN. STABILITY BD., *supra* note 10, at 27.

92. FIN. STABILITY BD., *FinTech and Market Structure in Financial Services: Market Developments and Potential Financial Stability Implications* 6 (Feb. 14, 2019), https://www.fsb.org/wp-content/uploads/P140219.pdf.

93. *Id.*

made).[94] When "records of all financial transactions are stored in a distributed ledger," regulators can be "given access to the relevant records in the distributed ledger and simply extract the information needed."[95]

The remainder of this Part will look at more specific suptech applications of these technologies.

A. *Innovation in Rulemaking*

One area of suptech experimentation relates to the format of the regulations themselves. Currently, computers cannot easily read most regulations. That doesn't mean that it's impossible for computers to help process these regulations, but natural language processing techniques are required.[96] Some regulators, however, are exploring how regulatory text can be converted into machine-readable data[97] to make it easier for computers to read regulations without NLP.[98]

Machine-readable regulations have strong appeal for private sector institutions, which would like to be able to automate regulatory compliance.[99] Complying with regulations read and executed by a computer would be faster, require fewer employees, and increase certainty that compliance requirements have in fact been satisfied.[100] Machine-readable regulations might also appeal to resource-strapped administrative agencies, who could presumably spend less time examining firms to determine regulatory compliance.

There is particular interest in enshrining *reporting requirements* in machine-readable form.[101] Reporting requirements form the backbone of many financial regulatory regimes and help regulators detect activities as varied as money laundering, discrimination in the provision of credit, market manipulation

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94. Primavera Del Filippi & Aaron Wright, BLOCKCHAIN AND THE LAW 2 (2018) (describing how blockchain, a type of distributed ledger, operates).

95. CRISANTO ET AL., *supra* note 73, at 9.

96. Patrick A. McLaughlin & Walter Stover, *Drafting X2RL: A Semantic Regulatory Machine-Readable Format*, MIT COMPUTATIONAL LAW REPORT, 3 (May 14, 2021), https://law.mit.edu/pub/draftingx2rl/release/2.

97. BROEDERS & PRENIO, *supra* note 88, at 9.

98. McLaughlin & Stover, *supra* note 96.

99. BAREFOOT, *supra* note 18, at 61.

100. Marc Gilman, *Where Is Suptech Heading?* TECHCRUNCH (Jul. 13, 2021), https://techcrunch.com/2021/07/13/where-is-suptech-heading/.

101. CRISANTO ET AL., *supra* note 73, at 14, 16.

by traders, and unsafe and unsound management of risks at banks. Different regulators have jurisdiction over different concerns, and so financial institutions currently need to collate their data into the different forms required by the different regulators, and then deliver or "push" the report to the relevant regulator (usually through a web portal).[102] Because it takes time to collate these reports, most reporting does not occur on a real-time basis. One possible benefit of making reporting rules machine-readable is that it might eliminate this time lag, allowing regulators to receive data reports from regulated firms in close-to-real-time.[103]

Although at least one U.S. regulator has argued that "'digitizing the rulebook' for machine-readability should be the top priority of every regulator,"[104] there has been limited experimentation on this front by U.S. financial regulatory agencies. The U.K.'s Financial Conduct Authority ("FCA") and the Bank of England, however, have been more aggressive in seeking to develop machine-readable (and machine-executable) regulations in the context of regulatory reporting requirements. Their joint Digital Regulatory Reporting or "DRR" initiative kicked off with a November 2016 techsprint,[105] followed by another techsprint in November 2017.[106] The FCA and Bank of England are now several years into the project, which has involved pilots with several large banks.[107] These pilots have explored the feasibility of using distributed ledger technology to exchange data, as well as APIs that "pull" data from regulated firms in accordance with the machine-readable rules.[108]

The FCA and Bank of England hope that "DRR will potentially allow firms to automatically supply data requested by the regulators, thereby reducing the cost of collection, improving data quality and reducing the burden of data supply on the

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102. *Id.* at 9.

103. *Id.*

104. BAREFOOT, *supra* note 18, at 62.

105. Otherwise known as a "hackathon", a techsprint brings together a cross-section of personnel from the private sector to collaborate on finding a technological solution. *See id.* at 77–79.

106. Digit. Regul. Reporting, *Digital Regulatory Reporting: Phase 2 Viability Assessment* 8 (Jan. 7, 2020), https://www.fca.org.uk/publication/discussion/digital-regulatory-reporting-pilot-phase-2-viability-assessment.pdf.

107. *Id.* at 3.

108. *Id.* at 17.

industry."[109] A progress report from January 2020 identified the goals of the project more specifically:

> "A DRR approach would require the regulator to publish a digital (machine-executable) version of their regulatory rules. Ideally, the production of these digital rules from the current natural language version of the rules would be automated, making the subsequent component of the approach (standardi[z]ing the description and identification of data) easier."[110]

However, these goals are still far from realized. The FCA and Bank of England believe that the "best way to pursue the DRR vision is in small, incremental steps which prove valuable to all each time."[111] One of the greatest challenges in developing machine-readable and executable regulations relating to reporting requirements is that they will only work if there are common data standards, so that different institutions refer to and store their data in the exact same ways (which is not currently the case).[112] The FCA and the Bank of England are therefore considering how to get "all stakeholders to align on definitions, interpretation and ongoing implementation of rules and data definitions in the same way."[113]

B. *Innovation in Supervision*

Making rules is only the first part of the regulatory process. Then comes the hard work of monitoring compliance with those rules. As Peter Conti-Brown and Sean Vanatta recently described it: "If regulation sets the rules of the road, supervision is the process that ensures obedience to these rules (and sometimes to norms that exist outside these rules entirely) . . . . Supervision is the mostly secret process of man-

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109. Bank of England, *FCA and Bank of England announce proposals for data reforms across the UK financial sector* (Jan. 7, 2020), https://www.bankofengland.co.uk/news/2020/January/fca-and-boe-announce-proposals-for-data-reforms-across-the-uk-financial-sector.

110. Digit. Regul. Reporting, *supra* note 106, at 4.

111. *Id.* at 38.

112. FIN. STABILITY BD., *supra* note 10, at 18, 20.

113. *Digital Regulatory Reporting*, FIN. CONDUCT AUTH. (Oct. 14, 2020), https://www.fca.org.uk/innovation/regtech/digital-regulatory-reporting.

aging the public and private responsibilities over the risks that the financial system generates."[114]

If supervisory activities reveal that the rules are not being followed, then regulatory agencies will need to respond. The response will vary depending on the context. Sometimes, the regulator and regulated entity will collaborate to achieve the desired outcome; other times, the regulator may take more coercive enforcement action.[115]

This Section will roughly disaggregate suptech applications into those performing the supervisory activities of reporting, surveillance, and analysis (all of which could lead to enforcement actions). While this is not a perfect categorization of suptech streams (there is no generally agreed upon categorization, and the streams identified here will inevitably overlap with one another) it is a helpful way of organizing our discussion about the suptech experimentation that is, and should be, occurring.

1. *Suptech Experimentation and Tools: In Progress*

With financial institutions required to report more (and more granular) data in response to post-2008 regulatory requirements, regulators are finding themselves overwhelmed as they seek to review the data they receive.[116] The use of suptech to improve regulatory reporting, surveillance, and analysis is therefore an obvious use case for suptech.[117] As one proponent of suptech put it, the aspiration is that:

> "Regulators will be able to aggregate and analyze all this data for each regulated entity and, importantly, across the industry. They will also be able to combine

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114. Peter Conti-Brown & Sean Vanatta, *Focus on Bank Supervision, Not Just Bank Regulation,* BROOKINGS (Nov. 2, 2021), https://www.brookings.edu/research/we-must-focus-on-bank-supervision/.

115. Regarding banking supervision more specifically, see CARNELL ET AL., supra note 31, at 313–33. Regarding supervision more broadly, see IAN AYRES & JOHN BRAITHWAITE, RESPONSIVE REGULATION: TRANSCENDING THE DEREGULATION DEBATE (1992).

116. "Post-crisis regulatory reforms have led to an upsurge in reporting requirements. This increases the need for efficient and effective monitoring to benefit from the resulting boost in data availability." BROEDERS & PRENIO, *supra* note 88, at 3.

117. "The most common 'use cases' reported by authorities for SupTech tools were in the areas of regulatory reporting and data management." FIN. STABILITY BD., *supra* note 10, at 1.

> it with external big data reflecting trends and risks. Using artificial intelligence (AI) and its branches in machine learning (ML) and Natural Language Processing (NLP), they will be able to find system-wide patterns that may signal compliance failings or emerging problems, at a very early stage before widespread harm can occur and before major liability accumulates to the industry. They will also be able to find valuable bits of information that would otherwise have been hidden like needles in haystacks."[118]

a. Reporting

We have already discussed reporting innovations in the United Kingdom, in the context of machine-readable regulations.[119] In the United States, the FDIC is exploring technological innovations in reporting with the ultimate goal of eliminating the periodic "call reports" it currently receives from banks: it has kicked off a "rapid prototyping competition," with technology firms competing to develop "an innovative new approach to financial reporting, particularly for community banks."[120]

Perhaps the most familiar U.S. suptech innovation in the area of reporting, though, actually predates the term "suptech." In 2009, the SEC mandated the use of machine-readable XBRL data in many regulatory filings.[121] Making regulatory filings machine readable allows computers to easily process the standardized items in the disclosure, and "allows for aggregation, comparison, and large-scale statistical analysis that is less costly and more timely for data users than if the information were reported in an unstructured format."[122] Still, the SEC has not fundamentally changed the way it receives re-

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118. BAREFOOT, *supra* note 18, at 30.

119. *See supra* Section II.A.

120. Fed. Deposit Ins. Corp., *FDIC Selects 14 Companies in Tech Sprint to Modernize Bank Financial Reporting* (Oct. 14, 2020), https://www.fdic.gov/news/press-releases/2020/pr20109.html.

121. Michael S. Piwowar, *Remarks at the 2018 RegTech Data Summit - Old Fields, New Corn: Innovation in Technology and Law* (Mar. 7, 2018), https://www.sec.gov/news/speech/piwowar-old-fields-new-corn-innovation-technology-law.

122. *Id.*

ports: they are still uploaded through the SEC's EDGAR web portal.[123]

Regulators increasingly want to access and analyze increased volumes and new types of data not accommodated by email, web portals, or other traditional methods of submitting reports to regulators.[124] In response, some regulators outside the United States are pursuing APIs that can "ferry large volumes of data directly between databases without human intervention, thereby overcoming the size limitations of file transfer via email or web portals as well as cutting down on time-consuming and error-prone manual submission."[125] Some regulators have also expressed interest in using distributed ledgers for reporting purposes: Australia's financial intelligence unit "AUSTRAC" has experimented with using a distributed ledger and associated smart contracts to automate the reporting of certain transactions.[126]

The "holy grail" for regulatory reporting seems to be a "pull" approach where regulators are able to pull data directly from regulated firms as and when needed: this eliminates costs for regulated entities (because they no longer have to compile reports for regulators) and also eliminates the possibility of human reporting errors by the industry.[127] It may also minimize opportunities for private sector entities to arbitrage reporting regulations (by which I mean satisfying the letter of the regulations, but not their spirit, by providing less information than the regulatory agencies need to fully discharge their functions).[128] However, pull approaches must be handled carefully, so that regulators do not go on fishing expeditions for information to which they have no legal right (an issue we will return to later).[129]

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123. SEC, EDGAR, https://www.sec.gov/edgar/searchedgar/company search.

124. DI CASTRI ET AL., *supra* note 9, at 4.

125. *Id.* at 4–5.

126. Yogita Khatri, *Australian Regulator Trials Blockchain to Automate Transaction Reporting*, COINDESK (Feb. 25, 2019, 5:00 AM), https://www.coindesk.com/markets/2019/02/25/australian-regulator-trials-blockchain-to-automate-transaction-reporting/.

127. BROEDERS & PRENIO, *supra* note 88, at 6–7; *see also* FIN. STABILITY BD., *supra* note 10, at 33.

128. For further discussion of regulatory arbitrage, see Victor Fleischer, *Regulatory Arbitrage*, 89 TEX. L. REV. 227 (2010).

