Decentralized Markets and Decentralized Regulation

Yuliya Guseva[*]

(*George Washington Law Review*, forthcoming 2024)

ABSTRACT

Distributed ledger technology, such as blockchains, is changing financial markets by creating the foundation for transacting with digital assets. New blockchain-enabled intermediaries—cryptoexchanges—have emerged to trade, broker, and settle transactions with digital assets, including innovative cryptoassets and other tokenized assets. U.S. regulators seek to place cryptoexchanges within the ambit of existing regulation and registration requirements for legacy exchanges. A critical underexplored corollary of this approach is converting cryptoexchanges into registered self-regulatory organizations (SROs) or members of legacy SROs, such as the Financial Industry Regulatory Authority. Put differently, a byproduct of the regulatory efforts to register the new digital asset intermediaries is bringing legacy self-regulation into blockchain-enabled markets. Unfortunately, in imposing this model without reform, policymakers continue to ignore the considerable economic potential of digital assets and blockchains. The regulators also fail to incorporate the economic gains from the technology, properly control its negative externalities, and ultimately produce economic welfare-improving outcomes.

This Article aims to offer solutions. It delves into the digital asset market structure and microstructure, the new intermediaries, their risks and economic benefits, and associated transaction costs. It shows why technology alone cannot optimally address the risks and costs of digital asset trading. Agreeing with the regulators' intuition to introduce formal self-regulation, the Article outlines an improved self-regulatory model. The proposed self-regulatory approach would aggregate the decentralized knowledge of individual participants in the global blockchain-enabled market to ensure well-informed and efficient regulation. Building on market expertise, the SRO would educate the regulators about ongoing market developments, mitigate the information asymmetry between the agencies and the markets, and reduce coordination costs among heterogeneous and dispersed developers in blockchain-enabled markets.

Namely, the Article proposes a two-tier SRO structure to oversee the digital asset market. The base layer of this model would be the centralized trading platforms themselves. The upper policy-level layer would develop comprehensive

rules and coordination mechanisms for centralized exchanges and digital asset broker-dealers. To address global spillovers between trading on centralized and decentralized exchanges, the policy-level SRO would also develop guidelines and best practices for decentralized exchanges built directly on blockchains. The Article illustrates why blockchain-native methods cannot control the risks of decentralized exchanges and suggests coordinating developer activity through guidelines to nudge the market to design technological solutions to transactional and regulatory problems. The proposed self-regulatory model considers the global interconnections within the centralized and decentralized digital asset infrastructure and addresses its risks in a coordinated and comprehensive manner.

INTRODUCTION

Technologies such as blockchain[1] have created a novel foundation for transacting with digital assets.[2] Initially emerging under the moniker of "cryptocurrencies," these assets have evolved to help secure the functionalities of blockchain-enabled projects, streamline payments, and create and trade digital and real-world assets.[3] Bonds, shares of stock, commodities, and other real-world assets may be tokenized *en masse* and transferred on-chain.[4] Large financial institutions are increasingly involved with these technology-based developments,[5] seeking to tap into the institutional ecosystems of blockchains and digital assets to benefit from their efficiencies, liquidity, faster transfers, instantaneous settlement, transparency, and customization.[6]

---

[1] Blockchains are a form of distributed ledgers. "An online ledger maintained by Distributed Ledger technology is 'distributed' because transactions are stored on up to several thousand computers connected to a common network via the internet. Changes and updates to the ledger may only be made if the network of computers . . . reaches a consensus that the change . . . is valid. . . . A Blockchain is . . . one type of Distributed Ledger; it is a decentralized, Peer-to-Peer network of independent computers recording, sharing, and synchronizing data according to preset protocols." CAROL GOFORTH & YULIYA GUSEVA, REGULATION OF CRYPTOASSETS 774 (West Academic Publishing 2022). I will use the terms "blockchain" and "DLT" interchangeably in this Article.

