Behind the Stock Market

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In January 2021, retail broker-dealer Robinhood abruptly restricted trading in GameStop and other "meme" stocks, sparking public outrage and political scrutiny. While conspiracy theories spread quickly, a more mundane structural explanation soon emerged: Robinhood's restrictions were driven by its contractual obligation to meet collateral requirements imposed by the National Securities Clearing Corporation (NSCC), the principal clearinghouse for broker-to-broker transactions in U.S. equity and certain debt securities.

This Article uses the Robinhood episode to examine three often overlooked dimensions of the obscure yet crucial post-trade infrastructure underpinning modern markets. First, securities transactions do not settle instantly: A period of latency separates trade execution from final settlement, creating time for multilateral netting while prolonging counterparty exposure. Second, drawing on Ronald Coase's theory of the firm, the analysis explains the economic logic behind the rise and persistence of specialized post-trade intermediaries such as NSCC. Third, it examines how blockchain, tokenization, and related financial technologies challenge—but may also be incorporated into—the existing intermediated architecture for clearing and settlement.

Far from being relics of an obsolete market structure, post-trade infrastructures, clearinghouses in particular, are institutional solutions to the transaction costs of multilateral securities markets. Their persistence reflects economic logic, not institutional atrophy. Technological innovation may nevertheless alter the relative costs of existing institutional arrangements and create new ways to perform post-trade functions. Rather than pursuing wholesale disruption, regulators should therefore adopt an incremental and experimental approach to modernization—one that fosters innovation, promotes efficiency, preserves market stability, and generates the institutional knowledge necessary for the post-trade system's future evolution.

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"Time is Money. Time is Risk"[1]

INTRODUCTION

Financial and legal scholars have left few stones unturned in the complex world of modern financial markets.[2] Yet they have paid far less attention to the institutional plumbing that underpins the financial system: the post-trade clearing and settlement infrastructure. That neglect became glaringly visible on January 28, 2021, when a perfect storm hit Wall Street: a volatility shock in a handful of "meme" stocks collided with the constraints of the post-trade system. On that day, Robinhood, one of the nation's largest retail broker-dealers, abruptly restricted buy orders in GameStop and several other meme stocks, triggering a market frenzy and igniting public outrage and a political firestorm.[3] Investors, suddenly shut out of the markets, were enraged. Hedge funds and high-frequency traders were swiftly blamed for the surge in volatility and the temporary breakdown of liquidity.[4] Policymakers quickly launched investigations into these disruptive events,[5] and early commentators hesitated to

1. Gary Gensler, Chair, U.S. Sec. & Exch. Comm'n, "Time is Money. Time is Risk": Prepared Remarks Before the European Commission (Jan. 25, 2024), https://www.sec.gov/newsroom/speeches-statements/gensler-speech-prepared-remarks-european-commission-012524.

2. *See generally* Jonathan R. Macey & Maureen O'Hara, *From Markets to Venues: Securities Regulation in an Evolving World*, 58 STAN. L. REV. 563 (2005) (discussing self-regulation of markets in a changing world); Zohar Goshen & Gideon Parchomovsky, *The Essential Role of Securities Regulation*, 55 DUKE L.J. 711 (2006) (discussing how securities regulation facilitates and protects information traders); MERRITT B. FOX, LAWRENCE R. GLOSTEN & GABRIEL V. RAUTERBERG, THE NEW STOCK MARKET: LAW, ECONOMICS AND POLICY (2019) (discussing current financial markets); Norman S. Poser, *Restructuring the Stock Markets: A Critical Look at the SEC's National Market System*, 56 N.Y.U. L. REV. 883 (1981) (discussing national stock market integration); Reena Aggarwal, *Demutualization and Corporate Governance of Stock Exchanges*, 15 J. APPLIED CORP. FIN. 105 (2002) (discussing stock market demutualization); Gregg A. Jarrell, *Change at the Exchange: The Causes and Effects of Deregulation*, 27 J.L. & ECON. 273 (1984) (discussing NYSE deregulation).

3. On the GameStop events and the academic debate that followed, see Dhruv Aggarwal, Albert H. Choi & Yoon-Ho Alex Lee, *The Meme Stock Frenzy: Origins and Implications*, 96 S. CAL. L. REV. 1387, 1401–04 (2023); Abraham J.B. Cable, *Regulating Democratized Investing*, 83 OHIO ST. L.J. 671, 688 (2022); Jill E. Fisch, *GameStop and the Reemergence of the Retail Investor*, 102 B.U. L. REV. 1799, 1806–25 (2022); Sue S. Guan, *Meme Investors and Retail Risk*, 63 B.C. L. Rev. 2051, 2061–63 (2022); James Fallows Tierney, *Investment Games*, 72 DUKE L.J. 353, 355–56 (2022).

4. Caitlin McCabe, *Robinhood, Other Brokerages Restrict Trading on GameStop, AMC*, WALL ST. J. (Jan. 28, 2021, at 21:05 ET), https://www.wsj.com/finance/stocks/online-brokerages-restrict-trading-on-gamestop-amc-amid-frenetic-trading-11611849934.

5. *See* Maggie Fitzgerald, *Here's What to Expect from Thursday's GameStop Hearing with Robinhood, Citadel and Reddit CEOs*, CNBC (Feb. 18, 2021, at 08:00 ET), https://www.cnbc.com/2021/02/17/gamestop-hearing-what-to-expect-from-robinhood-reddit-and-citadel.html; U.S. SEC. & EXCH. COMM'N, STAFF REPORT ON EQUITY AND OPTIONS MARKET STRUCTURE CONDITIONS IN EARLY 2021 2 (2021) [hereinafter SEC STAFF REPORT], https://www.sec.gov/files/staff-report-equity-options-market-struction-conditions-early-2021.pdf; Ben Bain & Daniel Avis, *SEC Hunts for Fraud in Social-Media Posts Hyping GameStop*, BLOOMBERG (Feb. 3, 2021, at 12:16 PT), https://www.bloomberg.com/news/articles/2021-02-03/sec-hunts-for-fraud-in-social-media-posts-that-drove-upgamestop; MAJORITY STAFF OF H. COMM. ON FIN. SERVS., 117TH CONG., GAME STOPPED: HOW THE MEME STOCK MARKET EVENT EXPOSED TROUBLING BUSINESS PRACTICES, INADEQUATE RISK MANAGEMENT, AND THE NEED FOR LEGISLATIVE AND REGULATORY REFORM 3 (2022) [hereinafter GAME STOPPED]; *Game Stopped? Who Wins and Loses When Short Sellers, Social Media, and Retail Investors Collide,*

offer a prompt and coherent account of the events.[6] In that vacuum, conspiracy theories proliferated.[7]

The picture became clearer the next day, when Robinhood explained that its actions were driven not by collusion or profit motives but by contractual risk-management obligations to its clearinghouse,[8] the National Securities Clearing Corporation (NSCC),[9] including the obligation to meet collateral demands as volatility spiked.[10] NSCC is a specialized and systemically important intermediary that supports securities transactions from execution on a trading venue through final legal settlement—a process known as the securities settlement cycle.[11] In doing so, NSCC manages the parties' default risk through several risk-management mechanisms, including requiring parties to back their trades with collateral.[12] Early on January 28, 2021, NSCC calculated a deposit requirement of approximately $3.7 billion for Robinhood; after crediting collateral already on deposit, Robinhood faced a deficit of roughly $3 billion.[13]

Within hours of Robinhood's clash with NSCC, clearing and settlement—the markets' "back office"—moved from the shadows into the spotlight.[14] Post-

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Part III: Hearing Before the H. Comm. on Fin. Servs., 117th Cong. 1 (2021) (statement of Gary Gensler, Chairman, U.S. Sec. & Exch. Comm'n).

6. SPENCER JAKAB, THE REVOLUTION THAT WASN'T: GAMESTOP, REDDIT, AND THE FLEECING OF SMALL INVESTORS 189 (2022); Michael Piwowar, Opinion, *It's T-0 to Go Faster Than T+2*, WALL ST. J. (Feb. 24, 2021, at 18:01 ET), https://www.wsj.com/opinion/its-t-0-to-go-faster-than-t-2-11614207705.

7. Editorial, *The Robinhood Non-Conspiracy*, WALL ST. J. (Feb. 1, 2021, at 18:41 ET), https://www.wsj.com/opinion/the-robinhood-non-conspiracy-11612222878; Katie Martin, Opinion, *What the GameStop Saga Revealed About US Markets*, FIN. TIMES (Oct. 22, 2021), https://www.ft.com/content/311d5e2a-aad8-4493-907d-b2bea10f66ea ("Depending who you believe, it was Occupy Wall St, it was David and Goliath, it was yet another example of the suits rigging the system against the little guy, or it was an outbreak of investment fever that quickly collided with reality.").

8. *See* Vlad Tenev (@vladtenev), X (Jan. 28, 2021, at 13:15 PST), https://x.com/vladtenev/status/1354900961542565889; *see also* Alicia Adamczyk, *Critics View Robinhood Restricting GameStop Trades as 'an Absolute Travesty'*, CNBC: Save and Invest (Jan. 28, 2021, at 17:32 EST), https://www.cnbc.com/2021/01/28/critics-call-robinhood-restricting-gamestop-trades-travesty.html (discussing Robinhood's explanation for restricting trading).

9. *See generally* Paolo Saguato, *The Ownership of Clearinghouses: When "Skin in the Game" Is Not Enough, the Remutualization of Clearinghouses*, 34 YALE J. ON REG. 601 (2017) (discussing the ownership of U.S. clearinghouses); Dan Awrey & Joshua C. Macey, *Open Access, Interoperability, and the DTCC's Unexpected Path to Monopoly*, 132 YALE L.J. 96 (2022) (discussing monopolization in U.S. securities clearing and depository markets).

10. Alexander Osipovich, *Robinhood's GameStop Debacle Spurs Calls to Modernize Stock Clearing*, WALL ST. J. (Feb. 8, 2021, at 05:30 ET), https://www.wsj.com/finance/stocks/robinhoods-gamestop-debacle-spurs-calls-to-modernize-stock-clearing-11612780200; *see* James J. Angel, *GameStonk: What Happened and What to Do About It* 29–31 (Geo. McDonough Sch. Bus., Working Paper No. 3782195, 2021), https://ssrn.com/abstract=3782195.

11. *See infra* Subpart.II.B.1.

12. *See infra* Subpart.II.B.2.

13. *Game Stopped? Who Wins and Loses When Short Sellers, Social Media, and Retail Investors Collide: Hearing Before the H. Comm. on Fin. Servs*., 117th Cong. 9–10 (2021) [hereinafter *Hearing*, Vlad Tenev] (statement of Vlad Tenev, CEO, Robinhood Markets, Inc.).

14. *See* Philip Stafford & Joe Rennison, *GameStop Curbs Put Clearing Houses Under the Spotlight*, FIN. TIMES (Jan. 30, 2021, at 03:07 GMT), https://www.ft.com/content/29b4cc1f-a970-4cd7-b452-90d982aacfb9; Philip Stafford, *US Stock Clearing House Proposes Quicker Settlements After GameStop Saga*, FIN. TIMES (Feb. 24, 2021), https://www.ft.com/content/4c33198e-245d-4aaf-a106-86d0de4d7cca; Eric Noll, *Stock Trades*

trade infrastructures such as NSCC, ordinarily hidden within the walls of Wall Street and largely invisible in daily market coverage, suddenly became central both to public debate and to understanding the structural fragilities exposed by the Robinhood episode.[15] This was not the first time post-trade plumbing had clogged, disrupted markets, and drawn public scrutiny. A similar breakdown occurred a half-century earlier, in the late 1960s and early 1970s, with the "back-office or paperwork crisis," when the back office of the New York Stock Exchange could not keep up with the increased volume of stock trades.[16] This forced the exchange to close on Wednesdays for months to allow market participants to reconcile trades and process physical stock certificates.[17] Again, in 2021, the pressure point was different, but the underlying theme was the same: A spike in trading volume by retail investors and a rise in market volatility tested the resilience of market infrastructure, raising questions about the adequacy and effectiveness of existing clearing and settlement arrangements.

Although Robinhood ultimately met its contractual obligations to NSCC, the episode ignited a broader policy debate over the structure and operation of post-trade markets. The central questions concerned the merits of retaining a two-day (T+2) settlement cycle, the need for centralized clearing intermediaries, and whether blockchain technology could supplant legacy clearing and settlement infrastructure.[18]

Stakeholders quickly took positions. NSCC and its institutional members, the large financial institutions, defended the current model,[19] arguing that the response to the spike in market volatility was an example of the proper functioning of the existing clearinghouse's risk-management practices and demonstrated the robustness of existing risk controls.[20] At the same time, NSCC, together with two of the major Wall Street trade associations,[21] endorsed the idea of shortening the securities settlement cycle and shifting from two (T+2)

Take Days to Settle. Unnecessary Risk Results., BARRON'S (Mar. 9, 2021, at 17:30 ET), https://www.barrons.com/articles/stock-trades-take-two-days-to-settle-unnecessary-risk-results-51615326916.

15. *See* George S. Geis, *Traceable Shares and Corporate Law*, 113 NW. U. L. REV. 227, 262–66 (2018) (suggesting that distributed ledger technology—blockchain—may solve many problems stemming from antiquated securities clearing mechanisms).

16. *See* JOEL SELIGMAN, THE TRANSFORMATION OF WALL STREET: A HISTORY OF THE SECURITIES AND EXCHANGE COMMISSION AND MODERN CORPORATE FINANCE 412 (3d ed. 2003).

17. *See* Larry E. Bergmann, Sr. Assoc. Dir., Div. of Mkt. Regul., U.S. Sec. & Exch. Comm'n, The U.S. View of the Role of Regulation in Market Efficiency, Remarks at the International Securities Settlement Conference (Feb. 10, 2004), https://www.sec.gov/news/speech/spch021004leb.htm; SELIGMAN, *supra* note 16, at 450–66; U.S. SEC. & EXCH. COMM'N, STUDY OF UNSAFE AND UNSOUND PRACTICES OF BROKERS AND DEALERS, H.R. DOC. NO. 92–231, at 13 (1st Sess. 1971) [hereinafter SEC, STUDY OF UNSAFE AND UNSOUND PRACTICES].

18. *See infra* Part.III.

19. As discussed later in Subpart.II.B.1, NSCC is a wholly owned subsidiary of the Depository Trust and Clearing Corporation (DTCC). Public statements during the Robinhood episode were published by DTCC that expressed the positions of its wholly owned subsidiary NSCC.

20. *See infra* Part.III.

21. *See generally* SIFMA, ICI, DTCC, DELOITTE, ACCELERATING THE U.S. SECURITIES SETTLEMENT CYCLE TO T+1 (2021) [hereinafter ACCELERATING THE U.S. SECURITIES SETTLEMENT CYCLE] (discussing the transition to a T+1 settlement cycle).

to one day (T+1) settlement to reduce exposure, uncertainty, and risk during the latency period.[22] By contrast, Robinhood, financial technology firms such as Paxos, and many retail investors called for more radical change.[23] They argued that blockchain and smart contracts could reduce transaction costs in securities trading and render post-trade intermediaries, including clearinghouses, redundant, ultimately making settlement more efficient.[24] The SEC found itself in the middle of these competing visions on the future of clearing and settlement infrastructure and faced a pivotal decision about whether and how to intervene in market structure reform.[25]

At the core of these debates lie two fundamental questions at the intersection of law, finance, and economics: What is the value of time in finance? And what is the role of financial intermediaries? The Robinhood–NSCC episode illuminated both.

First, the debate over the securities settlement cycle is, at its core, a debate over the value of time. Arguments over T+2 versus T+1 and the more ambitious calls for real-time gross settlement based on blockchain technology are not merely questions of technological modernization. They are ultimately institutional design choices about market structure: how the system prices latency and allocates risk, and how the temporal gap between trade execution and final settlement simultaneously creates risks (counterparty risk, liquidity demands, operational fragility) while enabling core efficiencies (netting, batching, liquidity saving, and scalable market making). In this sense, the settlement interval helps define how liquidity and risk circulate through the financial system and how exposure is allocated among market participants. The core inquiry, then, is whether settlement latency should be treated as a cost or friction to be eliminated or as an institutional feature that produces efficiencies and valuable economies of scale and scope to be preserved.

Second, the Robinhood–NSCC episode raises a foundational question of market structure: What role should financial intermediaries play in modern markets? The collateral calls in the midst of the Robinhood–NSCC episode demonstrated that a clearinghouse operates as a Coasean institutional arrangement designed to internalize transaction costs and stabilize markets under stress in precisely the moments when decentralized bilateral contracting would be most fragile. At the same time, the financial technology narrative of disintermediation argues that technological innovation can replicate (or improve upon) the functions currently performed by post-trade intermediaries without the need for centralized intermediaries, delivering lower costs and faster settlement

22. *See infra* Part.III.

23. Maddie Saghir, *Citadel and Robinhood Call for T+1 Settlement Cycle*, SEC. FIN. TIMES (Feb. 23, 2021), https://www.securitiesfinancetimes.com/securitieslendingnews/technologyarticle.php?article_id=224568; Julia Bronson, *T+1 and T+0 Are Possible Today if the SEC Opens the Market to Competition*, PAXOS: BLOG (Feb. 24, 2022), https://www.paxos.com/blog/t1-and-t0-are-possible-today-if-the-sec-opens-the-market-to-competition.

24. Saghir, *supra* note 23; Bronson, *supra* note 23.

25. *See infra* Subpart.IV.C.

through redesigned infrastructures, rendering such intermediation obsolete.[26] These two questions—how to value time, and whether intermediation remains welfare-enhancing—frame the analysis that follows.

In modern markets, trades do not settle instantaneously. The lag between trade execution and final settlement creates a "settlement latency" during which counterparties remain exposed to each other's credit and liquidity risk. Time, in this context, is risk: Latency creates counterparty risk. But time is also money: The longer the delay before settlement, the more flexibility firms have to reallocate or invest the underlying assets.[27] Over the past sixty years, the timing of securities settlement cycles has undergone a series of major reforms.[28] The system moved from manual clearing of paper stock certificates to a world of dematerialized and immobilized securities with centralized clearing and settlement infrastructures.[29] In parallel, the SEC has gradually shortened the settlement cycle.[30] From the prevailing market practice of T+5, which Congress empowered the SEC to regulate through the market structure reforms of 1975, the SEC adopted its first formal settlement cycle rules in 1993, establishing T+3 as the standard settlement period for most securities transactions. The SEC then shortened the cycle to T+2 in 2017 and to T+1 in 2023, with the compliance date set in May 2024.[31] As evidenced by the comment letters received by the SEC in each settlement cycle reform,[32] stakeholders have looked at technology as the driver of operational efficiencies and the resulting opportunity to shorten settlement cycles.

However, settlement latency has always been preserved in the system. Even in the most recent structural reforms to the post-trade infrastructure—and despite the many proposed blockchain-based real-time solutions—the SEC has retained a shorter, yet still meaningful, time lag between trade execution and final settlement. This persistence raises several critical questions: Why is latency needed? Is it justified by operational constraints? Does it provide an opportunity for market participants to extract profits? Or has the latency in securities settlement become such a deeply entrenched institutional feature of modern financial markets that its complete overhaul would impose prohibitive costs on both market participants and regulators? A common denominator in answering all these questions is the central role played by post-trade financial market infrastructures.

Historically, it is precisely in this settlement latency window—and in the trade-off it creates between risk and money—that clearinghouses emerged as

26. *See infra* Part.V.

27. *See* Gensler, *supra* note 1.

28. *See generally* George S. Geis, *The Historical Context of Stock Settlement and Blockchain*, 26 CHAP. L. REV. 557 (2023) (analyzing the history, politics, and policy of stock settlement regulation).

29. *Id.* at 566–74.

30. *See infra* Part.IV.

31. *See infra* Part.IV.C.

32. *See infra* Part.IV.

specialized intermediaries.[33] Operating in the clearing and settlement of securities and derivatives markets, clearinghouses are responsible for managing counterparty risk (and transaction costs) between market participants in these "deferred" markets.[34] The emergence of clearinghouses can be explained using the theoretical framework developed by Ronald Coase's seminal theory of the firm. In his 1937 article, *The Nature of the Firm*, Coase observed the emergence of firms as mechanisms to coordinate economic activity when the costs of transacting in the open markets exceed the costs of internal organization.[35] Clearinghouses can be best understood as Coasean institutions: They internalize the policing and enforcement function necessary to complete trades and minimize asymmetries of information and counterparty risk, thus lowering the aggregate (transaction) costs of post-trade activity.[36]

This Article argues that post-trade clearing and settlement infrastructures are not obsolete intermediaries, but rather institutional responses to the frictions of financial markets. They are Coasean institutions that reduce transaction costs and counterparty risk in markets characterized by settlement latency. By revisiting the Robinhood–NSCC episode, this Article reframes the debate on the future of post-trade infrastructures through the lens of Coase's theory of the firm, analyzing market infrastructures as firms shaped by deep—but ultimately contingent—economic logic.

The growing deployment of blockchain technology, smart contracts, and tokenized assets in financial markets—combined with the ascent of retail investor participation in the markets—raises critical questions about the continued efficiency of centralized clearing and settlement infrastructures. If these technologies have the capacity to materially reduce the transaction costs that clearinghouses were designed to minimize and are capable of achieving the scalability of the existing infrastructures, then they may reconfigure the boundary between markets and firms in the Coasean sense, challenging the institutional foundations that have long underpinned modern clearing and settlement.

In making these arguments, the Article contributes to two central scholarly debates: the economic foundations of financial intermediation, and the regulatory and market implications of financial technologies like blockchain, tokenized assets, and smart contracts. This Article's findings also have broader ramifications. On the one hand, this Article helps the reader understand the dynamics of modern financial markets, which are facing the challenges of

33. *See infra* Part.I.

34. *See infra* Subpart.II.B.

35. *See* R.H. Coase, *The Nature of the Firm*, 4 ECONOMICA 386, 390–98 (1937), *reprinted in* R.H. COASE, THE FIRM, THE MARKET, AND THE LAW 33–55 (1988).

36. Coase never defined "transaction costs," although he did endorse another scholar's articulation that transaction costs may be understood as consisting of "search and information costs, bargaining and decision costs, [and] policing and enforcement costs." *See* COASE, *supra* note 35, at 6 (citing Carl J. Dahlman, *The Problem of Externality*, 22 J.L. & ECON. 141, 148 (1979)).

emergent financial technology firms.[37] On the other hand, it rethinks the role of financial intermediation and the trade-offs between intermediaries' influence and disintermediating technological forces.[38]

This Article proceeds in five Parts. Part I develops the theoretical framework, applying Coase's theory of the firm and Hansmann's theory of ownership to clearinghouses.[39] Part II explains the trade lifecycle and examines NSCC's organization, governance, and risk-management practices. Part III reconstructs the Robinhood–NSCC episode and the reforms pursued through NSCC's SEC-supervised rule-filing process. Part IV traces the evolution from T+5 to T+1 and shows how regulators and market participants have repeatedly balanced risk reduction against operational and liquidity costs. Part V turns to the future, evaluating netting, liquidity, and emerging technologies, and argues for disciplined experimentation rather than wholesale redesign of the post-trade infrastructure.

I. THE ORGANIZATION OF ECONOMIC ACTIVITIES: MARKETS AND FIRMS

How economic activities are organized and why firms arise are long-standing questions in economics.[40] Economist Ronald Coase's 1937

37. *See infra* Part.V.

38. *See* Kathryn Judge, *Intermediary Influence*, 82 U. CHI. L. REV. 573, 577 (2015) (analyzing the role of established intermediaries and their use of their influence to promote high-fee institutional arrangements despite the presence of more efficient alternatives).

