PREDICTIVE DATA ANALYTICS IN RETAIL TRADING: A DISCLOSURE-BASED APPROACH TO ALGORITHMIC NUDGES

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Retail trading platforms increasingly incorporate "gamified" elements that encourage more frequent trading. These "gamified" elements include banners, nudges, badges, streaks, confetti animations, push notifications, and trade prompts. While these design choices help reduce barriers for new investors and have grown in popularity by providing easy, mobile-first access to financial markets, they also raise concerns about exploiting behavioral biases to increase the retail trading platforms' profits. This issue is especially pertinent under Payment for Order Flow (PFOF) structures, in which broker-dealers benefit from higher trade volumes rather than strictly focusing on providing best execution for their clients.

To better educate retail investors of these risks, this Note proposes a disclosure-based framework that mandates that broker-dealers reveal the principal factors driving each recommendation or nudge. By relying on explainable AI methods—namely, approximated Shapley values—to highlight the variables steering trading prompts, regulators can empower investors to make more informed decisions without imposing blanket restrictions. While some challenges like protecting trade secrets, managing smaller-firm compliance costs, avoiding information overload, and targeted transparency, are likely to remain, this solution safeguards retail investors while maintaining an open, competitive marketplace.

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Introduction

Take a fictional character named Margaret. She is a thirty-six-year-old software engineer and a self-directed retail investor who trades only her own savings.[1] She likes to browse *The Wall Street Journal* on her lunch breaks and trade on a digital brokerage platform.[2] That platform has the capacity to track many of her trading habits, including her tendency to buy small-cap tech stocks—those with generally less than $5 billion in market capitalization—after major announcements, monitor her portfolio for sudden changes, and analyze factors like market volatility. When NVIDIA slips five percent late Tuesday morning, the app's servers whir and within seconds her phone buzzes on the desk. A cartoon lightning bolt flashes across the home screen with a message: "Margaret, grab the dip before it disappears!" That note is accompanied by a progress bar that begins shrinking as if the app's window of opportunity to transact in the stock were ticking away.

That type of personalized, time-pressured prompt is one feature of the platform's gamification strategy. Gamification is the use of game-like features and incentives to encourage repeated interaction with an activity.[3] Such features include visual rewards, timed notifications, and progress indicators.[4] In the financial context, gamification encourages more frequent trades by triggering predictable cognitive responses and habitual behaviors.[5]

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[1] A retail investor is an individual who trades securities for her *own* account and is not classified as an institutional or professional investor. Anyone who falls outside the institutional/professional carve-outs in securities law is treated as "retail." Tech. Comm., Int'l Org. of Sec. Comm'ns, Principles on Point of Sale Disclosure: Final Report 4 n.1 (2011).

[2] A digital brokerage platform is an online or app-based system that lets a financial institution—or an intermediary acting for it—"market to customers, and/or conclude with customers' contracts for financial products and services." Eur. Banking Auth., Report on the Use of Digital Platforms in the EU Banking and Payments Sector 12 (2021).

[3] *See* Int'l Org. of Sec. Comm'ns, Digital Engagement Practices (DEPs): Final Report 9 (2025).

[4] *Id.* at 12–16 (describing gamification elements such as "badges, rewards, and celebratory messages," "push notifications," "achievement badges," "points," and "trader leaderboard[s]").

[5] *Id.* at 12, 35.

The practice is highly contentious.[6] For some, it reflects the efficiencies of a free market. These platform-driven prompts certainly connect Margaret to opportunities she might otherwise overlook. For others, it is simply exploitation of cognitive biases.[7] While the nudges themselves impose no inherent cost, the increased trading they induce does: the small gaps between the buying price ("ask") and selling price ("bid") that add up over many trades, the upfront costs paid for options contracts that turn worthless once they expire, and the triggering of short-term capital gains taxes. By spurring more trades, these prompts increase those costs. More trades, as decades of empirical research show, translate into lower net returns.[8]

Even if we assume that Margaret is a stand-in for the 'common investor' and that all consumers are equally well-versed in the domain they invest in, such manipulation feels eerie. It shifts decisionmaking from her hands to the algorithm's. In doing so, it raises an uncomfortable question: Are trading platforms designed to serve investors or to serve themselves?

To protect retail investors like Margaret, this Note advocates for an algorithmic disclosure regime. Part I discusses the rise of Predictive Data Analytics (PDA) and Digital Engagement Practices (DEP) as end products of a system that prioritizes the frequency of trades in a Payment for Order Flow (PFOF) system.[9] This Part also discusses how the democratization of financial markets, through widespread access

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[6] *See generally* Ian Bogost, *Why Gamification is Bullshit*, *in* THE GAMEFUL WORLD: APPROACHES, ISSUES, APPLICATIONS 65 (Steffen P. Walz & Sebastian Deterding eds., 2014) (citing HARRY FRANKFURT, ON BULLSHIT (2005)) (arguing that gamification fits within moral philosopher Harry Frankfurt's definition of "bullshit" as "a coercive strategy rather than one that has anything to do with the true value or promise of something"); ADAM ALTER, IRRESISTIBLE: THE RISE OF ADDICTIVE TECHNOLOGY AND THE BUSINESS OF KEEPING US HOOKED 225–27 (2017) (summarizing several ethical and economic critiques of gamification); Kyle Langvardt & James Fallows Tierney, *On "Confetti Regulation": The Wrong Way to Regulate Gamified Investing*, 131 YALE L.J.F. 717, 724–34 (2022) (discussing how gamification features like confetti and push notifications raise a host of regulatory challenges).

[7] *See* William Magnuson, *The Failure of Market Efficiency*, 48 BYU L. REV. 827, 898–99 (2022) (arguing that "regulators would be justified in prohibiting gamification features on financial apps" given that the "[t]wo behavioral problems of particular concern in markets are the targeting (and sometimes creation) of behavioral biases"); *id.* 898–99 n.322 ("[T]he presence of unyielding cognitive biases makes individual decisionmakers susceptible to manipulation by those able to influence the context in which decisions are made." (quoting Jon D. Hanson & Douglas A. Kysar, *Taking Behavioralism Seriously: The Problem of Market Manipulation*, 74 N.Y.U. L. REV. 630, 635 (1999))).

[8] *See* Brad M. Barber & Terrance Odean, *Trading Is Hazardous to Your Wealth: The Common Stock Investment Performance of Individual Investors*, 55 J. FIN. 773, 792–94 (2000) (documenting that higher portfolio turnover is associated with significantly lower net returns); *see also id.* at 800 ("Those who trade the most are hurt the most.").

[9] *See infra* Part I.

to trading platforms, has led investors to engage in speculative trading behaviors, which, in turn, has prompted a friction between protecting unsophisticated investors and fostering market innovation. It frames that tension as a question of welfare by asking how regulators can curb the harms from overtrading while preserving the real participation benefits many users derive from cheap, app-based access to markets.

Part II introduces a framework centered on disclosing the underlying logic, data inputs, and decisionmaking processes used by automated systems to influence retail investors.[10] It assesses the success and failure of disclosure-based regimes in financial markets. This section also introduces algorithmic disclosure as a mechanism to enhance transparency and accountability for PDA technologies.

Part III addresses the hurdles of implementation by highlighting the danger that disclosures might become mere "fine print" or be manipulated so investors miss critical details.[11] It also examines the tension between preserving trade secrets and offering enough transparency to ensure accountability.

I
Conflicts and Gamification

A decade of "free" trading has masked a big cost.[12] Broker-dealers monetize attention by pairing PFOF rebates with casino-style prompts that keep retail investors tapping, swiping, and, ultimately, overtrading.[13] This Part maps how behavioral designs direct order flow to the highest-paying wholesaler. Then, it excavates the conflict at the heart of this model: Extra trades likely reduce customer returns.

A. Rise of Gamified Retail Trading Platforms

Retail trading platforms—online brokers that allow retail investors to buy and sell financial assets through websites or mobile apps—attracted a new generation of investors by gamifying the investment experience. Robinhood rather infamously used to display confetti animations when users would make trades, send push notifications when they hit portfolio milestones, and deploy interactive features like

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10 *See infra* Part II.

11 *See infra* Part III.

12 "Free" appears in scare quotes because the marketing term "commission-free" does not mean costless.

13 *See* Conflicts of Interest Associated with the Use of Predictive Data Analytics by Broker Dealers and Investment Advisers, 88 Fed. Reg. 53960, 53999 (proposed Aug. 9, 2023) [hereinafter Proposed Rule] ("[S]ome stock trading apps appear to follow strategies employed by some firms in the gambling industry to encourage frequent repeat betting.").

a "First List" to make investing much more enticing.[14] These features were alarming, since retail investors—individual, non-professional market participants who invest their personal funds—tend to "perform worse the more actively they trade."[15]

This was not a problem in the world of the first generation of online brokers like Schwab or TD Ameritrade. Those platforms were mainly used by experienced investors.[16] When Robinhood came to the market with its mobile-first onboarding, it lowered barriers for beginners. New users could open an account, receive a free stock via a scratch-off animation, and start trading within minutes. No need to understand account types or fund settlement delays. Schwab, on the other hand, has historically required more steps to become a member: filling out longer forms, choosing between multiple account types, and waiting for approval.[17]

Now, retail investors have greater access to their smartphones and are eager to invest with them.[18] This heightened accessibility is precisely

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14 *See* Langvardt & Tierney, *supra* note 6, at 723 (highlighting how Robinhood "splashed confetti across users' screens upon execution of a trade" and used virtual rewards to maximize engagement).

15 *Id.* at 723–24. Some of these gamifying practices stopped following a consent order imposed by the Massachusetts Securities Division. *See* Robinhood Fin. LLC, Respondent, Nos. E-2020-0047, E-2022-0006, 2024 WL 790732, at *3 (Mass. Sec. Div. Jan. 18, 2024) (consent order) (noting that Robinhood ceased use of digital confetti features, digital "scratch-off" tickets, waitlist tapping features, and certain push notifications). Robinhood was ordered to remove "all emojis from . . . transaction[s]," cease the use of "waitlist tapping feature[s]," "confetti" animations, "celebratory imagery" tied to trading frequency, "generalized push notifications" for specific lists, and features mimicking "games of chance." *Id.* at *11.

16 Abraham J.B. Cable, *Regulating Democratized Investing*, 83 Ohio St. L.J. 671, 683 (2022) (noting Robinhood's departure from previous brokers, which catered to a sophisticated investor); *see also* Sergio Alberto Gramitto Ricci & Christina M. Sautter, *The Educated Retail Investor: A Response to "Regulating Democratized Investing*," 83 Ohio St. L.J. Online 205, 207 (2022) (citing FINRA Inv. Educ. Found. & NORC at the Univ. of Chi., Investing 2020: New Accounts and the People Who Opened Them 2–3 (2021), https://www.finrafoundation.org/sites/finrafoundation/files/investing-2020-new-accounts-and-the-people-who-opened-them_1_0.pdf [https://perma.cc/J4VK-Z7GR]) (analyzing a study showing "two-thirds of . . . new investors [opening non-retirement investment accounts] were below the age of 45" and that mobile-first investing apps have spurred the involvement of "Millennials and GenZ'ers[, who] make up for 67% of the new retail investors in 2020").

17 *See, e.g.*, Charles Schwab, *Open a Schwab One Brokerage Account* (2024), https://www.schwab.com/public/file/P-221707 [https://perma.cc/8YZ5-UHPA] (forms); Charles Schwab, *Homepage*, https://www.schwab.com [https://perma.cc/H53R-YTA8] (last visited Sep. 14, 2025) (site navigation under "Accounts & Products" lists "Brokerage and Trading," "Retirement Accounts (IRAs)," "Education and Custodial," "Personal Choice Retirement," and "Small Business") (account types); Charles Schwab Int'l, *How to Open an Account*, https://international.schwab.com/content/how-to-open-international-account [https://perma.cc/NX5S-FL8X] (last visited Sep. 14, 2025) (approval waiting period) ("Review and approval can take anywhere between 3 days to 2 weeks, depending on the completeness of the information we receive.").

18 *See* Gramitto Ricci & Sautter, *supra* note 16, at 207 ("[I]t is no surprise that young generations of investors rely on technology and online sources of information in their

why the use of PDA and DEP is so troubling. In finance, PDA are the use of machine learning models to predict when and how a retail user will trade, while DEP are the gamified prompts and design tweaks that use those predictions to prompt trading.[19] These systems mine granular behavioral data—everything from the user's scrolling habits to the precise times of day they check the app—to craft highly personalized prompts.[20] But unlike overt, game-like features that are conspicuous and identifiable, these predictive design mechanisms largely operate beneath the surface. Among those who are less experienced, such practices lead to users making ill-advised decisions.[21] For example, retail investors frequently engage in options trading, which is much riskier than buying equities and often results in 100% losses when trades fail.[22] The "Top Mover" list has also been shown to drive similar

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investing efforts."); *see also* Sergio Alberto Gramitto Ricci & Christina M. Sautter, *Corporate Governance Gaming: The Collective Power of Retail Investors*, 22 Nev. L.J. 51, 53 (2021) (noting the increasing use of these "wireless investors" in "corporate governance engagement").

19 Int'l Org. of Sec. Comm'ns, *supra* note 3, at 9.

20 *See, e.g.*, Jill E. Fisch, *GameStop and the Reemergence of the Retail Investor*, 102 B.U. L. Rev. 1799, 1855 (2022) ("A brokerage app can collect information on a customer's trading patterns, predict which types of securities the customer is most likely to buy, and target that customer with recommendations for more of those types of securities."); James Fallows Tierney, *Investment Games*, 72 Duke L.J. 353, 432–33 (2022) (noting that gamification strategies "are combined with data analytics that tailors content to users and targets content that will call *them* . . . to action"); Michael Kearns & Yuriy Nevmyvaka, *Machine Learning for Market Microstructure and High-Frequency Trading*, *in* High-Frequency Trading: New Realities for Traders, Markets and Regulators 91, 94–96 (David Easley, Marcos López de Prado & Maureen O'Hara eds., 2013) (discussing how machine learning uses granular data to optimize decisions and predict behavior like trade execution); Alessio Azzutti, Wolf-Georg Ringe & H. Siegfried Stiehl, *Machine Learning, Market Manipulation, and Collusion on Capital Markets: Why the "Black Box" Matters*, 43 U. Pa. J. Int'l L. 79, 86 (2021) ("[Machine Learning] can assist investment firms in both pattern recognition and financial decision-making tasks. . . . For instance . . . algorithms can use technical market indicators or other useful data to predict the next day's winning and losing stocks from past observations yielded from empirical data.").