129. *See infra* Section II.C.4.

b. Surveillance

In addition to using technology to improve reporting, there has been significant interest in using technology to surveil financial markets on a continuous, real-time basis (particularly as regulators find that fintech innovations are facilitating new forms of money laundering and fraud).[130] The hope is that this kind of surveillance will allow regulators to detect and respond to activities like fraud, market manipulation, and money laundering in real-time, which is an improvement over the status quo where regulators can usually only respond with enforcement actions after the fact. This kind of surveillance certainly uses reported data, but also uses data obtained from various other sources using "web-scraping, chatbots, text mining and others to fetch data on demand or as a continuous stream."[131]

There is a particular interest in using technology to improve surveillance of financial crime. Several regulators around the world have invested significantly in developing suptech innovations to detect money laundering and the financing of terrorism,[132] with some authorities "exploring the use of non-traditional sources of information (e.g., newspaper articles [and] social media) and integrating them with traditional information to come up with richer analyses."[133] There isn't much publicly available information about financial regulatory bodies in the United States engaging in this kind of suptech innovation, but "FinCEN," the U.S. financial intelligence unit, is encouraging the private sector to innovate in the realm of anti-money laundering compliance[134] (this kind of compliance-related private sector innovation is often referred

130. DI CASTRI ET AL., *supra* note 9, at 11.

131. *Id.* at 12.

132. FIN. STABILITY BD., *supra* note 10, at 5.

133. RODRIGO COELHO ET AL., *Suptech applications for anti-money laundering*, BANK FOR INTERNATIONAL SETTLEMENTS FINANCIAL STABILITY INSTITUTE INSIGHTS ON POLICY IMPLEMENTATION NO. 18, 1 (Aug. 2019).

134. Board of Governors of the Federal Reserve System et al., *Joint Statement on Innovative Efforts to Combat Money Laundering and Terrorist Financing* (Dec. 3, 2018), https://www.fincen.gov/sites/default/files/2018-12/Joint%20Statement%20on%20Innovation%20Statement%20(Final%2011-30-18)_508.pdf.

to as "regtech").[135] Recently, FinCEN partnered with the FDIC on a techsprint related to digital means of identifying people involved in financial transactions.[136]

In addition, the SEC has had some success with using artificial intelligence to detect insider trading activity in the securities markets. The SEC developed "ARTEMIS" (which stands for "Advanced Relational Trading Enforcement Metric Investigation System") and ATLAS (the "Abnormal Trading and Link Analysis System"), with ARTEMIS designed to identify serial cheaters and ATLAS seeking to find first-time cheaters.[137] In ARTEMIS, machine learning helps determine whether a flagged trader's trading behavior is consistent with their own previous trading behavior, or if the behavior is an outlier. With ATLAS, machine learning compares a flagged trader's trading behavior to the behavior of other flagged traders.[138] In both instances, the machine learning algorithm is trained using so-called "bluesheet" data, which are trading records for a specified time period provided by selected broker-dealers in response to requests from the SEC.[139]

Broader market surveillance—in the sense of trying to get a sense of *all* market interactions, not just instances of nefarious behavior—is a bigger challenge.[140] The SEC has experienced significant setbacks in developing its Consolidated Audit Trail ("CAT"): the ambition was for the CAT to maintain a timestamped record of every bid, offer, and completed trade

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135. For an explanation of the various meanings of the term "regtech," *see* Enriques, *supra* note 67, at 53.

136. FDITech, *Measuring the Effectiveness of Digital Identity Proofing for Digital Financial Services*, FDIC, https://www.fdic.gov/fditech/techsprints/measuring-effectiveness.html?source=govdelivery&utm_medium=email&utm_source=Govdelivery (last visited Jan. 2, 2023).

137. ENGSTROM ET AL., *supra* note 2, at 23–24.

138. *Id.* at 23–25. For a discussion of SEC enforcement actions aided by these technological tools, see Charles Riely & Danielle Muniz, *What Securities Pros Need To Know About SEC Data Analytics*, LAW360 (Jun. 7, 2019, 2:19 PM), https://jenner.com/system/assets/publications/19013/original/What%20Securities%20Pros%20Need%20To%20Know%20About%20SEC%20Data%20Analytics.pdf?1560358438.

139. ENGSTROM ET AL., *supra* note 2, at 24.

140. FIN. STABILITY BD., *supra* note 10, at 27. This type of market surveillance is harder because it tends to "rely on large data volumes and a combination of diverse regulatory, market intelligence and market data." *Id.*

of equity stocks and options,[141] but more than a decade after the project was first launched, it is still not fully operational.[142]

c. Analysis

The U.S. Consumer Financial Protection Bureau ("CFPB") also carries out market surveillance, through its online complaints portal.[143] The volume of complaints submitted has proved challenging for the CFPB to process, but suptech innovations can be used to analyze data once it has been amassed: the CFPB "deploys [natural language processing] to automatically analyze text to categorize narratives, identify trends, and predict consumer harm."[144] More specifically, "the CFPB is deploying contextual [natural language processing] tools to categorize complaints via topic modeling."[145] The results are then made publicly available for use by outside researchers.[146]

Analysis can also be assisted by machine learning technology designed to seek out anomalies in the data.[147] For example, some financial intelligence units use machine learning to reduce the number of false-positive suspicious transaction reports received[148] (due to the volume of transaction reports received, the potential efficiency gains are enormous).[149] As another example, in order to help detect fraud in regular corporate filings, the SEC uses "a machine learning tool that helps identify which filers might be engaged in suspect earnings management." Specifically, "[t]he" tool is trained on a histori-

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141. David A. Wishnick, *Reengineering Financial Market Infrastructure*, 105 MINN. L. REV. 2379, 2434 (2021).

142. *See* Chairman Jay Clayton, *Statement on Status of the Consolidated Audit Trail*, U.S. SEC. AND EXCH. COMM'N (Nov. 14, 2017), https://www.sec.gov/news/public-statement/statement-status-consolidated-audit-trail-chairman-jay-clayton (explaining that the SEC adopted the rule requiring the creation of CAT in 2012); *Timeline*, CATNMSPLAN, https://www.catnmsplan.com/timeline (last visited Feb. 19, 2023) (displaying a timeline that shows CAT is incomplete as of early 2023).

143. *See* CONSUMER FIN. PROT. BUREAU, https://www.consumerfinance.gov/complaint/ (last visited Jan. 2, 2023).

144. ENGSTROM ET AL., *supra* note 2, at 61.

145. *Id.* at 62.

146. Gilman, *supra* note 100.

147. DI CASTRI ET AL., *supra* note 9, at 5.

148. COELHO ET AL., *supra* note 133, at 3–4.

149. *Id.* at 2.

cal dataset of past issuer filings and uses a [type of machine learning algorithm known as a] random forest model to predict possible misconduct using indicators such as earnings restatements and past enforcement actions."[150] A human remains in the loop, though, as staff from the SEC's Division of Enforcement look at the results of this machine learning tool in the context of other indicators as well.[151]

So far, we have discussed suptech innovations by market regulators (like the SEC and the CFPB) and by financial intelligence units (like FinCEN). However, we have not yet looked at prudential regulation, which is designed to keep individual financial institutions like banks (as well as the financial system as a whole) "safe and sound."[152] Like their colleagues in other regulatory agencies, prudential regulators have also begun to look to suptech to enhance their analysis (as well as reporting and surveillance) functions—and this accelerated during the pandemic as traditional forms of prudential supervision (like on-site examinations) became practically impossible due to lockdown restrictions.[153]

For example, the Federal Reserve turned to natural language processing during the COVID-19 pandemic to help it "identify emerging trends" in documents submitted by regulated banks.[154] It developed a tool called "LEX" that "automates risk annotation of documents, allowing for text analysis, document summari[z]ation and analytics" and was "particularly good at finding "unknown unknowns", discovering many sentences that may have been missed by examiners, including via the summari[z]ation tool, which has become increasingly effective at capturing the essence of a document or part of a document."[155]

As with market surveillance, prudential regulators aren't just applying their natural language processing tools to data submitted directly by banks—they are also considering a broader range of unstructured data sources[156] and relying

150. ENGSTROM ET AL., *supra* note 2, at 23.
151. *Id.* at 27.
152. CARNELL ET AL., *supra* note 31, at 242.
153. BEERMAN ET AL., *supra* note 64, at 1.
154. FIN. STABILITY BD., *supra* note 10, at 57.
155. BEERMAN ET AL., *supra* note 64, at 19.
156. Unstructured data sources may include "internal bank-generated reports, board and committee minutes, newspaper articles, social media chat-

upon natural language processing for "text analysis, text summari[z]ation and information classification" to process the data from those sources.[157] So far, natural language processing has been particularly useful in assessing the quality of bank assets (an important indicator of the bank's health) and the quality of the bank's management and governance.[158]

2. *Suptech Experimentation and Tools: Possibilities*

As just discussed, while suptech experimentation for prudential purposes was slow to start, the COVID-19 pandemic inspired an uptick in suptech innovation as it relates to *micro*prudential regulation (meaning regulation designed to manage the solvency and liquidity risks of individual financial institutions).[159] The rules-based nature of microprudential regulation has allowed authorities "to codify some of the simpler checks and validations on structured data returns previously done manually, thus allowing supervisors to focus on higher value tasks."[160] *Macro*prudential regulation, on the other hand, considers how the risk management strategies of individual institutions might interact to cause systemic problems that undermine the stability of the financial system as a whole.[161] This is a "higher value task" that does not lend itself easily to hard and fast rules. It is, therefore, not particularly surprising that suptech innovation relating to systemic risks and financial stability remains limited.[162]

That is not to say that experimentation with macroprudential suptech is nonexistent. For example, the Bank of Italy has considered using machine learning to "analy[z]e real estate ads in a popular online portal to forecast housing prices and inflation,"[163] "authorities such as a Federal

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ter, audited financial statements, other company filings and analyst research reports." *Id.* at 11.

157. *Id.*

158. *Id.* at 2.

159. FIN. STABILITY BD., *supra* note 10, at 27; BEERMAN ET AL., *supra* note 64, at 1.

160. *Id.*

161. Samuel G. Hanson et al., *A Macroprudential Approach to Financial Regulation*, 25 J. ECON. PERSP. 3, 3 (2011) (defining a macroprudential approach as one which "recognizes the importance of general equilibrium effects, and seeks to safeguard the financial system as a whole").

162. FIN. STABILITY BD., *supra* note 10, at 27.

163. DI CASTRI ET AL., *supra* note 9, at 14.

Reserve Bank and the Bank of England are developing NLP solutions to parse large amounts of documents to identify trends. . . . [and] [t]he ECB is exploring the use of market sentiment analysis for enhanced risk monitoring."[164] More generally, there is significant interest in "visualization" technology (like dashboards) that make it easy for regulators to slice and dice data, drill down into it, or zoom out for a broader view.[165] This kind of data visualization could prove to be enormously helpful in detecting "how different developments fit together and where the unseen risks might be hidden,"[166] making long-term trends for financial stability more visible.[167] As we have already discussed, regulators are also interested in using innovative technologies to shift financial regulation from an often lagging exercise that can only respond once harm has occurred, to a real-time activity that allows for intervention to proactively prevent harm.[168] However, real-time reporting and analysis will have limited impact if regulators lack the tools needed to *respond* in real-time to the identified problems.

I have previously argued that creative suptech tools are needed that enable financial regulators to intervene, when necessary, to preserve financial stability, and that these creative tools are becoming increasingly necessary as the financial industry adopts artificial intelligence, cloud, and distributed ledger technologies.[169] For example, if the "decentralized finance" or "DeFi" industry becomes integrated with the more established financial industry, then financial regulators will have to figure out how to respond to financial stability risks associated with the technologies that DeFi relies on. These include decentralized distributed ledgers and the smart contracts and cryptoassets that run on those ledgers, "recreat[ing]

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164. FIN. STABILITY BD., *supra* note 10, at 26.

165. DI CASTRI ET AL., *supra* note 9, at 13.

166. Martin Hellwig, *Financial Stability and Monetary Policy 20 (Max Planck Inst. or Rsch. on Collective Goods*, Working Paper No. 2015/10, 2015), https://www.coll.mpg.de/pdf_dat/2015_10online.pdf.

167. BAREFOOT, *supra* note 18, at 34.

168. "For authorities, the use of SupTech could improve oversight, surveillance and analytical capabilities, and generate real time indicators of risk to support forward looking, judgement based, supervision and policymaking." FIN. STABILITY BD., *supra* note 10, at 1.

169. ALLEN, *supra* note 21, at 160–61.

traditional financial instruments and generat[ing] new ones."[170] Smart contracts are computer programs that are designed to be self-executing and self-enforcing, meaning there are few opportunities to halt their operation even if it would be in the best interests of the parties (or financial stability) to do so.[171] One way to pause smart contract execution might be to develop new types of circuit breakers that take the form of a regulator-maintained "oracle" (in smart contract-speak, "oracle" is used to describe an external data source consulted by the smart contract).[172] Any smart contract used to create a financial product could be required to check in with an oracle before executing; regulators could then use the oracle to block execution when necessary to preserve financial stability.