39. *See generally* MICHAEL CASEY, JONAH CRANE, GARY GENSLER, SIMON JOHNSON & NEHA NARULA, THE IMPACT OF BLOCKCHAIN TECHNOLOGY ON FINANCE: A CATALYST FOR CHANGE 13–16 (2018) (applying Coase's theory of the firm to blockchain-based applications); Geis, *supra* note 15 (suggesting that distributed ledger technology (DLT) may solve problems stemming from securities clearing mechanisms); David Yermack, *Corporate Governance and Blockchains*, 21 REV. FIN. 7 (2017) (positing that blockchain is a promising new technology that will ultimately have a transformative impact); Michael Mainelli & Alistair Milne, *The Impact and Potential of Blockchain on the Securities Transaction Lifecycle* (SWIFT Inst. Working Paper No. 2015-007, 2016) (finding that blockchain can provide substantial reductions in cost and risk); Spencer J. Nord, Note, *Blockchain Plumbing: A Potential Solution for Shareholder Voting?*, 21 U. PA. J. BUS. L. 706 (2019) (discussing DLT's applicability to shareholder voting).

40. The literature in organizational economics is vast and inaugurated by Ronald Coase. *See* Coase, *supra* note 35. Some noteworthy contributions by economists include Oliver E. Williamson, *The Vertical Integration of Production: Market Failure Considerations*, 61 AM. ECON. REV. 112 (1971) (arguing that market failures provide a broader justification for vertical integration of production than is commonly recognized); Armen A. Alchian & Harold Demsetz, *Production, Information Costs, and Economic Organization*, 62 AM. ECON. REV. 777 (1972) (arguing that firms arise not from hierarchical control but from the need to monitor team production more efficiently); KENNETH J. ARROW, THE LIMITS OF ORGANIZATION (1974) (examining how price systems, internal firm organization, and ethical norms serve as alternative mechanisms for allocating scarce resources); OLIVER E. WILLIAMSON, MARKETS AND HIERARCHIES: ANALYSIS AND ANTITRUST IMPLICATIONS (1975) [hereinafter WILLIAMSON, MARKETS AND HIERARCHIES] (developing an organizational failures framework to assess the relative efficiency of completing transactions through markets versus hierarchical firms); Michael C. Jensen & William H. Meckling, *Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure*, 3 J. FIN. ECON. 305 (1976) (developing a theory of ownership structure for the firm); Eugene F. Fama, *Agency Problems and the Theory of the Firm*, 88 J. POL. ECON. 288 (1980) (discussing how the separation of security ownership and control can be an efficient form of economic organization); Oliver E. Williamson, *The Modern Corporation: Origins, Evolution, Attributes,* 19 J. ECON. LIT. 1537 (1981) [hereinafter Williamson, *The Modern Corporation*] (contending that the modern corporation is primarily a product of transaction cost economizing); Steven N.S. Cheung, *The Contractual Nature of the Firm*, 26 J.L. & ECON. 1 (1983) (exploring

groundbreaking article, *The Nature of the Firm*,[41] offered an explanation of "why a firm emerges at all in a specialised exchange economy" coordinated by price.[42] Coase's article offered the first account of the trade-off between organizing production through market transactions versus within the firm.[43]

Coase observed that economists had traditionally conceived the economic system as coordinated through markets and contracts.[44] In the idealized world of neoclassical economic theory—a world with no transaction costs, where markets are frictionless, contracting is costless, and enforcement is perfect—firms would be unnecessary. All coordination of economic activities would occur entirely through markets and the price mechanism.[45]

But Coase observed that, in the real world, markets are not costless. Economic actors face "marketing costs," or what subsequent literature would term transaction costs: the costs of discovering prices, negotiating, and enforcing contracts.[46] He observed that, in the real world, resources can be allocated and economic activities can be carried out through the price system—what he termed the "price mechanism" and described as a "series of exchange transactions on the market"—or through internal coordination within a firm directed by an "entrepreneur coordinator."[47] He further argued that when transaction costs

how Coase's theory of the firm applies to contracts); OLIVER E. WILLIAMSON, THE ECONOMIC INSTITUTIONS OF CAPITALISM (1985) [hereinafter WILLIAMSON, ECONOMIC INSTITUTIONS] (providing a framework for understanding firms and other economic institutions); OLIVER HART, FIRMS, CONTRACTS, AND FINANCIAL STRUCTURE (1995) (discussing the impact of contractual incompleteness and power on economic institutions and arrangements); Sanford J. Grossman & Oliver D. Hart, *The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration*, 94 J. POL. ECON. 691 (1986) (presenting a theory of costly contracts); OLIVER E. WILLIAMSON, ECONOMIC ORGANIZATION: FIRMS, MARKETS AND POLICY CONTROL (1986) (collecting essays examining how bounded rationality, managerial discretion, and organizational structure shape the boundaries and internal governance of firms); JEAN TIROLE, THE THEORY OF INDUSTRIAL ORGANIZATION (1988) (discussing the theory of industrial organization); Henry Hansmann, *Ownership of the Firm*, 4 J.L. ECON. & ORG. 267 (1988) (examining economic factors responsible for different patterns of firm ownership); Oliver Hart & John Moore, *Property Rights and the Nature of the Firm*, 98 J. POL. ECON. 1119 (1990) (providing a framework for analyzing when transactions should occur within firms rather than through markets); FRANK H. EASTERBROOK & DANIEL R. FISCHEL, THE ECONOMIC STRUCTURE OF CORPORATE LAW (1991) (arguing that corporate law mimics the contracts parties would reach in a world of costless bargaining); Raghuram G. Rajan & Luigi Zingales, *Power in a Theory of the Firm*, 113 Q.J. ECON. 387 (1998) (developing a more general theory of the firm); THE ECONOMIC NATURE OF THE FIRM: A READER (Randall S. Kroszner & Louis Putterman eds., 3d ed. 2009) (providing a comprehensive anthology of the literature on the theory of the firm).

41. *See* Coase, *supra* note 35.

42. *See id.* at 390.

43. *See id.* at 390–92.

44. *See id.* at 387 (citing F. A. von Hayek, *The Trend of Economic Thinking*, 40 ECONOMICA 121 (1933)); N. GREGORY MANKIW, PRINCIPLES OF ECONOMICS 204–07 (10th ed. 2024). For a discussion on how Adam Smith viewed the invisible hand, see Emma Rothschild, *Adam Smith and the Invisible Hand*, 84 Am. Econ. Rev. 319, 319–22 (1994).

45. *See generally* F. A. von Hayek, *The Trend of Economic Thinking*, 40 ECONOMICA 121, 129–31 (1933) (discussing how problems are solved through spontaneous market forces, rather than deliberate regulation).

46. Coase, *supra* note 35, at 392.

47. *Id.* at 388.

exceed the costs of organizing activity internally in a firm, the firm emerges as the more efficient structure.[48]

In Coase's framework, coordinating production within the firm is not a costless process. Firms also incur internal coordination and governance costs—what Coase called "cost of organizing." Those costs overlap with, but are not identical to, the agency costs emphasized in later literature.[49] As Coase explained, "a firm will tend to expand until the costs of organizing an extra transaction within the firm become equal to the costs of carrying out the same transaction by means of an exchange on the open market or the costs of organizing another firm."[50]

Coase's insights laid the groundwork for a broad literature on the theory of the firm that explores when and why firms substitute for markets.[51] Building on this foundation, Oliver Williamson later noted that "transactions will be organized by markets unless market exchange gives rise to serious transaction costs. In the beginning, so to speak, there were markets."[52] When transaction costs are low, economic activities are more efficiently organized through markets and contracts, and market-based coordination prevails; when transaction costs are high, firms emerge as more efficient mechanisms to organize economic activities.[53] Williamson deepened Coase's insights by identifying the contractual foundations of transaction costs. He argued that private parties rely on firms as "commitment devices" in business relationships that require either long-term engagement or flexible contracting.[54] Williamson identified three sources of transaction costs that affect market contracting:

48. *Id.* at 389. Coase stated: "The main reason why it is profitable to establish a firm would seem to be that there is a cost of using the price mechanism." *Id.* at 390.

49. The concept of agency costs within a firm was later elaborated as the costs stemming from the separation of ownership and control that outside investors incur to create incentives for managers to maximize investor value. *See, e.g.*, Jensen & Meckling, *supra* note 40, at 308; Fama, *supra* note 40, at 295–96.

50. *See* Coase, *supra* note 35, at 395. A different account on the emergence of the firm was developed by Alchian and Demsetz. *See* Alchian & Demsetz, *supra* note 40. They introduced the problem of team production: where multiple agents jointly contribute to a collective output, but individual contributions are costly to monitor. *Id.* at 779. They argue that the firm emerges as a solution to this monitoring problem through the designation of a residual claimant, an individual or entity that has the incentive to oversee and discipline the team. *Id.* at 782–83. Alchian and Demsetz define the firm as "a central common party to a set of bilateral contracts [that] facilitates efficient organization of the joint inputs in team production." *Id.* at 794. In this view, the firm exists not to replace the market but to enhance its efficiency by coordinating team production and mitigating the costs of monitoring and contracts. *Id.* at 794–95.

51. These types of long-term or relational contracts, characterized by flexibility and ongoing adaptation, distinguish business relations from spot transactions. Such contractual dynamics are particularly salient in the context of post-trade infrastructures.

52. *See* Williamson, *The Modern Corporation*, *supra* note 40, at 1547.

53. *See* WILLIAMSON, MARKETS AND HIERARCHIES, *supra* note 40, at 20–21, 24–25.

54. *See* Morgan Ricks, *Organizational Law as Commitment Device*, 70 VAND. L. REV. 1303, 1347–51 (2017).

(1) bounded rationality,[55] (2) opportunism,[56] and (3) asset specificity.[57] He emphasized that these costs become more acute in transactions involving relationship-specific investments, where assets cannot be easily redeployed without loss.[58] Williamson subsequently expanded his framework to encompass a broader range of market scenarios and to develop more nuanced explanations for why private parties rely on firms as commitment devices—governance structures capable of sustaining business relations that require long-term, flexible, or adaptive contracting.[59] Subsequent work in the theory of the firm and property rights literature further developed these insights by emphasizing that asset-specific investments can generate lock-in effects in long-term business relationships—potentially transforming ex-ante competitive markets into ex-post monopolies.[60]

Firms, in this framework, function as commitment devices. They offer governance structures that mitigate the risks of opportunism and underinvestment in relationship-specific assets by replacing incomplete market contracts with internal coordination mechanisms. Williamson's theory shifted the focus from firm production to firm governance, giving rise to a comparative institutional analysis of markets, hierarchies, and hybrids based on the transaction in question.[61]

An interesting evolution of the theory of the firm literature, building on Coase's foundational insights, has centered on the diverse organizational forms through which firms can allocate control and economic rights among the firm's stakeholders. In his seminal work, *The Ownership of Enterprise*,[62] Henry Hansmann observed that enterprises (i.e., firms) can assign "ownership rights"[63]—the right to control the firm and to receive residual earnings—to any of the enterprise's transacting parties, whom he termed patrons, including investors, customers, suppliers, employees, or members.[64] Investor-owned enterprises, which allocate ownership rights to capital providers, are the most common form of enterprise. However, alternative structures exist where the firm can be owned by its employees, customers, or members.[65] Cooperative and mutual ownership structures may be more efficient when a particular class of

55. Bounded rationality is the limited cognitive capacity of economic actors that results in incompleteness of contracts: Boundedly rational actors are unable to contract for uncertainties and future contingencies. Oliver E. Williamson, *The Economics of Organization: The Transaction Cost Approach*, 87 AM. J. SOCIO. 548, 553–55 (1981).

56. Opportunism is defined as "self-interest seeking with guile." *Id.* at 554.

57. WILLIAMSON, ECONOMIC INSTITUTIONS, *supra* note 40, at 15–42.

58. *Id.* at 52–56.

59. *Id.* at 62–63; WILLIAMSON, MARKETS AND HIERARCHIES, *supra* note 40, at 20.

60. WILLIAMSON, ECONOMIC INSTITUTIONS, *supra* note 40, at 61–63; Hart & Moore, *supra* note 40, at 1120.

61. WILLIAMSON, ECONOMIC INSTITUTIONS, *supra* note 40, at 61–63.

62. HENRY HANSMANN, THE OWNERSHIP OF ENTERPRISE (2d ed. 2000).

63. *Id.* at 20–21. The costs of ownership include the costs of controlling managers, collective decision-making among owners, and bearing the risk associated with residual earnings. *Id.* at 35–49.

64. *Id.* at 11–12.

65. *See id.* at 20.

patrons bears high market contracting costs and can internalize governance costs effectively. Hansmann's analysis of the diverse organizational forms extends beyond ownership costs to encompass the "market contracting" costs that the different patrons incur in dealing with the firm.[66] His core insight is that different ownership models can be understood also as institutional responses to market frictions—designed not only to manage governance costs but also to reduce the transactional costs that patrons incur in accessing the firm's services.[67] Hansmann concludes that the most efficient organizational structure, then, is the one that minimizes in the aggregate "(1) the costs of market contracting for those classes of patrons that are not owners and (2) the costs of ownership for the class of patrons who own the firm."[68]

This theoretical arc that looked at the trade-offs between markets and firms, transaction costs and agency costs, and between investor-owned and user-owned enterprises provides a powerful framework for analyzing the evolution and persistence of post-trade infrastructures like NSCC in securities markets.[69] As Macey and O'Hara observed, "transaction costs of securities trading historically were very significant . . . [and] included the information costs of learning about firms (or potential investments), . . . the costs of clearing and settlement, and the basic contracting costs of trading between buyers and sellers."[70] The authors described the pre-2000 securities trading ecosystem as one characterized by high transaction costs; an environment in which economic activities were more efficiently organized through a single firm. This was largely due to the high "asset specificity" of stock exchanges, which required firms to incur substantial sunk costs to provide trading services to their members.[71]

The trading ecosystem radically changed in the late 1990s when technological innovation substantially reduced transaction costs in securities trading.[72] Technological innovation reduced transaction costs and enabled disintermediation, leading to a shift from firm-based to market-based coordination in trade execution.[73] As Macey and O'Hara argued, this shift prompted market participants to reassess the organization of trading markets.[74] In the early 2000s, the major stock exchanges demutualized their ownership, converting from user-owned firms into publicly traded corporations.[75] Until

66. *See id.* at 19. The costs of market contracting include, for instance, the situation where a firm has market power over some classes of patrons; the presence of monopolies or "lock-in" market power; and asymmetric information. *Id*. at 24–34.

67. *See id.* at 21–22.

68. *Id.* at 22.

69. For an insightful analysis of the economic organization of securities trading, see Macey & O'Hara, *supra* note 2.

70. *Id.* at 568.

71. *See* Williamson, *The Modern Corporation*, *supra* note 40, at 1548.

72. Macey & O'Hara, *supra* note 2, at 564.

73. *Id.* at 567–69.

74. *Id.* at 565.

75. *Id.* at 574.

then, stock exchanges had been mutual organizations owned by their members—brokers and dealers that were required to purchase a "seat" on the exchange to gain access to its trading services. Demutualization transformed exchanges from cooperative institutions designed to serve their members into profit-seeking enterprises accountable to shareholders and the broader capital markets.[76] The financial institutions that, until that moment, relied on the stock exchange *qua* firm began to organize their trading business through decentralized, competitive trading markets.[77] On the one hand, transaction costs for market participants were reduced by technological innovation. On the other hand, mutual stock exchanges had to balance increasing agency costs in governing a firm with diverse groups of members and the rise of competing trading platforms.

Scholars have dedicated a great deal of attention to the generational evolution in the trading environment and in the transition from "markets to venues"[78]—or, in other terms, "from firms to markets"—driven by the decrease in transaction costs fueled by technological innovation. Yet far less attention was paid to the institutional evolution of post-trade infrastructures, particularly clearinghouses like NSCC.[79]

Historically, clearing firms emerged as institutional commitment devices in securities and derivatives markets.[80] In deferred settlement environments, bilateral trades expose counterparties to credit risk and impose significant monitoring, policing, and enforcement costs.[81] Clearinghouses, in turn, developed as specialized institutions to manage, and in some configurations, internalize those risks and costs. Specifically, a specialized subset of clearinghouses, including NSCC, also operates as a central counterparty (CCP). Through novation, NSCC interposes itself between the parties on either side of

76. *See, e.g.*, Andreas M. Fleckner, *Stock Exchanges at the Crossroads*, 74 FORDHAM L. REV. 2541, 2542 (2006); Jonathan Macey & Hideki Kanda, *The Stock Exchange as a Firm: The Emergence of Close Substitutes for the New York and Tokyo Stock Exchanges*, 75 CORN. L. REV. 1007, 1008–10 (1990); PETER NORMAN, THE RISK CONTROLLERS, CENTRAL COUNTERPARTY CLEARING IN GLOBALISED FINANCIAL MARKETS 268–70 (2011); Roberta S. Karmel, *Turning Seats into Shares: Causes and Implications of Demutualization of Stock and Futures Exchanges*, 53 HASTINGS L.J. 367, 400–02 (2002).

77. *See* Macey & O'Hara, *supra* note 2, at 570–72 (discussing the effects of technological innovation on transaction costs and market structure).

78. *See, e.g.*, *id.* at 570–72; Oliver Hart & John Moore, *The Governance of Exchanges: Members' Cooperatives Versus Outside Ownership*, 12 OXFORD REV. ECON. POL'Y 53, 53–57 (1996); Carmine Di Noia, *The Stock-Exchange Industry: Network Effects, Implicit Mergers, and Corporate Governance*, 33 QUADERNI DI FINANZA 3, 7 (1999).

79. Awrey & Macey, *supra* note 9, at 122–23; Saguato, *supra* note 9, at 604–06; Paolo Saguato, *The Unfinished Business of Regulating Clearinghouses*, 2 COLUM. BUS. L. REV. 449, 520 (2020) [hereinafter Saguato, *Unfinished Business*]; Paolo Saguato, *Financial Regulation, Corporate Governance, and the Hidden Costs of Clearinghouses*, 82 OHIO ST. L.J. 1071, 1097 (2021) [hereinafter Saguato, *Hidden Costs of Clearinghouses*].

80. Ben S. Bernanke, *Clearing and Settlement During the Crash*, 3 REV. FIN. STUD. 133, 136 (1990); Randall S. Kroszner, *Can the Financial Markets Privately Regulate Risk?: The Development of Derivatives Clearinghouses and Recent Over-the-Counter Innovations*, 31 J. MONEY, CREDIT & BANKING 596, 598–604 (1999).

81. Darrell Duffie & Haoxiang Zhu, *Does a Central Clearing Counterparty Reduce Counterparty Risk?*, 1 REV. ASSET PRICING STUD. 74, 74–75 (2011).

the trade and becomes the legal counterparty to each member's net settlement obligations—the buyer to every seller and the seller to every buyer. By interposing itself through novation, NSCC centralizes counterparty exposures and commits to guarantee the performance of each party's obligations if a member defaults. In doing so, it stabilizes the trading system. NSCC fulfills this role through a multilayered framework of risk-management tools, ranging from transaction-level collateral requirements to more complex prefunded resources through members' Required Fund Deposits to the Clearing Fund. This structure effectively mutualizes losses, transforming individual counterparty risk into a collectively managed risk.[82]

Despite being deeply intertwined with the trading ecosystem, post-trade infrastructures have evolved along a different organizational path.[83] As technology reduced transaction costs and reshaped agency costs in the organization of securities exchanges, securities trading migrated to a fragmented, competitive ecosystem of investor-owned trading platforms. Post-trade services did not decentralize in parallel. Clearing and settlement instead remained centralized and were delivered by specialized firms operating as system-wide infrastructure. Today, in the United States, NSCC is the sole clearinghouse and central counterparty for broker-to-broker transactions in equities and certain debt securities, while The Depository Trust Company (DTC) performs central securities depository functions.[84]

NSCC and DTC are both wholly owned subsidiaries of the Depository Trust and Clearing Corporation (DTCC), a user-owned enterprise that, through its subsidiaries,[85] supplies the core post-trade infrastructure for U.S. securities

82. *See id.* at 90.

83. This Article focuses on securities market post-trade infrastructures. Post-trade infrastructures also play a critical role in derivatives markets, but derivatives are outside the scope of this Article. *See* Guido Ferrarini & Paolo Saguato, *Regulating Financial Market Infrastructures*, *in* THE OXFORD HANDBOOK OF FINANCIAL REGULATION 569, 569 (Niamh Moloney, Eilís Ferran & Jennifer Payne eds., 2015); Paolo Saguato, *Regulation of Clearing and Settlement*, *in* COMPARATIVE FINANCIAL REGULATION 239 (Edoardo D. Martino, Hossein Nabilou & Alessio M. Pacces eds., 2025) [hereinafter Saguato, *Regulation of Clearing & Settlement*]; *see also* Paolo Saguato, Guido Ferrarini & Eric Pan, *Financial Market Infrastructures: The International Approach and the Current Challenges*, *in* FINANCIAL MARKET INFRASTRUCTURES: LAW AND REGULATION 56 (Jens-Hinrich Binder & Paolo Saguato eds., 2022). For a historical perspective on the evolution of clearing firms in the futures markets, see generally Franklin R. Edwards, *The Clearing Association in Futures Markets: Guarantor and Regulator*, 3 J. FUTURES MKTS. 369 (1983); James T. Moser, *Contracting Innovations and the Evolution of Clearing and Settlement Methods at Futures Exchanges* (Fed. Rsrv. Bank of Chi., Working Paper No. 98-26, 1998); *see* Kroszner, *supra* note 80.

84. Derivatives post-trade infrastructures have developed in a completely different form. Like stock exchanges, futures exchanges demutualized their ownership structure in the early 2000s, maintaining a vertically integrated structure where the clearinghouse operates either as a business unit of the exchange or as a wholly owned subsidiary of the exchange. It is outside the scope of this Article to talk about derivatives markets and the evolution of clearinghouses operating in derivatives markets. For further discussion, *see* Saguato, *supra* note 9, at 623–24. The international and geopolitical dimensions of financial market infrastructures are likewise beyond the scope of this Article. *See* Paolo Saguato, *International Finance and the Geopolitics of Market Infrastructures*, 28 J. INT'L ECON. L. 647 (2025).

85. *See supra* note 19.

markets.[86] NSCC's business is characterized by high asset specificity and substantial scale and scope economies.[87] Together, these two elements set very high barriers for new entrants and potentially increase the cost of contracting for market participants. These features—combined with the network effects of central clearing—create powerful economic rationales for maintaining clearing as a firm-based, rather than market-based, function. Despite advances in technology and the rise of blockchain-based proposals for decentralized clearing, NSCC remains the dominant infrastructure, coordinating post-trade obligations for virtually the entire market.

Historically, NSCC's structure reflected its cooperative origins. Financial institutions pooled resources and risk-management experience to form a specialized mutual firm that would provide infrastructural services on a cost-recovery basis.[88] By doing so, the member firms outsourced infrastructural services to the clearinghouse, thus reducing transaction costs and coordination costs that would be present in a market without a clearinghouse managing the post-trade phase. The theory of the firm helps explain this persistence. NSCC's clearing services involve high asset specificity, systemic interdependencies, and significant counterparty risk. Relationship-specific investments—including the design of margin models, netting algorithms, and risk-management protocols—make exit costly and foster lock-in. NSCC also faces bounded rationality and enforcement limitations. The complexity of default scenarios and multilateral netting makes it impossible to pre-specify outcomes via contract. The clearinghouse, therefore, functions as a commitment device that internalizes these risks and replaces incomplete contracting with centralized risk governance.

DTCC is not a conventional investor-owned holding company; it is a user-owned enterprise. Henry Hansmann's theory of ownership provides a useful lens for understanding this unique governance structure.[89] DTCC is owned by the users of its subsidiary clearing and settlement firms. The shared interest of clearing members in running an efficient, resilient, risk-averse, and stable firm has proved the strength of DTCC and its subsidiaries thus far. Mutual ownership reduces agency costs that might arise in an investor-owned firm, whose profit-maximizing incentives could conflict with the risk aversion that clearing demands.[90] The firm has embraced technological innovation while maintaining its centralized structure and system-wide function.