21 *See* Liran Eliner & Botir Kobilov, To the Moon or Bust: Do Retail Investors Profit from Social Media-Induced Trading? 14 (July 30, 2023) (unpublished manuscript), https://afajof.org/management/viewp.php?n=64120 [https://perma.cc/U4X3-ZG2T] (highlighting that retail investors engaging in social media-induced trades consistently underperform with returns averaging 1.6–2.8% lower than other equity trades). Those who lack the financial literacy or awareness to identify potential drawbacks are especially vulnerable to gamification tactics. *See, e.g.*, U.S. Sec. & Exch. Comm'n, Study Regarding Financial Literacy Among Investors, at iii (2012), https://www.sec.gov/news/studies/2012/917-financial-literacy-study-part1.pdf [https://perma.cc/NN82-XYFC] ("Studies reviewed by the Library of Congress indicate that U.S. retail investors . . . have a weak grasp of elementary financial concepts and lack critical knowledge of ways to avoid investment fraud."); Fisch, *supra* note 20, at 1858–59 (noting that retail investors often lack understanding of "the products they are using" and that app-based brokers can leverage "just-in-time information" to influence decisionmaking).

22 *See* Betsy Vereckey, *Retail Investors Lose Big in Options Markets, Research Shows*, MIT Sloan Sch. of Mgmt. (Aug. 4, 2022), https://mitsloan.mit.edu/ideas-made-to-matter/retail-investors-lose-big-options-markets-research-shows [https://perma.cc/C9TV-4QKD] ("Options

financial losses by encouraging intense buying that is heavily linked to negative returns.[23]

Many retail brokers—companies that help consumers buy and sell securities—earn profits by driving trading activity through Payment for Order Flow (PFOF).[24] In this system, brokers receive payments from market makers in exchange for routing client orders to them.[25] Brokers send customer orders to off-exchange market makers, or "wholesalers"—these include Citadel Securities, Virtu Financial, and G1 Execution Services[26]—who either complete the trade themselves or pass it along to other market makers.[27]

To see why that routing choice matters, we must compare on-exchange and off-exchange trading. "On-exchange" trading happens

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can be much riskier than equities . . . [and] in a lot of cases there's no payoff and investors lose 100% of their investment."); *see also* Tim de Silva, Eric C. So & Kevin Smith, *Losing Is Optional: Retail Option Trading and Expected Announcement Volatility* 38 (Stanford Graduate Sch. of Bus. Working Paper No. 4278, 2025), https://ssrn.com/abstract=4050165 [https://perma.cc/N8ZP-8VC2] (highlighting that "unsophisticated investors" often face double-digit losses in options trading around high-volatility events).

[23] *See* Brad M. Barber, Xing Huang, Terrance Odean & Christopher Schwarz, *Attention-Induced Trading and Returns: Evidence from Robinhood Users*, 77 J. Fin. 3141, 3144–45 (2022); *see also* Ivo Welch, *The Wisdom of the Robinhood Crowd*, 77 J. Fin. 1489, 1499–1501 (2022) (finding that Robinhood users flock to stocks after sharp price swings, and that attention-driven herding usually leads to losses).

[24] Tierney, *supra* note 20, at 381; *see also 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. 5–6 (2021) [hereinafter *House Gamification Hearing*] (statement of Gary Gensler, Chairman, U.S. Sec. & Exch. Comm'n) (offering background on PFOF and possible market-wide risks associated with the practice). Many retail brokers have since eliminated trading commissions and lowered or eliminated account minimums to make their platforms more accessible. U.S. Sec. & Exch. Comm'n, Staff Report on Equity and Options Market Structure Conditions in Early 2021 7–8 (2021), https://www.sec.gov/files/staff-report-equity-options-market-struction-conditions-early-2021.pdf [https://perma.cc/M9D6-VAMN] [hereinafter Staff Report on Market Structure Conditions]. Some brokerage firms still act as "principal brokers" and hold inventory of popular stocks: A large broker like Schwab or E-Trade might keep a certain number of NVIDIA shares on hand to expedite trades. *See generally* Emily Norris, *Principal Trading vs. Agency Trading: What's the Difference?*, Investopedia (Sep. 29, 2021), https://www.investopedia.com/articles/03/012403.asp [https://perma.cc/L5LB-N7XD] (defining firms that act as principal brokers as those which trade with their "own inventory of securities" rather than as agents "trading with another investor, potentially at another brokerage"). Platforms like Robinhood, on the other hand, operate as agency brokers and carry zero stock inventory. *See id.*

[25] "A market maker is a firm, individual or trading strategy that always or often quotes both a buy and a sell price for a financial instrument or commodity, hoping to make a profit by exploiting the difference between the two prices, known as the *spread*." Tanmoy Chakraborty & Michael Kearns, *Market Making and Mean Reversion*, *in* 12 ACM Conf. on Elec. Com. 1, 1 (2011), https://dl.acm.org/doi/pdf/10.1145/1993574.1993622 [https://perma.cc/D9PV-HNJH].

[26] Eva Su, Cong. Rsch. Serv., IF12594, Payment for Order Flow (PFOF) and Broker-Dealer Regulation (2024).

[27] *See* Staff Report on Market Structure Conditions, *supra* note 24, at 11.

through public venues such as the New York Stock Exchange (NYSE) or Nasdaq, where transactions are visible, and prices are openly quoted. In contrast, "off-exchange" trading includes private or "alternative" networks, such as dark pools or direct broker-to-broker arrangements.[28] Off-exchange trades are often hidden from public view until after they're executed; we're most concerned about these types of trades since market makers in off-exchange trades are not bound by the penny-increment rule and can thus adjust their prices into sub-penny portions.[29] Moreover, many market makers can track every price flicker in real time. They buy at the perfect bid (e.g., $98) and resell at the optimal ask (e.g., $100).[30]

Conflict of interest issues arise when Margaret, the retail investor from the above example, puts in an order for NVIDIA shares, and her broker, the trading app, tries to maximize its revenue with the market maker rather than offer her the "best execution" for her trade.[31] Think of it like riding in a cab whose meter you don't see: the driver gets a kickback for taking a longer route, so your destination costs more than it should. Here, the app earns extra every time it steers your trade to the wholesaler willing to pay the highest rebate.[32] Margaret's interest in getting the best price therefore conflicts with the platform's interest of maximizing PFOF revenue.

For many years, PFOF was a poorly kept secret.[33] Then, amid the COVID-19 pandemic, the "GameStop Saga" pointed a spotlight

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[28] *See generally* Steven W. Poser, Market Makers in Financial Markets: Their Role, How They Function, Why They Are Important, and the NYSE DMM Difference (2021), https://www.nyse.com/publicdocs/nyse/NYSE_Paper_on_Market_Making_Sept_2021.pdf [https://perma.cc/ZT68-DKLS] (distinguishing between "on-exchange" trading occurring through transparent registered exchanges like NYSE or Nasdaq, and "off-exchange" trading including private venues such as dark pools).

[29] *See* Staff Report on Market Structure Conditions, *supra* note 24, at 11; Su, *supra* note 26, at 1 ("While PFOF is generally a fraction of a cent per trade . . . the 12 largest U.S. brokerages earned a total of $3.8 billion in PFOF revenue in 2021.").

[30] *See* Thomas Ernst & Chester Spatt, Wharton Initiative on Fin. Pol'y & Reg., Payment for Order Flow and the Retail Trading Experience 7 (2023), https://wifpr.wharton.upenn.edu/wp-content/uploads/2023/10/Payment-for-Order-Flow.pdf [https://perma.cc/DB84-4RU4] (explaining that "[i]f wholesaler revenue is the bid-ask spread, . . . [a]llocating a dollar toward PFOF . . . cannot be directed toward price improvement").

[31] *See* Tierney, *supra* note 20, at 382 n.108; *id.* at 381–84 (explaining the conflicted interests of the "best execution" requirement and the PFOF-based incentives of market makers).

[32] *See* Su, *supra* note 26 (highlighting concerns that brokers might have incentives to send retail orders to rebating wholesalers that are most beneficial to the broker rather than to the client).

[33] *See* Jeremy Grant, *Dark Times for Opaque Trading Platforms*, Fin. Times (June 26, 2014), https://www.ft.com/content/97810c5e-fd1c-11e3-8ca9-00144feab7de [https://perma.cc/F78K-HJ43] (describing how "dark pools," or "opaque trading platforms," lacked public transparency and often admitted predatory high-frequency traders). *See generally* Michael Lewis, Flash Boys: A Wall Street Revolt (2014) (describing the lack of knowledge, even

on the inner workings of retail trading platforms.[34] Regulators began investigating the platforms that enabled such collective trading strategies to occur.[35] These inquiries revealed how PFOF incentivized retail broker-dealers to route orders in ways that benefited market makers, often at the expense of retail investors.[36]

While that saga drew public attention, litigation was unfolding in the background. A class action lawsuit was filed against Robinhood in December 2020 alleging that the firm misled consumers on how they profited through PFOF.[37] At the same time, the Securities and Exchange Commission (SEC) charged Robinhood with failing to disclose its largest revenue source through PFOF and with violating its duty to provide the "best execution" of trades.[38] The Financial Industry Regulatory Authority (FINRA) filed an analogous enforcement action a year prior to that,[39] and imposed a subsequent penalty against Robinhood in June 2021 for a mix of supervisory failures and allegations that the platform enabled users to make trades they were ill-equipped to understand.[40] Alongside the civil lawsuit procured by the Massachusetts Securities Division, which alleged that Robinhood violated state fiduciary

among investors, about high-frequency trading and PFOF models at the time of the 2008 financial crisis).

[34] *See generally* Staff Report on Market Structure Conditions, *supra* note 24.

[35] *See* Chris Prentice & Michelle Price, *Explainer: The Regulatory and Legal Headwinds Facing Robinhood*, Reuters (July 2, 2021), https://www.reuters.com/technology/regulatory-legal-headwinds-facing-robinhood-2021-07-02 [https://perma.cc/5RW3-Z3YY].

[36] *See* Staff Report on Market Structure Conditions, *supra* note 24, at 2. *See generally House Gamification Hearing*, *supra* note 24 (questioning regulators on the ability of brokers who use gamification tactics and PFOF models to fulfill best-execution obligations to investors).

[37] Class Action Complaint, Lemon v. Robinhood Fin., LLC, No. 3:20-CV-09328 (N.D. Cal. Dec. 23, 2020).

[38] Press Release, U.S. Sec. & Exch. Comm'n, SEC Charges Robinhood Financial with Misleading Customers About Revenue Sources and Failing to Satisfy Duty of Best Execution (Dec. 17, 2020), https://www.sec.gov/newsroom/press-releases/2020-321 [https://perma.cc/J45W-DZRN]; Robinhood Fin., LLC, Securities Act Release No. 10906, Exchange Act Release No. 90694, 2020 WL 7482170 (Dec. 17, 2020).

[39] *See* Letter of Acceptance, Waiver, and Consent No. 2017056224001 from Robinhood Fin., LLC, to Dept. of Enforcement, Fin. Indus. Reg. Auth. 2–3 (Dec. 19, 2019), https://www.finra.org/sites/default/files/2019-12/robinhood-awc-121919.pdf [https://perma.cc/9FGT-63U6].

[40] Robinhood was sanctioned for violating FINRA Rules 2010 (misleading customers and failing to act equitably), 3110 (deficient supervision), 2360 (failing to exercise due diligence in approving options accounts), 4370 (inadequate business continuity planning), 4530 (failure to report customer complaints), and 3310 (flawed customer identification procedures allowing potential fraud). *See* Letter of Acceptance, Waiver, and Consent No. 2020066971201 from Robinhood Fin., LLC, to Dept. of Enforcement, Fin. Indus. Reg. Auth. 2–5 (June 30, 2021), https://www.finra.org/sites/default/files/2021-06/robinhood-financial-awc-063021.pdf [https://perma.cc/B4NX-QMFV].

rules by targeting inexperienced investors,[41] the platform was also subject to class action lawsuits for market manipulation when they halted GameStop and AMC trading in early 2021.[42]

The onslaught of civil and regulatory enforcement stripped away the most eye-catching forms of gamification but left in place the "nudges"—behavioral prompts that are designed to steer an investor toward a particular action without mandating it—that now power most retail-trading apps.[43] For instance, Robinhood's "Smart Notifications" feature still defaults to pushing an alert whenever a stock or crypto in a user's watchlist moves roughly five percent in a day, so "you won't miss a beat."[44] eToro's "CopyTrader" combs platform-wide performance data to spotlight top investors and nudges users to mirror their trades with a single tap.[45] SoFi's automated-investing tool relies on analytics to adjust allocations and prompt fresh deposits whenever a portfolio drifts from its target mix.[46]

Evidence continues to show that these price alerts are anything but neutral. Such push notifications, tied to a five percent price swing, boosts

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41 *See* Robinhood Fin., LLC, No. E-2020-0047, 2020 WL 7711667, at *3 (Mass. Sec. Div. 2020) (admin. complaint).

42 *See, e.g.*, Class Action Complaint, Perri v. Robinhood Markets, Inc., No. 21-CV-00234 (M.D. Fla. Jan. 29, 2021).

43 *See* Richard H. Thaler & Cass R. Sunstein, Nudge: Improving Decisions About Health, Wealth, and Happiness 6 (2008) ("A nudge . . . is any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives.").

44 *Smart Notifications*, Robinhood Newsroom (Feb. 4, 2016), https://newsroom.aboutrobinhood.com/smart-notifications [https://perma.cc/Y6MX-WMX2]; *see also Price Alerts*, Robinhood Help Ctr., https://robinhood.com/gb/en/support/articles/price-alerts [https://perma.cc/VS57-ZY7E] (last visited Sep. 20, 2025) (instructing users on setting up personalized price alerts).

45 *See CopyTrader Explained*, eToro, https://www.etoro.com/copytrader/how-it-works [https://perma.cc/G4M5-QR4L] (last visited Sep. 20, 2025) (showing users how to copy other traders and explaining how the Top Trader Smart Portfolio groups successful traders); *How Do I Set Price Alerts?*, eToro Help Ctr., https://help.etoro.com/s/article/how-do-i-set-price-alerts?language=en_GB [https://perma.cc/7V4K-277A] (last visited Sep. 20, 2025) (instructing users on setting up personalized price alerts).