New operational risks are also a significant concern as the financial industry becomes increasingly technologically complex. Although operational problems have thus far generally been considered something for financial institutions to manage internally, I have argued previously that operational problems at individual financial institutions may interact in ways that cause problems for the stability of the financial system as a whole.[173] To my knowledge, there has not been any focus on real-time reporting of major technological outages and similar operational failures. This is needed. And, again, once a problem is identified, real-time intervention will be needed, perhaps in the form of circuit breakers "that prevent a financial service provider from rerouting or transferring transactions to another provider or system, if regulators determine that that alternative could be compromised by the overload."[174]

C. *Potential Failures*

As we think about suptech innovation, we shouldn't just consider its potential benefits—we should also think about how it can go wrong. In his edited volume *Regulatory Excellence*, Cary Coglianese discusses several outcomes that denote regula-

170. Kevin Werbach, *DeFi Is the Next Frontier for FinTech Regulation*, REGUL. REV. (Apr. 28, 2021), https://www.theregreview.org/2021/04/28/werbach-defi-next-frontier-fintech-regulation.

171. ALLEN, *supra* note 21, at 98.

172. *Id.* at 188.

173. *See* Hilary J. Allen, *Payments Failure*, 62 B.C.L. REV. 453 (2021).

174. ALLEN, *supra* note 21, at 180.

tory success: effectiveness, cost-effectiveness, efficiency, equity, legitimacy, credibility, and trustworthiness.[175] The flip side, of course, is that failure to achieve these kinds of outcomes can be interpreted as regulatory failure. This Section will use these outcomes (or lack thereof) to organize a discussion of possible suptech failures.

1. *Failures of Effectiveness*

A failure of effectiveness is the most obvious type of suptech failure. The technology will not always succeed in achieving the outcomes it was developed for, and there are infinite ways in which this could happen. This Section will use several case studies from the previous Section as illustrative examples.

a. Machine Learning and SEC Enforcement Failures

Machine learning suffers from the so-called "garbage in, garbage out" problem, meaning that if the data used to train the algorithm is flawed, its decision-making will also be flawed[176] (and "[d]ata quality, reliability and completeness" issues may be a particular problem for new types of unstructured data, like social media data).[177] Decision-making based on problematic data could be wrong *entirely*, or it could have a disproportionately negative impact in some instances while working reasonably well the rest of the time. For example, the SEC's ARTEMIS and ATLAS algorithms (which seek to detect insider trading) are not trained using *all* available trading data. Instead, they are trained using "bluesheet data" collected in connection with the SEC's enforcement activities.[178] This data is not representative of the much wider universe of trading data out there and, instead, "reflects SEC staff judgments about the likelihood of market misconduct in each case. . . . As a result, the types of misconduct and entities targeted will reflect the assumptions, heuristics, and biases of enforcement staff."[179] The technology could therefore be very good at detecting the types of insider trading that the SEC expects but

175. Coglianese, *supra* note 46, at 11.
176. ALLEN, *supra* note 21, at 55.
177. BEERMAN ET AL., *supra* note 64, at 12.
178. See *supra* note 139 and accompanying text.
179. ENGSTROM ET AL., *supra* note 2, at 25.

may miss more creative forms of insider trading that SEC enforcement staff do not anticipate.

This problem could theoretically be addressed by training the machine learning algorithm with more comprehensive market data, but the SEC's attempts to develop a CAT to provide it with a record of *all* trading activity have faced many obstacles (an issue we will return to shortly).[180] Furthermore, a supervised machine learning algorithm would not be able to learn directly from such a large volume of market data; an unsupervised learning algorithm would first need to be applied to compress the available data into a useable form by identifying relevant variables for the supervised algorithm to learn from.[181] This creates more opportunities for technological failure, however, as decisions about which data to focus on and which to discard are delegated to an algorithm.[182]

In addition to its ARTEMIS and ATLAS tools, the SEC also uses a machine learning tool to review corporate filings that is "trained on a historical dataset of past issuer filings . . . to predict possible misconduct using indicators such as earnings restatements and past enforcement actions."[183] Another concern about relying on historical datasets to train regulatory tools is that, inevitably, industry participants will start to learn the types of misconduct that trigger the algorithm and change their behavior accordingly. Once this happens, a historical dataset will no longer be predictive of future misconduct. Some financial regulatory agencies have already expressed concerns that "their use of suptech might lead to market participants adjusting their behavior in order to 'game' the technology."[184] As regulated financial institutions might figure out "which signals create warnings or alerts in a SupTech monitoring system," they may try to avoid them.[185]

b. Circuit Breakers

In some circumstances, regulators may need to automate their emergency tools (like circuit breakers)—human re-

180. *See infra* Section II.C.2.
181. ALLEN, *supra* note 21, at 57–58.
182. *Id.*
183. ENGSTROM ET AL., *supra* note 2, at 10.
184. BROEDERS & PRENIO, *supra* note 88, at 2.
185. FIN. STABILITY BD., *supra* note 10, at 10.

sponse times may be too slow to shut down fully automated transactions before harm is transmitted to the broader financial system.[186] The efficacy of any automated adjudications of when to deploy circuit breakers will depend, however, on the quality of data available.[187] Unfortunately, if the circuit breaker has been created for the purpose of protecting financial stability, there are severe limitations on the data available to train the regulators' machine learning algorithms on when to activate the circuit breaker. As Rama Cont, the chair of mathematical finance at Imperial College London, said:

> "[w]e are not in a big data situation really . . . . The only situation where we are really strong with data is consumer loans, credit cards and so on. We only have one market history, so is the pattern which led to Lehman the same which leads to the fall of bank X the next time?"[188]

And it is not just limitations in the raw data that could limit the efficacy of automated adjudications in determining when to intervene: training a machine learning algorithm is a much more involved and judgment-dependent process than many people appreciate.

With a supervised machine learning algorithm, human data scientists are responsible for selecting the data (including weeding out outliers), dividing it into training and testing data, labeling the features in the data that the algorithm should study, and tuning the operations of the algorithm during the training process (the ability to tune is dependent on the type of machine learning algorithm selected, which is another choice that will influence how the algorithm will ultimately operate).[189] As they go through these steps, data scientists strive to avoid "overfitting" (a situation where the machine learning algorithm constructs a decision-making matrix that explains every single idiosyncrasy of the training data, but can-

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186. *See supra* notes 168–72 and accompanying text.

187. For more on "adjudicating by algorithm", see Coglianese & Lehr, *supra* note 14, at 1,170 (providing the example of a "pipeline safety machine-learning system that automatically issues shut-off orders when the system forecasts a heightened risk").

188. Nazneen Sherif, *Academics Warn Against Overuse of Machine Learning*, RISK.NET (Mar. 15, 2017), https://www.risk.net/risk-management/4120236/academics-warn-against-overuse-of-machine-learning.

189. Lehr & Ohm, *supra* note 84.

not respond to new data that does not display those exact idiosyncrasies).[190] However, avoiding overfitting involves deemphasizing low-probability events, which are the very events that any financial stability-oriented circuit breakers strive to protect against.[191]

There is therefore a risk that circuit breakers will fail to kick in when they are needed; negative consequences can also flow when circuit breakers *do* kick in:

> Inability to trade on the suspended market may create a frenzy of trading elsewhere, and this other trading will likely affect prices of equities and linked financial products once trading resumes. . . . [I]nvestors may be trapped in positions they wish to offload . . . . [and] traders with the quickest access to information will be the first to know when the halt in trading is ended, effectively allowing them to set a price that may be detrimental to other, longer-term investors when trading resumes.[192]

Deploying an unwarranted circuit breaker could therefore be considered a failure, just as it would be a failure if a circuit breaker was not deployed when needed.

c. Machine-Readable Rulemaking and Reporting Failures

A significant amount of suptech experimentation has focused on automating regulatory reporting, and many believe that machine-readable rules (and perhaps even machine-readable legislation) are critical to that process.[193] Projects to develop machine-readable law have the facially laudable goal of making the law more predictable and easier to understand and comply with: Australia's CSIRO (a government agency responsible for scientific research), for example, has recommended that national legislation be published in machine-readable code, "a move CSIRO suggests will boost the adoption of new regulatory technology across the economy, improv-

190. *Id.* at 684.

191. "[W]hen it comes to financial stability, unlikely events with catastrophic ramifications are exactly what we are worried about." ALLEN, *supra* note 21, at 27.

192. Hilary J. Allen, *The SEC as Financial Stability Regulator*, 43 J. CORP. L. 715, 748 (2018).

193. *See supra* Section I.A.

ing compliance while reducing costs."[194] However, critics of this recommendation have observed that written laws are always incomplete and that the circumstances in which they operate are always evolving. As such, there will always be a need for discretion and flexibility.[195]

An anticipated need to embody law in code may discourage legislators and regulators from including necessary nuances in the laws they adopt.[196] Instead, machine readable regulations will be easier to implement when rules are detailed and prescriptive, and this may encourage regulators to adopt these kinds of rules even when a different strategy might be better suited to managing the problem at hand.[197] Principles-based regulation, for example, may be needed to deal with the rapid technological changes occurring in the financial industry because, unlike static rules, a principles-based approach gives "regulators an umbrella framework under which they could flexibly deploy new types of regulatory strategies as new technologies arose."[198] In this context, adopting detailed machine readable rules to the exclusion of principles-based regulation may result in less effective regulation.

d. Prudential Supervision Failures

As we just explored, there is often a need for significant nuance in regulatory drafting. Agencies developing machine-readable regulation must *try* to ensure that the machine-readable version "still captures all the potential ambiguity of the

194. James Eyers, *CSIRO Says Laws Should be Published in Code*, AUSTRALIAN FIN. REV. (Jan. 16, 2020, 11:30 AM), https://www.afr.com/companies/financial-services/laws-should-be-published-in-code-so-computers-can-read-them-csiro-20200115-p53rlu.

195. Joe McIntyre, *CSIRO Wants Our Laws Turned into Computer Code. Here's Why That's a Bad Idea*, THE CONVERSATION (Jan. 19, 2020, 10:03 PM), https://theconversation.com/csiro-wants-our-laws-turned-into-computer-code-heres-why-thats-a-bad-idea-130131.

196. Mulligan & Bamberger, *supra* note 15, at 719.

197. Attempts to "technologize" principles-based regulation (by delegating decisions about what will satisfy the relevant principles to machine learning models) would face all of the same limitations of machine learning already discussed in this Article and would presumably require a significant "human-in-the-loop" presence to be effective.

198. ALLEN, *supra* note 21, at 173. For background on the merits of rules versus principles more generally, see Julia Black et al., *Making a Success of Principles-Based Regulation*, 1 L. & FIN. MKT. REV. 191 (2007).

original"[199]—but it is likely impossible to capture every ambiguity.[200] As such, machine-readable regulation will inevitably be incomplete. Any automated reporting system based on machine-readable regulation is, therefore, likely to result in reporting that is both over- and underinclusive—and the data that the agency receives will ultimately shape how the agency operates.[201] If the data is collected for prudential regulatory purposes, for example, regulators may be distracted or overwhelmed by superfluous data that provides little information about where risks are developing, while at the same time missing information that could be crucial to a big picture analysis of developing risks in the financial system. Overreliance on suptech could therefore train regulators' focus on "the risk that can be measured, rather than the risk that matters."[202]

There is also the question of how regulators should process the voluminous amounts of data they receive. If prudential regulators rely too heavily on natural language processing technology to review reports, their review may be incomplete. Text written for human consumption has so many dimensions that natural language processing often entails taking steps to reduce the complexity of the data:[203] these steps are ultimately judgment calls that reflect a data scientist's views on the importance (or unimportance) of certain elements of the text. For example, the steps taken may include "filtering out very common or uncommon words; dropping numbers, punctuation, or proper names; and restricting attention to a set of features such as words or phrases that are likely to be especially diag-

199. Harry Eddis et al., *What is digital regulatory reporting and why should you care?*, LINKLATERS (Jun. 19, 2018), https://www.linklaters.com/en-us/insights/blogs/fintechlinks/2018/june/what-is-digital-regulatory-reporting-and-why-should-you-care.

200. Usha Rodrigues similarly argues that smart contracting on a blockchain departs in a fundamental way from contract law because it provides no place for the law to step in to supply default rules. Usha Rodrigues, *Law and the Blockchain*, 104 IOWA L. REV. 679, 682 (2019).