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86. Paolo Saguato, *Securities and Derivatives Central Counterparties in the United States*, *in* FINANCIAL MARKETS INFRASTRUCTURES: LAW AND REGULATION 22–24 (Jens-Hinrich Binder & Paolo Saguato eds., 2022).

87. *Id.* at 22.

88. Paolo Saguato & Guido Ferrarini, *Clearinghouses and Systemic Risk*, *in* SYSTEMIC RISK IN THE FINANCIAL SECTOR: TEN YEARS AFTER THE GREAT CRASH 101, 104 (Douglas W. Arner, Emilios Avgouleas, Danny Busch & Steven L. Schwarcz eds., 2019).

89. *See* HANSMANN, *supra* note 62, at 12–15.

90. The SEC's 2023 governance rule—requiring independent directors, conflict-management processes, and enhanced board oversight—confirms that mutual ownership mitigates some agency problems but does not make governance concerns disappear. *See Clearing Agency Governance and Conflicts of Interest*, Exchange Act

NSCC's continued centrality illustrates its comparative institutional advantage in managing transaction and agency costs in multilateral securities markets. Its member-governed structure appears to have helped contain agency costs by aligning the clearinghouse with its users, although increasing heterogeneity among members may complicate that alignment. To date, no market- or technology-based alternative has displaced NSCC at scale or demonstrated an ability to perform the same clearing, netting, and risk-management functions more efficiently. In particular, decentralized solutions have not yet provided a demonstrably superior alternative for managing the transaction costs of securities clearing and settlement. NSCC's evolution therefore reflects not market failure but market design: an institutional response to persistent contracting frictions that neither bilateral market contracting nor decentralized protocols have yet fully overcome.

The next Part turns from institutional theory to market mechanics, tracing the lifecycle of a securities trade and explaining the functions NSCC performs within that process.

II. THE LIFE OF A TRADE AND THE ROLE OF NSCC

This Part offers a primer on the lifecycle of a stock trade—with a particular emphasis on the post-execution and post-trade phase. As discussed later, securities markets operate with a built-in settlement latency.[91] And it is within this latency period, between trade execution and final settlement, that a clearinghouse exercises its critical and systemically significant risk-management functions. A clearinghouse is the byproduct of synergies and cooperation among market participants, designed to centralize and discipline the management of counterparty risk inherent in transacting financial contracts.[92] By stepping into virtually all securities trades, interposing itself as the buyer to every seller and the seller to every buyer, a clearinghouse becomes the creditor and debtor of all its members, which include major broker-dealers, banks, and other financial institutions.[93]

This Part also introduces NSCC, a systemically important clearing agency at the center of U.S. securities markets, and analyzes its role as a central risk manager.[94] By netting obligations and guaranteeing trades, NSCC serves a

Release No. 34-98959, 88 Fed. Reg. 84,454, 84,454–55 (Dec. 5, 2023) (codified at 17 C.F.R. pt. 240) (adopting board-composition, independent-director, transparency, and conflict-management requirements for registered clearing agencies).

91. *See infra* Part.IV.

92. *See* Saguato, *supra* note 9, at 614–23; *see also* NORMAN, *supra* note 76, at 51–65 (offering a brief historical account of the evolution of trading and post-trade practices, with a narrow focus on clearinghouses).

93. *See* Saguato, *supra* note 9, at 615.

94. The term "clearing agency" is defined by statute. *See* 15 U.S.C. § 78c(a)(23)(A) (2018) ("The term 'clearing agency' means any person who acts as an intermediary in making payments or deliveries or both in connection with transactions in securities or who provides facilities for comparison of data respecting the terms of settlement of securities transactions, to reduce the number of settlements of securities transactions, or for the allocation of securities settlement responsibilities. Such term also means any person, such as a securities

critical function in promoting market stability and operational efficiency through the clearing and settlement cycle.

A. THE TRADE LIFECYCLE: FROM EXECUTION TO SETTLEMENT

What actually happens after an investor taps "Buy" or "Sell" on the Robinhood app? Almost immediately, the app displays a message indicating that the market order has been submitted, followed within seconds by another notification that the order has been executed; the purchased shares appear in the investor's portfolio, or cash is credited to the customer's available "buying power."[95] Yet this apparent immediacy conceals a far more complex, multi-step process that—at the time of the Robinhood–NSCC episode—was ordinarily scheduled to complete on the second business day after execution (T+2).[96] This latency reflects the layered architecture of modern securities markets, which relies on multiple intermediaries and infrastructures—including broker-dealers, market makers, CCPs, and securities depositories—to turn an executed trade into a legally and economically final transfer.

When a retail investor places an order to buy or sell stocks on the Robinhood app,[97] Robinhood's broker-dealer affiliates route the order to a venue for execution, typically a market maker such as Citadel Securities or Virtu, or a national securities exchange, such as the New York Stock Exchange (NYSE) or Nasdaq.[98] Once the order is executed, the trade is complete at the venue level. However, legal finality and economic completion do not occur at this point. Following execution on the NYSE, Nasdaq, or another trading platform, the relevant automated systems transmit the key trade details—including party identifiers, the security, price, quantity, and related identifiers—to NSCC.[99]

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depository, who (i) acts as a custodian of securities in connection with a system for the central handling of securities whereby all securities of a particular class or series of any issuer deposited within the system are treated as fungible and may be transferred, loaned, or pledged by bookkeeping entry without physical delivery of securities certificates, or (ii) otherwise permits or facilitates the settlement of securities transactions or the hypothecation or lending of securities without physical delivery of securities certificates.").

95. Jim Swartwout, *The Life of a Trade*, ROBINHOOD ENG'G (Mar. 26, 2021), https://robinhood.com/us/en/newsroom/the-life-of-a-trade.

96. *Id.*

97. Robinhood's securities brokerage business operates through two affiliated broker-dealers: Robinhood Financial LLC (RHF), an introducing broker-dealer, and Robinhood Securities, LLC (RHS), a carrying and clearing broker-dealer that provides execution and clearing services. Both are subsidiaries of Robinhood Markets, Inc., a publicly traded financial services company. *See* Robinhood Markets, Inc., Legal Entity Disclosures (May 20, 2025), https://cdn.robinhood.com/assets/robinhood/legal/robinhood-multiple-entity-disclosure.pdf (explaining that Robinhood Financial LLC provides brokerage services and Robinhood Securities, LLC provides clearing services).

98. Robinhood's broker-dealer affiliates route customer orders to market makers and other execution venues—such as Virtu or Citadel Securities—pursuant to their order-routing arrangements. *See* Robinhood Fin. LLC, Held NMS Stocks and Options Order Routing Public Report: First Quarter 2026, at 1 (Apr. 23, 2026), https://cdn.robinhood.com/assets/robinhood/legal/RHF%20SEC%20Rule%20606%20and%20607%20Disclosure.pdf.

99. NAT'L SEC. CLEARING CORP., DISCLOSURE FRAMEWORK FOR COVERED CLEARING AGENCIES AND FINANCIAL MARKET INFRASTRUCTURES 7–9 (2026) [hereinafter NSCC, DISCLOSURE], https://www.dtcc.com/-/media/Files/Downloads/legal/policy-and-compliance/NSCC-DISCLOSURE-FRAMEWORK-2026-Q1.pdf.

NSCC processes the transaction for post-trade risk management and eventual settlement.[100] NSCC then validates the submitted trade data and, for transactions it accepts into its Continuous Net Settlement (CNS) system, becomes the central counterparty in accordance with its rules.[101] Through its Universal Trade Capture (UTC) system, NSCC receives, validates, and reports trade data submitted by exchanges and qualified special representatives, enabling clearing firms to reconcile those data against their own records.[102] Once trades are validated, and when required, compared, they are routed into NSCC's CNS system. Obligations are then consolidated and netted into a single position in each security for each clearing member and settlement date.[103] NSCC also performs a critical compression function through multilateral netting. Rather than settling each trade on a gross basis, NSCC identifies offsetting obligations across participants and nets them out—cancelling economically redundant positions and converting a web of bilateral trades into a smaller set of net obligations. The result is a substantial reduction in the volume of securities and cash that must move on settlement date, and correspondingly, in the size of the exposures that must be managed during the settlement window. This process, known as multilateral netting,[104] is a foundational risk-reduction and efficiency-enhancing feature of central clearing.[105] This overall process of validation, comparison, netting, and trade guaranty constitutes the "clearing" process.

100. *See* NSCC, DISCLOSURE, *supra* note 99, at 7–8; *A Guide To Clearance & Settlement*, DTCC, https://www.dtcc.com/clearance-settlement-guide/#/chapterTwo (last visited July 20, 2026).

101. *See* NAT'L SEC. CLEARING CORP., RULES & PROCEDURES 112–20 (as of July 14, 2026) [hereinafter NSCC, 2026 RULES], https://www.dtcc.com/-/media/Files/Downloads/legal/rules/nscc_rules.pdf; NSCC, DISCLOSURE, *supra* note 99, at 7–8.

102. "A Qualified Special Representative [. . .] is a broker/dealer that operates an automated execution system or clears for a firm that operates an automated trading system and submits locked-in transactions on behalf of itself and/or another broker/dealer." *See* Universal Trade Capture (UTC), DTCC, https://www.dtcc.com/clearing-and-settlement-services/equities-trade-capture/utc (last visited July 20, 2026); NSCC, DISCLOSURE, *supra* note 99, at 7–9; COMM. ON PAYMENT & SETTLEMENT SYS., A GLOSSARY OF TERMS USED IN PAYMENTS AND SETTLEMENT SYSTEMS 4 (2016), https://www.bis.org/cpmi/glossary.pdf.

103. *See* NSCC, DISCLOSURE, *supra* note 99, at 8–9; Continuous Net Settlement (CNS), DTCC, https://www.dtcc.com/clearing-and-settlement-services/equities-clearing-services/cns (last visited July 20, 2026).

104. The NSCC's procedure states:

> Each Business Day at such time as determined by Corporation, the Corporation produces a Settlement Statement for each Member, Mutual Fund/Insurance Services Member, Insurance Carrier/Retirement Services Member and Fund Member. The Settlement Statement reflects each credit or debit which has been entered to such participant's account for each service in which it had activity that day together with amounts due to or from Members (and, if applicable, Mutual Fund/Insurance Services Members) as a result of Clearing Agency Cross-Guaranty Agreements. All credit and debit amounts are totaled and the net of the two is calculated. This net amount represents the amount owed to the participant or owed by the participant.

NSCC, 2026 RULES, *supra* note 101, at 324.

105. NSCC mitigates exposure to counterparty default risk, enhances collateral efficiency, and supports market liquidity. Netting is not limited to routine settlement cycles. It is also activated upon a participant's default through close-out netting (or close-out set-off netting), a mechanism that accelerates the termination and liquidation of the defaulting member's open positions. *See id.* at 160–63; Saguato, *Hidden Costs of Clearinghouses*, *supra* note 79, at 1084–85; NSCC, DISCLOSURE, *supra* note 99, at 43–69.

"Settlement" occurs when the resulting securities and funds movements are actually effected through the relevant settlement systems.

NSCC performs the central counterparty function of a clearing agency. Through the contractual mechanism of novation, NSCC interposes itself between its clearing members—i.e., the member on the buyer and seller sides—becoming the legal counterparty to each member's net settlement obligation and assuming performance obligations under its rules when one party defaults. This structure transforms a dense web of bilateral obligations into a centralized exposure to NSCC, which can then be managed—priced, collateralized, and monitored—through a single risk-management framework. In doing so, NSCC reduces participants' direct counterparty credit risks and helps contain the destabilizing effect of a member's failure.[106] These clearing functions generally occur on the applicable trade date.[107] Since June 29, 2026, however, NSCC has operated its UTC system on a 24-by-5 schedule, allowing eligible overnight transactions to be submitted and guaranteed outside traditional market hours.[108]

At this point, the executed trade enters the settlement window—two business days (T+2) at the time of the Robinhood–NSCC episode and, for most broker-dealer transactions, one business day (T+1) since May 28, 2024—for final settlement.[109] During this period, NSCC performs its central role as risk manager: monitoring exposures, calculating each clearing member's net obligations, and collecting required margin.[110] Before or on settlement date, NSCC issues settlement statements and related reports to its members indicating each firm's CNS positions (i.e., net obligations to deliver or receive securities) and net money settlement obligations.[111]

For CNS-eligible transactions, NSCC then transmits settlement instructions to DTC. At this stage, DTC processes the net securities obligations generated by NSCC's CNS system through book-entry accounting and acts as NSCC's settlement agent for the related end-of-day funds settlement, subject to the governing NSCC and DTC rules. DTC maintains electronic records of participants' positions and holds eligible equity and debt securities deposited with it on behalf of its participants.[112] On settlement date, if securities are

106. *See* NSCC, 2026 RULES, *supra* note 101, at 55–75; NSCC, DISCLOSURE, *supra* note 99, at 8–9, 43–69.

107. *Matching and Netting*, DTCC, https://www.dtcc.com/clearance-settlement-guide/#/chapterFour (last visited Apr. 3, 2026).

108. See DTCC's NSCC Now Live with Clearing Hours Extended to 24x5 Model, Marking Major Milestone for U.S. Equities Market, DTCC (June 29, 2026), https://www.dtcc.com/news/2026/june/29/nscc-now-live-with-clearing-hours-extended.

109. At the time of the Robinhood–NSCC episode, the standard settlement cycle for most broker-dealer transactions was T+2. The compliance date for the transition to T+1 was May 28, 2024. *See* 17 C.F.R. § 240.15c6-1(a) (2026); *see infra* Subpart.IV.C.

110. *See* NSCC, DISCLOSURE, *supra* note 99, at 43–69; Saguato, *Hidden Costs of Clearinghouses*, *supra* note 79, at 1084–85.

111. *Matching and Netting*, *supra* note 107; *see* NSCC, 2026 RULES, *supra* note 101, at 329–30.

112. DTCC's subsidiary, DTC, established in 1973, was created to reduce costs and provide clearing and settlement efficiencies by immobilizing securities and making "book-entry" changes to ownership of the securities. DTC brings efficiency to the securities industry by retaining custody of more than 1.4 million active

available in the DTC account of a clearing member with a net short position, DTC debits that account, credits the securities to NSCC's CNS account, and then allocates them to the DTC accounts designated by clearing members with net long positions.[113] These securities movements occur free of payment during the settlement day; the corresponding cash obligations are recorded on NSCC's books and settled on a net basis at the end of the day. For firms that participate in both systems, NSCC and DTC settlement balances are combined at the legal entity level and then aggregated through designated settling banks. DTC, acting as NSCC's settlement agent, effects the resulting net funds transfers through the Federal Reserve's National Settlement Service.[114] Settlement finality therefore occurs in stages, rather than at a single moment: a delivery is final as to the delivering member when the securities are credited to NSCC's CNS account; a long allocation is final as to the receiving member at the "effective time" specified in NSCC's rules; and the associated end-of-day funds transfers are final when effected through the National Settlement Service.[115]

Importantly, retail investors—such as Robinhood's users—are not direct participants in this post-trade process. NSCC's direct participants (broker-dealers, investment companies, banks) are its members, which are legally bound to perform their obligations to NSCC during the settlement window. The corresponding securities movements occur through DTC participant accounts, and retail investors participate indirectly through their brokers and, where applicable, their brokers' clearing firms and custodians.[116]

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securities issues valued at $87.1 trillion, including securities issued in the U.S. and more than 131 countries and territories. DTC provides securities movements for NSCC's net settlements, and settlement for institutional trades (which typically involve money and securities transfers between custodian banks and broker/dealers), as well as money market instruments. *See* Sam Wice, *Central Securities Depositories in the United States: Market Structure and Regulatory Framework*, *in* FINANCIAL MARKET INFRASTRUCTURES: LAW AND REGULATION, *supra* note 83, at 381; NSCC, DISCLOSURE, *supra* note 99, at 4; THE DEPOSITORY TR. CORP., DISCLOSURE FRAMEWORK FOR COVERED CLEARING AGENCIES AND FINANCIAL MARKET INFRASTRUCTURES 4 (Mar. 2026), https://www.dtcc.com/-/media/Files/Downloads/legal/policy-and-compliance/DTC-DISCLOSURE-FRAMEWORK-2026-Q1.pdf; THE DEPOSITORY TR. CORP., SETTLEMENT SERVICE GUIDE 10–11, 22–23 (June 10, 2026) [hereinafter DTC SETTLEMENT GUIDE], https://www.dtcc.com/-/media/Files/Downloads/legal/service-guides/Settlement.pdf.

113. *See* NSCC, 2026 RULES, *supra* note 101, at 112–20, 311–13; NSCC, DISCLOSURE, *supra* note 99, at 115; DTC SETTLEMENT GUIDE, *supra* note 112, at 22–23.

114. *See* NSCC, 2026 RULES, *supra* note 101, at 118–20, 329–30; NSCC, DISCLOSURE, *supra* note 99, at 69, 72–74, 115; DTC SETTLEMENT GUIDE, *supra* note 112, at 26–29.

115. *See* NSCC, 2026 RULES, *supra* note 101, at 118–20, 329–30; NSCC, DISCLOSURE, *supra* note 99, at 69–70, 77–78; THE DEPOSITORY TR. CORP., RULES, BY-LAWS & ORGANIZATION CERTIFICATE 56 (Apr. 28, 2026), https://www.dtcc.com/-/media/Files/Downloads/legal/rules/dtc_rules.pdf; FED. RSRV. BANKS, OPERATING CIRCULAR NO. 12: MULTILATERAL SETTLEMENT §§ 5.4, 5.6 (Mar. 8, 2021), https://www.frbservices.org/binaries/content/assets/crsocms/resources/rules-regulations/030821-operating-circular-12.pdf.

116. *See* DTC SETTLEMENT GUIDE, *supra* note 112, at 26–29.

B. NSCC AND ITS ROLE AS FINANCIAL MARKET INFRASTRUCTURE IN POST-TRADE SECURITIES MARKETS

Taking a step back and looking at the ecosystem of post-trade financial market infrastructures in the U.S. securities markets, post-trade services are currently provided by standalone clearing and settlement firms that operate horizontally. Securities clearinghouses and depositories offer infrastructure services across multiple trading venues without being vertically integrated into any exchange group.[117] The firms' structural independence reflects both regulatory design and economic logic, insulating post-trade risk management from the competitive and commercial incentives that characterize the trading environment.

1. NSCC Regulatory and Organizational Framework

Section 3(a)(23)(A) of the Exchange Act defines clearing agencies as entities that "act[] as an intermediary in making payments or deliveries or both in connection with transactions in securities," or that "provide[] facilities for comparison of data respecting the terms of settlement of securities transactions, to reduce the number of settlements of securities transactions, or for the allocation of securities settlement responsibilities."[118] Congress thus recognized clearing agencies as the central post-trade infrastructures of the U.S. securities markets.[119]

Under this statutory framework,[120] clearing agencies perform two core infrastructural functions.[121] They act as clearinghouses and central counterparties, which support clearing and settlement, or as central securities depositories (CSDs), which provide centralized custody, recordkeeping, and book-entry transfer of interests in securities.[122] In the United States, NSCC is the SEC-registered clearing agency that provides clearing and CCP services for

117. *See* Guido Ferrarini & Paolo Saguato, *Governance and Organization of Trading Venues: The Role of Financial Market Infrastructure Groups*, *in* REGULATION OF EU FINANCIAL MARKETS: MIFID II AND MIFIR 285 (Danny Busch & Guido Ferrarini eds., 2017).

118. Securities Exchange Act of 1934, 15 U.S.C. § 78c(a)(23)(A).

119. For a concurring opinion, *see* SEC STAFF REPORT, *supra* note 5, at 14.

120. Securities Exchange Act § 78c(a)(23)(A).

121. *Id.*

122. SEC STAFF REPORT, *supra* note 5, at 14. A CSD maintains a centralized system for the custody of securities and the transfer of interests on those securities, maintains securities accounts and settlement accounts for its members, and records changes in securities ownership through electronic entries. Morten Linnemann Bech, Jenny Hancock & Amber Wadsworth, *Central Securities Depositories and Securities Settlement Systems*, BIS (2020), https://www.bis.org/publ/qtrpdf/r_qt2003y.htm.

securities,[123] and DTC is a registered clearing agency that performs CSD functions.[124]

NSCC and DTC emerged from the industry and regulatory response to the Paperwork Crisis of the late 1960s and early 1970s.[125] Before the 1960s, almost every major U.S. stock exchange owned a CCP and a central securities depository to manage and process every step of a securities trade.[126] Interestingly, these infrastructures relied heavily on manual reconciliation and the physical movement of paper certificates. In the 1960s, surging volume overwhelmed these systems and the stock exchanges' back-office operations, and the system effectively collapsed.[127] The crisis prompted Congress and the SEC to modernize the post-trade system with the adoption of the Securities Acts Amendments of 1975, which established the "National Market System," added Section 17A to the Securities Exchange Act of 1934, and directed the SEC to facilitate the creation of a national clearance and settlement system. Pursuant to these reforms, the stock exchanges spun off their back-office infrastructures and created two national infrastructures.[128] NSCC was formed in 1976 by consolidating major clearinghouses for securities markets,[129] while DTC, formed in 1973, became the principal central securities depository.[130]

Beyond the framework established by Section 17A of the Securities Exchange Act and its implementing regulations, NSCC and DTC are also subject to the regime set by Title VIII of the Dodd-Frank Act for systemically important financial market utilities (SIFMUs),[131] because the Financial Stability Oversight

123. *National Securities Clearing Corporation (NSCC)*, DTCC, https://www.dtcc.com/about/businesses-and-subsidiaries/nscc (last visited Apr. 3, 2026); *see* NSCC, DISCLOSURE, *supra* note 99, at 6; *Clearing Agencies*, U.S. SEC. & EXCH. COMM'N, https://www.sec.gov/about/divisions-offices/division-trading-markets/clearing-agencies (last visited Apr. 13, 2026). In addition to NSCC, the principal clearing agencies that historically have played significant roles in U.S. securities and derivatives markets are: (i) the Depository Trust Company (DTC), the central securities depository for U.S. securities; (ii) the Fixed Income Clearing Corporation (FICC), which clears U.S. Treasury and mortgage-backed securities transactions; (iii) the Options Clearing Corporation (OCC), which clears listed equity derivatives; and (iv) ICE Clear Credit LLC, which clears credit default swaps. SEC, *Clearing Agencies,* https://www.sec.gov/about/divisions-offices/division-trading-markets/clearing-agencies.

124. *The Depository Trust Company (DTC)*, DTCC, https://www.dtcc.com/about/businesses-and-subsidiaries/dtc (last visited Apr. 13, 2026) ("DTC is a member of the U.S. Federal Reserve System, a limited-purpose trust company under New York State banking law and a registered clearing agency with the U.S. Securities and Exchange Commission."); *see also* NSCC, DISCLOSURE, *supra* note 99, at 6.

125. *See* SELIGMAN, *supra* note 16, at 450–66; Awrey & Macey, *supra* note 9, at 128 (describing the history of DTCC).

126. Awrey & Macey, *supra* note 9, at 128–29.

127. *Id.*

128. *See generally id.* (looking at DTCC, NSCC's holding company, path to monopoly through the lens of open-access and interoperability).

129. NSCC was formed in 1976 through the merger of three clearing agencies: the Stock Clearing Corporation (which served the New York Stock Exchange), the American Stock Exchange Clearing Corporation, and the National Clearing Corporation (which served the NASD). *See id.* at 134 n. 183. NSCC was granted registration by the SEC in January 1977. *Id.* at 134–35.

130. *See id.* at 127–29.

131. Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, § 802(b), 124 Stat. 1376, 1803 (2010) (codified as amended at 12 U.S.C. § 5461).