46 *See, e.g.*, SoFi Wealth LLC, Wrap Fee Program Brochure 14 (2024), https://d32ijn7u0aqfv4.cloudfront.net/wp/wp-content/uploads/raw/ADV-2A-Appx-Wrap-Fee-Program-Brochure-24.11.12-final.pdf [https://perma.cc/LW3X-M79Y] ("SoFi uses software that tracks portfolio drift . . . [and w]hen a tolerance band is breached . . . the portfolio is rebalanced."); *SoFi Is Making a Significant Shift in Its Robo-Advisor Offering*, The Wealth Advisor (Nov. 14, 2024), https://www.thewealthadvisor.com/article/sofi-making-significant-shift-its-robo-advisor-offering [https://perma.cc/3WQC-MPWX] ("SoFi partners with BlackRock, leveraging its Aladdin platform, a tool for portfolio management and risk analysis."); *How Do I Set Up, Edit, or Cancel a Recurring Deposit on My Invest Account?*, SoFi Support, https://support.sofi.com/hc/en-us/articles/360052645572 [https://perma.cc/KN4U-GMQY] (last visited Sep. 20, 2025) (describing SoFi's in-app "Add Cash" prompt and automated recurring-deposit feature).

retail-trading volume by about twenty-five percent in the following fifteen minutes.[47] The U.K. Financial Conduct Authority's controlled experiment on nine thousand users reached a similar conclusion. Adding push notifications raised total trades by eleven percent and pushed "risky" positions up eight percent.[48] The most noticeable impact in this study was, again, felt by younger investors and those with lower financial literacy.[49]

Just last year, Robinhood tried to take the logic of nudging into outright wagering. It launched a prediction-markets hub through KalshiEX, one of the leading Event Contracts platforms, that lets customers bet on events ranging from federal court decisions to March Madness brackets.[50] This move prompted an immediate investigation by Massachusetts's securities regulator, who called the feature "another gimmick."[51] A month earlier, the trading platform yanked its Super Bowl betting contracts after the CFTC warned they resembled illegal wagers.[52] In September of 2025, the Massachusetts attorney general filed suit against Kalshi in state court, accusing the platform of running an unlicensed sportsbook and seeking civil penalties and an injunction to shut down its sports-related event markets in the Commonwealth.[53] Robinhood then immediately countersued in the

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47 Austin Moss, How Do Brokerages' Digital Engagement Practices Affect Retail Investor Information Processing and Trading? 3–4 (Dec. 2022) (Ph.D. dissertation, University of Iowa Henry B. Tippie College of Business).

48 *FCA Keeps Trading Apps Under Review over Gaming Concerns*, Fin. Conduct Auth. (June 20, 2024), https://www.fca.org.uk/news/press-releases/fca-keeps-trading-apps-under-review-over-gaming-concerns [https://perma.cc/376Q-33ED].

49 *Id.* ("DEPs can have a larger impact on some subgroups, including those with low financial literacy, women and younger participants (18-34).").

50 *See* Niket Nishant, *Explainer: Event Contracts: Trading's Next Big Thing or 'Backdoor to Gambling'?*, Reuters (Mar. 18, 2025), https://www.reuters.com/markets/wealth/event-contracts-tradings-next-big-thing-or-backdoor-gambling-2025-03-17 [https://perma.cc/7LTV-JTFN].

51 Nate Raymond, *Exclusive: Massachusetts Regulators Probe Robinhood Over March Madness Basketball Betting*, Reuters (Mar. 24, 2025), https://www.reuters.com/business/finance/massachusetts-regulators-probe-robinhood-over-march-madness-basketball-betting-2025-03-24 [https://perma.cc/4FKS-9BBU].

52 *Id.*

53 *See* Complaint, Commonwealth of Massachusetts v. KalshiEX LLC, No. 2584CV02525 (Mass. Super. Ct. Suffolk Cnty. Sep. 12, 2025). Regulators in Maryland, Nevada, New Jersey, New York, Ohio, Arizona, Illinois, and Montana have similarly issued cease-and-desist letters against Kalshi. *See, e.g.*, Md. Lottery & Gaming Control Comm'n, Re: Notice to Cease and Desist (Apr. 7, 2025); Press Release, Nev. Gaming Control Bd., Nevada Gaming Control Board Issues Cease and Desist Order to Company Engaged in Unlawful Gaming (Mar. 4, 2025); N.J. Div. of Gaming Enf't, Dep't of Law & Pub. Safety, Re: Unauthorized Sports Wagering in New Jersey (Mar. 27, 2025); N.Y. State Gaming Comm'n, Re: Unlicensed Sports Wagering in New York State (Oct. 24, 2025); Ohio Casino Control Comm'n, Cease and Desist Notice to KalshiEX LLC, Re: Cease-and-Desist: Event Contracts on Sporting Events Violate Ohio Sports Gaming Laws (Mar. 31, 2025); Ariz. Dep't of Gaming, Re: Cease and Desist – Kalshi Online Gaming (May 21, 2025); Ill. Gaming Bd., Re: Suspected Illegal Sports

District of Massachusetts, arguing that the Commodity Exchange Act gives the CFTC exclusive authority over Kalshi's event contracts and therefore preempts Massachusetts gambling law.[54]

Could Robinhood's insistent effort on pivoting into and protecting the prediction-market space be a means of redirecting its behavioral-targeting engine for outright gambling? In the event-contract market, investor-protection rules are much weaker, and impulse-based engagement can be equally damaging.[55] This pivot is not only alarming because it is transferring the same data-driven nudges into a higher-stakes environment while retaining the veneer of a brokerage app, but it is collapsing an important conceptual boundary.

Public equity markets exist to intermediate capital and facilitate price discovery. Often, investing in such markets can be a positive-sum experience.[56] When businesses grow, they generate profits and pay dividends, so total wealth increases. But for a retail investor who is stock-picking in a market that is close to efficient—the notion that all information is fully reflected in an asset's price—the expected "alpha," or excess return, after fees, spreads, and taxes are taken, is roughly zero.[57] In other words, extra trading rarely buys the average retail investor anything beyond higher costs. Short-dated options and event contracts

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Wagering by KalshiEX LLC (Apr. 1, 2025); Mont. Dep't of Just., Gambling Control Div., Re: Order to Cease and Desist Illegal Gambling Activities in Montana (Mar. 26, 2025).

54 *See* Complaint, Robinhood Derivatives, LLC v. Campbell, No. 1:25-cv-12578 (D. Mass. Sep. 15, 2025). Robinhood has filed comparable lawsuits protecting their customer's ability to trade event contracts through Kalshi in New Jersey and Nevada. *See* Complaint, Robinhood Derivatives, LLC v. Flaherty, No. 1:25-cv-14723 (D.N.J. Aug. 19, 2025); Complaint, Robinhood Derivatives, LLC v. Dreitzer, No. 2:25-cv-01541 (D. Nev. Aug. 19, 2025).

55 For example, "insider trading rules in prediction markets are variable and unsettled, and it's not entirely clear . . . whether and to what extent, say, Polymarket allows insider trading." *See* Matt Levine, *Bill Ackman Has a Trade for Eric Adams*, Bloomberg: Op. (Sep. 8, 2025), https://www.bloomberg.com/opinion/newsletters/2025-09-08/bill-ackman-has-a-trade-for-eric-adams [https://perma.cc/765M-53UP]; *see also* Justina Lee, *Two MIT Math Nerds Crack Open Legalized Gambling on Wall Street*, Fin. Advisor (May 30, 2025), https://www.fa-mag.com/news/two-mit-math-nerds-crack-open-legalized-gambling-on-wall-street-82710.html [https://perma.cc/ZB4V-8EU8] (describing Kalshi's sports-betting contracts as a "high-tech casino operating in a legal gray zone . . . seemingly outside the reach of state regulators").

56 *See* Roger G. Ibbotson & Peng Chen, *Long-Run Stock Returns: Participating in the Real Economy*, 59 Fin. Analysts J. 88, 89–90 (2003) (estimating the equity risk premium on the S&P 500 at about four to six percent annually and showing stocks reflect real-economy growth).

57 *See* William F. Sharpe, *The Arithmetic of Active Management*, 47 Fin. Analysts J. 7, 7–8 (1991) (describing active management as zero-sum before costs and underperforming after costs); Eugene F. Fama & Kenneth R. French, *Luck Versus Skill in the Cross-Section of Mutual Fund Returns*, 65 J. Fin. 1915, 1916–17 (2010) (finding aggregate α for active U.S. equity funds is about zero gross and negative net).

are, however, much closer to zero-sum wagers.[58] One person's gain has to come at someone else's loss. So when these near zero-sum bets are offered inside the same app and framed with the same prompts as long-term investing, the line between capital allocation and pure wagering effectively disappears.

B. The SEC's PDA Proposal

Apart from the fines and enforcement proceedings levied in 2022, the SEC began an inquiry to solicit commentaries from the public on how digital engagement practices affect investor behavior and regulatory compliance.[59] It received over a thousand comments from the public, many of which seemed critical of the practices.[60] In August 2023, the SEC released its preliminary proposal aimed at addressing challenges posed by PDA.[61]

This proposed rule is a response to the increasing use of sophisticated techniques by broker-dealers and investment advisers to influence retail investors.[62] It sets clear expectations. Firms must identify any conflicts of interest stemming from their use of "covered technologies in investor interactions."[63] The covered technologies can include any technology that utilizes PDA, artificial intelligence (AI), machine learning, deep learning, neural networks, natural language processing (NLP), and large language models (LLMs).[64] Once identified, these conflicts must be either neutralized or eliminated altogether. To enforce this mandate, firms are required to, for example,

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58 *See* Changxi Li, Fenghua He & Ning Hao, *Verification and Design of Zero-Sum Potential Games*, *in* Preprints of the 21st IFAC World Congress (Virtual) 17173 (2020) (defining a zero-sum game as one "where one player's gain is equivalent to another's loss").

59 *See* Request for Information and Comments on Broker-Dealer and Investment Adviser Digital Engagement Practices, 86 Fed. Reg. 49067, 49067, 49077 (Sep. 1, 2021).

60 *See* Comments on Request for Information and Comments on Broker-Dealer and Investment Adviser Digital Engagement Practices (Sep. 1, 2021), https://www.sec.gov/comments/s7-10-21/s71021.htm#comments [https://perma.cc/ZMG9-UCX8].

61 In June 2025, the SEC formally withdrew that proposal as part of a broader "Withdrawal of Proposed Regulatory Actions," stating that it did not intend to issue final rules on the PDA proposal and would need to issue a new proposal if it revisits the area. *See Conflicts of Interest Associated with the Use of Predictive Data Analytics by Broker-Dealers and Investment Advisers*, SEC (June 12, 2025), https://www.sec.gov/rules-regulations/2025/06/s7-12-23 [https://perma.cc/MC2B-MUWE].

62 *See* Proposed Rule at 53963 ("In recent years, we have observed a rapid expansion in firms' reliance on technology and technology-based products and services. The use of technology is now central to how firms provide their products and services to investors."); *see also House Gamification Hearing*, *supra* note 24, at 5 (discussing use of features "such as gamification, behavioral props, and predictive data analytics" that "encourage investors to trade more frequently").

63 *See* Proposed Rule at 53967 n.80.

64 *Id.* at 53961 n.3.

include regular testing and evaluations of how the technology is used and its potential impact on investors.[65] Firms must also maintain records detailing the use of PDA tools and the steps they have taken to manage conflicts of interest.[66]

During the designated notice-and-comment period for this proposal, critics pointed to several issues. First, they noted that it is flawed due to its overly broad definitions of "covered technologies" and "customer interactions."[67] The way those terms were used in the rule's text, they noted, risked covering benign tools like spreadsheets and emails, which are critical in the securities markets.[68] Second, that by mandating the elimination or neutralization of conflicts of interest in all contexts, the rule imposed impractical compliance burdens, which would disproportionately affect smaller firms.[69] Third, that the existing regulatory framework under Regulation Best Interest (Reg BI) and fiduciary obligations for Registered Investment Advisors (RIAs)

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65 *Id.* at 53980.

66 *Id.* at 53995–96.

67 *See, e.g.*, Matthew Benchener, Vanguard Grp., Inc., Comment Letter on Conflicts of Interest Associated with the Use of Predictive Data Analytics by Broker-Dealers and Investment Advisers, at 2 (Oct. 10, 2023); Susan Olson, Inv. Company Inst., Comment Letter on Conflicts of Interest Associated with the Use of Predictive Data Analytics by Broker-Dealers and Investment Advisers, at 4 (Oct. 10, 2023); Melissa MacGregor & Kevin Ehrlich, Sec. Indus. and Fin. Mkts. Ass'n (SIFMA) & SIFMA Asset Mgmt. Grp., Comment Letter on Conflicts of Interest Associated with the Use of Predictive Data Analytics by Broker-Dealers and Investment Advisers, at 10–11 (Oct. 10, 2023) [hereinafter SIFMA Comment Letter]; Daniel M. Gallagher, Robinhood Fin. LLC, Comment Letter on File No. S7-12-23: Conflicts of Interest Associated with the Use of Predictive Data Analytics by Broker-Dealers and Investment Advisers, at 5 (Oct. 10, 2023) [hereinafter Robinhood Comment Letter]; *see also* Sergio A. Gramitto Ricci & Christina M. Sautter, Comment Letter on SEC's Proposed Rule on Conflicts of Interest Associated with the Use of Predictive Data Analytics by Broker-Dealers and Investment Advisers, at 3 (Oct. 9, 2023) [hereinafter Gramitto Ricci & Sautter Comment Letter] (arguing the proposal's definitions of "covered technology" and "investor interaction" create uncertainty by sweeping in benign tools like spreadsheets).

68 *See* Gramitto Ricci & Sautter Comment Letter, *supra* note 67, at 3 ("[T]he Commission itself recognizes that the proposed rule would apply to well established, common practices such as using spreadsheets in providing advice to clients . . . ."); *see also* SIFMA Comment Letter, *supra* note 67, at 11 ("[A]ny email or other communication that could be said to be part of a marketing effort would arguably be covered by the Proposed Rules even without the use of an investment analysis tool.").

69 SIFMA Comment Letter, *supra* note 67, at 17 ("These burdens would be especially severe for smaller BDs and RIAs that may not have the resources to take on (or to hire consultants to facilitate) the annual evaluation processes required under the Proposed Rules, even after increasing costs to investors or limiting their offerings."); *see also id.* at 25 ("Firms therefore will be required to expend massive resources and efforts, both initially and on an ongoing basis, to scour their systems and identify and assess all covered technologies . . . includ[ing] countless tools, models, and other resources that . . . are already fully integrated into day-to-day operations.").

already provides enough protections for consumers; any further regulation would be unnecessarily redundant.[70]

Under Reg BI, broker-dealers are required to act in the best interests of their clients. Brokers must disclose "material facts relating to *the scope and terms of the relationship with the retail customer*," including potential conflicts of interest and any limitations on product offerings.[71] They must act with "reasonable diligence, care, and skill" to understand the conflicts that are associated with a recommendation.[72] And they "must establish, maintain, and enforce written policies and procedures reasonably designed to address conflicts of interest" by eliminating, or at least disclosing and mitigating, material conflicts.[73] The rule sets broad conduct obligations but leaves specific technology-driven conflicts largely unaddressed.