201. ENGSTROM ET AL., *supra* note 2, at 63.

202. FIN. STABILITY BD., *supra* note 10, at 3.

203. "A sample of thirty-word Twitter messages that use only the one thousand most common words in the English language, for example, has roughly as many dimensions as there are atoms in the universe." Matthew Gentzkow, Bryan Kelly & Matt Taddy, *Text as Data*, 57 J. ECON. LITERATURE 535, 535 (2019).

nostic."[204] However, if the data scientist excludes elements from the analysis that actually carry important meaning, then the natural language processing analysis will be faulty as a result of these flawed assumptions. While these can be checked to some degree by human oversight,[205] that human oversight limits the efficiency gained from adopting the natural language processing techniques in the first place. Given the volume of material that regulators must review, it seems inevitable that some data points will be missed.

2. *Failures of Efficiency*

The previous Section discussed some ways in which suptech innovations may fail to fully deliver on their intended outcomes. Even imperfect innovations, though, may still be superior to the status quo: sometimes regulatory success is relative. This type of relative regulatory success is sometimes described as "cost-effectiveness" ("achieving a specific level of a desired outcome . . . at a low cost") or "efficiency" ("balancing problem reduction with other concerns, such as costs, so as to achieve an optimal level of reduction in the problem").[206] Regulatory failures can be relative too: a suptech technology may ultimately succeed in some respects, but the development costs may be hard to justify in light of the improvements offered. Or a suptech innovation may be said to have failed if it reallocates some of the costs of regulation that are currently being borne by the financial industry and shifts them to the regulator.[207]

One illustration of a potential efficiency failure is the SEC's CAT which, while it may not ultimately turn out to be a failure, was mired in difficulties for a decade. The impetus for CAT's creation was the Flash Crash of 2010 (an episode of extreme price movements in the stock market triggered by the interactions of algorithms selecting and executing trades).[208] As former SEC Commissioner Kara Stein articulated it:

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204. *Id.* at 536.

205. *Id.* at 555–56.

206. Coglianese, *supra* note 46, at 11.

207. The UK's Financial Conduct Authority and Bank of England have noted that as part of their DRR project, "the regulator would be responsible for the function of "Writing Digital Regulation" that is currently carried out by firms or vendors." Digit. Regul. Reporting, *supra* note 106, at 25.

208. For more on the Flash Crash, see Allen, *supra* note 192, at 737–38.

> "The Flash Crash and other events in our markets demonstrate the need for CAT. Only through a consolidated audit trail can we truly know what is happening in our marketplace, with trading activity cascading across multiple trading venues and asset classes. The linkages, complexity, and fragmentation of our markets outstrip the current ability to monitor, analyze, and interpret market events. Only through CAT can we develop regulations that are truly driven by facts. Only through CAT can regulators appropriately survey our high-speed and high-volume marketplace."[209]

The CAT's potential utility as a suptech tool is clear but achieving that potential has proved difficult. In 2012, the SEC adopted Rule 613, which required self-regulatory organizations (like the Financial Industry Regulatory Authority or "FINRA") to submit a plan for SEC approval pertaining to the creation, implementation, and maintenance of a CAT.[210] However, the self-regulatory organizations struggled to find a technology vendor to develop the CAT: in 2017, the SEC ultimately blessed the bid from the vendor Thesys.[211] Thesys vastly underestimated the costs and time needed to complete the project, though, and problems with the CAT's development quickly began to snowball.[212] The project experienced repeated delays, partly as a result of the project's having "too many cooks" (with it being unclear who among Thesys, its subcontractor Sapient, the SEC, or the self-regulatory organizations, was ultimately responsibility for the project).[213] To address these coordination problems, the SEC hired Manisha Kimmel in 2019 to be a

209. Kara M. Stein, Comm'r, U.S. Sec. and Exch. Comm'n, The Dominance of Data and the Need for New Tools: Remarks at the SIFMA Operations Conference (Apr. 14, 2015).

210. 17 C.F.R. § 242.613 (2012).

211. James Rundle & Anthony Malakian, *CAT's Tale: How Thesys, the SROs and the SEC Mishandled the Consolidated Audit Trail*, WATERSTECHNOLOGY (Feb. 14, 2019), https://perma.cc/SB44-AWSL.

212. *Id.*

213. *Id.*

"CAT tsar."[214] Two days after she was hired, Thesys was fired as a vendor and ultimately replaced with FINRA.[215]

The CAT's rollout was further delayed as a result of COVID-19,[216] with full customer and account reporting not coming online until July 2022.[217] The CAT may turn out to be enormously useful, but at least in the present moment, it does not appear to be a particularly cost-effective regulatory strategy. Wishnick has described the CAT as "a potentially valuable system to help the SEC carry out its statutory duties to police market integrity, but a policy albatross and a procedural quagmire."[218] In addition, Rundle & Malakian have argued that the SEC failed by not penalizing the self-regulatory organizations or contractors for delays in connection with the development of the CAT[219]—this illustrates the more general potential for regulatory bodies to waste resources by making mistakes in their choice and management of vendors.[220]

3. *Failures of Equity*

Regulatory technologies fail as a matter of equity if they do not result in "a fair distribution of the costs and benefits of regulation."[221] Equity is a particularly important concern for administrative agencies like the Social Security Administration as they consider automating the adjudication of benefit eligibility,[222] but there is no exact analogue to benefit administration in the suptech space. Still, suptech may entail technology making decisions or otherwise operating in a way that has dis-

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214. *Id.*

215. John Crabb, *Primer: The Consolidated Audit Trail*, IFLR (July 1, 2020), https://www.iflr.com/article/b1lmx9hd02cr4b/primer-the-consolidated-audit-trail; Rundle & Malakian, *supra* note 211.

216. *Id.*

217. *Consolidated Audit Trail (CAT),* SIFMA, https://www.sifma.org/explore-issues/consolidated-audit-trail/.

218. Wishnick, *supra* note 141, at 2435.

219. Rundle & Malakian, *supra* note 211.

220. "[T]asks that support agency management of resources, including employee management, procurement and maintenance of technology systems" are also important functions of the regulatory state. ENGSTROM ET AL., *supra* note 2, at 10.

221. Coglianese, *supra* note 46, at 11.

222. For discussion of how these kinds of agencies are using artificial intelligence in their adjudication tasks, *see* ENGSTROM ET AL., *supra* note 2, at 37–53.

tributional consequences. If those distributions are not fair, then the suptech could be said to have failed.

The failures of effectiveness already discussed could amount to failures of equity, if problems with efficacy impact different segments of society in different ways.[223] For example, this Article has discussed the use of automated circuit breakers as a suptech tool.[224] If decisions about whether to use a circuit breaker were delegated to a machine learning algorithm, a "black box" would be making mass adjudications about when people can and cannot transact, and this could have inequitable impacts. For example, if a circuit breaker halted people's ability to make payments in order to prevent the broader payments system from overload, that would have distributional impacts similar to those involved when deciding whether and how broadly to shut down access to power to avoid stress damaging the power grid[225] (there was significant outcry when PG&E selectively shut off power for some of its customers—but not others—during the 2019 California wildfires).[226]

Failures of equity could also occur in the enforcement context, although technology's contribution to those failures will be mitigated if there is a human in the loop. The output of artificial intelligence tools like ARTEMIS and ATLAS, for example, is reviewed by humans who then decide whether to pursue an enforcement action: most regulatory agencies anticipate keeping a human in the loop at least to some degree, in order to prevent enforcement actions that are based on specious correlations rather than actual problematic behavior.[227]

For now, the greater risk is that these tools will miss violations that *should* be investigated, which those who *are* subject to enforcement actions may consider inequitable. We generally accept that not all regulatory violations will be detected and punished—universal enforcement is currently implausible from a resource perspective (one survey of suptech innovations observed that "[s]ecurities markets supervisors . . . re-

223. Technology can be considered to have failed if it "overreaches by using overbroad technological fixes that lack the flexibility to balance equities and adapt to changing circumstances." Mulligan & Bamberger, *supra* note 15, at 704.

224. *See supra* notes 186–92 and accompanying text.

225. Allen, *supra* note 21, at 180–81.

226. *Id.*

227. FIN. STABILITY BD., *supra* note 10, at 10.

ceive thousands of regulatory filings from supervised entities. It is impossible for supervisors to review each one closely").[228] Most administrative law precedent supports and upholds this deference to agencies' decisions not to enforce rules in some instances.[229] But if suptech is able to mitigate some of the resource constraints faced by agencies, could norms (and the law) shift so that enforcement action in the case of *all* violations is expected? In these circumstances, if the technology misses people who should be investigated, that could be considered a failure of equity. Those who are pursued in enforcement actions might even challenge the actions against them as illegitimate in light of the false-negatives that are not pursued.

Equity failures may also emerge in the compliance burdens that suptech innovation places on regulated entities. Adjusting legacy technological systems or adopting new ones in order to interact with a regulatory agency's suptech tools may pose a much larger burden for smaller financial institutions than larger ones.[230] This might ultimately limit competition, if small firms find prohibitive the costs of making their technology interoperable with suptech solutions, and it may also have knock-on distributive consequences for the customers of financial institutions. For example, when the National Bank of Rwanda shifted to a "pull" approach to regulatory reporting, financial institutions began digitizing their other processes (such as loan applications) in response.[231] Other suptech measures might also encourage increased digitization by financial institutions, which might leave behind customers without internet access or technological sophistication.

4. *Failures of Legitimacy*

Ultimately, when technology results in inequitable outcomes (directly or indirectly), that will reflect poorly upon the agency using that technology and may even jeopardize the agency's legitimacy in the eyes of both the regulated industry and the general public. At a more fundamental level, people may resist the idea that consequential decisions should *ever* be automated: people want to be treated with empathy and un-

228. BROEDERS & PRENIO, *supra* note 88, at 17.
229. Engstrom & Ho, *supra* note 14, at 829–30.
230. CRISANTO ET AL., *supra* note 73, at 2.
231. *Id.* at 11.

derstanding when the stakes are high[232] but it is hard to portray decisions that emerge from a "black box" algorithm as empathic. In a fascinating article on empathy in the digital administrative state, Ranchordas argues that the "unique human feature of forgiving . . . mistakes is disappearing with the digitization of government services and the automation of government decision-making."[233] A possible failure of suptech is that it could automatically punish financial industry participants who deserve a little grace (their own "permission to fail," as it were).

Using suptech that is inappropriately draconian could ultimately undermine the legitimacy of a financial regulatory agency not just because the technology itself lacks empathy, but also because the use of technology may reduce human regulators' empathy as well. Effective supervision requires a certain culture among the regulatory personnel who discharge supervisory tasks: ideally, financial regulatory agencies will "possess and sustain an internal culture that fosters and reinforces humility, openness, empathy, and a steadfast commitment to public service."[234] Unfortunately, as I have explored in previous research on the use of technology in the private sector, overreliance on technological tools can have psychological impacts that undermine such a culture.[235] Culture is created and maintained, in part, by offering approval for compliance with cultural norms and shaming failure to comply with them.[236] But as work is increasingly delegated to technology, it will be easier for those who work alongside that technology to convince themselves that *the technology* is responsible, allowing them to avoid any shame that they might otherwise experience for failing to comply with prevailing cultural norms.[237] In short, the human values that currently animate supervision may be abandoned as the increased use of technology allows regulators to see their work as a much more technical exercise.

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232. Cary Coglianese, *Measuring Regulatory Excellence*, *in* ACHIEVING REGULATORY EXCELLENCE, *supra* note 46, at 298.