Council (FSOC) designated them as SIFMUs in 2012.[132] That designation subjects NSCC and DTC to Title VIII's heightened risk-management, governance, and supervisory framework. Within this overlapping regulatory structure, NSCC and DTC are also subject to the SEC's Covered Clearing Agencies Standards because, as a CCP and CSD, respectively, they qualify as covered clearing agencies.[133]

Today, both NSCC and DTC are wholly owned subsidiaries of DTCC.[134] DTCC was created in the late 1990s through the consolidation of U.S. securities clearinghouses and central securities depositories.[135] DTCC is a holding company for multiple subsidiaries that operate financial market infrastructures and operates as a user-owned enterprise.[136] Its common shareholders are the financial institutions—including broker-dealers, banks, and other companies in the financial services industry—that are participants and members of the subsidiaries' post-trade businesses.[137] Participants (i.e., members) in DTCC's clearing agencies are required or permitted (depending on the regulatory status of the financial firm) to own common stock in DTCC in amounts proportionate to their usage of the group's clearing agency services.[138] Becoming a clearing member is a prerequisite for access to NSCC's services.

As a registered clearing agency, NSCC is a self-regulatory organization (SRO) within the Exchange Act's statutory definition.[139] The SRO designation does not place NSCC outside the SEC's regulatory authority. Its self-regulatory authority, however, is exercised within a detailed federal regulatory regime. As

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132. Paolo Saguato, *Rethinking the Financial Stability Oversight Council*, 16 VA. L. & BUS. REV. 505, 532 (2022); *see Designations*, U.S. DEP'T OF THE TREASURY, https://home.treasury.gov/policy-issues/financial-markets-financial-institutions-and-fiscal-service/fsoc/designations (last visited Apr. 13, 2026); FIN. STABILITY OVERSIGHT COUNCIL, 2012 ANNUAL REPORT app. A at 145 (2012), https://home.treasury.gov/system/files/261/2012-Annual-Report.pdf (last visited Apr. 13, 2026).

133. "NSCC's designation as a SIFMU requires that it meet prescribed risk management standards and heightened oversight by the SEC in order to promote robust risk management and safety and soundness, reduce systemic risk, and support the stability of the broader financial system." *See* NSCC, DISCLOSURE, *supra* note 99, at 6. For the separate definition of "covered clearing agency," see 17 C.F.R. § 240.17ad-22(a)(5) (2026); *Definition of "Covered Clearing Agency,"* Exchange Act Release No. 34-88616, 85 Fed. Reg. 28,853, 28,855 (May 14, 2020) (codified at 17 C.F.R. § 240.17ad-22(a)(5)).

134. *See* NORMAN, *supra* note 76, at 169–74; *see also DTCC's Businesses, Subsidiaries and Joint Ventures*, DEPOSITORY TR. & CLEARING CORP., https://www.dtcc.com/about/businesses-and-subsidiaries (last visited Apr. 13, 2026) (describing DTCC's core clearing and settlement subsidiaries, DTC, NSCC, and FICC).

135. *See* NORMAN, *supra* note 76, at 169–74.

136. *See* NSCC, DISCLOSURE, *supra* note 99, at 6.

137. *Id.* at 24.

138. *Id*. Preferred stocks are owned by some institutional investors, by Stock Clearing Corporation, a subsidiary of the New York Stock Exchange, and by the Financial Industry Regulatory Authority; these two are the successors in interest respectively of the New York Stock Exchange and of the National Association of Securities Dealers, who were the original owners and founders of NSCC. *See* Awrey & Macey, *supra* note 9, at 128–29, 155. *See also* RUBEN LEE, RUNNING THE WORLD'S MARKETS: THE GOVERNANCE OF FINANCIAL INFRASTRUCTURE 20–21 (2011); Saguato, *supra* note 9, at 647. For an in-depth discussion of DTCC ownership and governance structure, see Saguato, *Unfinished Business*, *supra* note 79.

139. 15 U.S.C. § 78c(a)(26) (defining "self-regulatory organization" to include a registered clearing agency).

a covered clearing agency, NSCC's rules, procedures, and risk-management models must comply with the substantive Covered Clearing Agency Standards in Rule 17ad-22(e) and other applicable Commission rules.[140] The Commission's role is therefore not limited to supervising or approving changes initiated by NSCC: The Commission also prescribes substantive requirements governing clearing-agency risk management, governance, operations, and recovery planning. NSCC generally develops the technical means of implementation and files necessary rule changes under Section 19(b) and Rule 19b-4;[141] the Commission publishes the filing for comment and ordinarily must approve it as consistent with the Exchange Act before it becomes operative. Proposed changes not eligible for immediate effectiveness require Commission approval, while immediately effective changes remain subject to the Commission's suspension and review authority.[142] Recent Commission rulemaking underscores this allocation of authority. Rule 17ad-25 prescribes governance and conflicts-of-interest requirements; amendments to Rule 17ad-22(e)(6) prescribe aspects of intraday-margin monitoring and collection; and Rule 17ad-26 prescribes the required elements of recovery and orderly wind-down plans. NSCC retains meaningful technical and implementation discretion but exercises that discretion within binding requirements established by the Commission. NSCC's approved Rules & Procedures—its "Rulebook"—bind its members.[143]

2. NSCC Risk-Management Framework

NSCC's risk-management framework relies on two broad lines of defense: (1) stringent membership standards[144] and ongoing oversight of members,[145] and (2) a default management process (the "default waterfall"). Together, these tools allow NSCC to function as a centralized risk manager, converting decentralized bilateral exposures into a single, centrally managed—and tightly regulated—infrastructure that enhances market transparency, efficiency, and systemic stability.

The first line of defense in NSCC's risk-management framework is its membership requirement. Not all market participants can directly access clearing services: Only qualified financial institutions are permitted to become

140. *See* Saguato, *supra* note 9, at 605–07; NSCC, DISCLOSURE, *supra* note 99, at 14 (explaining NSCC's new rules or amendments to existing rules are filed with and reviewed by the SEC); *see also* 17 C.F.R. §§ 240.17ad-22(e), 240.17ad-25, 240.17ad-26 (2026).

141. NSCC, 2026 RULES, *supra* note 101, at 35.

142. *See* 15 U.S.C. § 78s(b)(1)–(3); 17 C.F.R. § 240.19b-4 (2026); U.S. Sec. & Exch. Comm'n, Proposed Rule Changes of Self-Regulatory Organizations (Mar. 19, 2004), https://www.sec.gov/rules-regulations/2004/03/proposed-rule-changes-self-regulatory-organizations (describing notice, comment, approval, immediate-effectiveness, and abrogation procedures).

143. NSCC, 2026 RULES, *supra* note 101, at 35.

144. *Id.* at 383.

145. *Id.* at 51.

clearing members.[146] NSCC retains broad authority to establish and enforce entry standards,[147] requiring prospective members to meet rigorous prudential, financial, and capital adequacy standards.[148] Once admitted, members agree to be bound by and comply with all conditions associated with their CCP membership status.[149] They are required to contribute to the CCP's financial resources and agree to bear allocated losses arising from the default of one or more of their fellow members (if one should occur).[150] Participation in this risk mutualization mechanism is a necessary condition of admission and of maintaining membership status.[151] In addition, members also submit to ongoing oversight.[152] NSCC has the right to (1) inspect the members' books, (2) require regular financial disclosures and conduct periodic assessments of members' internal risk-management policies and practices, and (3) continuously monitor members' creditworthiness and operational soundness.[153] NSCC also has the right to include its members in a "Watch List" and an "Enhanced Surveillance List" based on their credit rating.[154] In addition, NSCC reserves the right to suspend or withdraw membership privileges if the member falls short in complying with the prudential standards included in the CCP's Rulebook.[155]

NSCC contractually requires its members to contribute to the CCP's financial resilience. These loss-absorbing resources enable NSCC to manage the financial consequences of a member default and to continue providing critical clearance and settlement services.[156] Together, these resources constitute the second line of defense in NSCC's risk-management framework.[157] Viewed functionally, the default waterfall combines member-specific initial and variation margin (including discretionary supplemental charges),[158] a contribution of NSCC's own capital,[159] and contingent loss-allocation

146. *Id.* at 35–37 (identifying NSCC's three types of members: full members, limited members, and sponsored members). NSCC has more than 4,000 members. *See NSCC Member Directories*, DEPOSITORY TR. & CLEARING CORP. [hereinafter *NSCC Member Directories*, DTCC], https://www.dtcc.com/client-center/nscc-directories (last visited Apr. 5, 2026).

147. NSCC, 2026 RULES, *supra* note 101, at 39.

148. *Id.*

149. *Id.* at 41–42.

150. *Id.* at 42.

151. *NSCC Member Directories*, DTCC, *supra* note 146.

152. NSCC, 2026 RULES, *supra* note 101, at 51.

153. *Id.* at 46, 49–50.

154. NSCC may place members on its Watch List or Enhanced Surveillance List based on financial, operational, or other risk indicators specified in its rules and procedures. Member firms are placed on the Watch List if their credit rating, as measured by a credit rating system specified in NSCC Rules, is assessed at a 5, 6, or 7 or if NSCC otherwise considers that other relevant factors make a particular member firm pose a heightened risk to the clearinghouse. *See id.* at 34.

155. *Id.* at 45.

156. *See* NSCC, 2026 RULES, *supra* note 101, at 43 (requiring members to agree to be bound by the Rules and to pay amounts due under Rule 4); at 83 (requiring each member to make and maintain a Required Fund Deposit in the Clearing Fund).

157. *Id.* at 85–88.

158. *Id.* at 383–401.

159. *Id.* at 86–88.

obligations mutually borne by non-defaulting members.[160] NSCC implements these functions through a distinctive legal architecture.[161] Its rules do not establish separate pools of initial margin, variation margin, and guaranty fund contributions. Instead, that architecture centers on members' Required Fund Deposits,[162] NSCC's Corporate Contribution,[163] and, if those resources prove insufficient, loss allocations to non-defaulting members under Rule 4.[164]

At NSCC, the Required Fund Deposit functions as margin: It specifies the amount that each member must maintain in the Clearing Fund to secure its obligations to NSCC and to protect NSCC against losses arising from a member default, and it is the first layer of financial resource that can be tapped by the CCP to absorb the losses caused by a member's default and the liquidation of its portfolio.[165] Margin defends against counterparty exposure and default risk and operates as a micro-prudential transactional risk-management tool. The Required Fund Deposit is both a member-specific risk-management resource and the member's contribution to NSCC's Clearing Fund. Each business day, NSCC calculates the amount that a member must maintain for its unsettled positions during the settlement cycle (T+2 in 2021; T+1 today).[166] Although the familiar CCP vocabulary of "initial margin" and "variation margin" is functionally helpful, NSCC's rules instead identify components of the Required Fund Deposit,[167] including a volatility charge that addresses potential future exposure and mark-to-market charges that address current exposure. NSCC calculates Required Fund Deposits daily using a risk-based methodology outlined in Procedure XV.[168] The greater the trading volume and volatility associated with a member's portfolio, the higher that member's Required Fund Deposit generally will be.[169] NSCC also monitors exposures intraday and may

160. *Id.* at 83–94 (prescribing the application of a defaulting member's resources, NSCC's Corporate Contribution, and loss allocations to non-defaulting members).

161. A traditional CCP operates with a similar, yet different, default waterfall with the following structure: (1) initial and variation margin; (2) a prefunded guaranty fund, which mutualizes residual losses when a defaulting member's margin is insufficient; (3) a contribution of the CCP's own capital; (4) assessment rights, which allow the CCP to call for supplemental contributions in extreme circumstances if prefunded resources are depleted; *see* Saguato, *supra* note 9, at 618–23.

162. NSCC, 2026 RULES, *supra* note 101, at 83–84.

163. *Id.* at 88.

164. *Id.* at 85–88, 344–62.

165. The aggregate of all NSCC members' margin deposits (together with certain other deposits required under the Rules) constitutes NSCC's Clearing Fund. S*ee id.* at 82–94.

166. *Id.* at 83–84 (defining Clearing Fund).

167. NSCC, 2026 RULES, *supra* note 101, at 83, 363. Initial margin contributions are intended to cover the future exposures that might arise in the interval between the execution of the contract and either its performance or the close-out and liquidation of the cleared position upon the default of the clearing member.

168. NSCC, 2026 RULES, *supra* note 101, at 82–94. Procedure XV outlines mathematically how NSCC calculates the amount of funds that individual members must post to NSCC. *See id.* at 344–62.

169. SEC STAFF REPORT, *supra* note 5, at 15. This mechanism proved particularly challenging for retail broker-dealers like Robinhood, whose trading volumes tend to surge in periods of high volatility. *See infra* Subparts.III.A–B (discussing how, during the market turbulence of January 2021 and the surge in trading volumes processed by Robinhood, NSCC issued substantial variation margin calls to address increased risk exposure).

issue and collect an Intraday Margin Charge comprising an intraday mark-to-market charge, an intraday volatility charge, or both. Unless NSCC determines otherwise, a member must satisfy an intraday demand—by depositing the requested collateral—within one hour of the demand.[170]

In addition to intraday margin charges, NSCC's Rulebook authorizes the clearing agency to impose special additional charges. For instance, when NSCC observes unusual volatility in particular securities that could pose heightened risk to the clearing agency and its members,[171] it may impose an Excess Capital Premium (ECP) to mitigate the heightened credit risk posed by a member whose exposure to NSCC is disproportionate to its capital.[172] To promote transparency, NSCC provides its members with the models to estimate their potential Required Fund Deposit.[173] In addition, NSCC may waive or reduce collection of an ECP in exigent circumstances under the criteria and procedures specified in Procedure XV.[174] Finally, among these discretionary add-ons, NSCC may require a member placed on the Watch List to maintain a deposit above the

170. NSCC, 2026 RULES, *supra* note 101, at 360–62.

171. *Id.* at 358–59; SEC STAFF REPORT, *supra* note 5, at 15. An ECP is imposed when a member's volatility charge is large relative to its net capital or equity capital.

172. Order Approving Proposed Rule Change to Revise the Excess Capital Premium Charge (explaining that the ECP charge operates to collect additional margin if a member's exposure to NSCC based on its clearing activity is out of proportion to its capital); SEC STAFF REPORT, *supra* note 5, at 31; *see also* Risk Management Tools, Depository Tr. & Clearing Corp., https://www.dtcc.com/managing-risk/Risk-Management-Tools (last visited July 29, 2026) (describing the NSCC VaR Calculator and other risk-management tools available to members).

173. The volatility component of the clearing fund formula is outlined in the NSCC Rules, Procedure XV.I.(A)(1)(a)(i)–(iii) and (2)(a)(i)–(iii) and Procedure XV.I.(B)(6). *See* NSCC, 2026 RULES, *supra* note 101, at 340–43, 347–59. NSCC substantially changed the formula to calculate the volatility component. *Compare* NAT'L SEC. CLEARING CORP., RULES & PROCEDURES, Procedure XV.I(A)(1)–(2) (2021) [hereinafter NSCC, 2021 RULES] (on file with the author), *with* NSCC, 2026 RULES, *supra* note 101, §§ I.(A)(1)(a)(i)–(iii) and (2)(a)(i)–(iii).

174. *See* NSCC, 2026 RULES, *supra* note 101, at 53. In the aftermath of the events of January 2021, NSCC substantially revised the framework under which it may waive or reduce the ECP. The 2021 rules state that "the Corporation may: (i) collect an amount less than the Excess Capital Premium (including no premium), and (ii) return all or a portion of the Excess Capital Premium if it believes that the imposition or maintenance of the Excess Capital Premium is not necessary or appropriate." NSCC, 2021 RULES, *supra* note 173, at 301. Compare with the current language:

> The Corporation may waive the collection of an Excess Capital Premium of a Member in exigent circumstances when the Corporation, in its sole discretion, observes extreme market conditions or other unexpected changes in factors such as market volatility, trading volumes or other similar factors. In determining whether it is appropriate to waive the collection of an Excess Capital Premium in such circumstances, the Corporation would review all relevant facts, circumstances and other information available to it at the time of such determination, including the degree to which a Member's capital position and trading activity compare or correlate to the prevailing exigent circumstances and whether the Corporation can effectively address the risk exposure presented by a Member without the collection of the Excess Capital Premium from that Member. The collection of an Excess Capital Premium may be waived by a Managing Director in the Group Chief Risk Office of the Corporation, and such waiver shall be documented in a written report that is made available upon request to the Member impacted by the waiver.

NSCC, 2026 RULES, *supra* note 101, at 359.

amount otherwise calculated under Procedure XV; that additional deposit becomes part of the member's Required Fund Deposit.[175]

The Clearing Fund performs the loss-mutualization function that makes the risk-management model of a CCP unique. Each member's Required Fund Deposit operates both as margin and as its contribution to the Clearing Fund; collectively, those deposits provide a prefunded buffer against losses arising from a member default. The fund operates as a loss-sharing mechanism that mutualizes losses among the non-defaulting clearing members.[176] Following a member default,[177] if NSCC ceases to act for the member and the resulting closeout or liquidation produces a loss, Rule 4 directs NSCC's actions. NSCC first applies the defaulting member's Actual Deposit, together with other resources attributable to that member.[178] It then applies its Corporate Contribution. Only if a loss or liability remains does NSCC allocate it ratably among the non-defaulting members in accordance with Rule 4.[179] Each member's Required Fund Deposit is its contribution to the Clearing Fund,[180] and NSCC may demand additional contributions as exposure increases.[181]

Beyond their prefunded Required Fund Deposits, members are contractually bound to support NSCC's financial resilience through contingent loss allocations when needed.[182] When the prefunded financial resources in the default waterfall are depleted and losses remain, NSCC may allocate those losses among non-defaulting members.[183]

Having examined the economic and legal structure of NSCC's risk-management framework, Part III turns to the Robinhood–NSCC episode to show how these mechanisms operated in practice. The market frenzy of January 2021

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175. Specifically, Rule 2B states that a member placed on a watch list may be required by NSCC to:

> [M]ake and maintain a deposit to the Clearing Fund over and above the amount determined in accordance with Procedure XV (which additional deposit shall constitute a portion of the Member's or Limited Member's Required Fund Deposit), or such higher amount as the Board may deem necessary for the protection of the Corporation or other Members, which higher amount may include, but is not limited to, additional payments or deposits in any form to offset potential risk to the Corporation and its Members arising from activity submitted by such Member or Limited Member. The Corporation may also retain any deposit in excess of the Required Fund Deposit of a Member or Limited Member that has been placed on the Watch List . . . .

NSCC, 2026 RULES, *supra* note 101, at 36. This language was included in the February 2021 Rules and the current February 2026 Rules. *See id.*; NSCC, 2021 RULES, *supra* note 173, at 36.

176. NSCC, 2026 RULES, *supra* note 101, at 85–88, 354–55.

177. Under Rule 4, NSCC's determination pursuant to Rule 46 to cease to act for a member constitutes a "Defaulting Member Event[.]" *Id.* at 85.

178. *Id.*

179. *Id.* at 85–88.

180. *Id.* at 344–64.

181. *Id.* at 88.

182. *Id.* at 85–88, 91–94.

183. In contrast to members' contributions to the guaranty fund—which are countercyclical, prefunded, and adjusted to the risk profile of each member's cleared portfolio—assessment rights are not prefunded and are triggered only when losses cannot be contained within the already pledged resources. Due to the way they operate, assessment rights are pro-cyclical—they impose additional liabilities on financial institutions in a market environment that is likely experiencing severe distress.

exposed how the stability of the U.S. securities markets ultimately rests on the proper functioning of post-trade infrastructures, especially NSCC.

III. THE ROBINHOOD–NSCC EPISODE: POST-TRADE INFRASTRUCTURE UNDER THE SPOTLIGHT

In late January 2021, the U.S. post-trade infrastructure, especially NSCC and its risk-management toolkit, was tested in real time. The events of January 27 and 28 show how settlement latency, extreme market volatility concentrated particularly in a small set of meme stocks, and large unsettled positions activated NSCC's internal risk-management and control procedures.[184] This translated rapidly into concrete funding demands on clearing members, most notably Robinhood, as NSCC recalibrated members' collateral requirements to reflect the rapidly shifting risk profile of their portfolios.[185] Pressure peaked on January 28: at 5:11 a.m. ET,[186] Robinhood received notice of a margin deficit on the order of $3 billion,[187] and over the next four hours—until 9:11 a.m., just nineteen minutes before the 9:30 a.m. New York Stock Exchange trading floor opened—[188] NSCC and Robinhood undertook urgent operational triage that culminated in an agreement that avoided a potentially disruptive clearing member default and instead enabled an orderly management of settlement cycle risk under extraordinary market conditions.[189]

With the risk-management architecture set out in Part II in view, the Subparts that follow reconstruct this minute-by-minute sequence of events to situate NSCC's actions and its prompt self-regulatory response, the ensuing

184. The SEC Staff Report identified three recurring features of the meme stocks: frequent social-media mentions; consumer-facing companies familiar to the public; and unusually high short interest. SEC STAFF REPORT, *supra* note 5, at 17.

185. *See supra* Part.III.A.

186. *See Hearing*, *Vlad Tenev*, *supra* note 13, at 9–10.

187. *Id.* at 9. In times of heightened volatility, NSCC can exercise its authority under Rule 15 to call for additional collateral in the form of variation margin to preserve its risk integrity. NSCC, 2026 RULES, *supra* note 101, at 124.

188. GAME STOPPED, *supra* note 5, at 63.

189. During the Congressional hearing, one issue that received considerable attention was the relationship between Robinhood and wholesale market makers such as Citadel Securities, Virtu Financial, and Wolverine Execution Services. Lawmakers expressed concern that Robinhood's reliance on payment for order flow created incentives to maximize trading volume by retail investors. SEC STAFF REPORT, *supra* note 5, at 2. Robinhood earns roughly 80 percent of its revenue from PFOF. *See* Matt Levine, Opinion, *Does Robinhood Need Payment for Order Flow?*, BLOOMBERG (Aug. 31, 2021, at 12:23 ET), https://www.bloomberg.com/opinion/articles/2021-08-31/what-happens-to-robinhood-if-the-sec-bans-payment-for-order-flow?embedded-checkout=true. Robinhood does not disclose how it sets its PFOF rates; however, some analysts believe that Robinhood has contracted with market makers to earn more when volatility is higher. *See* Tomio Geron, *Data Shows How Robinhood Makes More Money from Its Users Than Other Brokers*, PROTOCOL (July 15, 2021), https://perma.cc/RX3N-J8RA. Moreover, Gary Gensler, the former SEC Chair, stated that "All facets of [Robinhood's] business model are designed to maximize order routing revenue . . . . It's the most aggressive version of the retail brokerage (payment for order flow) model that facilitates this level of trading activity." *Id.* Alphacution found that, for Robinhood, the ratio of its order routing revenue to average account value was 40,683, compared to other retail brokers, such as 2,079 for TD Ameritrade, 891 for E-Trade, and 195 for Charles Schwab. *Id.*; GAME STOPPED, *supra* note 5, at 5.

congressional and SEC investigation, and the reforms that ultimately accelerated the move to a shorter securities settlement cycle.

A. THE MEME STOCK FRENZY: MARKET VOLATILITY AND RISK-MANAGEMENT SYSTEMS ON ALERT

Since the early months of the COVID-19 pandemic in 2020,[190] an influx of individual investors into stock markets laid the groundwork for the meme stock frenzy.[191] Retail broker-dealers like Robinhood helped draw new retail investors into the capital markets by offering "zero commission" trading[192] on user-friendly, "gamified"[193] platforms. In January 2021, more than six million Americans downloaded trading apps;[194] Robinhood accounted for approximately 2.1 million of those downloads[195] and saw its customer base increase substantially in the second, third, and fourth quarters of 2020.[196]

This retail trading surge occurred alongside sharp price swings and unusually high trading volume across more than one hundred meme stocks,[197] but GameStop (GME)—a brick-and-mortar video game retailer—became the unlikely focal point of a market frenzy.[198] Throughout 2020, GME's stock exhibited pronounced volatility,[199] rising from approximately six dollars per

190. Many factors have contributed to the spike in retail investing: pandemic boredom, households' increased disposable income, cheap stock prices, and easily accessible trading apps and platforms (e.g., Robinhood, Webull, Sofi). Gordon Gottsegen, *Robinhood's Vlad Tenev Has Led a Trading Revolution to Become a New Wall Street Power*, MARKETWATCH (June 28, 2025, at 15:11 ET), https://www.marketwatch.com/story/robinhoods-vlad-tenev-has-led-a-trading-revolution-to-become-a-new-wall-street-power-6a73bf9b.