To date, broker-dealers have tried to manage conflicts largely through boilerplate risk disclosures and "education" portals. Robinhood's Options Knowledge Center warns that "day trading can be extremely risky."[74] It also explains that "[w]hen trading options, potential losses can accrue at a much faster rate, and it's possible to lose your entire initial investment (or more)."[75] Robinhood's social blog touts online tutorials and workshops for customers to grow their financial knowledge as part of their commitment to "breaking down barriers that have historically prevented . . . investors . . . from participating in the financial markets."[76] Traditional firms similarly flood users with free webinars and month-long "Financial Literacy" campaigns.[77] These measures, however, are all general and presented after-the-fact. They appear in education portals, PDF disclosures, and scheduled or on-demand webinars.[78] They are far removed from the

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[70] *Id.* at 5 (citing "Regulation Best Interest" and "suitability rules" as "existing rules and regulations [that] already require that any recommendation or advice be in the best interest of the investor"); Robinhood Comment Letter, *supra* note 67, at 12.

[71] *See* U.S. Sec. & Exch. Comm'n, *Regulation Best Interest: A Small Entity Compliance Guide* (Sep. 9, 2019) (emphasis added), https://www.sec.gov/resources-small-businesses/small-business-compliance-guides/regulation-best-interest [https://perma.cc/7985-JMR5].

[72] *Id.*

[73] *Id.*

[74] *Options Knowledge Center*, Robinhood, https://robinhood.com/us/en/support/articles/options-knowledge-center [https://perma.cc/2MJH-MKHA] (last visited Sep. 15, 2025).

[75] *Id.*

[76] *See Social*, Robinhood, https://esg.robinhood.com/social [https://perma.cc/H33H-3NL6] (last visited Sep. 15, 2025).

[77] *See TD Direct Investing, Investor Education Events*, TD Bank (Oct. 2, 2025), https://www.td.com/ca/en/investing/direct-investing/educationevents [https://perma.cc/NJ8S-B249].

[78] *See, e.g.*, *Schwab Coaching: On-Demand Webcasts*, Charles Schwab, https://www.schwab.com/coaching/ondemand-webcasts [https://perma.cc/6N7Q-M4G8] (last visited Oct. 2, 2025); *Events: Live and On-Demand*, E*TRADE from Morgan Stanley, https://us.etrade.com/knowledge/events [https://perma.cc/2RW7-5BV7] (last visited Oct. 2, 2025); Options

personalized prompts that drive trading behavior. Nothing in Reg BI forces a firm to reveal why its algorithm is pinging a user now. So, these fine-print disclaimers and post-trade tutorials amount to little more than box-checking for SEC compliance.

C. Risk of Overreach

As with any new SEC regulation, there is ongoing debate over how far the agency should go to protect investors. Trump's deregulatory policy agenda may have paused comparable regulations from being finalized in the short term,[79] but it has not disappeared entirely, and, if regulators revisit a rule aimed at nudges and behavior-targeting tools, the SEC will likely face the same definitional and cost hurdles as its PDA proposal.

Because securities regulations often emerge as a response to financial crises or scandals, the concern is that the government will overreact in an attempt to appease public sentiments.[80] This is especially

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Boot Camp, E*TRADE from Morgan Stanley, https://us.etrade.com/knowledge/library/options [https://perma.cc/KWK5-6689] (last visited Oct. 2, 2025); *Options Trading at Fidelity*, Fidelity Investments, https://www.fidelity.com/learning-center/investment-products/options/options-101-webinar-series-recording [https://perma.cc/BZ6W-XZZ5] (last visited Oct. 2, 2025); *Events Center*, Merrill (Bank of America), https://go.ml.com/events [https://perma.cc/WZ3E-9B3C] (last visited Oct. 2, 2025).

[79] *See, e.g.*, Memorandum of Jan. 20, 2025, Regulatory Freeze Pending Review: Memorandum for the Heads of Executive Departments and Agencies, 90 Fed. Reg. 8249, 8249 (Jan. 28, 2025) (ordering agencies to "not propose or issue any rule" until approved, to "[i]mmediately withdraw any rules . . . sent to the OFR but not published," and to "consider postponing for 60 days . . . the effective date" of rules not yet effective); Aidan T. Kane, Eli Schrag & Sanjay Patnaik, *What Will Deregulation Look Like Under the Second Trump Administration?*, Brookings (Feb. 24, 2025), https://www.brookings.edu/articles/what-will-deregulation-look-like-under-the-second-trump-administration [https://perma.cc/4G95-8QX7] (noting that Trump's Jan. 20, 2025 "'Regulatory freeze pending review' . . . halted all rulemaking processes, including any rules under development and in the proposal stages"); Form N–PORT and Form N–CEN Reporting: Guidance on Open-End Fund Liquidity Risk Management Programs; Delay of Effective and Compliance Dates, Investment Company Act Release No. 35538, 90 Fed. Reg. 16812 (Apr. 22, 2025) (to be codified at 7 C.F.R. pts. 270, 274) (delaying dates "to provide time for the Commission to complete its review in accordance with the Presidential Memorandum"); Johann M. Cherian, Lewis Krauskopf & Douglas Gillison, *Trump Renews Calls for Ending Quarterly Reports for Companies*, Reuters (Sep. 16, 2025, at 17:12 ET), https://www.reuters.com/sustainability/boards-policy-regulation/trump-renews-calls-ending-quarterly-reports-companies-2025-09-16 [https://perma.cc/MYX5-587V] (describing President Trump's renewed call for the SEC to allow semiannual rather than quarterly earnings reports).

[80] *See* Steven L. Schwarcz, *Securitization and Post-Crisis Financial Regulation*, 101 Corn. L. Rev. Online 115, 117 (2016). After all, the Securities Exchange Act of 1934 and the Investment Company Act of 1940 were both born out of the Great Depression. *See, e.g.*, *Mission*, U.S. Sec. & Exch. Comm'n, https://www.sec.gov/about/mission [https://perma.cc/YB2P-QD53] (last visited Sep. 15, 2025) ("Since our founding in 1934 at the height of the Great Depression, we have stayed true to our mission of protecting investors, maintaining fair, orderly, and efficient markets, and facilitating capital formation."); Comment, *The*

true in today's age of "augmented publicness," where corporate actions face heightened scrutiny on social media, pushing government measures to respond to public outcry.[81]

The SEC began its mission by empowering investors to make informed decisions through direct disclosures.[82] This approach has changed somewhat.[83] In the 1960s, the SEC began embracing the idea that individual investors did not need to directly analyze disclosures if professionals filtered the information into market prices.[84] The 1969 Wheat Report, and later amendments like Form S-16, promoted the idea that investors could rely solely on the market price as a reflection of all material information processed through professional analysis.[85]

With the SEC's PDA proposal, the agency is further repurposing its initial mandate of disclosure by putting the onus on the firms to discover and remove any conflicts that arise with the use "of a covered technology in any investor interaction."[86] In short, the PDA proposal mandates that brokerage firms, and investment advisers—professionals who provide guidance on managing and allocating assets—are tasked with doing the work of filtering their own technology for existing conflicts of interest.[87] Many contend that this rule would trigger a range of spillover costs.[88]

Investment Company Act of 1940, 50 YALE L.J. 440, 440 (1941). Similarly, the Insider Trading and Securities Fraud Enforcement Act of 1988 aimed to restore market integrity after scandals like those of Ivan Boesky. *See* Neil V. Shah, *Section 20A and the Struggle for Coherence, Meaning, and Fundamental Fairness in the Express Right of Action for Contemporaneous Insider Trading Liability*, 61 RUTGERS L. REV. 791, 798 (2009).

[81] *See generally* Sergio Alberto Gramitto Ricci, Corporate Governance & Public Opinion (forthcoming 2026) (unpublished manuscript) (on file with author) (analyzing how technology-driven transparency and social media scrutiny have intensified corporations' exposure to public opinion, creating a new form of shame-based accountability beyond traditional regulatory frameworks).

[82] *See* Howard M. Friedman, *On Being Rich, Accredited, and Undiversified*, 47 OKLA. L. REV. 291, 294 (1994) (noting that the SEC's "primary mandate" revolved around providing investors with comprehensive, comprehensible information).

[83] Nonetheless, the SEC has always relied on "disclosure" as the default for addressing conflicts of interest, specifically, over its ninety-year history. *See* Robinhood Comment Letter, *supra* note 67, at 11; *see also* Mark T. Uyeda, Comm'r, Sec. & Exch. Comm'n, Remarks at the Securities and Exchange Commission's 90th Anniversary Celebration (June 6, 2024), https://www.sec.gov/newsroom/speeches-statements/uyeda-remarks-90thsec-060624 [https://perma.cc/KAR8-LLTN] (explaining that the Securities Exchange Act of 1934 was based on a "disclosure-based . . . framework").

[84] *See* Friedman, *supra* note 82, at 294–95.

[85] *Id.* at 295–96.

[86] Proposed Rule, *supra* note 13, at 53971.

[87] *Id.*

[88] *See, e.g.*, Memorandum from Robinhood Mkts., Inc., A.I. in Fin. Servs., 4 (Jan. 2025) (on file with author); Press Release, Inv. Co. Inst., Comment Letter on SEC's Proposed Predictive Data Analytics Rule (Oct. 11, 2023), https://www.ici.org/news-release/23-news-sec-conflicts-proposal [https://perma.cc/D5V4-3AY6] (warning that firms might "stay frozen

And eliminating conflicts of interest may not even benefit ordinary investors. Before the 2003 Global Settlement, analysts' insights flowed freely to investment bankers, but once regulators walled them off, the resulting information blackout impaired investor decisionmaking.[89] In fact, by commanding a conflict-free operation in this case, regulators may well choke the very networks that help investors make better decisions.[90]

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in the past" to avoid "heavy" compliance burdens, which would be "especially damaging to smaller firms"); SIFMA Comment Letter, *supra* note 67, at 30 (noting the SEC's analysis "does not account for the likely reduction in the flow of information" to investors since firms will "curtail the amount of information" provided in order to avoid violations); Chamber of Com. of the U.S., Comment Letter on Conflicts of Interest Associated with the Use of Predictive Data Analytics by Broker-Dealers and Investment Advisers (Oct. 10, 2023), https://www.uschamber.com/assets/documents/ccmc/231010_CCMC-Comments_PredictiveDataAnalytics_SEC-FINAL.pdf [https://perma.cc/4Q6C-VNHL] (arguing the Proposal would create "a significant barrier to entry, potentially hindering smaller firms" and "risks . . . eliminating the ability of financial professionals to communicate and interact with their customers"); *MFA Calls for SEC to Withdraw Predictive Data Analytics Proposal*, Managed Funds Ass'n (Oct. 11, 2023), https://www.mfaalts.org/press-releases/mfa-calls-for-sec-to-withdraw-predictive-data-analytics-proposal [https://perma.cc/QK3R-4WLG] (stating "[t]he proposal will harm markets, advisers, and institutional investors . . . by reducing the number of market participants and driving up the costs of investing"); James Broughel & John Berlau, Comment Letter on Conflicts of Interest Associated with the Use of Predictive Data Analytics by Broker-Dealers and Investment Advisers (Oct. 10, 2023), https://cei.org/regulatory_comments/conflicts-of-interest-associated-with-the-use-of-predictive-data-analytics-by-broker-dealers-and-investment-advisers [https://perma.cc/L8YH-UTTK]; Hester M. Peirce, *Through the Looking Glass: Conflicts of Interest Associated with the Use of Predictive Data Analytics by Broker-Dealers and Investment Advisers Proposal*, Sec. & Exch. Comm'n (July 26, 2023), https://www.sec.gov/newsroom/speeches-statements/peirce-statement-predictive-data-analytics-072623 [https://perma.cc/T55R-3525] (predicting "a rule like this will prevent small firms from using technology . . . to serve their clients and compete with larger rivals"); Hardy Callcott, Jay Baris & Laurie Kleiman, *SEC's New Rules on Use of Data Analytics by Broker-Dealers and Investment Advisers*, Harv. L. Sch. F. on Corp. Governance (Aug. 26, 2023), https://corpgov.law.harvard.edu/2023/08/26/secs-new-rules-on-use-of-data-analytics-by-broker-dealers-and-investment-advisers [https://perma.cc/GZ2W-FB2Y] (observing the rule would impose "a substantial burden on the use of any technology" and be "especially challenging—particularly for smaller" firms to implement).

89 *See* Hamid Mehran & René M. Stulz, *The Economics of Conflicts of Interest in Financial Institutions*, 85 J. Fin. Econ. 267, 291 (2007); *see also Federal Court Approves Global Research Analyst Settlement*, Sec. & Exch. Comm'n (Oct. 31, 2003), https://www.sec.gov/enforcement-litigation/litigation-releases/lr-18438 [https://perma.cc/RY9G-XJAC] (detailing enforcement actions against investment firms for "undue influence of investment banking interests on securities research at brokerage firms").

90 *See generally* Giacomo Calzolari, Pol'y Dep't for Econ., Sci. and Quality of Life Poly's *Artificial Intelligence Market and Capital Flows: Artificial Intelligence and the Financial Sector at Crossroads*, PE 662.912 (2021) (arguing AI-powered robo-advisors democratize sophisticated portfolio management and investment advice). *See* Vishwanadham Mandala, *The Impact of AI and ML on Financial Performance Metrics in the Manufacturing Industry: A Data Engineering Perspective*, 29(4) Educ. Admin.: Theory & Prac. 1558, 1562 (2023) (discussing the power of AI and ML technologies in "processing large volumes of operational and financial data in real-time").

Efforts to eliminate or neutralize conflicts of interest, as noted in the SEC's PDA proposal,[91] are the pinnacle of regulatory overreach. They all reflect a growing sentiment of mistrust. Regulators are warier of having private actors self-regulate and would prefer to prioritize strict controls over market autonomy. This, in turn, idealizes a trend of trying to prioritize market efficiency over risks to undiversified, unsophisticated investors.[92] In practice, these heightened controls often just end up constraining market participation more than they protect individual investors.

Viewed through a welfare lens, the goal is not to purge all conflicts but to relax the frictions that matter most at the moment of choice. Some users derive real participation utility from low-friction, app-based trading—convenience, learning, even the entertainment of "playing the market." A rule that shuts down that channel would erase those gains. At the same time, designs that pair engagement nudges with routing incentives push trading above what a well-informed investor would choose. And the costs associated with those additional trades are hard to detect.

Because true Pareto improvements are rare in any regulation, the right question is whether a tailored intervention yields a Kaldor-Hicks-style improvement.[93] That is, whether the gains to investors from timely

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[91] Section 17(d) and Rule 17d-1 of the Investment Company Act of 1940 prohibit certain affiliated transactions within investment companies that could create conflicts of interest. 15 U.S.C. § 80a-17(d); 17 C.F.R. § 270.17d-1 (2023). Section 932 of the Dodd-Frank Act requires credit rating agencies to avoid sales and marketing influence on ratings. *SEC Proposes Rules to Increase Transparency and Improve Integrity of Credit Ratings*, Sec. & Exch. Comm'n (May 18, 2011), https://www.sec.gov/news/press/2011/2011-113.htm [https://perma.cc/8DPD-SU83] ("Section 932 of the Dodd-Frank Act seeks to prevent an [Nationally Recognized Statistical Rating Organization]'s 'sales and marketing' considerations from influencing . . . determining or monitoring a credit rating."). FINRA's proposed Rule 5121 addresses conflicts in public offerings by requiring broker-dealers to either eliminate conflicts or use a "Qualified Independent Underwriter" to neutralize their effects. *See FINRA Requests Comment on Proposed Changes to Corporate Financing Rules*, 2 FINRA (Dec. 20, 2024), https://www.finra.org/rules-guidance/notices/24-17 [https://perma.cc/55QA-RZVW]. The Department of Labor's "Fiduciary Rule" demands financial institutions to adopt impartial standards of conduct, provide prudent advice, and implement policies to neutralize conflicts. *See* Definition of the Term "Fiduciary"; Conflict of Interest Rule—Retirement Investment Advice, 81 Fed. Reg. 20946, 20954 (Apr. 8, 2016) (to be codified at 29 C.F.R. pts. 2509, 2510, 2550).