233. Sofia Ranchordas, *Empathy in the Digital Administrative State*, 71 DUKE L.J. 1341, 1341 (2022).

234. Coglianese, *supra* note 46, at 13.

235. Allen, *supra* note 21, at 187–91.

236. Richard H. McAdams, *The Origin, Development and Regulation of Norms*, 96 MICH. L. REV. 338, 355 (1997).

237. *Id.*

Because of regulatory agencies' position as public instrumentalities, the financial industry and the general public expect high standards of conduct from those agencies, including with respect to how they treat the information entrusted to them. Maintaining information privacy is therefore important to the legitimacy of financial regulatory agencies, but suptech innovation may require financial regulatory agencies to be even more vigilant regarding privacy. In a "pull" reporting system, for example, regulators would be able to reach into the data centers of regulated entities and obtain the information they need in real-time.[238] But they may be tempted to overstep and access more information than they reasonably need to discharge their regulatory tasks. Repeated "fishing expeditions" could undermine the legitimacy of a regulatory agency—at the very least, agencies must ensure that they have legal authority to access the information they collect.[239]

5. *Failures of Credibility*

Increased reliance on suptech will create new operational risks for financial regulatory agencies, and managing such risks effectively will be critical to maintaining public trust. The obvious concern is cybersecurity: the kind of non-public financial information provided to regulators is particularly attractive to hackers and to the extent regulators maintain large repositories of that kind of information, they will inevitably be targeted.[240] The SEC's EDGAR system, for example, was successfully hacked in 2016 by actors seeking information that would give them illegal trading advantages.[241] That breach generated significant negative press for the SEC and was cited as a factor contributing to delays in developing the CAT (because of increased cybersecurity concerns about the data the CAT would collect).[242] Failing to adopt strong protections for confidential reported data would undermine regulatory credibility and could even leave regulatory agencies vulnerable to civil lawsuits (some courts have found agencies liable for not

238. CRISANTO ET AL., *supra* note 73, at 9.
239. BROEDERS & PRENIO, *supra* note 88, at 18.
240. BAREFOOT, *supra* note 18, at 61.
241. SEC, *SEC Brings Charges in EDGAR Hacking Case* (Jan. 15, 2019), https://www.sec.gov/news/press-release/2019-1.
242. Rundle & Malakian, *supra* note 211.

taking adequate data security measures when private sector data was ultimately hacked).[243]

Suptech innovations that allow regulators to "pull" information from the private sector (rather than storing a goldmine of valuable information) could help alleviate this kind of operational risk. However, it's not just data that is vulnerable. Cyberattacks can also target the infrastructure on which financial regulatory agencies rely, which could paralyze an agency's ability to discharge its supervisory responsibilities. In 2021, for example, hackers targeted the computerized equipment that managed the Colonial Pipeline[244]—financial regulatory agencies also need to put in place measures to protect against these kinds of infrastructural attacks.[245] Failure to put these kinds of measures in place would certainly be a regulatory failure.

Operational problems may not always result from nefarious actions, though. Regulatory agencies also need to be increasingly attuned to the potential for technological glitches that can undermine their operations and credibility.[246] While the word "glitch" might suggest something minor, the impact is potentially significant. Research on complex systems shows that such systems are vulnerable to "normal accidents," where a seemingly minor problem kicks off a series of unanticipated, cascading failures that cause significant damage.[247] A system becomes more vulnerable to such cascade failures as it be-

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243. ENGSTROM ET AL., *supra* note 2, at 72. "The conventional view is that FISMA creates liability only for the intentional agency disclosures of data, but some courts have found that even negligent failures to prevent hacks are actionable." *Id.* at 116 (citing AFGE v. Hawley, 543 F. Supp. 2d 44 (D.D.C. 2008)).

244. David E. Sanger & Nicole Perlroth, *Pipeline Attack Yields Urgent Lessons About U.S. Cybersecurity*, N.Y. TIMES (May 14, 2021), https://www.nytimes.com/2021/05/14/us/politics/pipeline-hack.html.

245. CRISANTO ET AL., *supra* note 73, at 19 (Regulators will need to "ensure that they have proper safeguards in place, such as access controls, user authentication, data encryption and strong firewalls to defend against internal and external threats.").

246. DI CASTRI ET AL., *supra* note 9, at 4 ("Crucially, the architecture must have built-in quality assurance and security features to ensure the validity and integrity of the data from the point of collection to the point of consumption by end users.").

247. *See, e.g.*, Ian Dobson et al., *Complex Systems Analysis of Series of Blackouts: Cascading Failure, Critical Points, and Self-Organization,* 17 CHAOS 026103 1 (2007); *see also* Charles Perrow, NORMAL ACCIDENTS: LIVING WITH HIGH-RISK

comes more complex[248] and as more shortcuts between the components of the system are developed.[249] This is something that regulatory agencies must be aware of as they contemplate adopting suptech solutions.

For example, aspirations for interoperable reporting systems built on APIs that can ferry information back and forth between the systems of regulators and regulated entities could serve as shortcuts that inadvertently transmit technological problems from one system to the other.[250] Regulators would therefore become vulnerable if regulated entities underinvested in the robustness of their own technology (as well as vice versa), and glitches could ricochet back and forth between regulator and industry. Regulatory agencies' successes, failures, and overall reputations have always depended to some degree on how regulated entities behave.[251] With technological integration, their fates will become even more intertwined.

In addition to investing in their own operational integrity, regulatory agencies need to thoroughly oversee any third-party vendors providing suptech solutions. Unfortunately, management of these kinds of operational risks may be impeded if third-party vendors assert intellectual property protections or fail to explain how the technology actually works (the Department of Homeland Security faced this issue, reporting that "it could not explain the failure rates of iris scanning technology due to the proprietary technology being used").[252] As we've already discussed, the use of vendors may also exacerbate opportunities for regulatory arbitrage.[253]

TECHNOLOGIES (1999) (Perrow's seminal work on complexity theory and normal accidents).

248. Samuel Arbesman, OVERCOMPLICATED: TECHNOLOGY AT THE LIMITS OF COMPREHENSION 12 (2016) ("[W]hen it comes down to the real reason for the failure, it's more accurate to say it was the system's massive complexity, rather than any single component or choice.").

249. J.B. Ruhl, *Governing Cascade Failures in Complex Social-Ecological-Technological Systems: Framing Context, Strategies and Challenges*, 22 VAND. J. ENT. & TECH. L. 407, 417–19 (2020).

250. *See supra* note 125 and accompanying text. For a more general discussion of risks arising from increased interconnectedness through technology, see FIN. STABILITY BD., *supra* note 10, at 9.

251. Coglianese, *supra* note 232, at 298–99.

252. ENGSTROM ET AL., *supra* note 2, at 89.

253. *See supra* note 67 and accompanying text.

The use of vendors for suptech solutions also risks making some of the vendors themselves "too big to fail." This concern is particularly salient in the case of vendors offering cloud computing services.[254] While most regulatory bodies (with a few exceptions) continue to store core data on their own servers rather than in the cloud,[255] early indications suggested that CAT data would be stored using Amazon Web Services ("AWS")[256] and other regulatory bodies may also be contemplating the use of external cloud providers. While external cloud providers like AWS are likely to have more robust data storage protections than data centers maintained by individual regulatory agencies, we still hear headlines like "Prolonged AWS outage takes down a big chunk of the internet" several times a year.[257] Operational failures at AWS will ultimately become a problem for any affected agency, and so it may be a form of regulatory failure if an agency that relies on a cloud provider to house core data doesn't arrange for some kind of back-up.

Regulatory credibility can thus be threatened when the technology does not perform the way it should (members of the public, who are also susceptible to automation biases, may assume that new technological tools will be foolproof in addressing problems and may be doubly disappointed when that assumption turns out to be false).[258] The public may distrust suptech even when it performs as advertised, though. Machine learning algorithms have been described as "black boxes,"[259] because the ways in which they arrive at their outputs are often inscrutable—and lack of transparency in suptech data analysis

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254. FIN. STABILITY BD., *Third Party Dependencies in Cloud Services: Considerations on Financial Stability Implications,* 7 (Dec. 9, 2019), https://www.fsb.org/wp-content/uploads/P091219-2.pdf.

255. FIN. STABILITY BD., *supra* note 10, at 22.

256. Rundle & Malakian, *supra* note 211.

257. Jay Peters, *Prolonged AWS Outage Takes Down a Big Chunk of the Internet*, THE VERGE (Nov. 25, 2020, 5:39 PM), https://www.theverge.com/2020/11/25/21719396/amazon-web-services-aws-outage-down-internet.

258. In the context of suptech reporting innovations, the BIS has noted concerns that "having access to very granular data might lead to an unrealistic public expectation that authorities would be able to prevent failure by any financial institution." CRISANTO ET AL., *supra* note 73, at 19.

259. *See, e.g.*, Frank Pasquale, The Black Box Society: The Secret Algorithms That Control Money and Information (2016).

has been identified as a real concern.[260] As several administrative scholars have explored, the inability to explain administrative decisions based on the output of black box models could be seen as a failure of accountability and, ultimately, undermine trust in the regulatory agency.[261]

III.
Permission to Fail

After reading the previous Part's parade of possible "horribles," it might be tempting to throw up one's hands and give up on suptech technology. However, such an approach would result in a different kind of failure: a failure of *in*action.[262] When an industry is innovating at a breakneck pace, regulatory agencies that do not develop their own technological innovations in tandem may cede their ability to oversee that industry and discharge their statutory mandates.[263] Failures of inaction are often less noteworthy in the moment, though, than the failures that are part and parcel of trying something new.[264] What if resources seem wasted, at least in the short-term? What if the innovation malfunctions and harms someone? What if the innovation works but has unintended consequences that undermine public policy goals? Questions like these can haunt regulators considering new forms of technological regulation, and so "permission to fail" is needed to loosen constraints on regulatory innovation.

Not all failures are created equal, however. We need more of a societal consensus about the kinds of failures that should be tolerated (and in some instances, should even be encouraged in the spirit of "fail fast")[265] as well as the types of failures that should always be discouraged. While it is impossi-

260. di Castri et al., *supra* note 9, at 2.

261. For a survey of the algorithmic accountability literature, see Engstrom & Ho, *supra* note 14, at 824–27*; see also* Fin. Stability Bd., *supra* note 10, at 10.

262. "Regulating is itself a risky business, with risks form acting as well as risks from not acting." Coglianese, *supra* note 46, at 10.

263. *See supra* notes 17–21 and accompanying text.

264. Altshuler, *supra* note 1, at 1.

265. On "failing fast," see Sunnie Giles, *How to Fail Faster—and Why You Should*, Forbes (Apr. 30, 2018, 6:47 AM), https://www.forbes.com/sites/sunniegiles/2018/04/30/how-to-fail-faster-and-why-you-should/?sh=259348d6c177.

ble to devise a bright line separating the excusable failures from the inexcusable failures (hard cases are inevitable), this Article aims to start a conversation about different types of failures, their impact on the innovation process, and their importance to democratic accountability.

Once there is more consensus around what is and is not excusable, the next step is to develop legal structures that permit the excusable failures—but while such legal structures are necessary, they will not be sufficient.[266] "Permission to fail" will also depend on public opinion, and so insights from sociology, political science, technology ethics, and other fields will also be critical to developing this concept. Ultimately, the three Sections of this Part interrelate as there is a recursive relationship among them. The kinds of failures we are willing to tolerate or excuse will depend, to some extent, on public perceptions, which will be informed by law as well as by messaging.[267] But the law adopted will also be a product of public perceptions about which failures are tolerable, and messaging can be used to urge changes in that law.

A. *Thinking About Failures*

This Article has argued for more grace for certain types of regulatory failures while urging closer scrutiny of failures of inaction, which are often less visible and tend to be minimized as a result. The consequences of financial regulators' inaction can be severe, both for individual consumers and investors who are unprotected and, in the event of a financial crisis, for the financial system and economy more broadly. The avoidance of financial crises is generally regarded as the "apex" goal of financial regulation[268] and regulatory failures of inaction were significant contributing factors to the 2008 financial crisis: the Financial Crisis Inquiry Commission stated bluntly "we

266. *See* Peter Conti-Brown & David A. Wishnick, *Technocratic Pragmatism, Bureaucratic Expertise, and the Federal Reserve*, 130 YALE L.J. 636, 658 (2021).

267. On the expressive power of law in the financial regulation context, see Onnig H. Dombalagian, *The Expressive Synergies of the Volcker Rule*, 54 B.C. L. REV. 469, 497–98 (2013).

268. Jeffrey N. Gordon, *"Dynamic Precaution" in Maintaining Financial Stability: The Importance of FSOC*, *in* AFTER THE CRASH: FINANCIAL CRISES AND REGULATORY RESPONSES (Sharyn O'Halloran & Thomas Groll eds., 2019); *see also* Hilary J. Allen, *Putting the "Financial Stability" In Financial Stability Oversight Council*, 76 OHIO ST. L.J. 1087, 1088 (2015).

do not accept the view that regulators lacked the power to protect the financial system . . . . They had ample power in many arenas and they chose not to use it."[269] Consumer protection is also a critical goal of financial regulation and failure to protect consumers and investors from technologically sophisticated financial products and services has become a more pressing problem since 2008, as the financial industry's use of technology has rapidly increased.

Regulators must err on the side of precautionary intervention to prevent these harms, and failure to do so should not be readily excused.[270] The types of precautionary action needed are evolving as the technological sophistication of the financial industry increases,[271] and time is of the essence in developing suptech tools in response (failure to act now may leave regulatory agencies perpetually unable to catch up).[272]

For certain failures of inaction to become less acceptable, certain failures of regulatory action must become more acceptable. Efficiency failures (in the form of wasted resources if the innovation comes to naught or experiences vast cost overruns) are perhaps most necessary to the innovation process, and highly analogous to the failures embraced by the private sector as necessary to the innovation process.[273] If the only consequences of a failed innovation process are wasted time and resources, then any public harm is limited to seemingly wasted dollars.[274] I say "seemingly" because funds expended on innovation should not be considered "wasted" just because a partic-

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269. FIN. CRISIS INQUIRY COMM'N, THE FINANCIAL CRISIS INQUIRY REPORT xviii (2011).