191. *See* SEC STAFF REPORT, *supra* note 5, at 9–10 (estimating roughly six million new members opened accounts with retail brokers in January 2021). Moreover, retail investors made up 10 percent of total investments in 2020; that number ballooned to 25 percent in early 2021. *See* GAME STOPPED, *supra* note 5, at 5.

192. Because Robinhood and many other broker-dealers do not charge commissions on trades, they generate revenues through other means, such as (1) payment for order flow; (2) advisory services or managed accounts; (3) interest earned on margin loans and cash deposits; and (4) income generated from securities lending. SEC STAFF REPORT, *supra* note 5, at 9.

193. Examples of how Robinhood and other retail broker-dealers gamify their apps include leaderboards of volatile or popular stocks, push notifications prompting users to trade, and lottery-like rewards for frequent users. *See* James Fallows Tierney, *Investment Games*, 72 DUKE L.J. 353, 357 (2022). All these features add to the already user-friendly and appealing designs. *See id.*

194. Dylan Walsh, *Absent Fees, Retail Traders Do Better*, U.C. BERKELEY RSCH. (June 21, 2023), https://vcresearch.berkeley.edu/news/absent-fees-retail-traders-do-better.

195. Cat Zakrzewski & Aaron Schaffer, *The Technology 202: More Than 2 Million Downloaded Robinhood's App During GameStop Frenzy*, WASH. POST (Feb. 2, 2021), https://www.washingtonpost.com/politics/2021/02/02/technology-202-more-than-2-million-downloaded-robinhood-app-during-gamestop-frenzy.

196. Robinhood Mkts. Inc., Amendment No. 1 to Registration Statement 45 (Form S-1) (July 19, 2021).

197. SEC STAFF REPORT, *supra* note 5, at 16–17.

198. GameStop exhibited all these features—including an exceptionally high short interest of 84 percent—which drew intense online attention, as retail investors identified an opportunity to coordinate a 'short squeeze' against institutional investors holding the short positions. *Id.* at 18.

199. At the beginning of 2020, GME was priced at just over $6 per share. *Id.* at 17. After large movements throughout the year, GME's stock ended 2020 priced at over $20 per share. *Id.* at 17. While the price was fluctuating, the social media attention around GME grew, and mentions about potential short squeezes grew as well. *Id.* at 17–18. The price per share moved from $20.65 on January 11, 2021, to $31.40 on January 13 (on trade volume of 144 million shares, compared with seven million the prior day), to $347.51 on January 27 (a 1,600 percent increase from the January 11 trading price), and finally to $483.00 on January 28. *Id.* at 17–18.

share to over twenty dollars by year-end. The rally accelerated dramatically in January 2021, with the stock price peaking at $483 on January 28.[200] From January 13 to January 29, 2021, an average of approximately one hundred million GME shares traded per day—an increase of more than 1,400 percent relative to the stock's 2020 average daily volume.[201] On January 22, daily volume peaked at 197.2 million shares. This extreme volatility was mirrored by an unprecedented surge in retail investor activity: the number of individual accounts trading GME on a given day rose from fewer than ten thousand at the beginning of the month to nearly nine hundred thousand by January 27.[202]

These conditions mattered for post-trade risk because large and rapidly changing, unsettled positions translate directly into CCP exposure during the settlement window. Beginning Tuesday, January 26, Robinhood observed a historic spike in customer trading activity and a corresponding surge in volatility concentrated in a small set of meme stocks.[203] On January 27, meme stock trading volume rose further, and Robinhood began to respond by imposing trading limits aimed at containing its incremental exposure and managing potential risk ahead of settlement.[204]

That same day, NSCC issued market-wide intraday margin calls to thirty-six clearing members totaling $6.9 billion,[205] of which $2.1 billion reflected intraday mark-to-market calls and $4.8 billion was attributed to Excess Capital Premium (ECP) charges assessed under NSCC's rules in response to unusual volatility in certain securities and the heightened risk to the CCP and its members.[206] The episode underscores that NSCC's risk-management regime—including Supplemental Liquidity Deposit calls under Rule 4A and intraday mark-to-market calls under Rule 15—can generate substantial, time-sensitive funding demands during periods of rapid volatility, and that clearing members

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Overall, GME's intraday share price increased by approximately 2,700 percent between its January 8 low and its January 28 high, before plummeting by more than 86 percent from that peak to the closing price at the end of the first week of February. *Id.* at 19.

200. *Id.* at 18.

201. *Id.* at 18–19.

202. *Id.* at 20.

203. *See supra* Part.III.A.

204. *See* Alec Caden, Commentary, *Robinhood Restricts Trading of "Meme" Stocks: Legal or Illegal?*, 2 ARIZ. ST. U. CORP. & BUS. L.J.F. 1, 1 (2020); *When and Why We Restrict Trading*, ROBINHOOD (Mar. 23, 2021), https://robinhood.com/us/en/newsroom/when-and-why-we-restrict-trading; Maggie Fitzgerald, *Robinhood Restricts Trading in GameStop, Other Names Involved in Frenzy*, CNBC (Jan. 28, 2021, at 17:34 ET), https://www.cnbc.com/2021/01/28/robinhood-interactive-brokers-restrict-trading-in-gamestop-s.html.

205. Fin. Stability Oversight Council, 2021 Annual Report 117 (2021).

206. *Id.* Several members incurred ECP charges due to heightened risk-to-capital ratios in their portfolios—a consequence not of their own trading behavior, but of extreme market volatility, particularly in individual equities. In light of these systemic conditions, NSCC exercised its discretion under its internal rules to waive ECP charges for all members on January 28. GAME STOPPED, *supra* note 5, at 101. This temporary relief was lifted on February 2, at which point affected members were again subject to ECP obligations going forward. *Id.* at 103.

bear the burden of maintaining the liquidity and operational readiness to meet them.[207]

By the early hours of January 28, NSCC's margin framework had transformed market turbulence into an immediate liquidity problem for a single, highly exposed member—setting up the four-hour, minute-by-minute sequence that began with NSCC's 5:11 a.m. ET notice to Robinhood and ran to just before the 9:30 a.m. ET open.

B. THE MORNING OF JANUARY 28, 2021: ROBINHOOD AND NSCC'S RISK MANAGEMENT IN ACTION

At approximately 5:11 a.m. ET on January 28, 2021, just hours before the New York Stock Exchange opened for trading, Robinhood Securities, Robinhood's broker-dealer and NSCC clearing member, received NSCC's daily automated notice setting out Robinhood's Required Fund Deposit (RFD) at roughly $3.7 billion.[208] The figure reflected the mechanical output of NSCC's risk model applied to a clearing member that had rapidly accumulated large, unsettled exposures in highly volatile securities. It was not a single charge but several interlocking components of NSCC's margining framework, principally a Value-at-Risk (VaR) charge of approximately $1.4 billion (up from $696 million) and an Excess Capital Premium (ECP) charge of over $2.2 billion.[209] Because Robinhood reportedly had roughly $700 million already on deposit at NSCC, the notice implied a deposit deficit of approximately $3 billion, an amount Robinhood could not meet on the timeline contemplated by NSCC's 5:11 a.m. ET notice.[210] Nonpayment would have risked triggering a default and the consequential steps under NSCC's framework, including NSCC taking control and liquidating Robinhood's portfolio. That outcome was avoided because of actions taken by the two parties between approximately 5:11 a.m. and 9:11 a.m. ET.

Facing these liquidity demands, Robinhood moved to slow the growth of its unsettled exposures.[211] During the early morning hours of January 28, 2021, Robinhood executives and the operations team decided to impose trading

207. Charles Forelle, *Employees Scrambled to Keep Robinhood Afloat in January 2021 Meme Stock Frenzy, House Report Finds*, WALL ST. J. (June 25, 2022, at 17:00 ET), https://www.wsj.com/finance/stocks/employees-scrambled-to-keep-robinhood-afloat-in-january-2021-meme-stock-frenzy-house-report-finds-11656185206 ("Robinhood employees seemed unaware of how their margin requirements would be affected. '[T]he NSCC deposit seems like a black box to me,' Robinhood's head of data science wrote to colleagues. '[W]ho knew about NSCC fees?' the head of market operations wrote in a later message.").

208. GAME STOPPED, *supra* note 5, at 51.

209. *Id.* at 52. Robinhood later estimated that of the $1.4 billion VaR, roughly $850 million was attributable to AMC and $250 million to GME. *Id.*

210. *Id.* at 51–52. Robinhood Markets' COO sent internal messages to the company CFO stating Robinhood had a "huge liquidity issue with NSCC." *Hearing*, *Vlad Tenev*, *supra* note 13, at 9. Robinhood Securities had approximately $696 million already on deposit with NSCC, so the net amount due was approximately $3 billion. GAME STOPPED, *supra* note 5, at 54.

211. GAME STOPPED, *supra* note 5, at 56.

restrictions—the so-called "position close only" restrictions—on certain volatile securities, including GameStop and other meme stocks,[212] and to throttle (i.e., slow the pace of) new account openings.[213] Internally, Robinhood had prepared for a deposit closer to what it viewed as the "core" requirements—approximately $1.4 billion—yet it had not anticipated the magnitude of the ECP component.[214] Meanwhile, Robinhood and NSCC engaged in time-sensitive discussions and negotiations that progressed from confirming and verifying the required deposit,[215] and understanding the basis for its components,[216] to seeking relief from the most burdensome add-ons, particularly the ECP,[217] that threatened a sudden liquidity default.

After several back-and-forth exchanges,[218] sometime between 8:00 a.m. and 8:15 a.m. ET,[219] NSCC signaled that the ECP add-on was under review and then communicated a substantial reduction—more than halving the ECP charge from a multi-billion-dollar figure of $2.2 billion to under $1 billion—without providing a detailed, member-specific rationale.[220] Eventually, Robinhood's

212. *Id.* at 55. Robinhood customers were not allowed to place "buy" orders on GameStop and a set of meme stocks, but they were allowed to sell their shares. *Id.* at 78.

213. *Id.* at 56. Robinhood Markets' COO, Gretchen Howard, sent an email to her team asking, "Can we slow down new account approval? Do we have a playbook for turning off auto approvals?" *Id.* at 56 fig. 33. By the afternoon of January 28, roughly 300,000 customer applications were waiting in the queue to be approved. *Id.* at 57. Robinhood employees debated throughout the day whether to re-enable automatic approvals but ultimately kept them turned off for the remainder of the day to avoid additional operational and risk strain. *Id.* at 57. As one employee put it in an internal chat: "[A]ny additional load takes us to the bottom faster." *Id.* at 57 fig. 34. By the next morning, January 29, 2021, Robinhood estimated the queue of customers awaiting approval was roughly seven hundred and thirty thousand. *Id.* at 58.

214. *Id.* at 52.

215. *Id.* A Robinhood clearing manager reached out to the firm's former head of clearing operations and asked "[h]ypothetically, what happens if a firm can't meet their morning NSCC margin requirement?" *Id.* at 53 fig. 29. The former head of clearing operations said the "[f]irst offense is a fine" and "I would call them so they have a heads up . . . [h]ypothetically they will work with you. Can't say I ever had to make such a call." *Id.* at 53 fig. 29. The January 2021 rules provided this calculation tool in "Procedure XV." *See* NSCC, 2021 RULES, *supra* note 173, at 92–93.

216. GAME STOPPED, *supra* note 5, at 59. Robinhood requested NSCC to verify the size and composition of the collateral demand and to understand how it had been calculated. *Id.* NSCC responded that the firm could have estimated key volatility-related components using a calculator tool available in NSCC's member portal or a methodology guide publicly available to members but also emphasized that any relief from the assessed requirement was constrained by the CCP's rules and oversight framework. *Id.* The market risk manager at DTCC spoke with the Head of Securities Processing of Robinhood on the phone and discussed the way the excess capital premium charge and volatility charge components of the daily clearing fund requirement had been calculated. *Id.*

217. *Id.* at 59–60. Robinhood's Chief Legal Officer contacted DTCC's Deputy General Counsel, characterizing NSCC's clearing fund requirement as "problematic," and requested escalation to DTCC's risk department (the unit responsible for calculation, assessment, and waiver of collateral charges). *Id.* DTCC's Deputy General Counsel cautioned that NSCC's rules constrain extensions or other modifications to clearing fund requirements. *Id.*

218. *Id.* at 61.

219. *Id.*

220. *Id.* at 62. It is important to note that the House Committee Report did not cite any specific NSCC rules that DTCC officials were employing to reduce the excess premium charges for Robinhood. On the contrary, the House Committee Report specifically calls into question whether such a rule or guideline existed in NSCC rules. However, the then-current NSCC Rules—Procedure XV, Sections I.(A)(1)(a)(i)–(iii)—specifically allow for

official ECP charge was reduced from the original $2.2 billion to $876 million.[221] Robinhood continued to press for additional relief, contending that the VaR component captured the core credit exposure,[222] and that the remaining add-on would still present an "operational strain on the firm's liquidity."[223] Robinhood executives urged NSCC to exercise its discretion to reduce further—and if possible waive—the ECP entirely, pointing to the size of the VaR charge and the steps Robinhood had taken to reduce the volatility and size of its unsettled portfolio.[224] At 9:11 a.m. ET, nineteen minutes before the market opened, Robinhood received an updated notice: NSCC waived the ECP entirely and reduced Robinhood's total RFD to approximately $1.4 billion, leaving a remaining deficit of $737 million, which Robinhood wired to NSCC by the 10:00 a.m. ET deadline.[225] The waiver helped avoid a potential clearing member default and the associated risk of market disruption.[226] In parallel with the negotiations with NSCC, Robinhood moved to raise additional capital, viewing new financing as necessary to stabilize its liquidity position and restore more normal customer trading access.[227] By January 30, 2021, Robinhood sought to raise $3.5 billion by issuing convertible notes to participating investors,[228] and from January 28 to February 1, it raised $3.4 billion from its investors.[229]

All of these critical operational decisions and negotiations unfolded in less than four hours. Within that narrow window, the stability of the securities markets was, in a very real sense, negotiated and preserved, and Robinhood and NSCC managed a potentially destabilizing liquidity shortfall without triggering a clearing-member default. NSCC later told the House Financial Services Committee that the spike in market volatility caused a total of six member firms, including Robinhood, to generate ECP charges on January 28, 2021, and that

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NSCC to waive ECP charges "if it believes that the imposition or maintenance of the ECP is not necessary or appropriate." NSCC, 2021 RULES, *supra* note 173, at 342.

221. GAME STOPPED, *supra* note 5, at 62.

222. *Id.* at 61–62. Witnesses gave conflicting testimony on whether Robinhood and its Markets COO, Gretchen Howard, attempted to negotiate a lower value-at-risk charge. *Id.* DTCC refused to lower the charges any further, even after Robinhood personnel explained all the steps the firm had taken to reduce trading and account activation. *Id.*

223. *Id.* at 61.

224. *Id.* at 62. NSCC personnel responded that NSCC's rules and oversight framework did not permit waiver of nondiscretionary charges. *Id.* Robinhood disputed that characterization, arguing that the ECP could be reduced or waived consistent with NSCC's rules. *Id.*

225. *Id.* at 63.

226. *See id.* at 63–64.

227. *Id.* at 58. Robinhood later reported to the House Financial Services Committee that DTCC personnel did not provide the "precise rationale" for the waiver, and the Committee report similarly indicates that Robinhood did not receive an explanation for why NSCC ultimately exercised discretion to grant the relief. *Id.* at 63.

228. *Id.* at 59. It is important to note that Robinhood estimated it would need $2.5 billion to return to normal, unrestricted trading, and the company sought to raise $1 billion additional to this amount as a prudential measure. *Id.*

229. *Robinhood Raises $3.4 Billion to Fuel Record Customer Growth*, ROBINHOOD (Feb. 1, 2021), https://newsroom.aboutrobinhood.com/robinhood-raises-3-4-billion-to-fuel-record-customer-growth.

NSCC waived those charges across the board out of "concerns that applying the charges as assessed could have created systemic risk to the market."[230] The House Report further noted that Robinhood's likely nonpayment of the charges would have constituted a "serious rule violation" according to NSCC's rules,[231] and the Committee's subsequent investigation indicates that Robinhood would have been unable to meet the collateral obligation absent the ECP waiver.[232]

Robinhood maintained trading restrictions on certain meme stocks through February 4, 2021, seeking to manage volatility and collateral pressures driving NSCC's requirements.[233] Notably, however, NSCC neither instructed nor required Robinhood, or any other clearing member, to halt or restrict trading in any specific securities.[234] Robinhood's restrictions were unilateral measures aimed at reducing its own exposure in light of the collateral requirements generated by NSCC's risk-management framework.[235]

The Robinhood–NSCC episode illustrates two broader points about the relationship between a registered clearing agency acting as an SRO and the participants it serves. First, NSCC provides members with tools and disclosures designed to help them estimate and monitor their collateral obligations under its margin framework, including how those obligations may change under stressed conditions. The events of January 28 nevertheless show how difficult it can be to forecast the magnitude and timing of liquidity demands in real time when unsettled positions change rapidly. The episode therefore underscores both the limits of ex ante modeling and the importance of internal systems capable of translating NSCC's disclosures into actionable liquidity plans. Second, NSCC may exercise discretion to reduce or waive certain charges in exigent circumstances, but it exercises that discretion through rules subject to SEC oversight. Such discretion can serve a stabilizing function, preventing liquidity

230. GAME STOPPED, *supra* note 5, at 63–64.

231. *Id.* at 64. NSCC rules state that when a member clearing broker cannot deposit the required collateral, the member is in default to the CCP and NSCC may "cease to act" for that member under its rules. NSCC, 2026 RULES, *supra* note 101, at 65. This means NSCC would assume control of the defaulted member's portfolio and liquidate it. *Id.* at 65–66. The rationale provided for this rule in the House Report is that such an act would limit the risk that the defaulted member poses to NSCC and to other non-defaulting members, who can be subject to mutualized losses if the collateral already held by NSCC is insufficient to cover losses on the defaulter's portfolio. GAME STOPPED, *supra* note 5, at 64. This language is also included in the February 2021 rules and the January 2023 rules. NSCC, 2021 RULES, *supra* note 173; NAT'L SEC. CLEARING CORP., RULES & PROCEDURES (Jan. 2023) (on file with the author). Robinhood Financial's President and COO, David Dusseault, expressed doubt in filings submitted to the House Committee that DTCC would shut down Robinhood as a result of its collateral obligations. Specifically, David Dusseault stated in an email exchange that "we [Robinhood] are [too] big for them to actually shut us down." *Id.* at 65 fig. 36.

232. GAME STOPPED, *supra* note 5, at 64, 69.

233. *Id.* at 73. Implementing such restrictions allowed Robinhood to avoid total position close only (PCO) restrictions on its customers. *Id*. These restrictions were placed on the top fifty symbols that the broker assessed were driving its heightened value-at-risk charge, permitting purchase of only one equity share per customer in aggregate for thirty-five symbols, and a maximum of five for the rest. *Id.* at 73. By February 4, 2021, Robinhood removed limits on GME and AMC, fully allowing customers to purchase these stocks again. *Id.*

234. *See id.* at 30–32.

235. *See id.* at 32.

demands from becoming destabilizing fire sale dynamics; it can also shape members' expectations about the treatment of acute stress. As Robinhood Financial's President and COO, David Dusseault, wrote in an internal exchange, "We [Robinhood] are [too] big for them to actually shut us down."[236]

C. CONGRESSIONAL AND SEC RESPONSES: HEARINGS, REPORTS, AND THE SETTLEMENT CYCLE REFORM

Following the meme stock episode of January 2021, policymakers turned sustained attention to the functioning and potential reform of the U.S. post-trade clearing and settlement infrastructure.[237] The House Financial Services Committee convened hearings,[238] beginning with its February 18, 2021, hearing titled "Game Stopped? Who Wins and Loses When Short Sellers, Social Media, and Retail Investors Collide," to understand what happened and the sources and consequences of market disruption, and later in October 2022, released a detailed report prepared by majority staff of the committee examining the episode's institutional dynamics and the points at which retail trading activity intersected with clearing and settlement constraints.[239] In parallel, in October 2021, the SEC published its Staff Report on Equity and Options Market Structure Conditions in early 2021, using the meme stock episode as a lens through which to assess broader market-structure and post-trade questions. Taken together, these investigations helped define the Robinhood–NSCC episode of January 2021 as a "plumbing" event: a stress episode in which volatility and settlement latency translated into time-sensitive collateral and liquidity demands on intermediaries, with downstream implications for trading access and market continuity.[240]

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236. *Id.* at 65 fig. 36.

237. *Id.* at 4; SEC STAFF REPORT, *supra* note 5, at 3.

238. *See Game Stopped? Who Wins and Loses When Short Sellers, Social Media, and Retail Investors Collide: Virtual Hearing Before the H. Comm. on Fin. Servs.*, 117th Cong. (Feb. 18, 2021); *Game Stopped? Who Wins and Loses When Short Sellers, Social Media, and Retail Investors Collide, Part II: Virtual Hearing Before the H. Comm. on Fin. Servs.*, 117th Cong. (Mar. 17, 2021); *Game Stopped? Who Wins and Loses When Short Sellers, Social Media, and Retail Investors Collide, Part III: Virtual Hearing Before the H. Comm. on Fin. Servs.*, 117th Cong. (May 6, 2021).

239. GAME STOPPED, *supra* note 5, at 1. The House Committee report was not officially adopted by the Committee on Financial Services. This report was more programmatic, explicitly endorsing the move to T+1 (alongside complementary "straight-through processing" modernization), while also recommending enhanced oversight of retail-facing intermediaries, closer scrutiny of broker-dealer revenue models and payment for order flow, stronger capital and liquidity expectations for retail broker-dealers, and related measures aimed at improving transparency and resilience in a market structure increasingly shaped by technology-driven retail participation. *See id.* at 108–17.

240. SEC STAFF REPORT, *supra* note 5, at 3. The SEC Staff Report highlighted several priority areas for further consideration: the drivers of broker-dealer trading restrictions and the transmission of stress through CCP margin calls (with settlement cycle shortening as a possible mitigation); the interaction between digital engagement practices and payment for order flow; the implications of retail order flow being executed off-exchange through wholesalers and dark pools; and the need for improved short-selling transparency to better monitor short-interest dynamics. *Id.* at 43–44.

Two major policy impulses emerged. The first, advanced by DTCC and many incumbent intermediaries, favored incremental modernization that would reduce settlement cycle exposure while preserving the core clearing architecture—an approach that culminated in the SEC's adoption and the industry implementation of T+1.[241] On this view, January 2021 showed how settlement latency, when combined with concentrated volatility, can amplify counterparty risk and rapidly translate into time-sensitive collateral and liquidity demands. The second impulse, advanced by some financial technology firms and blockchain proponents, treated the episode as support for more fundamental redesign of the settlement architecture, including near real-time settlement and alternative ledger structures.[242] The incremental approach prevailed in the near term because T+1 could reduce counterparty risk and improve efficiency and operational resilience of the market plumbing while preserving the institutional architecture of clearance and settlement.[243] This is the path the SEC ultimately adopted and the industry implemented, as discussed in greater detail in the next Subpart.

The congressional record also surfaced governance and operational issues beyond settlement cycle length. In the face of the strong influence of financial intermediaries, financial technology firms supported T+1 as an achievable near-term reform while continuing to advocate more fundamental redesign. The House Committee, for example, highlighted evidence that internal forecasting and understanding of NSCC-generated collateral requirements—particularly during rapid volatility—was uneven even at major retail intermediaries.[244] These public-sector inquiries therefore framed the episode not merely as a trading frenzy but as a stress test of the institutional mechanisms that convert volatility into collateral and liquidity demands.