[92] *See* Friedman, *supra* note 82, at 294–96.

[93] *See generally* Guido Calabresi, *The Pointlessness of Pareto: Carrying Coase Further*, 100 Yale L.J. 1211, 1215–16 (1991) (arguing the Pareto test for efficiency is "of no use as a normative guide" because even desirable legal changes create winners and losers); *id*. at 1221 (noting that the "[Kaldor-Hicks test for efficiency] is sometimes called potential Pareto superiority, because it has the potential of leading to a Pareto improvement" when winners win more than the losers lose, and are therefore able to compensate the losers to their satisfaction); *id*. at 1232 ("[M]ost technological changes, like most legal ones, do entail both ultimate winners and uncompensated losers.").

transparency plausibly exceed the compliance costs to platforms and any marginal loss of "fun." The disclosure regime developed below aims for exactly that. It seeks to keep access and participation benefits intact while reducing information asymmetry and surfacing conflicts precisely when a prompt arrives. That preserves choice, respects heterogeneity in users' objectives, and, most importantly, directs regulatory effort at the frictions that distort user decisions.

II
Algorithmic Transparency

We have a clear problem: nudges let retail platforms earn more on every swipe while hiding the real cost of high-volume trading borne by retail investors. The SEC's 2023 PDA proposal tried to stamp out those conflicts by forcing firms to "eliminate or neutralize" them, but a series of shortfalls show why that cure might be worse than the problem it is trying to address. This Part advances a disclosure-based remedy which requires firms to surface consumer friendly explanations of the variables driving each nudge so investors and regulators can see exactly how the algorithm steers behavior.

A. A Disclosure-Based Approach

My proposal advocates for a rule requiring firms to disclose personalized, consumer-accessible explanations of the models used in predictive analytics and financial decisionmaking. Specifically, it calls for the disclosure of both the factors driving financial recommendations and the logic behind gamification strategies.

Currently, there are two prominent categories driving the explainable AI movement, the community dedicated to developing techniques that translate a model's inner workings into human-understandable terms. The first is the "exogenous approach," which seeks to explain how a model operates as a whole or in specific cases by examining factors such as the programmer's intentions, training data, and testing methods.[94] The second is the "surrogate model," which approximates the decisionmaking of models by analyzing parts of their inputs and outputs.[95] My proposal leverages the exogenous approach through approximated Shapley values.

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[94] Gina-Gail S. Fletcher, *Deterring Algorithmic Manipulation*, 74 Vand. L. Rev. 259, 314 (2021); *see also* Ashley Deeks, *The Judicial Demand for Explainable Artificial Intelligence*, 119 Colum. L. Rev. 1829, 1834–37 (2019) (detailing how different types of models operate).

[95] Fletcher, *supra* note 94, at 314–15; *see also* Deeks, *supra* note 94, at 1837 (explaining how surrogate models approximate decisionmaking).

Shapley values are a tool from cooperative game theory that has been increasingly adopted for use in explainable AI implementation.[96] These values measure how much each feature contributes to a predictive model's outcome. Think of a potluck dinner. Each guest brings a different dish that might vary in taste, plating, and ingredient quality. You want to calculate how each dish influences the party's overall enjoyment, so that next time, people bring more of one food and less of the other. To figure that out, you would consider every possible mix of dishes—both with and without a given one—and note the change in total enjoyment.

When applied to predictive models, each player is a feature in the data, and the outcome is the model's final prediction. Calculating exact Shapley values requires checking every possible way the features can combine. This method can be both hard and computationally expensive. But generating approximated Shapley values is much less resource intensive.[97]

Approximated Shapley values use a sampling or grouped subset approach to estimate each feature's marginal impact.[98] In the potluck dinner example, rather than considering dish aesthetics, ingredient quality, and serving temperature within the dish feature, you might just take a few quick bites to get a general sense of the dish's impact on the party's overall enjoyment. Approximations are not as precise as the exhaustive approach. But, while a more complex model would enhance accuracy, it would reduce interpretability.[99] Mandating approximated Shapley values seems like the most reasonable middle ground in terms of cost and accessibility for both firms and consumers.

Drawing on my previous example of a retail investor, Margaret, consider that when she receives a notification to buy NVIDIA stock, she logs onto the trading platform and sees two separate disclosure statements; to keep the information digestible, each is limited to the

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[96] *See* Benedek Rozemberczki, Lauren Watson, Péter Bayer, Hao-Tsung Yang, Olivér Kiss, Sebastian Nilsson & Rik Sarkar, *The Shapley Value in Machine Learning*, Thirty-First Int'l Joint Conf. on A.I. 5572, 5572 (2022).

[97] *See generally* Scott M. Lundberg & Su-In Lee, *A Unified Approach to Interpreting Model Predictions*, Thirty-First Conf. on Neural Info. Processing Sys. (2017) (arguing Kernel SHAP can replace the classic Shapley equation by linking it to weighted linear regression, which drastically cuts down on the computational load by requiring fewer model evaluations compared to traditional sampling methods).

[98] *See* Rory Mitchell, Joshua Cooper, Eibe Frank & Geoffrey Holmes, *Sampling Permutations for Shapley Value Estimation*, 23 J. Mach. Learn. Res. 1, 4 (2022) (noting that exact Shapley-value computation is NP-hard and a common approach is to sample a subset of all feature permutations for approximation).

[99] *See* Fletcher, *supra* note 94, at 290–91 (explaining the difficulty of interpreting black boxes).

seven most influential variables.[100] The statement for the model's decision to nudge her toward investing in NVIDIA reads:

Past Trading Behavior During Market Dips: +20% – Margaret's trading history shows a 20% increase in activity during market dips. She is likely to act on opportunities presented during similar conditions.

Browsing History of Technology Sector Performance: +15% – Frequent searches and article reads about technology sector performance signal her strong interest in this area. This information enhances the model's confidence in targeting tech-related investments.

Recent Volatility in the Tech Sector: +10% – High market volatility in the tech sector, historically linked to growth opportunities, positively influenced the recommendation.

Stock's Low Price-to-Earnings Ratio: +12% – The recommended stock's low P/E ratio suggests undervaluation, which resonates with Margaret's preference for value-oriented trades.

Recent Technology Earnings Reports: +8% – Strong earnings reports across the technology sector reinforce the timing of the recommendation.

Portfolio Diversification Needs: +7% – Margaret's current portfolio shows a concentration in large-cap stocks, making a recommendation for a small-cap tech stock more relevant.

Market Sentiment Index: +5% – Positive sentiment and news coverage surrounding tech stocks contribute to the recommendation.

The statement for why the model thinks NVIDIA is a particularly good investment at that time reads:

Market Volatility Index: +20% – The model identified heightened market volatility, which historically correlates with growth opportunities in the tech sector.

Earnings Growth Rate of Constituents: +18% – NVIDIA's recent earnings report showed exceptional growth. This signals strong profitability and potential for sustained performance.

Debt-to-Equity Ratio: -12% – A relatively high debt-to-equity ratio flagged financial leverage concerns. This information detracts from the overall recommendation.

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100 I am largely borrowing the number seven from "Miller's Law," which states that the average person can hold about seven (plus or minus two) items in their working memory. *See generally* George A. Miller, *The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information*, 63 Psych. Rev. 81 (1956). As Miller explains, "the span of immediate memory impose[s] severe limitations on the amount of information that we are able to receive, process, and remember. By organizing the stimulus input simultaneously into several dimensions and successively into a sequence of chunks, we manage to break (or at least stretch) this informational bottleneck." *Id.* at 95.

Historical Performance of Fund: +15% – NVIDIA's stock has consistently outperformed the market over the past five years.

Interest Rate Trends: +10% – Current trends in declining interest rates positively impact NVIDIA's valuation, particularly for growth-oriented companies in the tech sector.

Sector Diversification Index: +8% – NVIDIA operates in diversified markets, from gaming to AI, which reduces sector-specific risks and enhances its overall score.

Asset Liquidity Score: +6% – The model rated NVIDIA highly for its robust cash reserves and asset liquidity, which indicate financial stability.

In both cases, the models' predicted recommendation for NVIDIA is explained by summing the individual approximated Shapley values for the variables disclosed. In the latter disclosure, the Market Volatility Index contributed +20% to the recommendation, while the Debt-to-Equity Ratio reduced the score by -12%. This means the algorithm heavily favored current market conditions because it expects potential gains during periods of increased volatility. The higher debt-to-equity ratio introduced a cautionary element, so the model reduced the overall score to account for potential risks.

Other variables, such as interest rate trends and portfolio diversification needs, reflect the typical metrics a financial advisor would use to gauge a stock's risk profile and growth prospects. Historical performance shows whether a stock has delivered consistent returns or is prone to volatility. Browsing history reveals a user's specific interests or investment preferences. Earnings growth rate highlights whether a company is expanding its revenue base over time. And factors like an asset liquidity score help indicate how quickly a company can convert its assets into cash, which would be relevant information if the firm needed to, say, raise capital for a major acquisition in the future.

B. Efficacy of Disclosure

Disclosure-based approaches have historically proven effective in reducing informational asymmetries. Disclosure-based approaches have historically targeted manufacturing and nutrition labeling, corporate reports, and campaign finance data.[101] These forms of disclosure are effective because they preserve consumers' freedom of choice without unduly harming their decisionmaking abilities.[102] Disclosure "steers

[101] *See* Paula J. Dalley, *The Use and Misuse of Disclosure as a Regulatory System*, 34 Fla. St. U. L. Rev. 1089, 1126–28 (2007).

[102] *See* Cass R. Sunstein, Why Nudge? The Politics of Libertarian Paternalism 138 (2014) ("[D]isclosure itself promotes autonomy, by allowing individuals to make informed decisions about their own ends.").

people toward active choosing, when people have not made an active choice in favor of active choosing."[103] Such regimes, as with default rules, are generally less invasive than mandates because they merely provide the user with information that they can either disregard or opt out of entirely.[104] In the gamification setting, a well-designed disclosure rule would target how information is presented at the moment of a nudge rather than banning it altogether. It would let users keep enjoying the "game," but give the marginal investor who is about to be tipped into a trade clear context about costs, risk, and conflicts.

In finance, one sees that disclosure has worked—with varying degrees of success. After the Department of Labor required 401(k) plan providers to give participants a standardized summary of fees in 2012, researchers observed a strong shift away from high-cost funds toward cheaper index funds.[105] The reason for this shift was that clearer disclosures drew investors' attention to higher management costs, prompting them to favor the lower-cost index options.[106] In 2002, the National Association of Securities Dealers (NSAD), the predecessor to FINRA, launched the Trade Reporting and Compliance Engine (TRACE), which publicly shared, in near real time, the actual prices at which corporate bonds were trading.[107] Once investors could see these prices, firms could no longer add large hidden markups, and the gap between buy and sell prices narrowed.[108] As a result, ordinary investors got better deals when buying or selling bonds. More recently, FINRA passed amendments to Rule 2232, which compel brokers to

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103 *Id.* at 95.

104 *See id.* at 139–40 ("Disclosure policies . . . promote freedom of choice; they do not violate autonomy, however conceived.").

105 Mathias Kronlund, Veronika K. Pool, Clemens Sialm & Irina Stefanescu, *Out of Sight No More? The Effect of Fee Disclosures on 401(k) Investment Allocations*, 141 J. FIN. ECON. 644, 646 (2021).

106 *See id.* (explaining that after the Department of Labor's 404(a)(5) disclosure reform, the cheapest funds in defined contribution plans received much higher inflows while the most expensive funds lost flows and participants reallocated toward index funds, which are typically lower-cost).

107 *See* Jennie Getsin, *NASD and NYSE Member Regulation Combine to Form FINRA*, REED SMITH LLP (Aug. 2007), https://www.reedsmith.com/en/perspectives/2007/08/nasd-and-nyse-member-regulation-combine-to-form-fi [https://perma.cc/2X7F-QBS3] (choose "bull0768.pdf.pdf" to download the bulletin); NASD, *Corporate Debt Securities Transactions Subject to Reporting and Dissemination*, FINRA 815, 817, 828 (2002), https://www.finra.org/rules-guidance/notices/02-76 [https://perma.cc/QU4K-EQ9A]; *see also* Hendrik Bessembinder, William Maxwell & Kumar Venkataraman, *Market Transparency, Liquidity Externalities, and Institutional Trading Costs in Corporate Bonds*, 82 J. FIN. ECON. 251, 257 (2006) (stating that the TRACE system required reporting of "all corporate bond transactions . . . within 1 hour and 15 minutes").

108 *See* Bessembinder, Maxwell & Venkataraman, *supra* note 107, at 283 (finding that increased transparency from TRACE lessened hidden costs in transactions).

explicitly disclose the markup or markdown on retail bond trades.[109] These amendments have been effective at lowering the information asymmetry that allowed bond-market professionals to overcharge unknowing investors for smaller trades.[110]

At other times, disclosure in the financial context has not been as useful. For example, experts have questioned whether FINRA's BrokerCheck, the online platform that aims to provide transparency about broker disciplinary and employment histories,[111] provides the necessary context for users to make informed decisions. "[A]n investor might discover that a broker has had two past customer complaints over a twenty-year career in the industry. How is the investor to assess this compared to similarly situated brokers, or the rest of the industry?"[112] Others note that brokers can use FINRA arbitration to expunge customer complaints and settlements.[113] When brokers seek expungement, arbitrators grant those requests in roughly 84% of cases.[114] So, brokers are often assured of a clean slate simply by leveraging the arbitration process.

There is some pushback here. Proponents of BrokerCheck note that only unsubstantiated customer complaints can be expunged—formal regulatory actions stay on BrokerCheck—so the worst offenders remain visible.[115] But for the less egregious offenders, disputing a few

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109 *See* Christine Cuny, Omri Even-Tov & Edward M. Watts, *From Implicit to Explicit: The Impact of Disclosure Requirements on Hidden Transaction Costs*, 59 J. ACCT. RES. 215, 222, 239 (2021) ("We find that markups on trades subject to markup disclosure (small trades with a same-day offset) decline by 5% relative to the pre-period average in the six months following the rule change.").