270. Hilary J. Allen, *A New Philosophy for Financial Stability Regulation*, 45 LOY. U. CHI. L. J. 173 (2013).

271. "Technology is now part and parcel of financial services and there is no question that it will continue to drive profound changes for consumers and financial institutions." JERMY PRENIO & JEFFERY YONG, FIN. STABILITY INST., FSI INSIGHTS ON POLICY IMPLEMENTATION NO. 37: HUMANS KEEPING AI IN CHECK – EMERGING REGULATORY EXPECTATIONS IN THE FINANCIAL SECTOR 1 (2021).

272. BAREFOOT, *supra* note 18, at 9–10.

273. *See supra* note 265 on "failing fast."

274. It's important to note that losses related to suptech innovation will not always come out of the public purse: many of the financial regulatory agencies in the United States are independently funded. Some regulatory agencies, like the SEC and CFTC, do rely on Congressional appropriations for their funding though. *See supra* note 54 and accompanying text.

ular innovation does not pan out. Regulators may learn important lessons from failed innovations.

Private sector venture capital funds are considered successful if only 10–20% of the companies they invest in turn out to be "winners;"[275] a similar success rate on an agency's portfolio of suptech innovation projects should be considered a success overall. Failures of efficiency should therefore be the most readily excused but, at present, these types of failures are perhaps the most frequently cited evidence of government failure (as was amply demonstrated by the Solyndra episode).[276] Efforts to reorient the law and public opinion to permit failures of efficiency are therefore some of the most important steps that can be taken towards promoting regulatory innovation.

Failures of efficacy may similarly need to be excused in order to encourage innovation, at least in the early stages of the innovation process. Not all technological experiments will achieve the desired outcome, and that is simply the nature of experimentation (in the public *or* the private sector).[277] On top of that, financial regulators are often trying to address complex problems with systemic dimensions while juggling competing mandates;[278] these problems are characterized by great uncertainty and are often far more difficult to solve than any problem the private financial industry would take on (the systemic risk that macroprudential regulation seeks to manage is a case in point).[279] Furthermore, the efficacy of a regulatory innovation will ultimately depend not just on what the regula-

275. "[M]ore than half the companies will at best return only the original investment and at worst be total losses. Given the portfolio approach and the deal structure VCs use, however, only 10% to 20% of the companies funded need to be real winners to achieve the targeted return rate of 25% to 30%. In fact, VC reputations are often built on one or two good investments." Bob Zider, *How Venture Capital Works,* HARV. BUS. REV. (1998), https://hbr.org/1998/11/how-venture-capital-works.

276. Solyndra was an innovator in clean energy technologies that received significant funding from the Obama Administration, but ultimately filed for bankruptcy. For a discussion of the rhetoric around the Solyndra bankruptcy, see MAZZUCATO *supra* note 40, at 11, 114–16.

277. TOM NICHOLS, THE DEATH OF EXPERTISE: THE CAMPAIGN AGAINST ESTABLISHED KNOWLEDGE AND WHY IT MATTERS 174–76 (2017).

278. *See* Coglianese, *supra* note 46, at 6.

279. *See generally* ENGSTROM ET AL., *supra* note 2 (reporting on use of AI by government agencies, identifying challenges, and presenting recommendations).

tors do, but also on the choices and actions of regulated private sector actors over whom regulators' control is limited.[280] Finally, the existence of potentially conflicting regulatory mandates means that different constituencies are likely to have different ideas about what "efficacy" even means (unlike corporate actors, who have the more straightforward yardstick of profitability to judge their outcomes by). A technological tool may therefore be considered effective even if it does not always succeed in preventing a particular harm if the tool was purposely designed to allow some risks to be taken in order to further competition and efficiency.[281] For all these reasons, perceived failures of the efficacy of suptech innovation should often be excused – again, though, existing perceptions around such failures must be changed.

To be clear, regulators should not be given *carte blanche* for inefficiency and inefficacy in perpetuity. Regulatory agencies should be expected to learn from their mistakes and adapt accordingly, and suptech innovations that have been deployed should be adjusted in light of new knowledge or changing circumstances.[282] While structures are needed to give regulators the kind of grace that facilitates this adaptation and learning, the legitimacy and credibility of an agency will be undermined if no learning takes place, and the same mistakes are repeated over and over again. In other words, regulators bear part of the responsibility for creating their own permission to fail: they should face public scrutiny if there is no meaningful response to failures (or no meaningful response other than blame shifting).[283] Furthermore, while we need to increase our tolerance for regulatory failures, some one-off failures of efficiency and efficacy may be so extreme that they remain incompatible with democratic accountability: the magnitude of

280. *See* Coglianese, *supra* note 46, at 7.

281. "When a disaster occurs it may not necessarily reflect the failure of regulation as much as the tragic but rare and inevitable consequence of a regulatory policy that responds to and makes tradeoffs in society's competing values." Cary Coglianese, *Preface* to REGULATORY BREAKDOWN: THE CRISIS OF CONFIDENCE IN U.S. REGULATION (Cary Coglianese ed., 2012).

282. *See* Mulligan & Bamberger, *supra* note 15, at 743.

283. For a discussion of the management literature on how to "fail better" and how it might apply to regulatory agencies, see Jodi Short, *Regulatory Managerialism as Gaslighting Government* (unpublished manuscript) (on file with author).

the failure will therefore be relevant to preserving regulators' legitimacy and credibility.

Failures of legitimacy and credibility, along with failures of equity, are highly problematic when associated with an unelected body that is publicly charged with coercing some people and protecting the rights of others.[284] Democratic accountability demands that failures of equity, legitimacy, and credibility should be less readily excused than similar failures by a private sector innovator.

One way of reconciling the need for experimentation with the need for the agency to retain legitimacy in the eyes of the public (especially when that experimentation fails) is to limit the impact of experimentation on regulated entities:[285] Conti-Brown and Wishnick argue that the least coercive activities are most able to retain legitimacy during experimentation.[286] Applying that logic to our discussion of regulatory innovation, innovation is less likely to undermine ideals of equity, legitimacy, or credibility when it is in "beta mode": technology cannot be coercive before it is launched. While that is a good strategy as far as it goes, some issues with a technology will not become apparent until it is actually operational, at which point it *will* be coercive. Heightened attention to failures of equity, legitimacy, and credibility must be applied to any technology that ultimately goes "live"—and the developers of suptech cannot wait until the launch date to start engaging with such issues.

When regulation is carried out through technological means, choices and values are embedded throughout the technological design process, "cementing regulatory compromises

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284. "The history of administrative law," Professors Sidney Shapiro, Elizabeth Fisher, and Wendy Wagner write, "constitutes a series of ongoing attempts to legitimize unelected public administration in a constitutional liberal democracy." Sidney Shapiro et al., *The Enlightenment of Administrative Law*, 47 WAKE FOREST L. REV. 463, 463 (2012). Democratic accountability requires regulators to balance the interests of the regulated industry (who are subject to the regulators' coercive powers) with the interests of the public who benefit from the regulation (who are often too dispersed to monitor the agency to ensure that their interests are being properly represented). Kathryn Harrison, *Regulatory Excellence and Democratic Accountability*, *in* ACHIEVING REGULATORY EXCELLENCE, *supra* note 46, at 56.

285. *See* Conti-Brown & Wishnick, *supra* note 266.

286. *Id.* at 664.

struck at foundational moments."[287] Because technology is often perceived as neutral, though, those choices and values may become less visible when they are carried out through technological means;[288] suptech's impact may also be more "durable" than other regulatory approaches, to the extent that it is "more automatic, more self-enforcing" than traditional regulatory strategies.[289] Suptech can therefore "bake in" failures of equity, legitimacy, or credibility,[290] and even technology that succeeds along all of these axes at the time of initial implementation may ultimately become more problematic with time, particularly if it invites unthinking deference in the form of automation bias.[291] Law and policy should therefore seek to prevent design choices from embedding and obscuring failures of equity, legitimacy, and credibility.

B. *Legal Standards*

If steps need to be taken during the suptech design process to limit failures of equity, legitimacy, and credibility, the law can and should encourage these steps, as well as lessen the consequences associated with failures of efficiency and efficacy. Many areas of law may be implicated here (for example, individual agency employees engaged in innovation may desire employment law protections that protect them should the innovation fail; uses of technology by government actors, particularly in the context of criminal law enforcement, raise Constitutional issues that are well beyond the scope of this discussion).[292] This Part, however, will focus on adapting administrative law to create permission to fail.

The starting point for this discussion is recognizing that the adoption of a new technology by a regulatory agency may,

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287. Heimer & Kuo, *supra* note 17, at 565.

288. *See* Mulligan & Bamberger, *supra* note 15, at 704.

289. Heimer & Kuo, *supra* note 17, at 564.

290. "Administrative process frequently fails even to recognize technology design choices as matters of public policy." Mulligan & Bamberger, *supra* note 15, at 701.

291. "[I]n hardened systems, regulatory complacency may further reduce capacity to respond to exogenous shocks." Heimer & Kuo, *supra* note 17, at 566.

292. *See* Andrew Guthrie Ferguson, The Rise of Big Data Policing: Surveillance, Race, and the Future of Law Enforcement (2019) for a discussion of these issues.

in some circumstances, be interpreted as the adoption of a new rule.[293] While regulatory agencies typically have significant discretion regarding how they carry out their supervision and enforcement activities, activities that rise to the level of rulemaking must follow certain procedures. The D.C. Circuit has held that the Transportation Security Agency's adoption of body scanners needed to go through the notice and comment rulemaking process,[294] and many of the suptech innovations discussed in Part III could be similarly considered as tantamount to a rulemaking as they "encode[ ] legal principles and agency priorities."[295] Where a technological innovation is itself considered a rule, it will be susceptible to both notice-and-comment rulemaking procedures and judicial review under the arbitrary and capricious standard.[296] Even where a technological innovation is not itself considered a rule, an agency may kickstart the development of that technology by adopting a rule, as was the case when the SEC adopted Rule 613 to precipitate the development of the CAT. Such rulemakings would similarly be subject to notice-and-comment and judicial review.

These rulemakings may therefore be subjected to the major questions doctrine embraced by the Supreme Court in *West Virginia v. EPA*.[297] That doctrine, which had been applied only infrequently and in "exceptional circumstances" prior to the ruling in *West Virginia v. EPA*,[298] stipulates that when the "economic and political significance" of a matter is great enough, courts should "hesitate before concluding that Congress meant to confer such authority."[299] Many have interpreted the Supreme Court's decision (which applied the major questions doctrine to invalidate certain efforts by the Environmental Protection Agency to regulate greenhouse gases) as a harbin-

293. Engstrom & Ho, *supra* note 14, at 836.

294. ENGSTROM ET AL., *supra* note 2, at 35 (citing Elec. Priv. Info. Ctr. v. Dep't of Homeland Sec., 653 F.3d 1, 8 (D.C. Cir. 2011)).

295. *Id.* at 28.

296. *Id.* at 76.

297. West Virginia v. EPA, 142 S. Ct. 2587, 2595 (2022).

298. Natasha Brunstein & Richard L. Revesz, *Mangling the Major Questions Doctrine*, 74 ADMIN. L. REV. 317, 319 (2022).

299. *West Virginia*, 142 S. Ct. at 2595.

ger of increasingly limited judicial deference to agency decision-making.[300]

Such limitations on deference unfortunately seem to be ratcheting up just as regulatory agencies need *more* grace for their technological experimentation. There is a lot of uncertainty about how the major questions doctrine will be applied going forward, but administrative law scholars have begun to explore how various other administrative law doctrines should apply to the use of technology (particularly machine learning technology) by the administrative state.[301] Many of these doctrines are designed to ensure regulatory outcomes of equity, legitimacy, and credibility, and we will return to how to navigate failures in these areas shortly. We will start, though, with administrative law requirements that are particularly inimical to regulatory innovation because they are laser-focused on efficiency and efficacy: requirements for cost-benefit analysis.