The two reports offer a detailed account of how market volatility, in a system with settlement latency, is translated into CCP risk-management responses (i.e., liquidity and collateral demands), and how those demands can, in turn, become a market-access constraint at the broker-dealer level. They also illuminate the political economy of financial markets modernization. In this episode, incumbents and regulators generally favored incremental reform within the existing regulatory architecture and market structure, while newer entrants were more inclined to press for an architectural redesign of the system. Finally, the reports differ in posture. The SEC Staff Report is largely diagnostic; it does not offer policy solutions to the events of January 2021, but identifies areas for further research, emphasizing that January 2021 exposed multiple pressure points in the trading, clearing, and settlement pipeline, and that settlement cycle reform is only one component of a broader market-structure conversation. The

241. *See* ACCELERATING THE U.S. SECURITIES SETTLEMENT CYCLE, *supra* note 21, at 8–9.

242. *See* Bronson, *supra* note 23.

243. *See infra* Part.IV.

244. *See* Forelle, *supra* note 207; GAME STOPPED, *supra* note 5, at 51–52.

House Financial Services Committee's report is more policy-forward and pragmatic: it endorses the move to T+1, while emphasizing that settlement cycle compression should be complemented by process modernization.[245]

D. NSCC'S RULEMAKING RESPONSE UNDER SEC OVERSIGHT: LIQUIDITY AND MARGIN REVISIONS

In the wake of January 2021, NSCC pursued several Rulebook amendments in its SRO capacity and through the Exchange Act's Section 19(b) filing process. The amendments recalibrated the timing, methodology, and governance of the liquidity and margin tools that featured prominently in Robinhood's stress.[246]

In May and June 2021, NSCC replaced its periodic Supplemental Liquidity Deposit (SLD) with a daily start-of-the-day framework and expanded its authority to make intraday SLD calls during Options Expirations Activity Periods.[247] The SLD is a temporary, event-driven liquidity contribution aimed at addressing liquidity risk that NSCC can call from certain members (known as "SLD Providers") when it forecasts that a given day's settlement activity will require more cash-on-hand than its ordinary liquid resources cover.[248] Before its overhaul in mid-2021, SLDs were calculated and collected around predictable settlement stress points, like quarterly options expiration dates, when NSCC expected unusually large net settlement obligations.[249] Members usually knew well in advance that an SLD period was coming, and funds could be locked up for a longer stretch—sometimes several days—before being returned.[250] The rules allowed ad hoc calls for liquidity, but there was no standing intraday monitoring and same-day adjustment process like the one created in 2021.[251] Also, only designated SLD Providers—members with the largest projected liquidity exposure—had to post, and the calculations were based on historical data rather than real-time exposure.[252] As a result, the old SLD regime was built for foreseeable large liquidity needs rather than fast-moving, one-off volatility events.

January 2021 highlighted that liquidity needs can spike outside predictable stress windows and that liquidity tools calibrated primarily to scheduled events

245. GAME STOPPED, *supra* note 5, at 108–10. Beyond settlement, the House Committee report advances a set of recommendations aimed at the governance and resilience of retail-facing intermediaries and the transparency of key market practices. *See id.* at 108–17.

246. *Notice of Filing of Proposed Rule Change to Increase the National Securities Clearing Corporation's Minimum Required Fund Deposit*, Exchange Act Release No. 34-91809, at 9–10 (May 10, 2021); *Notice of Filing of Proposed Rule Change to Amend the Supplemental Liquidity Deposit Requirements*, Exchange Act Release No. 34-91350, at 1–2 (Mar. 18, 2021).

247. NSCC, 2026 RULES, *supra* note 101, at 92.

248. *Supplemental Liquidity Deposit Requirements*, *supra* note 246, at 6–9.

249. *Id.*

250. *Id.*

251. *Id.*

252. *Id.*

may be less well-suited to volatility-driven shocks. The episode therefore sharpened attention to NSCC's liquidity-risk governance—specifically, how quickly NSCC may need to mobilize additional liquidity resources to ensure timely settlement under acute market stress—alongside the margin-driven Required Fund Deposit dynamics that proved consequential for Robinhood, as described in the prior Subparts.

NSCC amended the SLD rules to make it daily (with 8:30 a.m. notifications and 9:30 a.m. ET funding)[253] and intraday,[254] to return funds the next business day outside narrow exceptions,[255] and to allow pro rata allocation of outsized obligations.[256] The pro rata allocation method can now occur on days when multiple SLD providers each owe more than $2 billion, meaning NSCC can spread the largest daily liquidity need across all providers and thereby temper member-specific default risk spikes.[257] Also, by committing to return unused SLDs the next business day (rather than holding them, sometimes for multiple days), NSCC provided its members with greater predictability about when their cash would be released. In summary, the SLD rules were amended to be faster, more flexible, and less prone to sudden, large shocks to individual members.[258]

In 2022, NSCC proposed refinements to Procedure XV that, taken together, strengthened its credit risk margining toolbox—the set of interrelated charges that make up each member's Required Fund Deposit. Under Procedure XV, the largest component of that deposit is the Value-at-Risk (VaR) Charge, an estimate of the potential loss on a member's unsettled portfolio over a specified risk horizon, calculated at a 99 percent confidence level.[259] VaR works in tandem with other add-ons, such as the Gap Risk Measure for concentrated positions and the Excess Capital Premium (ECP) for members with low excess capital relative to their margin requirement, to ensure coverage of idiosyncratic and structural risks.[260]

Before the Intraday Volatility Charge (IVC) was implemented, NSCC calculated and collected each member's volatility charge at the start of the day based on the member's prior end-of-day net unsettled positions. NSCC nevertheless monitored volatility intraday and could collect other intraday amounts, including an Intraday Mark-to-Market Charge and an Intraday

253. *Id.* at 11–13.

254. *Id.* at 15–17.

255. *Id.* at 17–19.

256. *Id.* at 13–15.

257. *Id.*

258. In June 2026, NSCC proposed a further overhaul that would extend standardized intraday SLD calculations beyond Options Expiration Activity Periods, refine its liquidity-projection and netting methodologies, eliminate the $2 billion threshold for pro rata allocations, and generally apply a standardized pro rata method to both start-of-day and intraday SLD obligations. As of July 29, 2026, the proposal remained pending before the Commission. *See Notice of Filing of Proposed Rule Change to Enhance the Supplemental Liquidity Deposit Rules, Methodology and Processes*, Exchange Act Release No. 34-105817 (June 30, 2026).

259. *See* NSCC, 2026 RULES, *supra* note 101, at 340–60.

260. *Id.*

Backtesting Charge. It did not, however, have a dedicated mechanism for collecting an increase in the volatility charge caused by material changes in a member's intraday positions. On July 7, 2022, NSCC proposed the IVC—which the SEC approved in March 2023—as an intraday addition to the Required Fund Deposit that permits NSCC to collect additional margin when material changes in the size or composition of a member's intraday net unsettled positions cause the recalculated volatility charge to increase materially.[261] The IVC generally may be collected when the intraday calculation of a member's volatility charge exceeds its start-of-day volatility charge by more than 100 percent and the resulting charge is greater than $250,000. NSCC may lower the percentage threshold, and the charge is reduced by the portion of the Margin Requirement Differential Charge representing the volatility component collected at the start of that business day.[262] In connection with the adoption of the IVC, NSCC eliminated the prior Intraday Backtesting Charge; the two measures, however, addressed different risks: the former charge was based on historical backtesting deficiencies, whereas the IVC measures significant intraday increases in the volatility charge attributable to changes in a member's net unsettled positions.[263]

In parallel, NSCC changed how the Gap Risk Measure operates within the VaR Charge under Procedure XV. The Gap Risk Measure is a portfolio-level margin component designed to capture the risk of extreme, idiosyncratic price moves (or "gaps") that may occur over a short period in a single security or closely related group of securities held in a concentrated position.[264] Before the rule change, NSCC's methodology treated the Gap Risk Measure component as a potential alternative in calculating the VaR Charge for a member's largest non-diversified position. In certain circumstances, the Gap Risk Measure could therefore replace, rather than supplement, the other calculations underlying the VaR Charge.[265] The 2022 proposal made the Gap Risk Measure an additive component of the VaR Charge for relevant portfolios, allowing the charge to reflect both portfolio-level market risk and the idiosyncratic concentration risk associated with abrupt gap moves.[266] The amendments also expanded the trigger and calculation to the member's two largest non-diversified positions; lowered the rule-based haircut floor for the largest position from 10 percent to 5 percent; established a 2.5 percent floor for the second-largest position; and provided that NSCC would initially apply haircuts of 10 percent and 5 percent, respectively, together with a 10 percent concentration threshold, subject to periodic review

261. *Order Approving Proposed Rule Change to Adopt Intraday Volatility Charge and Eliminate Intraday Backtesting Charge*, Exchange Act Release No. 34-97129, 88 Fed. Reg. 16,681 (Mar. 20, 2023).

262. *Id.*

263. *Id.* at 4–6.

264. *Order Approving a Proposed Rule Change to Make Certain Enhancements to the Gap Risk Measure and the VaR Charge*, Exchange Act Release No. 34-98086, at 6–10 (Aug. 8, 2023).

265. *Id.*

266. *Id.* at 10–21.

and recalibration.[267] By making the Gap Risk Measure additive and broadening its scope, NSCC enhanced the VaR Charge's coverage of potential losses from abrupt, outsized price moves in concentrated portfolios.

Finally, the Excess Capital Ratio used to calculate the ECP (still within the Procedure XV framework) was capped to limit potentially burdensome charges during periods of sudden market volatility. The ECP is an add-on that generally applies when a member's Volatility Charge exceeds its applicable capital measure—Net Capital for broker-dealers and Equity Capital for other members—signaling heightened default risk to NSCC.[268] Under the prior methodology, which applied during the Robinhood episode, NSCC instead compared a defined Calculated Amount—a portion of the member's Required Fund Deposit, adjusted by specified exclusions and additions—to the member's applicable capital measure. The Excess Capital Ratio was uncapped and could result in large, sometimes volatile ECP amounts, including the approximately $2.2 billion ECP initially calculated for Robinhood.[269] The amendments proposed in 2022 and approved in 2023 replaced the Calculated Amount with the Volatility Charge and capped the Excess Capital Ratio at 2.0, meaning that once a member's Volatility Charge equals twice its applicable capital measure, no further proportional increase in the ratio is factored into the ECP calculation.[270] This limits extreme outlier ECP amounts that could otherwise result from temporary spikes in the Volatility Charge or declines in reported capital.[271] Without the cap, a short-term market swing could produce an abrupt, outsized ECP obligation poorly calibrated to NSCC's actual credit exposure during a transitory shock. The ECP rule now also explicitly defines the applicable capital inputs. For broker-dealer members, NSCC uses the Net Capital amount reported in the member's most recent Financial and Operational Combined Uniform Single (FOCUS) Report; for other members, NSCC uses the Equity Capital amount reported in the member's most recent Call Report or, where applicable, its most recent financial statements or equivalent reporting.[272] The prior approach used excess net capital for broker-dealers and different capital measures drawn from NSCC's membership standards for other members, which could lead to less consistent ECP outcomes across member types.[273] Standardizing the definitions is intended to improve comparability across member types and make the ECP calculation more consistent and predictable.[274]

267. *Id.*

268. *Notice of Filing of Partial Amendment No. 2 and Amendment No. 3 and of Designation of Longer Period for Commission Action on Proceedings to Determine Whether to Approve or Disapprove a Proposed Rule Change to Revise the Excess Capital Premium Charge Order*, Exchange Act Release No. 34-96426, at 7–8 (Dec. 1, 2022).

269. *Id.* at 6–11.

270. *Id.* at 16.

271. *Id.*

272. *See* NSCC, 2026 RULES, *supra* note 101, at 22–23, 358–59.

273. *Id.*

274. *Id.*

The amendments also clarified and formalized NSCC's authority to waive the ECP in certain situations, including exigent circumstances such as extreme market conditions or unexpected changes in market volatility, trading volumes, or similar factors.[275] A waiver may be granted when, after reviewing the relevant facts—including the relationship of the member's capital position and trading activity to the exigent circumstances—NSCC determines that it can effectively address the member's risk exposure without collecting the ECP.[276] Before the amendments, the rules granted NSCC broad discretion to waive or reduce the ECP but did not specify the circumstances, information, or approval process governing that determination, creating uncertainty for members.[277] By formalizing the waiver criteria and process, NSCC increased transparency and predictability while retaining the flexibility to avoid collecting the ECP when it is unnecessary or inappropriate.[278]

Another post-2021 amendment theme was market access expansion paired with strict collateral discipline. NSCC updated its Sponsoring/Sponsored Member categories so that smaller or specialized institutions could clear through large Sponsoring Members, who remain responsible for their margin and clearing fund obligations.[279]

In 2022, NSCC launched its Securities Financing Transactions (SFT) service, a centrally cleared platform for equity financing transactions.[280] The service is designed to bring the benefits of central clearing—netting, standardization, and risk mutualization—to a segment of the market that historically operated bilaterally or through non-clearing intermediaries.[281] To manage credit and liquidity risks, participants must post an "Independent Amount SFT Cash," which functions as an upfront margin separate from the standard VaR and add-on components under Procedure XV.[282] This ensures that NSCC has a dedicated liquidity buffer for SFT activity, reflecting the potential funding obligations associated with returning borrowed securities or unwinding financing trades under stress.[283] In addition to the Independent Amount SFT Cash, participants engaging in SFT activity must also contribute to the Clearing Fund in proportion to their SFT-related exposures.[284] The SFT service is fully integrated into NSCC's margining and membership risk frameworks.[285] Trades

275. *Id.* at 16–22.
276. *Id.*
277. *Id.*
278. *Id.*
279. NSCC, 2026 RULES, *supra* note 101, at 61.
280. *Notice of Filing of Proposed Rule Change to Establish the Securities Financing Transaction Clearing Service and Make Other Changes*, Exchange Act Release No. 34-94694, 87 Fed. Reg. 23,372, 23,372 (Apr. 12, 2022).
281. *Id.* at 23,372–73.
282. *Id.* at 23,375.
283. *Id.*
284. *Id.* at 23,399.
285. *Id.* at 23,392.

are subject to the same daily mark-to-market and margining discipline applied to other NSCC activity, and Sponsoring Members clearing SFTs for Sponsored Members are accountable for meeting all related margin and clearing fund calls.[286] This pairing of market access expansion with conservative liquidity and credit safeguards mirrors the broader post-2021 trend in NSCC rulemaking: widening participation in centrally cleared markets while building in resource protections that can withstand stress scenarios.

Read together, these amendments reflect an institutional effort to recalibrate NSCC's toolkit along two margins that the January 2021 episode put in tension: risk sensitivity and operational predictability. NSCC moved toward faster, more responsive tools—daily and intraday liquidity resources and intraday margin add-ons—while also seeking to bound outliers and formalize discretion to reduce destabilizing "cliff" effects during stress. In governance terms, the post-2021 trajectory is toward a more responsive Rulebook paired with clearer standards and more transparent mechanisms for exigent intervention.

The next Part shifts from NSCC's internal rulemaking response to the SEC's external rulemaking on settlement cycle policy. It traces the historical evolution of the U.S. securities settlement cycle and culminates in the Commission's decision to shorten the settlement cycle from T+2 to T+1.

IV. THE REGULATION OF TIME IN SETTLEMENT CYCLES: FROM PAPERWORK TO AUTOMATION

Although often overlooked by academics and commentators, the clearing and settlement process remains the linchpin of the modern financial system. Its failure can pose "the greatest threat to the stability of the financial system as a whole," as E. Gerald Corrigan, former President of the Federal Reserve Bank of New York, warned in the immediate aftermath of the 1987 "Black Monday" crash, when the financial system's post-trade plumbing nearly ground to a halt.[287] This Part traces the regulatory evolution of the U.S. clearing and settlement infrastructure, focusing in particular on the shortening of the securities settlement cycle over the past fifty years.[288] The history of settlement cycles in U.S. securities markets reveals that settlement timing has never been static, but rather has evolved in response to operational capacity and market structure. A persistent theme emerges: Structural reforms to post-trade infrastructure have been largely reactive, typically implemented in response to moments of crisis that expose fragilities in the system.

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286. *Id.*

287. E. Gerald Corrigan, *Perspectives on Payment System Risk Reduction*, *in* THE U.S. PAYMENT SYSTEM: EFFICIENCY, RISK AND THE ROLE OF THE FEDERAL RESERVE 129–30 (David B. Humphrey ed., 1990).

288. *See* Geis, *supra* note 28, at 561–91 (providing an insightful analysis of the history, policy, and politics of stock settlement regulation). *See generally* LOUIS LOSS, JOEL SELIGMAN & TROY A. PAREDES, SECURITIES REGULATION, chs. 7–8 (2025).

The paperwork crisis of the late 1960s prompted Congress to pass the Securities Acts Amendments of 1975, which authorized federal regulation of the time and method by which broker-dealers settle securities transactions. Section 17A of the Exchange Act directed the SEC to "facilitate the establishment of a national system for the prompt and accurate clearance and settlement of transactions in securities."[289] Markets continued to settle on a T+5 basis until 1993.[290] Following the 1987 stock market crash and the influential Brady Report,[291] the SEC shortened the settlement cycle from T+5 to T+3 in an effort to mitigate settlement risk.[292] Although financial market infrastructures withstood the 2007–2008 global financial crisis, Congress nevertheless acted to enhance their stability by introducing an enhanced prudential and supervisory framework for systemically important financial market utilities under Title VIII of the Dodd-Frank Act.[293] In 2017, the Commission again shortened the settlement cycle, from T+3 to T+2, to align with major foreign jurisdictions and improve market efficiency.[294] Most recently, the SEC adopted another structural reform—just five years after the previous one—moving to a T+1 settlement cycle.[295] This most recent change reflects regulators' growing recognition that in an environment of rapid retail digital trading and heightened market volatility, reducing the latency between trade execution and final settlement is critical to mitigating both counterparty and liquidity risk.

A. THE PAPERWORK CRISIS AND THE SECURITIES ACTS AMENDMENTS OF 1975

In the 1920s, many U.S. stock markets settled on a T+1 basis. The New York Stock Exchange, for instance, originally settled trades on T+1. But as trading volumes grew—and the operational machinery of clearance and settlement struggled to keep pace—the cycle gradually lengthened, eventually hardening into T+5. The American Stock Exchange moved from T+2 to T+3 in 1953, then to T+4 in 1962, and to T+5 in 1968; the NYSE followed a similar path, drifting from T+1 in the 1920s to T+5 by the late 1960s.[296] Settlement timing had been governed primarily through self-regulatory organization rules and industry practice, with "regular way" settlement occurring on a T+5 basis—five business days after trade execution.[297] That lengthening was not benign. By

289. 15 U.S.C. § 78q-1(a)(2)(A)(i).

290. *See infra* Subpart.IV.A.

291. REPORT OF THE PRESIDENTIAL TASK FORCE ON MARKET MECHANISMS (1988) [hereinafter BRADY REPORT].

292. *See infra* Subpart.IV.A.

293. *See supra* note 131.

294. *See infra* Subpart.IV.B.

295. *See infra* Subpart.IV.C.

296. *See* Nat'l Ass'n of Sec. Dealers, *SEC Adopts Rule 15c6-1; Establishes Three-Business-Day Settlement for Securities Transactions*, Notice to Members 93-77 (Nov. 1, 1993) [hereinafter *SEC Establishes Three-Business-Day Settlement*], https://www.finra.org/rules-guidance/notices/93-77.

297. *Id.*

the late 1960s and early 1970s, surging volumes overwhelmed the paper-based post-trade system, triggering the Paperwork Crisis.

The paperwork crisis—or the "Paper Crunch" as the SEC calls it—[298] was the turning point in the regulation of clearing and settlement in the United States.[299] Between 1967 and 1970, Wall Street faced one of the most severe operational crises in financial history. "Brokerage firms [found] themselves in the paradox of being forced out of business by having too much business."[300] The back office of the New York Stock Exchange (NYSE) and of the National Association of Securities Dealers (NASD) could not process all submitted securities transactions in an orderly manner.[301] The stress on the clearing and settlement process was so severe that the stock exchanges and NASD first shortened trading hours; the NYSE ultimately closed on Wednesdays.[302] In 1971, the SEC published its study on the causes of the Paperwork Crisis,[303] and a critical causal factor was the system for clearing and settlement—which the report described as "archaic."[304] The SEC concluded its report by asking Congress for more authority to redesign the regulatory and supervisory framework for self-regulatory organizations.[305]

In 1972, the Senate Subcommittee on Securities issued a landmark report on the Paperwork Crisis,[306] identifying two interrelated root causes of the breakdown in the securities clearance and settlement process, both ultimately traceable to the failure of the stock exchanges' self-regulatory authority:[307] "First, the industry had failed to develop a nationwide system for the clearance and settlement of securities transactions. Second, there existed a lack of uniformity and coordination among the various methods and systems of clearing

298. SEC, STUDY OF UNSAFE AND UNSOUND PRACTICES, *supra* note 17.

299. Regarding the back-office crisis, see generally *id.*; SELIGMAN, *supra* note 16, at 450–66; STAFF OF H. COMM. ON INTERSTATE & FOREIGN COM., 92D CONG., REVIEW OF SEC RECORDS OF THE DEMISE OF SELECTED BROKER-DEALERS (Comm. Print 1971); *Securities Industry Study, Report of Subcomm. on Commerce & Fin.*, House Comm. on Interstate & Foreign Commerce, H.R. Rep. No. 92-1519, 92d Cong., 2d Sess. chs. 2, 5–7 (1972), https://www.govinfo.gov/app/details/CHRG-92hhrg67228p2; HURD BARUCH, WALL STREET: SECURITY RISK (1971); U.S. GEN. ACCT. OFF., GAO-86-26, SECURITIES AND FUTURES: HOW THE MARKETS DEVELOPED AND HOW THEY ARE REGULATED (1986); DIV. OF MKT. REG., U.S. SEC. & EXCH. COMM'N, THE OCTOBER 1987 MARKET BREAK (1988); CHRIS WELLES, THE LAST DAYS OF THE CLUB (1975); Egon Guttman, *Transfer of Securities: State and Federal Interaction*, 12 CARDOZO L. REV. 437 (1990); Charles W. Mooney Jr., *Property, Credit, and Regulation Meet Information Technology: Clearance and Settlement in the Securities Markets*, 55 L. & CONTEMP. PROBS. 131 (1992); Neal L. Wolkoff & Jason B. Werner, *The History of Regulation of Clearing in the Securities and Futures Markets, and Its Impact on Competition*, 30 REV. BANKING & FIN. L. 313 (2010).

300. *Securities Markets Agencies: Hearings Before Subcomm. on Com. & Fin., H. Comm. on Interstate & Foreign Com.*, 91st Cong. 8 (1969) [hereinafter *Securities Markets Agencies*].

301. *See* SELIGMAN, *supra* note 16, at 450–66.

302. SEC, STUDY OF UNSAFE AND UNSOUND PRACTICES, *supra* note 17.

303. For a discussion of the conduct of broker-dealers, see generally SELIGMAN, *supra* note 16, at 455–66.

304. SEC, STUDY OF UNSAFE AND UNSOUND PRACTICES, *supra* note 17, at 35–36.

305. Geis, *supra* note 28, at 581–82.

306. *Id.* at 582–83.

307. *Securities Markets Agencies*, *supra* note 300, at 49.

and settlement."[308] The Subcommittee further found an alarming lack of supervision, coordination, and central decision-making, which had delayed the implementation of technological innovations that might have prevented the processing breakdown.[309]

The Securities Acts Amendments of 1975 directly tackled these shortcomings in the clearing and settlement of securities transactions. Section 17A of the Exchange Act[310] granted the SEC extensive authority to "facilitate the establishment of a national system for the prompt and accurate clearance and settlement of transactions in securities."[311] The new legislative framework introduced the definition of a clearing agency,[312] required clearing agencies to register with the SEC,[313] meet heightened financial standards, and possess the organization and capacity to support efficient and resilient "clearance and settlement" of securities transactions.[314] Section 19 established clearing agencies as self-regulatory organizations and granted the SEC oversight responsibility over them, conferring the authority to review and approve most clearing agency rules.[315]

In the wake of the 1975 Amendments, the central task was to build the institutional machinery that could make a national clearance and settlement system workable at scale. The industry responded by consolidating what had

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308. *Processing of Tender Offers Within the National Clearance and Settlement System*, Exchange Act Release No. 34-19678, 48 Fed. Reg. 17,603, 17,605 n. 9 (Apr. 25, 1983).