[2] Blockchains introduce an element of decentralization to ledgers, which are typically maintained by centralized intermediaries, enabling digital asset transfers. *See, e.g.,* Onnig H. Dombalagian, *Bond Trading at the Digital Frontier,* 49 J. CORP. L. 489, 518 (2024) ("By maintaining parallel records of verified transactions, DLT obviates the need for 'centralized' intermediaries to process transactions and maintain ownership records"). The terms "digital assets" and "cryptoassets" include assets that are created and stored digitally and often transferred on blockchain; both terms are frequently used interchangeably. *See e.g.*, Yuliya Guseva & Irena Hutton, *Regulatory Fragmentation: Investor Reaction to SEC and CFTC Enforcement in Crypto Markets*, 64 B.C. L. REV. 1555, 1560 (2023).

[3] *See* Guseva & Hutton, *supra* note 2, at 1563-1566 (providing several examples of how blockchain-based assets can use blockchains to trade and transfer assets within the economy).

[4] "Tokenization is the use of digital tokens to represent the ownership of physical assets." CRAIG JAMES CALCATERRA & WULF ALEXANDER KAAL, DECENTRALIZATION: TECHNOLOGY'S IMPACT ON ORGANIZATIONAL AND SOCIETAL STRUCTURE (2021). Commentators suggest that tokenization may generate efficiencies. *See e.g.*, Morten Bech et al., *On the Future of Securities Settlement*, BANK FOR INT'L SETTLEMENTS Q. REV., Mar. 2020, at 67, 67; John Caslin, *Breaking Down Barriers with New Building Blocks: How Tokenization Streamlines Funds for Faster Settlement, Efficiency and Fractionalization*, DELOITTE PERFORMANCE MAG. (June 29, 2023), https://www2.deloitte.com/lu/en/pages/investment-management/articles//breaking-down-barriers-with-new-building-blocks.html; HONG KONG MONETARY AUTHORITY, BOND TOKENISATION IN HONG KONG 19 (2023), https://www.hkma.gov.hk/media/eng/doc/key-information/press-release/2023/20230824e3a1.pdf [hereinafter HKMA]; David G.W. Birch, *Larry Fink Says Tokens Are "The Next Generation For Markets,"* FORBES (Mar 1, 2023, 10:56 AM), https://www.forbes.com/sites/davidbirch/2023/03/01/larry-fink-says-tokens-are-the-next-generation-for-markets/.

[5] *See, e.g.*, Dombalagian, *Bond Trading, supra* note 2, at 520 (2024) ("In the United States, some bond issuers are keen to embrace DLT as a tool for raising capital, particularly in issuances targeted at higher-net-worth investors."); Peter Gaffney, *Tokenization and Real-World Assets Take Center Stage*, COINDESK (Nov. 22, 2023, 12:02 PM), https://www.coindesk.com/business/2023/11/22/tokenization-and-real-world-assets-take-center-stage/; Greg Ahlstrand, *NYSE Parent ICE Takes Stake in tZERO in Potential Move Toward Tokenized Stocks*, COINDESK (May 11, 2023, 1:57 PM), https://www.coindesk.com/business/2022/02/23/nyse-parent-ice-takes-stake-in-tzero-in-potential-move-toward-tokenized-stocks/; Asa Sanon-Jules, *Swiss Bank Cité Gestion Becomes First Private Bank to Tokenize Its Own Shares*, COINDESK (May 9, 2023, 12:06 AM), https://www.coindesk.com/business/2023/01/24/swiss-bank-cite-gestion-becomes-first-private-bank-to-tokenize-its-own-shares/; *Onyx by J.P. Morgan: About Coin Systems*, J.P. MORGAN, https://www.jpmorgan.com/onyx/coin-system.

[6] *See infra* Part I; HKMA, *supra* note 4.