1. *Problems with Cost-Benefit Analysis*

In their strictest form, cost-benefit analysis mandates require that both the costs of an activity and its benefits be quantified, that the benefits outweigh the costs, and that this analysis be performed to the satisfaction of someone external to the agency (such as the Office of Information and Regulatory Affairs ("OIRA") or the D.C. Circuit).[302] Pursuant to Executive Orders 12,866 and 13,563, many regulatory agencies are re-

300. *See, e.g.*, New York Times Editorial Board, *The Supreme Court Sabotages Efforts to Protect Public Health and Safety*, N.Y. TIMES (July 1, 2022), https://www.nytimes.com/2022/07/01/opinion/supreme-court-epa-ruling.html ("The decision amounts to a warning shot across the bow of the administrative state. The court's current conservative majority, engaged in a counter-revolution against the norms of American society, is seeking to curtail the efforts of federal regulators to protect the public's health and safety."); Amy Howe, *Supreme Court curtails EPA's authority to fight climate change*, SCOTUSBLOG (June 30, 2022, 2:48 PM), https://www.scotusblog.com/2022/06/supreme-court-curtails-epas-authority-to-fight-climate-change/ ("Roberts' full-throated embrace of the major-questions doctrine – a judicially created approach to statutory interpretation in challenges to agency authority – likely will have ripple effects far beyond the EPA. His reasoning applies to any major policymaking effort by federal agencies.").

301. See sources cited *supra* note 14 for a more comprehensive discussion of machine learning in the administrative state.

302. John C. Coates IV, *Cost-Benefit Analysis of Financial Regulation: Case Studies and Implications*, 124 YALE L.J. 882, 893–95 (2015).

quired to prepare quantified cost-benefit analysis in connection with every rulemaking and submit that analysis to OIRA before they publish their rules for public notice and comment.[303] Financial regulatory agencies are not covered by these executive orders and therefore do not have to submit their rules to OIRA;[304] still, as a result of a mishmash of legal requirements and external pressure, some agencies nonetheless prepare quantified cost-benefit analysis in support of their rulemakings.[305]

The D.C. Circuit has repeatedly vacated SEC rulemakings based on perceived infirmities in cost-benefit analyses, most notably in the Business Roundtable case.[306] Perhaps even more aggressively, in 2015, the D.C. Circuit struck down the Financial Stability Oversight Council's designation of MetLife, Inc. as a "systemically important financial institution" deserving of heightened prudential regulation, on the grounds that the FSOC failed to consider the costs that MetLife would bear as a result of the designation (notwithstanding the absence of any cost-benefit analysis requirement in the relevant legislation).[307] Cost-benefit analysis requirements therefore seem to be increasingly operating as constraints on financial regulatory agencies—and this could spell bad news for suptech innovation.

The adoption of a new technology that proves effective but expensive might be struck down if the D.C. Circuit determines that the technology is tantamount to a rule and its benefits do not justify the costs (which, as we saw in the case of the CAT, can be substantial).[308] In fact, unanticipated cost overruns on a technology project could conceivably result in that technology being retroactively declared "arbitrary and capri-

303. Exec. Order No. 12,866, 58 Fed. Reg. 51735 (Oct. 4, 1993); Exec. Order No. 13,563, 76 Fed. Reg. 3821 (Jan. 21, 2011).

304. The independent regulatory agencies listed in 44 U.S.C. § 3502 (which include the Federal Reserve Bank ("FRB"), the Federal Deposit Insurance Corporation ("FDIC"), the Commodity Futures Trading Commission ("CFTC"), and the Securities and Exchange Commission ("SEC")) are excluded from the ambit of Executive Order 12,866 by operation of section 3(b) of that Order.

305. Coates, *supra* note 302, at 911–12.

306. See *id.* at 912–19 for an overview of this case law.

307. Jeremy C. Kress et al., *Regulating Entities and Activities: Complementary Approaches to Nonbank Systemic Risk*, 92 S. CAL. L. REV. 1455, 1486 (2019).

308. *See supra* Section II.C.2.

cious"[309]—and therefore not able to be used—even after the development costs are incurred. Ultimately, cost-benefit analysis could exacerbate the impact of resource constraints on innovation and judicial rebukes for failure to satisfy cost-benefit analysis may reinforce public perceptions of an agency as a blundering bureaucracy, further reinforcing the constraints of rule-obsession and risk-aversion.

To be sure, requirements for strict quantified cost-benefit analysis have already been widely criticized, particularly because of their propensity to hide value judgments about the benefits of regulatory action (or inaction) beneath a veneer of seemingly impartial economics.[310] In the context of financial regulation more specifically, cost-benefit analysis has been critiqued for downplaying the benefits of financial stability[311] and for simply being an unreliable guide for policymaking because "finance is at the heart of the economy; is social and political; and is composed of non-stationary relationships that exhibit secular change . . . . These features undermine the ability of science to precisely and reliably estimate the effects of financial regulations, even retrospectively."[312] To this list of critiques we can now add another: requiring strict empirical cost-benefit analysis can impede necessary regulatory innovation.

2. *Adapting to Regulatory Innovation*

Other administrative law requirements are less focused on efficiency and efficacy, and more focused on bedrock principles of democratic accountability. Democratic accountability could be undermined by many different types of failures, but some examples already discussed in this Article include: what if the technology treats people differently when making decisions about who gets to transact, or enforcing rules? Should the public trust in decisions that come from a black box, or

309. Administrative Procedure Act, 5 U.S.C. § 706.

310. *See, e.g.*, FRANK ACKERMAN & LISA HEINZERLING, PRICELESS: ON KNOWING THE PRICE OF EVERYTHING AND THE VALUE OF NOTHING 40 (2004) ("In practice, most cost-benefit analyses could more accurately be described as "complete cost-incomplete benefit" studies. Most or all of the costs are readily determined market prices, but many important benefits cannot be meaningfully quantified or priced, and are therefore implicitly given a value of zero.").

311. *See, e.g.*, Allen, *supra* note 270.

312. Coates, *supra* note 302, at 1003.

even from human regulators working alongside a black box? What if regulators do not invest enough in keeping their technological systems and our information safe? This Section will engage in some limited discussion of how administrative law mechanisms might afford protections to those impacted by suptech innovations—on the understanding that the broader subject of how administrative law should grapple with artificial intelligence and other technology is far too big a topic for this Article to tackle comprehensively.[313]

As we have already discussed, design choices made during the development process will have an impact on how suptech tools function once they go live. It is also important to realize that suptech innovations will not remain static in their operation but, rather, continuously evolve after launch.[314] As such, a notice-and-comment procedure that only applies to a rule outlining the initial goals for the technology (such as Rule 613, which started the CAT development process)[315] will not offer sufficient room for meaningful public engagement. As Mulligan & Bamberger have observed, the initial notice-and-comment process "misses the action when regulators delegate or hand off the design and crafting of regulatory technology to standard-setting bodies, engineers, designers, and program managers."[316]

Better engagement could be achieved by requiring transparency regarding suptech innovation during its development process and after its launch. However, achieving transparency will be challenging if the technology is provided by third-party private vendors who assert that the technology is proprietary and its details cannot be disclosed.[317] Furthermore, traditional administrative law transparency mechanisms like notice-and-comment rulemaking procedures and Freedom of Information Act ("FOIA") requests presuppose that the public can truly engage with the agency action in question. It is already challenging for people to engage with dense agency disclosures when they are dealing with words on paper:[318] public

313. For further discussion of these issues, *see* Bell, *supra* note 14, at 89–90.

314. BEERMAN ET AL., *supra* note 64, at 10.

315. *See supra* note 210 and accompanying text.

316. Mulligan & Bamberger, *supra* note 15, at 772.

317. *Id.* at 720.

318. For a discussion of the challenges everyday citizens have in participating in the notice-and-comment process for financial regulations, see

scrutiny may become near impossible when people are expected to engage with software code or some other form of complex technology.[319] For example, in order to engage meaningfully with the output of a machine learning algorithm, "[c]ommenters themselves would have to investigate the correlation [in the data] to either prove it is coincidental (essentially disproving all possible reasons for the existence of the correlation) or identify the underlying causes driving the correlation."[320]

In light of the deficiencies of existing administrative law mechanisms, Mulligan & Bamberger have suggested a useful set of norms for regulators to abide by when their regulation takes the form of a technological intervention.[321] These kinds of norms can work to limit failures of equity, legitimacy, and credibility. One such norm is that both technologists and policymakers should be "in the room where it happens," actively involved in designing the regulatory technology, so that the technology actually reflects the goals the policymakers are trying to achieve.[322] Another general guidepost is to not overreach: these types of technological regulatory solutions should be tailored as narrowly as possible to the problem at hand.[323] This will limit the coercive impact of regulatory technologies, and potentially limit the scope for unintended consequences (as compared to wider-reaching technological tools). It will also preserve more flexibility for future action. In addition, there should be a very deliberate discussion about the conflicting values at stake: the regulatory goals impacted by the technology should be clearly articulated and communicated, and assessments of technology and its impact on multiple identi-

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Kimberly D. Krawiec, *Don't "Screw Joe the Plummer": The Sausage-Making of Financial Reform*, 55 ARIZ. L. REV. 53, 80 (2013).

319. Mulligan & Bamberger, *supra* note 15, at 770 ("Diminished citizen awareness of techno-regulation, moreover, undermines the viability of traditional political checks.").

320. Bell, *supra* note 13, at 98–99.

321. Mulligan & Bamberger, *supra* note 15, at 705.

322. Mulligan & Bamberger note that, if left to their own devices, technical personnel may "maximize engineering values such as interoperability, efficiency, elegance, and innovation." *Id.* at 755.

323. *Id.* at 743.

fied goals can be made by cross-sectoral bodies[324] (the Office of Financial Research seems well suited to performing this kind of task for suptech).[325]

Administrative law norms may also have to adapt to deal with machine learning's "black box" problem. Although core administrative law doctrines are likely already expansive enough to permit the use of machine learning by administrative agencies,[326] in order to satisfy those doctrines, norms will have to evolve in terms of "explaining in general terms how the algorithm was designed to work and demonstrating that it has been validated to work as designed by comparing its results to those generated by the status quo process."[327] While strides have been made in designing machine learning algorithms that can retrospectively identify the variables they relied upon in their decision making, these types of advances are of limited utility when trying to prospectively assess how the algorithm is likely to make future decisions based on new data.[328] There are ways that the prospective workings of machine learning algorithms can be made more explainable, but these entail trade-offs (machine learning algorithms that lend themselves better to identifying the relationships between input and output variables are sometimes less predictive than more opaque machine learning algorithms).[329] And so norms will have to evolve about when to sacrifice accuracy for explainability; norms will also have to evolve about what are "acceptable" error rates for the machine learning algorithm more generally.[330]

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324. Mulligan & Bamberger, for example, have argued for a revived version of the Office of Technology Assessment that was defunded during the Gingrich era. *Id.* at 734.

325. Hilary J. Allen, *Resurrecting the OFR*, 47 J. CORP. L. 1, 44 (2021).

326. Coglianese, *Administrative Law in the Automated State, supra* note 14, at 108 ("Administrative law has never demanded anything close to absolute transparency nor required meticulous or exhaustively detailed reasoning.").

327. *Id.*

328. Allen, *supra* note 21, at 175–76.

329. *Id.* at 176*; see also* BEERMAN ET AL., *supra* note 64, at 10 ("Tightening modelling criteria may reduce noise in the results, but it could also lead to the tool not spotting supervisory issues. Loosening criteria could lead to too much noise, which could also result in the tool not being of much help in identifying real issues.").

330. Coglianese & Lehr, *supra* note 14, at 1,218.

Bearing in mind that these new types of regulatory approaches will take commitment and time to adopt and refine, it is worth considering how to minimize suptech innovations' inequities and shore up agency legitimacy and credibility in the interim. One possibility is to make experimental regulation less coercive by reducing enforcement penalties that relate to the output of suptech tools. At least at the outset, financial regulatory agencies may need to excuse errors by the regulated industry as the industry familiarizes itself with suptech regulation. Determining when private sector errors deserve forgiveness is beyond the scope of this Article, but it is worth noting that in 2018, France recognized the right for private citizens to make a one-time mistake in their interactions with government technologies.[331] This step might provide some ideas and context for how "permission to fail" should be extended to the private sector.

Another possibility is to mandate regular review of the technology involved:[332] these kinds of automatic reviews could soften the impact of technological regulatory failures and, in doing so, create more permission to fail. In general, technological tools are not "set and forget;" to retain legitimacy and credibility, they must be continually maintained and recalibrated in light of observed failures and changes in the regulated industry.[333] Finally, given the suspicion with which the public may regard automated decision-making,[334] an agency's legitimacy and credibility may depend on ensuring that technological interventions do not completely automate the regulatory function (again, at least in the early days). Instead, they

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331. Ranchordas, *supra* note 233, at 44.

332. For example, the Copyright Office is charged with a unique, triennial rulemaking procedure that confers upon "the Copyright Office the responsibility to create a regularized process for reviewing the impact of technical protection measures (TPMs) on noninfringing uses. This process allows any stakeholder to petition for an exemption for a particular class of content and gives the Copyright Office the authority to establish temporary (three-year) exemptions from the law to protect such noninfringing uses." Mulligan & Bamberger, *supra* note 15, at 762.