309. *Id.*

310. "The Congress finds that:

> (A) The prompt and accurate clearance and settlement of securities transactions, including the transfer of record ownership and the safeguarding of securities and funds related thereto, are necessary for the protection of investors and persons facilitating transactions by and acting on behalf of investors.
>
> (B) Inefficient procedures for clearance and settlement impose unnecessary costs on investors and persons facilitating transactions by and acting on behalf of investors.
>
> (C) New data processing and communications techniques create the opportunity for more efficient, effective, and safe procedures for clearance and settlement.
>
> (D) The linking of all clearance and settlement facilities and the development of uniform standards and procedures for clearance and settlement will reduce unnecessary costs and increase the protection of investors and persons facilitating transactions by and acting on behalf of investors."

Securities Acts Amendments of 1975, Pub. L. No. 94–29, § 17A(a)(1), 89 Stat. 97, 141 (1975) (codified as amended at 15 U.S.C. § 78q-1(a)(1)).

311. *See* Securities Acts Amendments of 1975, Pub. L. No. 94–29, § 17A(a)(2), 89 Stat. 97, 112 (codified as amended at 15 U.S.C. § 78q-1(a)(2)(A)(i)). In 1990, Congress further ordered the SEC "to facilitate the establishment of linked or coordinated facilities for clearance and settlement of transactions in securities." Market Reform Act of 1990, Pub. L. No. 101-432, § 17A(a)(2), 104 Stat. 963, 973 (codified as amended at 15 U.S.C. § 78q-1(a)(2)(A)(ii)).

312. 15 U.S.C. § 78c(a)(23)(A).

313. 15 U.S.C. §§ 78q-1(b)(1)–(2).

314. See 15 U.S.C. § 78q-1(b)(3)(A), (C). Subsection (A) requires a clearing agency to be organized and have the capacity to facilitate prompt and accurate clearance and settlement, safeguard securities and funds, comply with applicable law, and enforce its rules. Subsection (C) requires fair representation of shareholders or members and participants in director selection and administration.

315. 15 U.S.C. § 78s.

been a patchwork of regional clearinghouses. NSCC was established in 1976 as the clearinghouse for most U.S. securities.[316] Together with DTC, these institutions operationalized the vision of Section 17A: a unified, centralized infrastructure for prompt and accurate clearance and settlement.

The 1975 Amendments directed the SEC to facilitate a national system for the "prompt and accurate clearance and settlement" of securities transactions but did not mandate any specific timing for the settlement cycle of securities transactions. Nor did the SEC adopt any regulation on settlement cycles until 1993.[317] Clearing agencies, within their self-regulatory authority, set the regular-way settlement for securities transactions on the fifth business day after the trade date, T+5.[318]

Despite the SEC's new statutory authority, T+5 nevertheless persisted for nearly two decades. The Commission did not exercise its authority to mandate a set (and shorter) settlement cycle until 1993. That delay was not simply regulatory drift. In the immediate post-1975 period, the Commission's priority was to build the institutional infrastructure the Amendments contemplated: centralized clearing and depository arrangements, the migration from paper certificates to book-entry settlement, and the operational backbone of a national clearance and settlement system. Shortening the cycle would have required a second, costly round of industry-wide coordination on top of that foundational build—and, absent a fresh crisis, there was little urgency to force it. It ultimately took the 1987 market break—and the Brady Report's subsequent emphasis on the systemic consequences of unsettled exposures—to supply the catalyst for the Commission's first exercise of its settlement cycle authority.

B. BLACK MONDAY, THE BRADY REPORT, THE REPORT OF THE BACHMANN TASK FORCE, AND THE MOVE TO T+3

Clearing and settlement returned to the regulatory agenda after the stock market crashed on Monday, October 19, 1987—an event known as "Black Monday."[319] On Black Monday, the Dow Jones Industrial Average dropped 22.6 percent in a single trading session and nearly 35 percent over the course of a month. A record volume of 604.33 million shares traded hands that day, three times the daily average. Extraordinary price moves and record trading volume

316. *See supra* Subpart.II.B.1; *see also* Awrey & Macey, *supra* note 9, at 129.

317. *See infra* Subpart.IV.B.

318. *See SEC Establishes Three-Business-Day Settlement*, *supra* note 296.

319. *See* Bernanke, *supra* note 80, at 133–35; BRADY REPORT, *supra* note 291, at v. For alternative diagnoses of the market crash focused more on international causes, see, e.g., David D. Haddock, *An Economic Analysis of the Brady Report: Public Interest, Special Interest, or Rent Extraction?*, 74 CORN. L. REV. 841, 841 (1989); SELIGMAN, *supra* note 16, at 591–94.

strained the operational capacity of broker-dealers, exchanges, and post-trade utilities.[320]

In response, the President convened a working group to investigate the causes of the crash and to propose reforms to foster efficiency and strengthen the resilience of the markets. The resulting Brady Report included several important structural proposals for post-trade markets.[321] One of them was the consolidation of clearing systems across marketplaces to reduce financial risk.[322] The SEC Division of Market Regulation, now called the Division of Trading and Markets, published its own report on the events of October 1987, a month after the Brady Report was published.[323] The report expressly mentioned the desirability of shortening the then existing T+5 settlement cycle. Both the Brady Report and the contemporaneous SEC Report treated clearance and settlement as part of the market's systemic architecture and identified the settlement cycle as a key variable shaping exposure during stress. Although policymakers acknowledged the desirability of shortening the then-prevailing T+5 standard, the Commission did not implement cycle compression until the early 1990s.

That reform effort crystallized when SEC Chairman Richard Breeden convened the Bachmann Task Force on Clearance and Settlement Reform in 1991; the Task Force delivered its blueprint for improving the safety and soundness of the post-trade system in May 1992.[324] Among its principal recommendations was the shortening of the settlement cycle to T+3 expressly justified "in the interest of reducing settlement exposure and increasing the safety and soundness of the securities clearing and settlement system." The Task Force concluded that the transition was both feasible and desirable and urged implementation on an expedited timetable,[325] calling for the adoption of T+3 settlement by mid-1994.[326] This recommendation reflected growing consensus that extended settlement windows exacerbated systemic risk, exposed counterparties to credit and liquidity pressures, and hindered efficiency in securities markets.[327]

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320. *Global Financial Markets Crash on Black Monday*, GOLDMAN SACHS, https://www.goldmansachs.com/our-firm/history/moments/1987-black-monday (last visited Apr. 8, 2026); BRADY REPORT, *supra* note 291, at 64.

321. BRADY REPORT, *supra* note 291, at 64.

322. *Id.*

323. THE OCTOBER 1987 MARKET BREAK, *supra* note 299, at 1.

324. The Bachmann Task Force, chaired by John Bachmann, presented its findings to the Commission in May 1992. The Task Force concluded that "time equals risk" and that the safety and soundness of the U.S. securities markets would be substantially improved by shortening the settlement cycle for corporate securities to T+3 by mid-1994. BACHMANN TASK FORCE, REPORT OF THE BACHMANN TASK FORCE ON CLEARANCE AND SETTLEMENT IN THE U.S. SECURITIES MARKETS 1 (1992) [hereinafter BACHMANN REPORT]; *see also Securities Transactions Settlement,* Exchange Act Release No. 34-31904, 58 Fed. Reg. 11,806, 11,807 (Mar. 1, 1993).

325. *See* Securities Transactions Settlement, *supra* note 324, at 11,810.

326. *Id.*

327. *Securities Transactions Settlement*, Exchange Act Release No. 34-33023, 58 Fed. Reg. 52,891, 52,891–92 (Oct. 13, 1993) [hereinafter *T+3 Adopting Release*]. Rule 15c6-1 became effective on June 7, 1995.

The Bachmann Task Force also supplied an analytic foundation for cycle compression. It framed the central proposition as "time equals risk" and relied on NSCC modeling to show that shortening the settlement interval materially reduces clearinghouse exposure in default scenarios, including in stressed conditions. At the same time, it treated speed as an implementation challenge as much as a design objective: the principal constraints were infrastructural—especially retail payment mechanisms and institutional trade affirmation—suggesting that the gains from faster settlement depend on upgrading the mechanisms that move cash and confirm trades, not simply rewriting the settlement rule.[328]

In 1993, the Commission adopted Exchange Act Rule 15c6-1, shortening the settlement cycle for most broker-dealer securities transactions from T+5 to T+3. The SEC received comments from 1,914 commenters—an unusually large response for a technical post-trade rulemaking. The comment record included sixty-three individualized submissions and 1,550 substantially identical letters from individual investors urging the Commission to preserve investors' ability to obtain direct registration of their securities on issuers' records in a T+3 settlement environment.[329]

C. THE TRANSITION TO T+2 AND THE LEAP TO T+1

Following the 1993 move to T+3, settlement cycle reform continued along a familiar path: incremental compression rather than architectural redesign. That pattern resurfaced in 2017, when the SEC amended Rule 15c6-1(a) to shorten the standard settlement cycle from T+3 to T+2.[330] The case for T+2 was framed in both risk and operational terms. A shorter cycle reduces the time during which trades remain unsettled—and therefore the period over which counterparty, market, and liquidity risks can accumulate—while also pushing the industry toward more disciplined post-trade processing. In practice, the transition required coordinated changes across the trade lifecycle, from confirmations and allocations to exception management and securities lending/recall workflows, implemented through an industry-wide effort led by DTCC in collaboration with major market associations.

Importantly, T+2 also functioned as a governance template. It demonstrated that cycle compression is feasible only when market participants align on shared operational standards and timelines, and it reinforced the broader logic that settlement reform tends to proceed through coordinated modernization around the existing clearance and settlement architecture. That experience—and

328. BACHMANN REPORT, *supra* note 324, at 6–7.

329. *See T+3 Adopting Release, supra* note 327, at app. 1.

330. Unlike the voluminous retail response to the 1993 proposal, the move to T+2 drew a comparatively modest and generally supportive comment record. See *Securities Transaction Settlement Cycle*, Exchange Act Release No. 34-80295, 82 Fed. Reg. 15,564, 15,569 (Mar. 29, 2017) (codified at 17 C.F.R. pt. 240) (noting that the Commission "received a number of comment letters in response" and that "commenters generally supported the reasoning in the T+2 Proposing Release for shortening the standard settlement cycle").

the remaining exposure still embedded in a two-day settlement window—set the stage for the post-January-2021 push for the next step in the trajectory: T+1.

In the immediate aftermath of the Robinhood episode, the industry committed to accelerating and shortening the settlement cycle for U.S. securities to T+1 through a coordinated effort led by DTCC and two major trade associations of financial market participants, the Investment Company Institute (ICI) and the Securities Industry and Financial Markets Association (SIFMA).[331] Industry participants agreed that reducing intraday exposure to trades would benefit markets, in particular by preserving the benefits of market-wide netting.[332] Yet these participants also acknowledged the operational and liquidity benefits of retaining a one-day settlement window.[333] Nevertheless, reducing the settlement cycle to one day would lower counterparty risk, lower the costs associated with posting collateral as margin with the clearing agency, and result in quicker access to funds.

The white paper published by DTCC, ICI, and SIFMA acknowledges the benefits of shorter settlement cycles on risk-management practices and procedures.[334] By simply removing one day, NSCC reduces its open exposure to every single clearing member.[335] From a clearing member's perspective, a shorter settlement cycle generally reduces the amount and duration of unsettled exposure and, in turn, may reduce the member's margin requirements and related liquidity demands. However, as the white paper explains, keeping a settlement window open, even a reduced T+1 window, allows NSCC to deliver netting efficiencies to its members.[336]

The industry broadly supported the transition from T+2 to T+1, with NSCC and its members aligned around its implementation.[337] However, in the future, NSCC's membership base may grow more heterogeneous, with members advocating for potentially diverging policy choices. As retail investment platforms mature and expand, the broader range of business models and trading activity represented within NSCC may increase internal governance frictions and create pressure to reconsider clearing market design.[338]

If we assume that DTCC's member-owners are rational profit maximizers, then they have incentives to reduce the transaction costs of securities trading, specifically by accelerating settlement, reducing counterparty default risk, and improving operational efficiencies. Their willingness to innovate within—rather than abandon—the incumbent architecture raises the central question: Why have

331. *See* ACCELERATING THE U.S. SECURITIES SETTLEMENT CYCLE, *supra* note 21.

332. *See, e.g.*, *id.*

333. *Id.*

334. *Id.*

335. *Id.*

336. *Id.*

337. *See id.*

338. In the 1990s, technological advancement, diversification, and increasing heterogeneity in the membership base of stock exchanges, at that point mutual enterprises, resulted in their demutualization.

they not pursued a wholesale "move back to the market"? One answer is that financial-technology enthusiasts, while correctly emphasizing the potential benefits of near-real-time bilateral settlement, may overlook or undervalue a central feature of existing post-trade market structure: multilateral netting.

That preference for incremental reform within the existing post-trade architecture became the organizing premise of the SEC's regulatory response. As discussed above, the industry had already committed to T+1 following the January 2021 episode.[339] In February 2022, the SEC proposed shortening the standard settlement cycle from T+2 to T+1, beginning the process of translating that industry-led initiative into a regulatory mandate.[340] At the same time, the Commission solicited comment on more structural alternatives, including a move to T+0 or a transformation of the existing deferred-net-settlement structure into real-time gross settlement, thereby opening a more fundamental inquiry into the limits of cycle compression.

In February 2023,[341] the SEC adopted its final rules shortening the standard settlement cycle for most securities transactions from two business days after trade date (T+2) to one (T+1).[342] The Commission framed the move to T+1 as an intervention in settlement latency and the risks that latency generates:[343] compressing the interval between trade execution and settlement reduces the duration of unsettled credit and liquidity exposures and, in turn, the margin and liquidity resources required to support those exposures during the settlement window.[344] Consistent with that logic, the SEC coupled cycle compression with greater trade-date processing discipline, pushing key post-trade steps—allocation, confirmation, and affirmation—onto the day of execution rather than allowing them to drift into the settlement window.[345]

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339. *See, e.g.,* ACCELERATING THE U.S. SECURITIES SETTLEMENT CYCLE, *supra* note 21, at 8–9.

340. *Shortening the Securities Transaction Settlement Cycle*, Exchange Act Release No. 34-94196, 87 Fed. Reg. 10,436 (Feb. 24, 2022).

341. Other jurisdictions have already moved or are planning to shorten their settlement cycle to T+1. Canada moved with the United States to T+1 in May 2024. *See Canadian Securities Regulators Announce Move to T+1 Settlement Cycle*, CAN. SEC. ADM'RS (May 27, 2024), https://www.securities-administrators.ca/news/canadian-securities-regulators-announce-move-to-t1-settlement-cycle. India had completed its phased transition to T+1 by January 2023. Navdeep Singh, *Indian Markets Achieve Complete Transition to T+1 Settlement Cycle*, THE ECON. TIMES (Jan. 27, 2023), https://economictimes.indiatimes.com/markets/stocks/news/indian-markets-achieve-complete-transition-to-t1-settlement-cycle/articleshow/97375009.cms. By contrast, the European Union has since mandated T+1 beginning October 11, 2027, through Regulation (EU) 2025/2075. *See* Regulation (EU) 2025/2075 of the European Parliament and of the Council of 8 October 2025 Amending Regulation (EU) No 909/2014 as Regards a Shorter Settlement Cycle in the Union, 2025 O.J. (L 2075) 1, 3–4, https://eur-lex.europa.eu/eli/reg/2025/2075/oj/eng. Finally, the United Kingdom has committed to the same date; HM TREASURY, *Accelerated Settlement (T+1)* (Nov. 20, 2025), https://www.gov.uk/government/publications/accelerated-settlement-t1.

342. *Shortening the Securities Transaction Settlement Cycle*, Exchange Act Release No. 34-96930, 88 Fed. Reg. 13,872, 13,874 (Mar. 6, 2023) (codified at 17 C.F.R. pts. 232, 240, 275) [hereinafter *Shortening the Settlement Cycle*].

343. Press Release, Gary Gensler, Sec. & Exch. Comm'n Chair, Statement on Adopting Rules Regarding the Settlement Cycle (Feb. 15, 2023), https://www.sec.gov/newsroom/speeches-statements/gensler-statement-settlement-cycle-021523.

344. *See id.*

345. *See id.*

The Commission approved the reform by three-to-two, with Commissioners Hester M. Peirce and Mark T. Uyeda dissenting. Their dissent focused principally on the implementation timetable and the operational risks associated with an accelerated transition, rather than on the desirability of T+1 itself.[346] T+1 nevertheless attracted broad support from market participants as a means of reducing settlement risk and improving operational and capital efficiency.[347]

The post-implementation record supplies an important ex post check. On the first day of T+1 settlement, DTCC reported a 1.90 percent CNS fail rate, below the 2.01 percent May average for T+2 settlements, and a $3.7 billion—or 29 percent—decline in the NSCC Clearing Fund relative to the prior-quarter average. DTCC's later regulatory reporting described the May 2024 transition as smooth and minimally disruptive.[348] These early results do not prove that every projected benefit has materialized, but they support the operational feasibility of T+1 and strengthen the case for treating the reform as a successful incremental redesign.

That consensus, however, did not extend to the next step. As previously mentioned, the Commission deliberately left open a consequential question for further discussion: whether the standard settlement cycle should be shortened beyond T+1 to T+0, or even to real-time gross settlement (RTGS). In her statement on the proposal, Commissioner Hester Peirce identified four important questions that a potential transition beyond T+1 would require the Commission and the industry to confront:[349] "(1) whether a T+0 settlement cycle would unnecessarily increase trading costs, including in some cases potentially by effectively requiring prefunding of transactions;[350] (2) whether it would force other changes that could significantly affect market structure in ways that decrease liquidity;[351] (3) whether blockchain technology could meaningfully facilitate a transition to a T+0 timeframe;[352] and (4) how the Commission, working with the market, could manage such a transition to T+0 if it proved

346. Press Release, Mark T. Uyeda, Sec. & Exch. Comm'n Comm'r, Statement on Final Rule on Shortening the Securities Transaction Settlement Cycle (Feb. 15, 2023), https://www.sec.gov/newsroom/speeches-statements/uyeda-statement-settlement-cycle-021523; Press Release, Hester M. Peirce, Sec. & Exch. Comm'n Comm'r, Timing Matters: Statement on Shortening the Settlement Cycle (Feb. 15, 2023), https://www.sec.gov/newsroom/speeches-statements/peirce-statement-settlement-cycle-021523.

347. *Shortening the Settlement* Cycle, *supra* note 342, at 13, 874–75.

348. Depository Tr. & Clearing Corp., DTCC Comments on Industry's T+1 Progress (May 30, 2024), https://www.dtcc.com/news/2024/may/30/dtcc-comments-on-industrys-t1-progress; DTCC ITP Matching (U.S.) LLC, Annual Report for Central Matching Service Provider 4 (2024), https://www.sec.gov/Archives/edgar/data/2034958/000203495825000045/ITPM_CMSP_Report_2024.htm.

349. Press Release, Hester M. Peirce, Sec. & Exch. Comm'n Comm'r, Statement on Proposal to Shorten the Settlement Cycle (Feb. 9, 2022), https://www.sec.gov/newsroom/speeches-statements/peirce-settlement-cycle-20220209.

350. *Id.*

351. *Id.*

352. *Id.*

worthwhile."[353] In responding to the SEC's proposal and Commissioner Peirce's questions, many institutional market participants echoed these concerns and urged the SEC not to treat T+1 as a mere waypoint on an inevitable move to T+0.[354] In the final rule, the Commission concluded that T+1 was the more prudent and practical approach at that time, while describing the transition as a useful step toward identifying potential paths to T+0.

Moving from deferred net settlement to real-time gross settlement would not be an incremental upgrade. It would require a fundamental reorganization of how trades are financed and how intermediaries provide liquidity. In a real-time gross-settlement environment, covered transactions would settle individually rather than through multilateral netting over a settlement window. Participants would therefore need access to cash and securities at or near the moment of settlement and would generally have to prefund transactions or maintain substantially greater immediately available liquidity. Eliminating multilateral netting for transactions settled gross could materially increase funding and operational demands, with uncertain implications for market liquidity, pricing, and the microstructure of intermediation. A serious move toward real-time settlement would require a systematic reassessment of liquidity needs and liquidity transmission across the financial system—an exercise likely to require coordination among the SEC, the Federal Reserve, and potentially FSOC. The central question, then, is what role the SEC should play in that process: Should it act as the central architect of a redesigned settlement regime, or as a policy sponsor that catalyzes and disciplines market-led experimentation?[355]

Part V takes up this debate and frames settlement speed as a market design choice. Technology may compress latency, but the harder questions are institutional: where must liquidity sit, how much netting should be preserved, and who should bear default risk when the system is under stress?

V. TIME AS MARKET DESIGN: LATENCY, NETTING, TECHNOLOGY, AND INSTITUTIONAL CHANGE

This final Part builds on the Robinhood–NSCC episode of January 2021 and the SEC's institutional response to pose a forward-looking question about the design of the post-trade clearing and settlement architecture. How should regulators conceptualize settlement latency? As a cost and source of risk to be eliminated through ever-faster settlement and new technologies? Or, as an institutional feature that enables netting, liquidity savings, and scalable intermediation, while concentrating default risk in specialized risk managers such as central counterparties? Put differently, the settlement cycle is not merely a technical parameter. It is a market design and governance choice about how

353. *Id.*

354. *See, e.g.*, ACCELERATING THE U.S. SECURITIES SETTLEMENT CYCLE, *supra* note 21, at 6.

355. *See* David A. Wishnick, *Reengineering Financial Market Infrastructure*, 105 MINN. L. REV. 2379, 2405 (2021) (discussing the role of regulators as catalyzers of transformation of financial markets).

the system "prices" time, where it warehouses liquidity demands, and how it allocates exposure across market participants.

This Part uses the Article's institutional framework to identify the next set of market design questions: whether blockchain can disintermediate post-trade firms, whether it will instead be incorporated into incumbent infrastructure, and how further settlement compression would redistribute liquidity and risk.

In recent years, financial technology proponents have framed distributed ledger technology (DLT) solutions as the pathway to a more "atomic" settlement model—one in which both securities and cash are tokenized and exchanged through smart contracts in delivery-versus-payment.[356] On that view, settlement becomes less a post-trade process mediated through a centralized multilateral netting infrastructure and more an automated swap executed on a shared ledger. A parallel academic literature has explored the same possibility: Early work by Emilios Avgouleas and Aggelos Kiayias,[357] for example, emphasizes DLT's potential to reduce certain transaction costs and to reduce reliance on centralized post-trade intermediaries such as CCPs and CSDs—while necessarily shifting the system toward different funding and liquidity constraints.[358] They claim that technology can repatriate control to end investors—an argument advanced by financial technology firms in the aftermath of the Robinhood–NSCC episode of January 2021.[359]

The narrative of disintermediation of the financial industry fits naturally into Coase's theory of the firm framework. Financial intermediaries persist when they reduce the costs of transacting through markets and of coordinating complex activity. The securities post-trade environment presents unique structural features that make it a plausible place to observe a reverse Coasean dynamic. In the late nineteenth century, securities markets moved from a world of bilateral exchanges to centralized organizations. In the twenty-first century, they may experiment—at the margin—with more decentralized ledger-based settlement.