110 *See id.* at 217, 239 (arguing that disclosure of markups "should reduce information asymmetry" and that Rule 2323 effectively did so).

111 *About BrokerCheck*, FINRA https://www.finra.org/investors/investing/working-with-investment-professional/about-brokercheck [https://perma.cc/JF98-DSHM] (last visited Sep. 11, 2025).

112 James Fallows Tierney & Benjamin P. Edwards, *Stockbroker Secrets*, 26 UNIV. PA. J. BUS. L. 793, 808 (2024).

113 *See, e.g.*, Christine Lazaro, *Has Expungement Broken BrokerCheck?*, 14 J. BUS. & SEC. L. 123, 137 (2014) ("[E]xpungements may have moved from extraordinary remedies to a normally bargained for benefit in case settlements."); *see also* Colleen Honigsberg & Matthew Jacob, *Deleting Misconduct: The Expungement of BrokerCheck Records*, 139 J. FIN. ECON. 800, 800 (2021) (finding that "brokers attempt to expunge 12% of the allegations of misconduct reported" against them and "arbitrators approve expungement 84% of the time"); *2263. Arbitration Disclosure to Associated Persons Signing or Acknowledging Form U4*, FINRA (May 13, 2022), https://www.finra.org/rules-guidance/rulebooks/finra-rules/2263 [https://perma.cc/8QND-BS32] ("You are agreeing to arbitrate any dispute, claim or controversy that may arise between you and your firm, or a customer, or any other person that is required to be arbitrated under the rules . . . .").

114 Honigsberg & Jacob, *supra* note 113, at 800.

115 *See 8312. FINRA BrokerCheck Disclosure*, FINRA (June 27, 2024), https://www.finra.org/rules-guidance/rulebooks/finra-rules/8312 [https://perma.cc/Q4VM-9LGT] (describing

instances of wrongdoing is much easier than FINRA might be willing to admit. This practice in turn frustrates the efforts of investors to identify patterns of misconduct necessary for informed decisionmaking.[116]

Evidence from the credit card and consumer contract sector illustrates how disclosures often fail to protect the most vulnerable consumers. Only a fraction of consumers read or comprehend standard-form contracts.[117] Less than one percent of software shoppers access and read end user license agreements (EULAs).[118] Among those who do, consumers spend far less time than needed to understand the terms because their dense language and format discourage careful review.[119] Professor Marotta-Wurgler argues that when a consumer thinks she is dealing with a trusted financial institution, that consumer may be less likely to discover unfavorable terms of a contract.[120] And, even when disclosures are simplified, they often fail to meaningfully alter consumer decisionmaking or impose competitive pressure on sellers.[121] Federal safeguards like the Truth in Lending Act and Credit Card Accountability Responsibility and Disclosure Act (CARD Act) have achieved modest improvements in consumer awareness.[122] Yet cash-advance annual percentage rates (APRs) have increased, late payment fees have been structured in such a way to vary by balance size, and there have been increased penalties for repeat offenses

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how BrokerCheck permanently discloses information about former associated persons who have been the subject of certain regulatory actions, including final regulatory actions by the SEC, CFTC, federal banking agencies, state regulatory agencies, foreign financial regulatory authorities, or self-regulatory organizations). Additionally, individuals who have been convicted of or pled guilty or no contest to certain crimes, or who have been subject to civil injunctions involving investment-related activity, are also permanently included in BrokerCheck. *Id.*

116 *See* Tierney & Edwards, *supra* note 112, at 797–99, 806–09 (arguing that BrokerCheck's expungement procedure allows bad brokers to masquerade as higher quality).

117 Yannis Bakos, Florencia Marotta-Wurgler & David R. Trossen, *Does Anyone Read the Fine Print? Consumer Attention to Standard Form Contracts* 22 (N.Y.U. L. & Econ. Rsch., Working Paper No. 09-40, 2013).

118 *Id.*

119 *Id.*

120 *See* Florencia Marotta-Wurgler, *Does Contract Disclosure Matter?*, 168 J. Inst. & Theoretical Econ. 94, 111 (2012) ("[One] method of becoming 'informed' without reading is to rely on sellers' reputations when deciding whether to purchase.").

121 *See id.* at 115–16 (arguing that even increased disclosure does not lead consumers to reject unfavorable terms because they simply do not read the terms, further suggesting that simplifying those terms may not address the problem that consumers do not read).

122 *See id.* at 95 ("Many provisions of the 2009 Credit CARD Act rely on plain-sight, plain-language disclosures to increase transparency and help credit-card users make more-informed choices."). *Contra* Ryan Bubb & Richard H. Pildes, *How Behavioral Economics Trims Its Sails and Why*, 127 Harv. L. Rev. 1593, 1660 (2014) (concluding that disclosure nudges yielded negligible gains compared to the Act's product rules).

within six months.[123] All the while many consumers struggle to grasp the cost of borrowing.[124]

Disclosure remains the most viable means of advancing adequate consumer protections in the PDA context, nonetheless. In 2022, noting that app-based trading can "entice a lot of speculation, and a kind of gamification," the European Securities and Markets Authority (ESMA) implemented disclosures under the Markets in Financial Instruments Directive (MiFID) of 2014 requiring firms to break down costs and charges so that retail investors can see exactly what fees they pay.[125] Noticeably, this regulation has lessened the impact of hidden fee structures that historically cut into consumer returns.[126]

Disclosure struggles in the financial system when the incentives to obscure details are high, or facts are hidden from view. That is why my proposal focuses on exposing what has gone largely undetected by the public: algorithms.[127] Unlike BrokerCheck, where brokers can purge bad facts through arbitration, approximated Shapley-value reports are generated directly from the live model and leave a tamper-evident trail. And, while credit card fine print is designed to overwhelm consumers with opaque fees, my proposal requires each disclosure to focus on only the most influential variables. So, the model's logic is distilled into a snapshot that investors can use.

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123 *See* Oren Bar-Gill & Ryan Bubb, *Credit Card Pricing: The Card Act and Beyond*, 97 Corn. L. Rev. 967, 991, 997 (2012).

124 *See generally* Victor Stango & Jonathan Zinman, *Exponential Growth Bias and Household Finance*, 64 J. Fin. 2807, 2813–14 (2009) (finding that over ninety-eight percent of respondents substantially underestimated the APR on a standard twelve-month installment loan).

125 *See* Huw Jones, *EU Watchdog Targets Misleading Online Financial Promotions*, Reuters (Apr. 29, 2022), https://www.reuters.com/business/finance/eu-watchdog-targets-misleading-online-financial-promotions-2022-04-29 [https://perma.cc/68AW-ZWH7].

126 *See The Average Cost of Retail Investment Products Declines but Significant Differences Across EU Member States Remain*, Eur. Sec. & Mkt. Auth. (Dec. 18, 2023), https://www.esma.europa.eu/press-news/esma-news/average-cost-retail-investment-products-declines-significant-differences [https://perma.cc/PML9-DSYG] (stating that EU-mandated disclosures help keep transaction costs low).

127 *See, e.g.*, Michael Selmi, *Algorithms, Discrimination, and the Law*, 82 Ohio St. L.J. 611, 622 (2021) (arguing that public discourse evinces a lack of understanding of algorithms); *see* Carsten Orwat, Jascha Bareis, Anja Folbreth, Jutta Jahnel & Christian Wadephul, Normative Challenges of Risk Regulation of Artificial Intelligence and Automated Decision-Making 3 (Nov. 2022) (unpublished manuscript) (on file with the New York University Law Review) ("The 'opacity' and 'black box' nature of AI and ADM applications is seen as another critical characteristic."); *see also* Maayan Perel & Niva Elkin-Koren, *Black Box Tinkering: Beyond Disclosure in Algorithmic Enforcement*, 69 Fla. L. Rev. 181, 188 (2017) (stating that a critical difficulty in holding algorithms accountable is their inscrutability to most people); Gina-Gail S. Fletcher & Michelle M. Le, *The Future of AI Accountability in the Financial Markets*, 24 Vand. J. Ent. & Tech. L. 289, 301 (2022) (explaining the "black box problem" as "the difficulty humans have when attempting to understand or explain how AI arrives at its output").

C. Regulatory Enforcement

My proposal's design equips federal regulators with an auditable record that makes conflicts of interest and suitability violations far easier to spot and prosecute. As previously observed, Reg BI does not speak to the challenges posed by AI-driven financial recommendations.[128] It merely advises that broker-dealers not "place their own interests 'ahead' of the retail customers."[129] Algorithmic transparency would strengthen the adherence and enforcement of all obligations for Reg BI by enabling firms to demonstrate that AI recommendations are based on reasonable diligence and align with client interests.[130] Regulators, as well as the public, can more easily verify that brokers are considering appropriate risks and rewards for retail clients. My proposal would also support the conflict of interest obligation by revealing or drawing attention to potential biases embedded within AI models.

The SEC alternatively relies on Regulation Systems Compliance and Integrity (Reg SCI) to directly regulate algorithmic traders.[131] Reg SCI requires covered entities to enforce written policies and procedures designed to ensure their technological systems "have levels of capacity, integrity, resiliency, availability, and security, adequate to maintain the [entity's] operational capability and promote the maintenance of fair and orderly markets" and comply with federal law.[132] Individuals

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128 Neither does the PDA proposal, which the SEC admitted does not cover some digital interactions that constitute "recommendations for the purposes of Reg BI." Proposed Rule, *supra* note 13, at 54007. *But see* Robinhood, Comment Letter on Proposed Rule on Conflicts of Interest Associated with the Use of Predictive Data Analytics by Broker-Dealers and Investment Advisers (Oct. 10, 2023), https://www.sec.gov/comments/s7-12-23/s71223-271299-654022.pdf [https://perma.cc/ZZW2-MQWC] (discussing how the Proposed Rule is redundant with Reg BI and FINRA's suitability rules); Patrick Donachie, *AI-Generated Recommendations Can Still Fall Under Reg BI, FINRA Exec Warns*, Wealth Mgmt. (May 18, 2023), https://www.wealthmanagement.com/regulation-compliance/ai-generated-recommendations-can-still-fall-under-reg-bi-finra-exec-warns [https://perma.cc/ADG9-QJH6] (recounting an SEC official's claim that AI recommendations are covered under Reg BI).

129 Tierney & Edwards, *supra* note 112, at 801 n.30.

130 Data driven transparency and Reg BI has been the center of large SEC's enforcement actions in recent years. *See* Press Release, *SEC Orders BlueCrest to Pay $170 Million to Harmed Fund Investors*, Sec. & Exch. Comm'n (Dec. 8, 2020), https://www.sec.gov/newsroom/press-releases/2020-308 [https://perma.cc/8WAJ-YYKU] (imposing a $170 million fine against BlueCrest Capital Management); *see* BlueCrest Cap. Mgmt. Ltd., Order Instituting, Securities Act Release No. 10896, 2020 WL 7264641, at 14 (Dec. 8, 2020) (same); *see also* J.P. Morgan Sec. LLC, Securities Act Release No. 11324, 2025 WL 4650961 (Oct. 31, 2024) (detailing JP Morgan Securities's failure to disclose its Distribution Management team's systematic discretion in share sales).

131 *See* Regulation Systems Compliance and Integrity, 79 Fed. Reg. 72252, 72252 (Dec. 5, 2014) (to be codified at 17 CFR pts. 240, 242, 249) (stating that Reg SCI will be used to regulate "automated systems" used in securities trading).

132 *Id.* at 72256–57.

designing or modifying algorithmic trading programs must register as "Securities Traders" with FINRA and pass a qualifying exam.[133]

With such preexisting oversight, the SEC (and FINRA) should be well equipped to detect the issues with gamification.[134] However, several challenges make this regulation difficult to enforce. The SEC's decision to pursue a compressed nine-month rollout made uniform implementation difficult.[135] Institutions covered by this rule differ substantially in how they operate, and even the broad classification of "SCI entities" does not consider all the risks posed by different types of firms.[136] It only accounts for "registered exchanges, clearing agencies, plan processors, alternative trading systems that trade national market system and unlisted stocks exceeding specified volumes, and organizations that disseminate market data."[137] The classification also omits "OTC market makers, exchange market makers, order-entry firms, clearing broker-dealers or large multi-service broker-dealers."[138] Moreover, the use of AI in the financial context carries a few general problems that make it hard to prove intent or misconduct. Data disclosures by private entities are often incomplete or biased.[139] And the sheer volume of disclosed data creates an "accumulation problem" that overwhelms regulators.[140]

Simply put, utilizing Reg SCI is difficult because there is too much noise, and not enough clarity. Regulators need a system that ensures that disclosures cut through the clutter. My proposal provides that clarity by standardizing the disclosure format into something readily digestible.

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133 Fletcher, *supra* note 94, at 305; *see also* Fletcher & Le, *supra* note 127, at 308 ("[U]nder FINRA Rule 1220, two categories of persons are required to register as a 'Securities Trader' and pass a qualifying examination: (1) those responsible for the design, development, or modification of an algorithmic trading program and (2) those responsible for the day-to-day supervision and monitoring of algorithmic trading.").

134 Fletcher, *supra* note 94, at 307 (arguing that the SEC has the capability for "meaningful oversight over algorithmic trading").

135 *See* Michael Morelli, *Managing Relative Regulatory Inefficiencies in Complex Financial Systems*, 25 U. PA. J. BUS. L. 705, 767 (2023).

136 *See id.*

137 *Id.*

138 *Client Alert: SEC Adopts Regulation SCI to Strengthen Controls for Technological Systems at Core of U.S. Markets*, MILBANK, TWEED, HADLEY & MCCLOY LLP (Dec. 4, 2014), https://www.milbank.com/a/web/18575/Regulation-SCI-Client-Alert-Formatted-SYE.pdf [https://perma.cc/6796-XZX8].

139 *See* Perel & Elkin-Koren, *supra* note 127, at 190 ("Deconstructing the final code [of an AI algorithm] requires knowing what cognitive frames—as well as social, political, economic, and legal motivations—shaped the programmers' choice."); Fletcher & Le, *supra* note 127, at 302–03 (explaining that the data an AI model uses is often unclear to its own programmers and that AI's ability "to make decisions, independent of human involvement, raises issues related to liability" due to uncertainty in how to assign intentionality to an AI model).

140 *See* Perel & Elkin-Koren, *supra* note 127, at 194–97 (describing the difficulties the accumulation program causes for individuals or organizations trying to sift through digital material).