In addition to legacy industry firms, new intermediaries have emerged to trade and process transactions with various digital assets. We often misleadingly call them "cryptoexchanges,"[8] although they combine the functions of several legacy intermediaries, including trading platforms, broker-dealers, and clearinghouses.[9] By enabling these new intermediaries to operate atop and in reliance on blockchain protocols,[10] blockchains and distributed ledger technology (DLT) have offered us institutional innovations in financial and commodity markets. These new forms of assets and transaction execution systems are Schumpeter's "combinations" of process improvements and product innovations.[11] Their associated efficiencies can be considerable, but so can the risks to markets, consumers, and established regulatory frameworks.[13]

Together, these two factors (the risks and the benefits) point toward the need for reform,[14] which, ideally, should incorporate the economic gains from the technologies and control their possible negative externalities and risks to produce economic welfare-improving outcomes. Unfortunately, policymakers in the United States have yet to grapple with these fundamental questions. Instead, when confronted with new institutions such as cryptoexchanges, U.S. regulators attempt to pigeonhole them within the remit of existing regulation and registration requirements for legacy exchanges, broker-dealers, and clearinghouses.[15] The underexplored corollary of this regulatory approach is converting cryptoexchanges into either registered self-regulatory organizations (SROs) or members of legacy SROs.[16]

From the early days of the federal securities and commodity laws, the Securities and Exchange Commission (SEC) and the Commodity Futures Trading Commission (CFTC) (together, "Commissions") mandated that registered intermediaries either perform self-regulatory functions or participate in SROs such as the Financial Industry Regulatory Authority (FINRA)

---

[8] *See infra* Part II.

[9] *Id.*; *infra* Part III.

[10] "A protocol is a standardised set of rules that allows computers to format, process and transmit data." AUTORITE DES MARCHES FINANCIERS, DECENTRALISED FINANCE (DEFI), TRADING PROTOCOLS AND GOVERNANCE ISSUES: OVERVIEW, OBSERVED TRENDS, AND REGULATORY DISCUSSION POINTS 5 (2023) [hereinafter AMF]. They are "superimposed into various 'layers' that perform . . . different tasks." *Id.* A blockchain ecosystem may include several layers for transaction recording and settlement, scaling and smart-contract-enabling functionalities such as trading. *Id.*

[11] For a relevant discussion of Schumpeter's work, see ARNOLD HEERTJE, SCHUMPETER ON THE ECONOMICS OF INNOVATION AND THE DEVELOPMENT OF CAPITALISM 49, 82–84 (2006).

[13] *See infra* Parts II-III.

[14] Scholars on blockchain-enabled markets have long argued for such reforms. *See, e.g.*, The Future of Digital Asset Regulation, Hearing before the Subcomm. on Commodity Exchanges, Energy, and Credit of the U.S. House of Representatives, (June 23, 2002) (testimony of Chris Brummer, Georgetown Law School, critiquing the application of Regulation S-K), https://www.congress.gov/event/117th-congress/house-event/114931/text. Some even called for the creation of "a single crypto regulatory agency." Joel Seligman, *The Rise and Fall of Cryptocurrency: The Three Paths Forward*, 19 NYU J.L. & BUS 93, 135 (2022). There is also a scholarly and policy debate on whether fintech produces and enhances the same services or introduces new ones, which would support using the existing rules of designing new regulations. *See, e.g.,* Moran Ofir & Ido Sadeh, *More of the Same or Real Transformation: Does Fintech Warrant New Regulations,* 21 HOUS. BUS. & TAX. L. J. 280, 284, 287-95 (2021) (discussing the debate and suggesting that new technologies produce new capabilities in financial transactions).

[15] *See, e.g.*, Complaint at 4, SEC v. Coinbase, Inc., No. 1:23-cv-04738 (S.D.N.Y. June 6, 2023).

[16] *See infra* Parts V-VI.

and the National Futures Association (NFA).[17] Through statements, enforcement actions,[18] and a proposed rule change expanding the definition of the term "exchange,"[19] the Commissions have pushed the new digital asset exchanges into this well-known SRO territory. The Commissions effectively attempted to coopt centralized cryptoexchanges (i.e., venues that provide trading in digital assets but are run mainly off-chain by identifiable firms and individuals)[21] and decentralized platforms (i.e., cryptoexchanges that operate autonomously through applications built on blockchains)[22] into the ranks of SROs.