Part I of the Article provided two theoretical pillars for understanding the evolution of clearing and settlement firms. On one side, Coase's theory of the firm and market evolution explains the emergence of specialized post-trade intermediaries as transaction-cost-reducing institutions. On the other, Hansmann's theory of ownership helps contextualize NSCC's mutual, user-

356. COMM. ON CAP. MKTS. REGUL., BLOCKCHAIN AND SECURITIES CLEARING AND SETTLEMENT 12 (2019), https://capmktsreg.org/wp-content/uploads/2022/11/CCMR_statement_Blockchain_Securities_Settlement-Final-1.pdf; Merritt B. Fox, Lawrence R. Glosten, Edward F. Greene & Sue S. Guan, *Distributed Ledger Technology and the Securities Markets of the Future: A Stakeholder Survey*, 2021 COLUM. BUS. L. REV. 651, 659 (2021); *see* MICHAEL JUNHO LEE, ANTOINE MARTIN & ROBERT M. TOWNSEND, OPTIMAL DESIGN OF TOKENIZED MARKETS 2 (2024).

357. Emilios Avgouleas & Aggelos Kiayias, *The Promise of Blockchain Technology for Global Securities and Derivatives Markets: The New Financial Ecosystem and the 'Holy Grail' of Systemic Risk Containment*, 20 EUR. BUS. ORG. L. REV. 81, 105 (2019).

358. *Id.* at 92.

359. *Id.* at 105.

owned structure as the governance form of the central clearinghouse in the U.S. securities markets.[360]

Over time, clearing and settlement firms consolidated their position as essential infrastructure in U.S. securities markets. Their influence rests not only on scale and network effects but also on agenda-setting capacity. As a registered clearing agency and SRO, NSCC participates directly in private rulemaking: It drafts proposed changes to its Rulebook, procedures, and risk models and submits them to the SEC under Section 19(b). That role gives NSCC meaningful influence over the content and timing of reform, but it does not have final regulatory authority: The Commission publishes filings, considers public comments, and approves or disapproves proposals that require approval; specified categories may become effective on filing, subject to suspension or abrogation.[361] This form of supervised private ordering allows members' and users' preferences to influence implementation while preserving binding public law constraints and the Commission's final regulatory authority. Nor should NSCC's influence be reduced to a simple story of rent extraction. DTCC, which wholly owns NSCC, is user-owned and does not distribute dividends to its member-shareholders;[362] fees generally support reserves and operations or are returned through rebates and reductions.[363]

This institutional setting maps closely onto what Kathryn Judge describes as "intermediary influence":[364] the capacity of structurally central intermediaries to shape market outcomes by setting standards, steering implementation choices, and managing the pace of change. Even where an intermediary is not extracting profits in the conventional shareholder-dividend sense, its position at the center of an operational network can translate into governance power.[365] Judge's account highlights how, in some settings, intermediary influence can entrench incumbent arrangements, delay migration to alternatives, or selectively accelerate reforms that preserve the intermediary's core institutional role.[366] In post-trade markets, where network effects are strong and interoperability is not automatic, this dynamic of intermediary influence is especially salient: the infrastructure that coordinates settlement today often becomes the infrastructure that defines what settlement can look like tomorrow.[367] This is less a claim about motive than about institutional position in a network industry. Accordingly, incumbent market infrastructure may be

360. Saguato, *supra* note 9, at 618–23.

361. *Id.* at 591.

362. *See* Awrey & Macey, *supra* note 9, at 157.

363. DTCC, *Guide to the DTC Fee Schedule*, 28 (Mar. 31, 2026), https://www.dtcc.com/-/media/Files/Downloads/legal/fee-guides/DTC-Fee-Schedule.pdf.

364. *See* Judge, *supra* note 38, at 590–93.

365. *Id.* at 592–93.

366. *Id.* at 590–91.

367. *See, e.g.*, DTCC Connection Staff, *SEC Grants DTCC No-Action Letter on Blockchain Tokenization Initiative* (Dec. 15, 2025), https://www.dtcc.com/dtcc-connection/articles/2025/december/15/sec-grants-dtcc-no-action-letter-on-blockchain-tokenization-initiative.

selectively pro-change, supporting reforms that modernize the system and improve resilience and efficiency within the existing architecture—such as settlement cycle compression—while approaching more transformative alternatives—such as real-time gross settlement models—with greater caution, given implementation complexity, system-wide coordination needs, potentially non-obvious downstream effects on liquidity provision, and the possibility that such changes could materially reconfigure the existing intermediation roles.

Recent developments at DTC demonstrate that tokenization may transform post-trade processes without eliminating the intermediaries that perform them. In December 2025, DTC received SEC staff no-action relief to develop and operate a preliminary, voluntary tokenization service under a three-year framework.[368] The service permits DTC participants to convert specified security entitlements into tokenized form and transfer those entitlements between registered participant wallets on supported blockchains.[369] In July 2026, DTCC completed initial live production transactions involving tokenized DTC-custodied assets, ahead of the service's anticipated October 2026 launch.[370]

Yet the service remains embedded within the incumbent legal and operational architecture: The underlying securities remain registered in the name of Cede & Co. and held through DTC; participation is limited to DTC participants using registered wallets; and transfers of tokenized entitlements are reflected on DTC's official books and records.[371] The service thus changes the technological form in which security entitlements are recorded and transferred without fundamentally reallocating the institutional functions that support the market. It does not displace DTC's custodial and recordkeeping roles or NSCC's clearing function. The initiative is therefore better understood as incumbent-led

368. *See* Depository Tr. & Clearing Corp., SEC Staff No-Action Letter (Dec. 11, 2025), https://www.sec.gov/files/tm/no-action/dtc-nal-121125.pdf; Press Release, Depository Tr. & Clearing Corp., DTCC Authorized to Offer New Tokenization Service, Paving the Way to Tokenized DTC-Custodied Assets (Dec. 11, 2025), https://www.dtcc.com/news/2025/december/11/paving-the-way-to-tokenized-dtc-custodied-assets. This modernization initiative, built on tokenization and distributed ledger technology, does not affect the clearance of securities transactions performed by NSCC, but rather is limited to the settlement and recording stage operated by DTC.

369. *See* Letter from Jeffrey S. Mooney, Assoc. Dir., Div. of Trading & Mkts., U.S. Sec. & Exch. Comm'n, to Brian Steele & Nadine Chakar, DTCC (Dec. 11, 2025), https://www.sec.gov/files/tm/no-action/dtc-nal-121125.pdf; Press Release, Depository Tr. & Clearing Corp., DTCC Authorized to Offer New Tokenization Service, Paving the Way to Tokenized DTC-Custodied Assets (Dec. 11, 2025), https://www.dtcc.com/news/2025/december/11/paving-the-way-to-tokenized-dtc-custodied-assets. The pilot concerns DTC security entitlements and does not replace NSCC's clearance of securities transactions.

370. *See* Depository Tr. & Clearing Corp., *Tokenization Becomes a Reality Today* (July 15, 2026), https://www.dtcc.com/digital-assets/tokenization/live-production-trades (reporting live production transactions involving approximately forty firms and tokenized DTC-custodied assets ahead of an expected October 2026 launch).

371. See Letter from Jeffrey S. Mooney, Assoc. Dir., Div. of Trading & Mkts., U.S. Sec. & Exch. Comm'n, to Brian Steele & Nadine Chakar, DTCC 1–7 (Dec. 11, 2025), https://www.sec.gov/files/tm/no-action/dtc-nal-121125.pdf; U.S. Sec. & Exch. Comm'n, Statement on Tokenized Securities (Jan. 28, 2026), https://www.sec.gov/newsroom/speeches-statements/corp-fin-statement-tokenized-securities-012826-statement-tokenized-securities.

hybridization than as decentralized disintermediation. This distinction matters because tokenization, standing alone, does not reproduce the risk-management and liquidity-saving functions of a central counterparty. Any proposal to combine tokenization with real-time bilateral settlement must still confront the liquidity consequences of foregoing multilateral netting.

NSCC therefore occupies a dual institutional position: it is a privately governed market infrastructure and an SRO exercising delegated regulatory authority over its participants, with meaningful influence over post-trade market design choices.[372] Through the SEC-supervised rule-filing process, NSCC retains substantial agenda-setting and implementation capacity because it drafts the rules, procedures, and risk models governing its services. But those rules do not become federal regulation through NSCC's unilateral action. Proposed rule changes are filed under Section 19(b), publicly noticed, and—unless eligible for immediate effectiveness—reviewed and approved by the SEC under the Exchange Act and the Commission's clearing-agency standards. The SEC also examines NSCC, may abrogate or amend SRO rules through statutory procedures, and supervises NSCC under Title VIII and the Covered Clearing Agency Standards.[373] The relationship is therefore interactive but hierarchically structured: NSCC supplies technical design and operational expertise and retains meaningful implementation capacity, while the Commission establishes binding regulatory requirements through its own rulemaking and retains authority over NSCC rule changes that require approval.[374]

Informally, NSCC's influence is reinforced by its central role in U.S. securities markets and by its ownership structure. As a deeply embedded market infrastructure, NSCC occupies a focal position for coordinating clearing and settlement obligations across the market.[375] Its user-owned structure—under which clearing members and participants are shareholders—can be an efficient arrangement for internalizing transaction costs in a network industry. At the same time, it means that NSCC's policy voice often reflects an aggregated, but not necessarily unanimous, industry position. Where reform requires coordination across clearing members, NSCC is institutionally positioned to convene and steer modernization efforts—particularly when a critical mass of major clearing members supports change.[376]

A core transactional benefit provided by NSCC in its role as a CCP is the liquidity savings of multilateral netting. Every business day, investors execute enormous volumes of transactions in equities and other eligible securities.

372. *See* Roberta S. Karmel, *Should Securities Industry Self-Regulatory Organizations be Considered Government Agencies?*, 14 STAN. J.L. BUS. & FIN. 151, 154 (2008).

373. See 15 U.S.C. §§ 78s(b)–(c), 78q-1; 12 U.S.C. §§ 5464–5466; 17 C.F.R. § 240.17ad-22(e) (2026); *Standards for Covered Clearing Agencies*, Exchange Act Release No. 34-78961, 81 Fed. Reg. 70,786, 70,786–88 (Oct. 13, 2016).

374. *See supra* Part.III.

375. *See* Awrey & Macey, *supra* note 9, at 110–11.

376. *See* Saguato, *Regulation of Clearing & Settlement*, *supra* note 83, at 250.

NSCC compresses the resulting volume of obligations through an automatic netting process that offsets each member's buys and sells in a particular security,[377] and consolidates its payment obligations across securities into a single net debit or net credit. By netting securities delivery and payments obligations, NSCC reduces both the securities movements and the value of payment obligations at settlement. DTCC reports that NSCC's netting rate remained approximately 98–99 percent each day in 2025.[378] Netting, in turn, reduces counterparty exposures and clearing members' liquidity needs, and permits them to use their balance sheet capacity more efficiently, including to support market making and liquidity provision.

During the settlement window (whether one day or longer), the clearing agency reduces counterparty default risk through collateralization.[379] Margin and related charges function as the bridge between execution and final settlement, helping ensure performance even as positions remain unsettled.[380] For clearing members, the existence of a settlement window—combined with netting—reduces operational frictions and economizes on liquidity, because members do not need to prefund every trade on a gross, trade-by-trade basis.[381] In that sense, latency is not merely a delay; it is part of an institutional arrangement that enables netting and liquidity-saving efficiencies—so long as the risks created by deferral are governed effectively.[382]

Recent work by Dennis McLaughlin sharpens the trade-off between settlement cycle compression and multilateral netting.[383] Fitting a theoretical network model to aggregate NSCC statistics for the U.S. equity market, McLaughlin's model indicates that, for the network as a whole, a substantial portion of netting efficiencies accrue quickly after a trade enters the clearing system—on the order of an hour—suggesting that a settlement window of at least one hour would produce no material loss of multilateral netting.[384] The model further estimates that highly connected participants—the network's "hubs"—would achieve their maximum potential netting benefit within approximately thirty minutes and 90 percent of that benefit within approximately ten minutes. These findings complicate the intuitive assumption

377. Michael McClain, *Advancing Together: Leading the Industry to Accelerated Settlement* (Feb. 24, 2021), https://www.dtcc.com/dtcc-connection/articles/2021/february/24/advancing-together-leading-the-industry-to-accelerated-settlement.

378. Depository Tr. & Clearing Corp., 2025 Annual Report 12 (2026), https://www.dtcc.com/about/-/media/Files/Downloads/Annual%20Report/2025/DTCC-Annual-Report-2025-Print.pdf.

379. *See* Saguato, *supra* note 9, at 604–05.

380. *See id.* at 620–21.

381. *See id.* at 616–23.

382. *See id.*

383. Fitting a theoretical network model to aggregate NSCC statistics for the U.S. equity market, McLaughlin finds that, within the model, extending the netting window beyond approximately one hour yields little additional aggregate multilateral-netting benefit. Dennis A. McLaughlin, *The Trade-off Between Shorter Settlement Times and Multilateral Netting Benefits in Deferred Net Settlement*, 11 J. FIN. MKT. INFRASTRUCTURES 2 (2023).

384. *Id.*

that longer settlement horizons necessarily generate proportionally greater netting benefits and suggest that significant cycle shortening could preserve most of netting's value while reducing the duration of unsettled exposure.

At the same time, the analysis clarifies what more radical compression would ultimately test. The relevant constraint is not merely whether settlement can be made incrementally "faster" while preserving netting; it is whether the market can absorb the liquidity, financing, and microstructure consequences of moving from a margin and netting architecture toward prefunded, atomic trade-by-trade settlement, in which securities must be available at or near the moment of settlement.[385] McLaughlin also briefly considers whether DLT might facilitate alternative settlement architectures. His model indicates, however, that instantaneous, atomic settlement would eliminate multilateral netting and require both sides to be ready to perform at the time of the transaction. McLaughlin does not determine whether RTGS—potentially supplemented by a liquidity-saving mechanism—would be preferable to deferred net settlement, leaving that institutional comparison outside the paper's scope.[386]

In addition, recent network-theoretic work underscores the same point in a more formal register: "[F]aster" settlement does not necessarily mean greater financial stability. In a Federal Reserve paper, Agostino Capponi and Jin-Wook Chang treat settlement speed as an institutional design choice in a network of interconnected payment obligations. They show that shortening the settlement cycle can compress counterparty and time exposures in the system, thus reducing the chance that losses propagate. But faster settlement also weakens the liquidity-saving benefits of netting and forces participants to mobilize cash and collateral on a tighter clock—often precisely when funding conditions are most fragile. The result is an institutional trade-off: faster settlement may make crises less likely, but when a stress does arrive it can make the liquidity squeeze sharper and the episode more severe. The policy implication is not "speed is bad" or "slow is good," but that optimal settlement speed is contingent and sensitive to market structure, liquidity conditions, and the system's capacity to mobilize funding under stress without impairing market making and liquidity provision.[387] Together, McLaughlin and Capponi–Chang suggest that the next step after T+1 is not simply "more speed," but a different architecture—one that must be evaluated as market design under stress.

Seen in this light, the relevant policy question is not whether the market can move from T+1 to a "faster" settlement cycle, but what institutional architecture a move toward T+0—or real-time gross settlement—would actually require. Real-time settlement is not merely a shorter clock; it is a different

385. *Id.* at 15.

386. *Id.* at 14–15.

387. Agostino Capponi & Jin-Wook Chang, Settlement Speed and Financial Stability (Fed. Rsrv. Bd., Fin. & Econ. Discussion Series, Working Paper No. 2025-101, rev. June 2026), https://www.federalreserve.gov/econres/feds/settlement-speed-and-financial-stability.htm.

system, one that may shift the market away from a margin-and-netting architecture toward prefunded, trade-by-trade liquidity demands. Those demands would be distributed across dealers, custodians, banks, and end investors—and they would bind most tightly precisely in periods of stress. Evaluating T+0 as a policy endpoint therefore requires coordinated attention to funding frictions, operational capacity, and market-liquidity dynamics, not simply a change in settlement convention.[388]

Administrative law scholarship on innovation and governance points toward a sensible regulatory posture in settings like this one: disciplined experimentation.[389] A next step would be to structure that experimentation more explicitly. The SEC should define each pilot's objective, eligible participants and assets, quantitative limits, duration, reporting obligations, stress-testing criteria, and exit or conversion conditions. Pilots should also identify which rules are relaxed, why the relief is necessary, how customers and risks will be monitored, and what evidence would justify expansion, modification, or termination. This test environment would allow the Commission (and, where appropriate, other regulators) to observe how alternative settlement designs operate under realistic liquidity constraints, frictions in payment rails, and stress scenarios. Properly designed, such testing would not bypass the existing clearance and settlement architecture; it would generate the evidence about when further compression improves resilience on net and when it merely relocates risk into less visible, more fragile corners of the financial system.[390]

That trade-off is precisely where the SEC chose to stop. In adopting T+1, the Commission reduced the duration of unsettled exposures without committing the market to the more radical step of T+0 or real-time gross settlement.[391] The final rule thus leaves open the next institutional design question: whether shortening settlement beyond T+1 would reduce risk on net once one accounts for the potential costs of prefunding, changes in liquidity provision, and the reconfiguration of existing intermediation roles. It is on this unresolved question

388. DTCC began exploring the use of distributed ledger in 2015, completed its Project ION case study in 2020, and launched ION in parallel production in 2022. *See* DEPOSITORY TR. & CLEARING CORP., PROJECT ION CASE STUDY (2020), https://www.dtcc.com/~/media/Files/Downloads/settlement-asset-services/userdocumentation/Project-ION-Paper-2020.pdf; *see also* Press Release, Depository Tr. & Clearing Corp., DTCC's Project ION Platform Moves to Development Phase Following Successful Pilot with Industry (Sep. 15, 2021), https://www.dtcc.com/news/2021/september/15/dtccs-project-ion-platform-moves-to-development-phase-following-successful-pilot-with-industry. This program is a mechanism for NSCC and DTC participants to test the use of distributed ledger technology alongside 'classic' settlement infrastructure at NSCC and DTC.

389. *See* Tim Wu, *Agency Threats*, 60 DUKE L.J. 1841, 1857 (2011).

390. Earlier experimentation included the SEC's temporary no-action letter granted to Paxos, a digital financial infrastructure firm, to test its blockchain-based settlement system. *See* Paxos Tr. Co., LLC, SEC Staff No-Action Letter (Oct. 28, 2019), https://www.sec.gov/divisions/marketreg/mr-noaction/2019/paxos-trust-company-102819-17a.pdf; *see also* Neil McNaughton, Letter to the Editor, *Folk Tale Sheds Light on Equities Settlement Times*, FIN. TIMES (Apr. 12, 2021), https://www.ft.com/content/d54af6ff-2e17-4e01-bb64-f58484fa43d1 (drawing parallels between Paxos' Blockchain and a traditional European folk tale).

391. *Shortening the Securities Transaction Settlement Cycle*, Exchange Act Release No. 34-94196, 87 Fed. Reg. 10,465–75 (Feb. 24, 2022).

that Commissioner Hester Peirce focused in her statement on the proposal, framing four issues that would have to be confronted before T+0 or real-time settlement could be treated as a policy endpoint: whether additional compression would raise trading costs through prefunding; whether it would force market-structure changes that diminish liquidity; whether DLT could facilitate a transition; and how—if at all—the Commission should work with the market to pursue T+0.[392] Read together, those questions underscore the central claim of this Part: settlement speed is market design. The issue is not whether time can be compressed, but where liquidity demands will sit, who will intermediate them, and how the system will absorb stress when funding is scarce.

A June 2026 disruption illustrates why the distinction between nominal cycle length and operational settlement capacity matters. Erroneous trades submitted by one participant produced an unusually large net-debit balance. Even after the Federal Reserve extended the settlement deadline, NSCC and DTC could not reverse the trades before the National Settlement Service closed. They rolled over the day's settlement balances, imposed an additional next-day Clearing Fund charge to cover the extra day of unsettled guaranteed activity, and completed both days' settlement on June 30.[393] The incident does not show that T+1 failed. It shows that operational error can recreate latency and collateral demands even within a compressed cycle—a concrete example of this Article's claim that settlement time is a governed feature of market design, not merely a calendar convention.[394]

CONCLUSION

Time is money—and time is risk.[395] That premise, stated at the outset, frames the institutional story this Article tells. As the Robinhood–NSCC episode of January 2021 illustrates, the modern settlement cycle is not a mere back-office detail but a governance and liquidity architecture that determines who bears risk, when they bear it, and how quickly they must fund it. Clearing and settlement infrastructures are therefore central to the financial system. Brokers, dealers, banks, investment funds, and retail investors rely on an effective clearance and settlement system to support efficient markets, and these infrastructures deserve greater attention from policymakers and commentators.

This Article has framed clearing and settlement intermediaries as a Coasean response to transaction costs. As trading scaled and became multilateral, market participants addressed rising transaction costs by building intermediary firms—clearinghouses in particular—to economize on operational

392. *See* Press Release, Hester M. Peirce, *supra* note 349.

393. Nat'l Sec. Clearing Corp. & Depository Tr. Corp., Important Notice A#9788, Notice of Actions Taken Under NSCC Rule 60—Market Disruption and Force Majeure and DTC Rule 38—Market Disruption and Force Majeure (June 30, 2026), https://www.dtcc.com/-/media/Files/pdf/2026/6/30/a9788.pdf.

394. DTCC Important Notice A-9788, Notice of Actions Taken Under NSCC Rule 60 and DTC Rule 38 (June 30, 2026), https://www.dtcc.com/-/media/Files/pdf/2026/6/30/a9788.pdf.

395. Gensler, *supra* note 1.

frictions, coordinate information, mutualize and allocate default risk, and make multilateral netting feasible. Market participants did not "choose latency" by accident: Settlement time was a design choice that managed risk and supported efficiency. That firm-based, centralized, and intermediated organizational design has been reinforced by member and user ownership arrangements intended to mitigate agency costs among heterogeneous patrons.

The core questions of this Article are, in the end: Why does latency persist in settlement, and why do intermediaries persist in post-trade markets? The answer to the first is that time is not deadweight; it performs institutional, legal, and economic work. It creates a window in which multilateral netting can operate, processes can run to completion, and liquidity can be planned. But time is also a risk window: It lengthens exposures and, when volatility spikes, converts price movements into immediate—and sometimes destabilizing—funding demands.[396]

The answer to the second question is the mirror image. Post-trade intermediaries persist because they make a multilateral market governable. They coordinate information, standardize risk controls, allocate and mutualize losses, and—crucially—provide a credible default-management process. These services are difficult to reproduce at scale through bilateral contracting. Yet the same architecture inevitably raises second-order questions: who controls these firms, whose interests dominate during periods of stress, and how liquidity burdens are distributed among members and, ultimately, investors.

These institutional arrangements, which have proved efficient and remarkably resilient for much of the past sixty years, may nonetheless face new challenges. On one side, frictions among heterogeneous members of a user-owned clearinghouse may increase internal agency costs and sharpen governance conflicts.[397] On the other, blockchain technology and smart contracts may reduce some categories of transaction costs and compress the time needed to complete post-trade functions. That compression could make some intermediaries comparatively costly to maintain and substitute code and contractual automation for functions currently performed by centralized intermediaries. Whether that substitution improves efficiency and stability, however, is not a matter of engineering alone. It is a question of market design: Speed can reduce exposure, but it can also relocate liquidity needs and reshape the system's capacity to absorb stress.

Post-trade markets may therefore experience a partial "reverse" Coasean arc: private contracting gave way to specialized firms that internalized the transaction costs of multilateral trading, but some functions may now migrate back toward market-based contracting through tokenization, blockchain, and smart contracts. If that transition occurs, it will not arrive as a neutral

396. *See supra* Subpart.III.B.

397. *See* Aggarwal, *supra* note 2, at 105.

technological upgrade. It will be an institutional choice about how the market allocates time, liquidity, and risk.

And that brings the argument back to the Article's first line. Time is money, and time is risk. The ultimate question is not simply whether settlement can be made faster, but how the system should allocate settlement time—and thereby balance netting, liquidity, and resilience—and which institutions should be accountable for that choice. The answer cannot be left to NSCC alone; it must emerge through Commission rulemaking, meaningful public participation, and transparent implementation by registered clearing agencies acting as SROs.