D. Private Enforcement

My proposal would also empower individual investors to pursue legal remedies for harm caused by misleading AI-driven recommendations.[141] If a broker's model disproportionately factors behavioral data indicative of gambling tendencies, the disclosure requirement would expose this bias; if a model overemphasizes short-term market trends at the expense of long-term stability, the disclosure would highlight this imbalance as well. Moreover, investors could more easily identify material misrepresentations or inaccuracies in AI-generated advice. If a firm's disclosed variables do not adhere to the Generally Accepted Accounting Principles (GAAP), the standardized accounting rules used in the United States, an investor could argue that they were misled and suffered losses as a result.[142]

In fact, the disclosure of Shapley values in particular would allow potential litigants to point to tangible proof that AI systems encouraged them to make certain trading behaviors.[143] Explainable AI generally helps illustrate why a model made a recommendation by "attun[ing]" algorithmic outputs to the elements a plaintiff must prove in court.[144] Since approximated Shapley values are estimates, my proposal would require firms to document statistical confidence intervals so litigants can test reliability. Courts routinely accept such sampling and probabilistic evidence in damages payouts.[145] And, they are especially receptive to

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[141] Outside of the financial context, challenges for faulty AI recommendations are common. *See* State v. Loomis, 881 N.W.2d 749, 753 (Wis. 2016) (deciding plaintiff's due process challenge to a proprietary AI tool's use in judicial sentencing); Jon Danielsson & Andreas Uthemann, *How AI Can Undermine Financial Stability*, CEPR (Jan. 22, 2024), https://cepr.org/voxeu/columns/how-ai-can-undermine-financial-stability [https://perma.cc/6KA6-PKUC] (arguing that overreliance on AI can undermine financial markets). As these systems become more frequent in the financial context, such risks will undermine market integrity if not addressed. *See* D'Agostino v. Innodata, Inc., 2024 WL 4615728 (D.N.J. 2024) (appointing a lead plaintiff in a class action lawsuit against Innodata for failing to disclose its use of AI).

[142] *See, e.g.*, *In re* Glob. Brokerage, Inc. f/k/a FXCM Inc. Sec. Litig., 2019 WL 1428395, at *10–11 (S.D.N.Y. Mar. 28, 2019) (holding that investors adequately alleged securities fraud where the firm failed to disclose that its financial statements violated GAAP by not consolidating a Variable Interest Entity and mischaracterized payments from that entity, preventing investors from understanding the risks associated with the company's business model); *In re* Countrywide Fin. Corp. Sec. Litig., 273 F.R.D. 586, 602 (C.D. Cal. 2009) (holding that material misrepresentations made by a company could support the typicality requirement for a class action).

[143] *See* Henry Fraser, Aaron J. Snoswell & Rhyle Simcock, *AI Opacity and Explainability in Tort Litig.*, 2022 ACM Conf. 185, 192–93 ("[I]f a plaintiff is granted query access to the allegedly faulty object detection and classification system . . . they might be able to apply local XAI methods such as SHAP or LIME, and show that the object classification system's defective output was positively correlated with [a particular] feature.").

[144] *Id.* at 185.

[145] *See generally* Jonah E. Gelbach & Jill E. Fisch, *Power and Stat. Significance in Sec. Fraud Litig.*, Harv. L. Sch. F. on Corp. Governance at 1 (May 12, 2020), https://corpgov.law.harvard.

cases where plaintiffs present quantitative methods to help establish manipulative algorithmic features.[146]

Claims regarding faulty algorithmic disclosure under Section 10(b) of the Securities Exchange Act[147]—the antifraud provision that bans deceptive acts or omissions in securities transactions—have already been made. In *Jaeger v. Zillow*, shareholders alleged that the company's statements about the reliance on algorithms were misleading because, contrary to these claims, Zillow applied systematic 'overlays' that deviated from the algorithm's recommendations.[148] These overlays would drive up acquisition costs significantly. Zillow's representations about its algorithms' pricing accuracy created a false narrative of automation but concealed manual interventions that materially affected the market.[149] In another lawsuit, *In re Meta Platforms, Inc.*, plaintiffs claimed Meta misled investors by overstating how its algorithms reduced harmful content while hiding that the algorithms also spread divisive material to increase engagement.[150] Meta's failure to reveal how its algorithms really worked kept investors from understanding the risks these practices posed to the company's reputation.[151] In both cases, learning about the companies' algorithmic practices helped investors spot gaps between their public claims and actual operations.

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edu/2020/05/12/power-and-statistical-significance-in-securities-fraud-litigation [https://perma.cc/6TVH-5PJV] (explaining that in securities fraud cases, event studies, a statistical and economic method of assessing the impact of events on outcome variables, are used to measure "the impact of the fraudulent disclosures on market prices, the causal relationship between the fraud and plaintiff's economic harm, and the appropriate calculation of damages"); *Pure Earth, Inc. v. Call*, No. 12-2130, 2013 WL 3776218 (3d Cir. July 19, 2013) (unpublished) (reversing expert exclusion in a face-to-face stock deal case); *Ludlow v. BP, P.L.C.*, 800 F.3d 674, 682–85 (5th Cir. 2015) (affirming class certification with an event-study-based damage model); *Pirnik v. Fiat Chrysler Autos., N.V.*, 327 F.R.D. 38, 46–47 (S.D.N.Y. 2018) (holding that a ninety-two percent confidence drop was still probative of price impact).

146 *See* Harrington Glob. Opportunity Fund, Ltd. v. CIBC World Mkts. Corp., 585 F. Supp. 3d 405, 416–17 (S.D.N.Y. 2022) (providing seven examples of algorithmic spoofing episodes detailing what manipulative acts were performed, when the manipulative acts were performed, and what effect the scheme had on the market).

147 *See* 17 C.F.R. § 240.10b-5 (2024).

148 The U.S. District Court consolidated the Silverberg and Hillier securities class actions with the Barua action and appointed Jeremey Jaeger (Jaeger) as Lead Plaintiff. *See* Complaint, Silverberg v. Zillow Grp., Inc., No. 21-CV-1567 (W.D. Wash. Nov. 19, 2021); Complaint, Hillier v. Zillow Grp., Inc., No. 22-CV-00014 (W.D. Wash. Jan. 6, 2022); Complaint, Barua v. Zillow Grp., Inc., No. 21-CV-01551 (W.D. Wash. Nov. 16, 2021); Jaeger v. Zillow Grp., Inc., 644 F. Supp. 3d 857 (W.D. Wash. 2022).

149 *See Jaeger*, 644 F. Supp. at 871 ("Defendants concealed the broader, more complicated, human-driven process implemented by Project Ketchup, as well as the resultant 'offer calibration' practice, and instead created the misleading impression that Zillow was still advancing its automation efforts.").

150 *See* Consol. Amended Class Action Complaint, In re Meta Platforms, Inc. Sec. Litig., No. 21-CV-08812 (N.D. Cal. Oct. 28, 2022).

151 *Id.* at 7–9.

Consequently, greater transparency provides a stronger basis for Section 10(b) claims against companies.

III
Challenges to Implementation

This Part walks through the four greatest challenges to implementing my disclosure regime: (1) information overload and investor comprehension, (2) strategic gaming of variable definitions, (3) leakage of trade secrets, and (4) the technical limits of explainable AI. Then, this Part explains why none of these challenges defeats the case for disclosure. Targeted formatting caps and behavior-segment tables blunt overload; standardized taxonomies and recklessness-based enforcement deter variable-splitting; confidentiality safeguards and limited Shapley snapshots protect proprietary code; and time-stamped model cards paired with fairness tests keep explanations faithful even as models are retrained.

A. Utility of Information

Transparency gives investors access to information that was previously opaque. Over time, open access to information makes finance and related industries more accessible.[152] Yet increased transparency could also serve as a liability to consumers. Equalizing access to information can concentrate advantages among those best equipped to utilize it. Major financial institutions could leverage their resources to pool and analyze disclosed information. If an AI model used by Robinhood recommends Apple stock to a large segment of its users at the same time, this disclosure might signal a strong buying trend. Another major firm equipped with advanced data aggregation tools and financial analysts could aggregate these recommendations and accompanying disclosures from various sources, identify patterns, and predict widespread investor behavior. They could then preemptively buy Apple stock to capitalize on the anticipated surge in demand and drive up the stock's price before individual investors act. Additional regulations may need to add restrictions on the use of pooled disclosure information or require enhanced scrutiny for trading strategies based on collective data patterns.

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[152] *See* Sergio Alberto Gramitto Ricci, *The Vitruvian Shareholder*, 75 Fla. L. Rev. F. 113, 130–31 (2024) (arguing for the benefits of increasing market accessibility for underprivileged communities).

As with BrokerCheck's arbitration procedure, gamifying and obfuscation pose a distinct type of risk.[153] Firms might manipulate variable definitions or fragment important factors into multiple subcategories to avoid their inclusion in the disclosures. For instance, a firm could break "debt" into granular subcategories such as "short-term debt," "long-term debt," and "deferred liabilities." This tactic would dilute the apparent significance of "debt" to the point where it fell outside the top variable list. To mitigate this risk, there would need to be an accompanying standardization framework for variable definitions. When testing compliance with this framework, the regulators would need to apply a recklessness standard to assess whether the preparer used "objective standards of ordinary care" in complying with my proposal's mandates.[154]

Then there is the concern that these disclosures might become yet another "terms and conditions" sheet with dense print that goes widely ignored.[155] This reason is primarily why the SEC decided against using a disclosure model in promulgating their proposal.[156] Practical ways to address this issue would include the use of larger font sizes, clear bullet-pointed summaries free from legal jargon, and, as previously mentioned, the limitation of disclosures to the most significant variables to prevent information overload.[157] This concern is further mitigated if the disclosures are presented alongside human-centric explanations—*i.e.*, simplified language and visual aids—that adapt to the user's feedback and preferences.[158]

Even then, retail investors with limited financial or statistical literacy may struggle to interpret any amount of disclosed data, no matter how accessibly it is presented.[159] Like credit card disclosures,

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153 Fletcher, *supra* note 94, at 317 (discussing data manipulation generally and the effects it has); Dalley, *supra* note 101, at 1128 (discussing how disclosure schemes may lead to market distortions or manipulation).

154 Fletcher, *supra* note 94, at 321.

155 *See supra* notes 112–14 (discussing the vast majority of consumers who do not read standard-form contracts).

156 They noted that "the addition of more information . . . may not mitigate the negative effects of . . . DEPs on investing behavior." Proposed Rule, *supra* note 13, at 54007.

157 *See supra* note 102 and accompanying text.

158 *See* Waddah Saeed & Christian Omlin, *Explainable AI (XAI): A Systematic Meta-Survey of Current Challenges and Future Opportunities*, Knowledge-Based Sys., 2023, at 6–7 (emphasizing a need for both objective and human-centered explanations); *see also id.* at 15–16 (noting that visual analytics and adaptive explanatory techniques can improve user comprehension).

159 The complexity of disclosed information generally overwhelms ordinary investors who lack the expertise to process it. This effect will likely lead to a reliance on intermediaries to disseminate the information. *See* Dalley, *supra* note 101, at 1124–25 (discussing how intermediaries can relay information to uninformed investors); *see also* Proposed Rule, *supra* note 13, at 54007 ("[C]omplex algorithms used in discretionary or nondiscretionary

people may gloss over the variables and not pay them much attention. Still, some insight is better than the current regime of *no* algorithmic insight. Even a sliver of transparency gives regulators and investors a foothold to audit platform behavior for patterns that would remain invisible under total opacity. But because disclosure's protective value rises with investors' ability to decode it, its long-term effectiveness hinges on parallel investments in improving U.S. financial and data literacy. Currently, the patchwork implementation of personal finance education leaves many students unprepared to navigate financial markets.[160] While progress has been made—some states guarantee personal finance courses for high school students—the existing measures remain insufficient.[161]

B. Trade Secrets

In finance, predictive modeling is the heart of a company's competitive edge.[162] Sharing predictive analytics models threatens trade secrets. Firms routinely allocate tens of millions of dollars annually to cybersecurity to protect sensitive data, proprietary code, and modeling.[163] Yet both regulators and investors deserve transparency. How can these transparency-versus-secrecy interests be reconciled?

Experience shows that firms can disclose a narrow set of explanatory factors without giving rivals the blueprint. Under the Fair Credit Reporting Act (FCRA), if an adverse action is based on a consumer report or certain third-party information, users must notify the consumer, disclose relevant data or credit scores upon request, and inform them of the right to dispute or correct errors.[164] Regulation B of the Equal Credit Opportunity Act (ECOA) also requires lenders to

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robo-advising platforms could make it difficult for an investor to understand material facts or conflicts of interest and make an informed decision whether to consent or to allocate assets into or out of the platform.").

160 *See* Gramitto Ricci & Sauter, *supra* note 16, at 211.

161 *Id.* at 212 ("[O]ver three-quarters of public high school students are not required to take a personal finance course prior to graduating.").

162 *See* Jill Eicher, *Embedded Predictive Analytics: Transforming Risk Management from Review Function to Competitive Advantage*, *in* Risk Management in Finance: Six Sigma and Other Next-Generation Techniques 182, 183–84 (Anthony Tarantino & Deborah Cernauskas eds., 2009) (explaining that "predictive analytics provide the ability to perform these analyses routinely and efficiently" and that by "embedding predictive analytics into business processes, a business taps into a proprietary source of competitive information").

163 Ponemon Inst. LLC, 2024 Cybersecurity Threat and Risk Management Report 7 (2024) (reporting an average twenty-six million dollars allocated to cybersecurity investments in 2024); Ponemon Inst. & DTEX Systs., 2023 Cost of Insider Risks Global Report 32 (2023) (reporting that the average financial services firm incurs $20.68 million per year on insider-related security and protective controls).

164 *See* 15 U.S.C. § 1681m(a)–(b).

provide notices for adverse credit decisions to any credit applicant that is denied or adversely affected. Such notices must give specific reasons for the decision.[165]

In practice, these disclosures look something like: "Dear Applicant: Thank you for your recent application for _____. We regret that we are unable to approve your request."[166] They then list the specific reasons for the denial: "Insufficient bank references," "Type of occupation," "Insufficient credit experience," and "Number of recent inquiries on credit bureau report," etc.[167] Here, credit reporting agencies keep their exact formulas secret. But they disclose the key factors that influenced a consumer's score or denial.

Credit rating agencies must also publish their general methodologies and the key risk factors that influence their ratings.[168] Unlike the "reason codes" that consumer credit bureaus must provide individual consumers, credit rating agencies issue "rating rationales" with top risk considerations for corporate and bond ratings.[169] The same expectations apply for both organizations: disclose only relevant factors to the consumer.

State insurance regulations now require transparency in AI models. New York's Department of Financial Services (DFS) directs insurers to explain model outputs like "sensitivity analysis, Shapley values,

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165 Fed. Deposit Ins. Corp., Consumer Compliance Examination Manual, at V–7.6 (2024) (noting that Regulation D requires statements to be "specific and indicate the principal reason(s)" that led to the adverse action). Creditors and credit reporting agencies cannot cite factors that were not actually scored, and no principal factor can be omitted. 12 C.F.R. § 1002.9(b)(2) (2023) ("Statements that the adverse action was based on the creditor's internal standards or policies or that the applicant, joint applicant, or similar party failed to achieve a qualifying score on the creditor's credit scoring system are insufficient.").