In their efforts to impose this model without reform, the SEC and CFTC have ignored the valuable economic potential of blockchains as institutional innovations, the unique risks and transaction costs of the new markets, and the differences between digital assets and conventional markets.[26] They have also elided the distinctiveness of decentralized exchanges, their

---

[17] 15 U.S.C. §§ 78e, 78f, 78o; 7 U.S.C. § 7; *Futures Commission Merchants (FCMs)*, CFTC, https://www.cftc.gov/IndustryOversight/Intermediaries/FCMs/fcmib.html (last visited Dec. 17, 2023); *Register a New Broker-Dealer Firm*, FIN. INDUS. REGUL. AUTH., https://www.finra.org/registration-exams-ce/broker-dealers/new-firms (last visited Dec. 17, 2023).

[18] *See generally*, Carol R. Goforth, *Regulation of Crypto: Who Is the SEC Protecting?*, 58 AM. BUS. L.J. 643 (2021) [hereinafter Goforth, *Regulation of Crypto*] (discussing the problems of SEC enforcement and selective enforcement); Yuliya Guseva, *When the Means Undermine the End: The Leviathan of Securities Law and Enforcement in Digital-Asset Markets*, 5 STAN. J. BLOCKCHAIN L. & POL'Y 1, 4 (2022) (describing the SEC's "regulation-via-enforcement approach"); Chris Brummer et al., *Regulation by Enforcement,* 96 SO. CAL. L. REV. 1297, 1303 (2024). The first SEC statement on cryptoassets and cryptoexchanges was Report of Investigation Pursuant to Section 21(a) of the Securities Exchange Act of 1934: The DAO, Exchange Act Release No. 34-81207, 117 SEC Docket 745 (July 25, 2017). A momentous development happened in the spring of 2024 when a federal district court denied a major centralized cryptoexchange's motion for judgment on the pleadings and concluded that the SEC's complaint plausibly supported the claim that the cryptoexchange provided a platform for trading securities and operated as several unregistered intermediaries: a broker, an exchange, and a clearing agency. *Coinbase, Inc.*, 2024 WL 1304037, at *1, 17-18, 26-27. On CFTC enforcement against decentralized and centralized exchanges, *see, e.g.,* Press Release, Commodity Futures Trading Commission, CFTC Issues Orders Against Operators of Three DeFi Protocols for Offering Illegal Digital Asset Derivatives Trading (Sept. 7, 2023), https://www.cftc.gov/PressRoom/PressReleases/8774-23 (detailing enforcement actions by CFTC against three decentralized platforms that developed blockchain-based digital assets); Guseva & Hutton, *supra* note 2, at 1578 (discussing CFTC cases against centralized exchanges). For an overview of enforcement actions, see, e.g., Simona Mola, *SEC Cryptocurrency Enforcement: June 2023 Update*, CORNERSTONE RSCH., https://www.cornerstone.com/insights/research/sec-cryptocurrency-enforcement-june-2023-update/ (last visited Dec. 17, 2023); Press Release, Commodity Futures Trading Commission, CFTC Releases FY 2023 Enforcement Results, Addendum (Nov. 7, 2023), https://www.cftc.gov/PressRoom/PressReleases/8822-23; Press Release, Commodity Futures Trading Commission, CFTC Releases Annual Enforcement Results, Addendum A (Oct. 20, 2022), https://www.cftc.gov/PressRoom/PressReleases/8613-22.

[19] *See* Supplemental Information and Reopening of Comment Period for Amendments Regarding the Definition of "Exchange," Exchange Act Release No. 34-97309, 88 Fed. Reg. 29448 (May 5, 2023).

[21] A centralized exchange "resembles traditional asset exchanges, such as stock exchanges, in having an identifiable firm that takes custody of users' assets, maintains an order book, and matches trades." Kevin Werbach, *Digital Asset Regulation: Peering into the Past, Peering into the Future*, 64 WM. & MARY L. REV. 1251, 1297 (2023).

[22] *See* AMF, *supra* note 12, at 12 (discussing decentralized exchanges or "DEXs" as autonomous code-based trading platforms). For a discussion of decentralized exchanges, see notes 71-73 and accompanying text.

[26] *See infra* Parts I-III. *See also* Edoardo D. Martino & W. Georg Ringe, *The Social Cost of Blockchain: Externalities, Allocation of Property Rights, and the Role of the Law,* Institute of Law and Economics, Working Paper Series, Working Paper No. 80, at 22-23 (2024), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4821063 (observing that "plainly applying existing legislation to new phenomena implies potentially significant costs, as existing rules, for instance on securities offerings and trading, may not align with the unique characteristics of

infrastructure, and their microstructure.[27] This regulatory approach seems ossified and manifestly contrary to the Commissions' normative objectives of promoting efficient markets and innovation, ultimately ensuring economic growth.[28] It also strengthens the calls for reform.