333. In a survey of prudential regulators developing suptech tools, "[s]everal authorities mentioned assessing effectiveness through ongoing exchanges between those with data science skills and front-line supervisors/other users." BEERMAN ET AL., *supra* note 64, at 10.

334. *See supra* notes 232-34 and accompanying text.

could serve as a complementary tool within the total mix, with human regulators kept "in the loop."

C. *Messaging & Other Methods for Building Permission to Fail*

The legal treatment of failures is not the only relevant consideration for regulators, though. Regulators understandably fear negative press—and any Congressional scrutiny that may flow from such negative press (although the more independent an agency is, the more insulated it will be from Congressional scrutiny).[335] Regulatory failures can be very noteworthy,[336] particularly in the United States where the population tends to be much less comfortable trusting government with proactive discretion.[337] Mazzucato tracks this fear of failure back to "the emergence of 'new public management' theory, which grew out of 'public choice' theory in the 1980s" and "led civil servants to believe that they should take up as little space as possible, fearing that government failures may be even worse than market failures."[338] Mazzucato emphasizes that this is, in many ways, a "discursive battle" and that "how we talk about the State [matters]."[339] Creating permission to fail, therefore, requires complementary non-legal strategies for managing the public narrative around regulatory innovation and its inevitable setbacks.[340] These strategies are critical for managing the constraints of publicness and short-termism on

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335. For further elaboration on agency independence, see *supra* notes 50–54 and accompanying text.

336. ALTSCHULER, *supra* note 1, at 1; *see also* Heimer & Kuo, *supra* note 17, at 564 ("[W]ide and vivid reporting may lead to overestimates of the frequency of regulatory failures and a belief that some exceedingly rare types of failure are pervasive problems. In contrast, regulatory successes are hard to see and remember.").

337. ALTSHULER, *supra* note 1, at 1. It's worth noting that this is not a uniform phenomenon, though. In the United States, there is often a high level of comfort with giving government significant discretion when it comes to security issues – but less so when it comes to financial regulation (as well as many other forms of government action). *See* Jonathan B. Wiener, *Whose Precaution After All? A Comment on the Comparison and Evolution of Risk Regulatory Systems*, 13 DUKE J. COMPAR. & INT'L L. 207, 209 (2003).

338. MAZZUCATO, *supra* note 40, at xxiii.

339. *Id.* at 14.

340. "[N]arrative is a key means through which people organize and make sense of reality and engage in reasoned argument." Brett Davidson, *Storytelling and Evidence-Based Policy: Lessons from the Grey Literature*, 3 PALGRAVE COMMC'NS 2 (2017).

regulatory innovation, as well as the constraints of rule-obsession and risk-aversion that flow from them (in this latter sense, it is important to shift the regulators' opinions of themselves, as well as in public opinion generally).

Cristie Ford has observed the power in framing something as innovative, because the positive connotations associated with "innovation" can provide legitimacy to the innovator.[341] So how do we build support for financial regulatory agencies as innovative bodies? Altshuler has argued that public sector innovation is more politically appealing when it addresses problems of "intense public concern."[342] Accordingly, regulators should stress that regulatory innovation is necessary to the pursuit of critically important public goods like consumer protection and financial stability—ends that are much harder to achieve than the profits that private sector innovation pursues. This needs to be messaged—in press releases, speeches, and media interviews—in snappy and accessible terms.[343]

A key messaging challenge is that regulatory successes are often invisible. When it comes to financial stability regulation, for example, successful regulation will ensure that financial crises are avoided, but it is difficult for regulators to point to the absence of crisis as evidence of their success.[344] Regulatory successes can also be overlooked to the extent that they become old news and unworthy of media attention.[345] The issue is particularly salient with respect to technological systems that may become so successful that they become a "part of the furniture" and cease to be viewed as regulation at all.[346]

It is therefore critical to message "failures of inaction" as failures, because they endanger the valuable outcomes of consumer protection and financial stability. One effective way to

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341. Ford, *supra* note 28, at 220.

342. ALTSHULER, *supra* note 1, at 3.

343. For a discussion of strategies for changing a narrative, see Davidson, *supra* note 340, at 3 ("[I]nformation has to be packaged in a manner that takes into account people's inherent cognitive biases and ensures that the information is quickly and easily—and accurately—grasped."); *see also* ALTSHULER, *supra* note 1, at 3.

344. Allen, *supra* note 270, at 190.

345. Heimer & Kuo, *supra* note 17, at S64. ("Despite their importance, regulatory successes, and especially those that are old news by virtue of longevity, are rarely reported, generally lack drama, and are therefore easily overlooked and forgotten.").

346. *Id.* at S65.

build support for new regulatory responses to new regulatory problems may be to tell stories about what could go wrong in the *absence* of regulation.[347] History has demonstrated that (while sometimes minimized as "merely economic") regulatory failures to protect consumers and financial stability can cause significant harm to human beings. The public needs to be reminded of this history of human harm. A complementary, more forward-looking approach might entail regulators partnering with science fiction writers to explore what harms might lurk in an unregulated, technologized future.[348]

In addition, rather than focusing exclusively on individual innovations, the *process* of innovation should be celebrated as an indication that regulators are technologically sophisticated enough to keep up with their regulated industry. Publicizing and celebrating what would otherwise be behind-the-scenes innovation processes can act as a counterfactual to narratives of bureaucratic stodginess and inefficiency (this could also impact regulators' self-perception—hopefully in a virtuous cycle that creates a culture of innovation).[349] It can also work to improve the public profile of a regulatory agency at the time the innovation process occurs, even if the outcome of the innovation may not become apparent for some time (providing more explanation of those processes may also improve perceptions of equity, legitimacy, and transparency). For example, the private sector uses organizational management strategies like agile workflows to promote innovation; regulatory agencies should broadcast the extent to which they have adopted these kinds of strategies internally.[350] Agencies could send similar

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347. Hilary J. Allen, *Regulatory Managerialism and Failures of Inaction: A Case Study of Banking Regulation and Climate Change*, L. & CONTEMP. PROBS. (forthcoming); *see also* Davidson, *supra* note 340, at 3 ("Through the mechanism of plot, stories can help make causal relationships apparent, helping audiences process complex information even when they are engaging in fast thinking.").

348. For further exploration of science fiction stories as a vehicle for building public goodwill around financial regulation, see Allen, *supra* note 347.

349. Esty, *supra* note 55, at 141.

350. Ford, *supra* note 28, at 148 ("Attributes thought to positively influence innovativeness include how much structural flexibility and decision-making freedom employees have; whether workers have adequate resources, and reward and recognition structures that support innovation; whether the firm values open communication and participatory decision-making; how

messages by partnering (where appropriate) with industry bodies or universities for hackathons and tech sprints. Tools or projects that are abandoned or retired should be branded as learning opportunities achieved through trial and error, rather than as failures.[351]

Admittedly, successful outcomes are probably more likely to be salient to the public than successful processes. It is therefore worth identifying some outcomes from technologies developed through regulatory innovation that lend themselves well to measurement, and actually measuring those so that successes can be easily communicated to the public (this can also be a useful internal check on whether the technology itself is doing what it needs to do).[352] As we have already explored, it is critical that any benchmarks and metrics used refer to the agency's public goals, not just to efficiency.[353] Also, when it comes to selecting the outcomes to celebrate, Altshuler has argued that public sector innovations will be more politically appealing when they are "value-neutral, in the sense they can be usefully employed by partisans of divergent policy objectives."[354] It might make sense for financial regulatory agencies to build both their goodwill and their innovative "muscle" by initially engaging in win-win projects supported by the financial industry.[355] For more controversial suptech strategies, regulators can experiment with technologies now but may need to cultivate a broader coalition of public support before launch (the occurrence of a related crisis or emergency could certainly help cultivate this public support).[356]

So far, this Section has focused exclusively on messaging; the previous Section focused on administrative law measures. In between those administrative law measures and a public relations strategy lie hybrid measures that could also assist in creating permission for acceptable failures. These might include

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entrepreneurial and how cohesive it is; and how much it emphasizes learning and development.").

351. MAZZUCATO, *supra* note 40, at 10.

352. Esty, *supra* note 55, at 144.

353. ENGSTROM ET AL., *supra* note 2, at 73.

354. ALTSHULER, *supra* note 1, at 3.

355. *See supra* note 48 and accompanying text.

356. For a discussion of ways to amass public support for financial regulatory reform, see Peter Conti-Brown & Brian D. Feinstein, *The Contingent Origins of Financial Legislation*, 99 WASH. U. L. REV. 145 (2021).

the use of advisory committees (or requiring consultation with specified outside groups) that are particularly likely to value innovation in service of goals like consumer protection or financial stability (these approaches would be particularly effective if these outside groups had technological expertise). Brian Feinstein has referred to these as "identity-conscious measures," designed to "further agencies' accountability by explicitly elevating certain subgroups."[357] Such measures could be used to build goodwill for the agency's ventures that will afford some grace when its regulatory innovations inevitably fumble on the efficiency and efficacy axes—and they could be used to help prevent failures of equity, legitimacy, and credibility. These kinds of measures would not constitute a significant departure from current practice: as Feinstein observes, many financial regulatory agencies already have committees that seek to exert influence from traditionally underrepresented groups.[358] There may even be particular media interest in the view of these people by virtue of their committee membership,[359] which could serve as a potent public relations strategy.

To be clear, distrust of the regulatory state runs deep for some political persuasions.[360] Creating "permission to fail" in the minds of those who perceive regulation as generally doing more harm than good would entail resolving seemingly intractable problems of political polarization in the United States. This Article has no suggestions for how to respond to the divided media landscape and partisan online information streams that limit the efficacy of public communications strategies across party lines.[361] However, the strategies explored in this Part could incrementally build permission to fail in the minds of those who are less ideologically opposed to regulation in the first place.

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357. Brian D. Feinstein, *Identity-Conscious Administrative Law: Lessons from Financial Regulators*, 90 GEO. WASH. L. REV. 1, 1 (2022).

358. *Id.* at 35 ("Of the nineteen committees that counsel agencies on financial regulatory matters, eight have charters that require their memberships to be drawn from groups that are conventionally perceived as underrepresented.").

359. *Id.* at 61–62.

360. Matthew A. Baum, *Partisan Media and Attitude Polarization: The Case of Healthcare Reform*, *in* REGULATORY BREAKDOWN: THE CRISIS OF CONFIDENCE IN U.S. REGULATION, supra note 281, at 118–19.

361. *Id.*

CONCLUSION

Private actors in the financial industry tend to lack both incentives and the ability to pursue public goals like consumer protection and financial stability. We therefore depend on financial regulators to pursue these goals, but regulators' ability to oversee the financial industry will increasingly depend on their ability to engage with the industry's technological innovation—which will sometimes require regulatory agencies to engage in technological innovation of their own. This Article has explored the constraints that could prevent this kind of technological innovation (and therefore lead to failures of inaction) and discussed how to lessen those constraints by expanding regulatory agencies' "permission to fail."

This idea of "permission to fail" is culturally specific, though, and the permission granted will vary between nations depending on expectations of government effectiveness, efficiency, and democratic accountability. This Article has focused on legal strategies and messaging to respond to *U.S.* attitudes on regulatory innovation (particularly about expectations of government effectiveness and efficiency), but this calculus will be different in other countries. Some foreign financial regulatory agencies may already benefit from more trust in regulation and public innovation and may therefore have much more "permission to fail" than their U.S. counterparts. The good news is that the technology driving suptech is not typically country-specific[362] and because suptech innovation is driven by a desire to create public goods (rather than competition for private profits), U.S. financial regulatory agencies will likely have significant opportunities to collaborate with their foreign counterparts.[363] If we start creating more "permission to fail" for U.S. financial regulatory agencies now, then they may soon be able to take advantage of the progress that other financial regulatory agencies have made in the area of suptech

362. *See* Yesha Yadav, *FinTech and International Financial Regulation*, 53 VAND. J. TRANSNAT'L L. 1109 (2020). (observing that some fintech may operate in culturally specific ways, and the same may be true of suptech).

363. For a discussion of the suptech collaboration that is already occurring, see FIN. STABILITY BD., *supra* note 10, at 14; *see also* DI CASTRI ET AL., *supra* note 9, at 17.

solutions,[364] preventing them from falling too far behind the financial industry's technological advancement.

364. An Informal SupTech Network was launched by the Bank for International Settlements in 2018, and members of this body can "access SupTech related materials contributed by other members through a platform hosted by the BIS." FIN. STABILITY BD., *supra* note 10, at 15.