166 *Spanish-English Translations: Notices After You Applied for Credit*, Consumer Fin. Prot. Bureau (Mar. 11, 2024), https://www.consumerfinance.gov/language/notices-after-you-applied-for-credit [https://perma.cc/98GS-R9SM].

167 *Id.*

168 *See, e.g.*, 15 U.S.C. § 78o-7(a)(1)(B)(ii) (requiring that a Nationally Recognized Statistical Rating Organization (NRSRO) must explain "the procedures and methodologies that the applicant uses in determining credit ratings"); *id.* § 78o-7(s)(3)(iv) (must disclose "information on the uncertainty of the credit rating, including—(I) information on the reliability, accuracy, and quality of the data relied on in determining the credit rating; and (II) a statement relating to the extent to which data essential to the determination of the credit rating were reliable or limited"); 17 C.F.R. § 240.17g-7(a)(1)(ii)(B)–(D) (2024) (must disclose "the version of a procedure or methodology" used with a particular rating, along with the "main assumptions" and "potential limitations" of the rating).

169 *Compare* 15 U.S.C. § 1681g(f)(1) (requiring consumer credit bureaus to provide individuals with up to four "key factors" adversely affecting their credit score), *with* 17 C.F.R. § 240.17g-7(a)(ii)(B)–(E), (H), (K), (M) (2024) (requiring NRSROs, upon any "rating action," to publish a disclosure form detailing the methodology version, key assumptions, limitations and data quality, volatility factors, and sensitivity to assumptions).

regression coefficients, or other suitable explanatory techniques to ensure no unfair bias."[170] Firms must document how their algorithms work and be prepared to share this information with regulators.[171]

It is worth highlighting that there is a meaningful distinction between disclosure to regulators versus disclosure to the public. When compelled by law to submit proprietary details in a nonpublic filing, trade secret protections typically remain intact because the regulator is bound to maintain confidentiality.[172] In contrast, publicly posting these factors may risk surrendering more than a firm is comfortable sharing, even though some courts have recognized that limited or partial disclosures do not necessarily destroy a firm's competitive advantage if other proprietary aspects of the model remain secret.[173]

In this regard, approximated Shapley-based explanations serve the perfect middle ground of informing investors while still safeguarding trade secrets.[174] Because a handful of influential factors typically will not suffice to replicate a complex predictive system, the limited information gleaned from these disclosures is unlikely to compromise

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170 N.Y. Dep't of Fin. Servs., Insurance Circular Letter No. 7, (July 11, 2024), https://www.dfs.ny.gov/industry-guidance/circular-letters/cl2024-07 [https://perma.cc/895D-YE5S] (emphasis added).

171 *See generally id.* (listing the expectations for all insurers in New York State using AI systems). But in some instances, the New York DFS allows insurers to request trade-secret confidentiality for sensitive model information submitted, which shields them from public disclosure under freedom-of-information laws. *See id.* ("Confidentiality" subsection).

172 Christopher Suarez & Anne-Gabrielle Haie, *How to Keep Trade Secrets Secret When Regulators Expect AI Transparency*, Corp. Compliance Insights, Mar. 5, 2025, https://www.corporatecomplianceinsights.com/how-to-keep-trade-secrets-secret-ai-transparency [https://perma.cc/BDM3-4CRT] (noting that "competent authorities are bound by certain confidentiality obligations" in AI disclosure requests). Moreover, the Freedom of Information Act (FOIA) has an exemption that shields "trade secrets and commercial or financial information" obtained by regulators from being released to the public. Off. of Info. Pol'y, *FOIA Guide, 2004 Edition: Exemption* 4, U.S. Dep't of Just. (May 2024), https://www.justice.gov/archives/oip/foia-guide-2004-edition-exemption-4 [https://perma.cc/FVN6-YRHZ].

173 *See, e.g.*, Neural Magic, Inc. v. Meta Platforms, Inc., 659 F. Supp. 3d 138 (D. Mass. 2023) (recognizing that disclosure of individual components does not necessarily destroy competitive advantage when the combined trade secret remains confidential); DNC Parks & Resorts at Yosemite, Inc. v. United States, 127 Fed. Cl. 435 (2016) (holding that maintaining confidentiality of trade secrets preserves competitive standing even if some information is disclosed); Pi Elecs. Corp. v. United States, 54 Fed. Cl. 56 (2002) (concluding that the aggregation of functionalities and components may remain proprietary despite disclosure of individual elements).

174 While the algorithm's code or full logic is protectable as a trade secret, information like feature importance or performance metrics is generally not. *See* Lena Chan, *The Weaponization of Trade Secret Law*, 124 Colum. L. Rev. 703, 719 n.128 (2024) (comparing Zabit v. Brandometry, LLC, 540 F. Supp. 3d 412, 424 (S.D.N.Y. 2021) ("[A]lthough Plaintiffs cannot lay claim to the [training] data, the algorithm and its methodology for using that data might still be protected.") with Lab. Ready, Inc. v. Williams Staffing, LLC, 149 F. Supp. 2d 398, 412 (N.D. Ill. 2001) (granting trade secrecy protection to a corporation's "models and data")).

an entire algorithm. As demonstrated in this section, other regulations have already adopted explainable AI approaches. And many more are likely to authorize "explainability" for limited disclosures.[175]

C. Technical Limitations of Model Explainability

Even assuming standardized Shapley-style disclosures, recommender models that decide which prompts to send, and when, do not lend themselves to a simple variable-by-variable explanation. First, models tend to learn interactions that can flip a variable's sign from positive to negative depending on context. A browsing-history flag for "tech news" may strengthen a buy signal when the user's portfolio is under-diversified, but weaken it when she already holds several correlated positions.[176] Because Shapley methods apportion credit at a single point in the feature space, they do not always summarize these shifting effects precisely.

Second, many broker-dealer models are retrained daily (or even intraday) to capture new order-flow and volatility data. Each refresh recalibrates the underlying weight matrix. Intraday order-flow and volatility regimes shift so fast that yesterday's weight matrix no longer captures the live spread.[177] This type of "drift" erodes execution quality. To keep predictions aligned with the market, broker-dealer engines are taught to rebuild the matrix on a clock. For example, the NYSE Arca's Selective Midpoint Indicator is "retrained daily (outside of market hours)," while Nasdaq's Dynamic M-ELO re-evaluates over 140 data features every thirty seconds before re-optimizing its parameters.[178]

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175 *See* Bipartisan Senate AI Working Group, *Driving U.S. Innovation in Artificial Intelligence*, Sen. Charles E. Schumer (May 2024), https://www.schumer.senate.gov/imo/media/doc/Roadmap_Electronic1.32pm.pdf [https://perma.cc/MR9H-WGA7] (encouraging relevant U.S. Senate committees to draft legislation regulating AI disclosure); *see also* Exec. Order No. 14,110, 88 Fed. Reg. 75191, 75214 (Nov. 1, 2023), https://www.govinfo.gov/content/pkg/FR-2023-11-01/pdf/2023-24283.pdf [https://perma.cc/7SUV-BCGH] ("Independent regulatory agencies are encouraged . . . [to] emphasiz[e] or clarify[] requirements and expectations related to the transparency of AI models and regulated entities' ability to explain their use of AI models.").

176 *See generally* Christoph Molnar, *Individual Conditional Expectation (ICE)*, in Interpretable Machine Learning (3rd ed. 2025), https://www.firmai.org/bit/ice.html [https://perma.cc/WU3U-9YS6] (using individualized conception explanation (ICE) plots to show that the direction of a feature's effect can switch across sub-groups—e.g., higher humidity barely alters predicted winter bike rentals yet lowers predicted summer rentals).

177 *See generally* George Coxon, Optimal Execution with Intraday Liquidity Changes and Transient Nonlinear Impact at 28–30 (2023) (MSc thesis, Imperial College London) (documenting intraday swings in the price-impact coefficient λ; concluding that "frequent retraining of the price impact model is necessary to capture frequent changes in λ").

178 *See, e.g.*, Hanyu Zhang, Shreejith B. Lokegowda, Stefanos Bazinas & Sophia Lichoulas, *Selective Midpoint Indicator (SMI): A Gradient Boosted Signal Enabling Stable Order Executions* 43 (N.Y. Stock Exch. Nov. 25, 2024) (noting that the New York Stock Exchange uses Selective Midpoint Indicator (SMI) models that are "retrained daily using data from

These adjustments ensure that the live model always reflects current microstructure conditions.

To account for both of these challenges, there need to be some additional safeguards. First, to handle context-dependent sign flips, models ought to cluster users into intelligible "behavior segments" (such as under-diversified versus highly concentrated portfolios) and release a separate Shapley table for each segment. This tactic would let investors see when a "tech-news" flag turns from a plus to a minus instead of relying on one potentially misleading average. Second, to manage rapid model drift from daily retraining, every disclosure must carry a timestamp and a simple "updated since" badge. Explanations should also automatically refresh whenever material weights move. Version-controlled model cards should link each Shapley table to the exact training run so regulators can trace any figure back to the model that produced it.[179]

The third major issue to address is fairness. Disclosure can reveal not just what drives a recommendation but who it may disadvantage. As previously mentioned, Shapley-based disclosures may arm individual investors with the proof necessary to bring private suits when a model's predictions lean on biased inputs.[180] They may also help surface platform-wide steering patterns that regulators can tackle even when no single victim suffers discernible losses. For example, a model that distributes buy prompts evenly across gender or racial groups may still steer one cohort toward leveraged crypto while nudging another toward blue chip stock recommendations.[181]

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the preceding three days"); Notice of Filing of Proposed Rule Change to Amend Rule 7.31-E to Adopt the Selective Midpoint Order, 89 Fed. Reg. 106630, 106634 (Dec. 30, 2024) (stating that NYSE Arca's rule filing for its new Selective Midpoint Order "SMI models will undergo daily retraining (outside of market hours)" so they always reflect the latest order-flow regime); Notice of Filing of Amendment No. 2 and Order Granting Accelerated Approval of a Proposed Rule Change, as Modified by Amendment No. 2, to Amend Rules 4702(b)(14) and (b)(15) Concerning Dynamic M-ELO Holding Periods, 88 Fed. Reg. 62850, 62852–53 (Sep. 13, 2023) (describing Nasdaq's Dynamic Midpoint Extended Life Order (M-ELO) timer, a feature that adjusts the holding period of an order before it's eligible to trade and updates its machine-learning parameters every thirty seconds).

179 *See* Nat'l Inst. of Standards & Tech., Artificial Intelligence Risk Management Framework: Generative AI Profile 34 (2024) (establishing version control systems can also "provide a tamper-proof history of the content, promote transparency, and enable traceability").

180 *See supra* Section III.B.

181 *See* Consumer Fin. Prot. Bureau, Fair Lending Report of the CFPB 5–6, 35 (2024) (describing investigations of AI-driven credit-card marketing models for discriminatory practices; "Creditors subject to ECOA and Regulation B may violate these laws if they use these data to engage in discriminatory targeting, steering, redlining, or in other ways that create unlawful discrimination."). For an example of steering in other contexts, see generally Muhammad Ali, Piotr Sapiezynski, Miranda Bogen, Aleksandra Korolova,

Because the disparity may hide in the riskiness of the assets being recommended, auditors should check not only which factors drive a recommendation, but also whether some groups are being steered into riskier assets. Statistical-parity testing is one leading mechanism to assess disparate impact in credit-scoring and hiring practices.[182] Statistical-parity testing compares the share of positive outcomes (e.g., "buy-blue-chip" prompts) across protected groups and flags a disparate-impact ratio below some accepted threshold.[183] Imagine a company handing out job interview invitations. If men and women with similar résumés apply, but one group consistently gets more callbacks, the imbalance only becomes clear once you compare the invitation rates across groups. Statistical-parity testing works the same way: It checks whether "positive outcomes" are spread evenly or if one group is being systematically left out. Ideally, auditors would compute the ratio, apply confidence intervals, and then rerun the check after counterfactual feature swaps to confirm the gap is data-driven rather than model-driven. Where parity gaps persist, a firm's own disclosures could supply the evidence regulators or plaintiffs need to bring a claim.

Conclusion

We circle back to our example of Margaret's alternative world. It's lunchtime, and she sees a nudge: "Buy now. Don't miss out." She taps into her app and skims a disclosure statement. It shows why the algorithm singled out NVIDIA based on her browsing habits, portfolio history, and sector interests. She knows that all these factors boosted the model's confidence.

Alan Mislove & Aaron Rieke, *Discrimination through Optimization: How Facebook's Ad Delivery Can Lead to Biased Outcomes*, 3 Proc. Ass'n for Computing Mach. on Hum.-Comp. Interaction, 199:14–16 (2019) (showing delivery algorithms steered identical ads toward different demographic cohorts).

182 *See* Christophe Hurlin, Christophe Pérignon & Sébastien Saurin, *The Fairness of Credit Scoring Models* 3 (Feb. 9, 2024), https://arxiv.org/abs/2205.10200 [https://perma.cc/84YR-HQV6]; Mike H. M. Teodorescu & Christos Makridis, *Fairness in Machine Learning: Regulation or Standards?*, Brookings Institution (Feb. 15, 2024), https://www.brookings.edu/articles/fairness-in-machine-learning-regulation-or-standards [https://perma.cc/RU6Q-YD3M] (noting that parity metrics are "simple to run" and are now a standard first check in hiring and lending algorithms); *see also* N.Y. City Dep't Consumer & Worker Prot., Automated Employment Decision Tools: Frequently Asked Questions (2023), https://www.nyc.gov/assets/dca/downloads/pdf/workers/NYC-AEDT-FAQ.pdf [https://perma.cc/2PJX-JDNP] (requiring annual bias audits using measures such as demographic-parity ratios for any automated hiring tools).

183 *See* Hurlin et al., *supra* note 182, at 11 (defining statistical parity as requiring "equal True Positive Rates" and "equal False Positive Rates" across groups); Hurlin et al., *supra* note 182, at 5 (citing the EEOC's four-fifths rule, which treats a selection rate less than eighty percent of the highest group rate as evidence of disparate impact).

Suddenly, investing feels less like luck and more like a choice. Margaret knows that the platform gets paid for her trades, but now she can see, in plain language, the rationale behind each recommendation.

All people really need is a chance to read the fine print without drowning in it. Algorithmic transparency can help. This strategy will likely not eliminate every risk. No amount of disclosure can turn human beings into perfect decisionmakers. Nudges will still draw some of us in. But imagine a world where small steps align, and investors can see the top factors that shape a recommendation. Regulators require firms be honest about how they profit. Over time, these efforts build a system that respects innovation and warns against manipulative design.

Next time, the prompt to "buy on the dip" is not just empty lights and confetti. Margaret, if she did not already, will understand the mechanics and consequences behind every tap. Armed with real knowledge, she is free to say yes, or no, or to walk away entirely. That type of freedom is power.