In May 2024, the United States House of Representatives took up that gauntlet and passed the "Financial Innovation and Technology for the 21st Century Act" in a rare demonstration of bipartisanship.[29] The Bill, however, is unlikely to gain traction in the Senate[30] and offers incomplete solutions, failing to appreciate how the fast-paced innovative markets challenge existing self-regulatory frameworks in novel ways.[31]

With these considerations in mind, this Article aims to offer solutions. It delves into the digital asset market structure and microstructure, the new intermediaries, and the associated transaction costs. Agreeing with the Commissions' intuition to introduce self-regulation, the Article explains why this policy needs more finesse, outlines a new self-regulatory model, and joins the scholarship that calls for self-regulation in digital asset markets.[33] The suggested model takes into account the unique risks and contributions of the technology and blockchain-enabled market infrastructure, as well as the critical differences and spillovers between centralized and decentralized trading systems.

This Article develops in three main segments: It starts with the projected economic benefits of DLT, proceeds to demonstrate how these theoretical expectations conflict with the existing transaction costs and risks in digital asset offerings and trading, and concludes with offering policy solutions based on self-regulation. Part I examines blockchains as an institutional innovation built to reduce transaction costs through decentralization and self-governance. In Parts II and III, the Article demonstrates how reality clashes with this theoretical potential, explores why blockchain-enabled markets need regulatory intervention, and explores how the new intermediaries introduce novel risks (or recreate old ones) throughout the lifecycle of digital

---

blockchain issuance and coin transactions" and "simply applying existing laws to blockchain transactions is deemed desirable (i.e. a Coasean improvement) only if the functionally equivalent off-chain transaction exhibits precisely the same externalities and the same efficiency gains.").

[27] For a comprehensive comparison of centralized and decentralized exchanges, their microstructure, custody and settlement, see generally, Campbell R. Harvey et al., *The Evolution of Decentralized Exchange: Risks, Benefits and Oversight,* Wharton Initiative on Financial Policy and Regulation White Paper (2024) (unpublished manuscript on file with the author).

[28] *See The Commission*, CFTC, https://www.cftc.gov/About/AboutTheCommission (reflecting the mission of the CFTC to "promote . . . integrity, resilience, and vibrancy" and "[f]orward-thinking"); *About the SEC*, SEC (Apr. 6, 2023), https://www.sec.gov/strategic-plan/about (summarizing the mission "[t]o protect investors, maintain fair, orderly, and efficient markets, and facilitate capital formation" and reflecting the SEC's commitment to "innovative, flexible, and pragmatic regulatory approaches"). For a discussion of the impossibility of achieving all agency objectives, see, e.g., Yesha Yadav & Chris Brummer, *Fintech and the Innovation Trilemma*, 107 GEO. L.J. 235, 248-64 (2019).

[29] *See* Financial Services Committee, *House Passes Financial Innovation and Technology for the 21st Century Act with Overwhelming Bipartisan Support,* Press Release, May 22, 2024 [hereinafter House Bill], https://financialservices.house.gov/news/documentsingle.aspx?DocumentID=409277.

[30] LexisNexis, 118 Legislative Outlook H.R. 4763 (2024).

[31] *Infra* Section II(C); Parts IV-VI.

[33] *Infra* Parts V-VI. Note that there are concerns about SROs' effectiveness, discussed *infra* Section IV(B). Some scholars have also argued against new SROs in securities markets. *See, e.g.,* Donna M. Nagy, *Regulating the Mutual Fund Industry,* 1 BROOK. J. CORP. FIN. & COM. L. 11, 33 (2006).

assets (i.e., from their offering to exchange trading and settlement). In Parts IV, V, and VI, the Article concludes with a possible solution—an organized, formal self-regulatory system. Part IV takes a deep dive into the pros and cons of self-regulation in blockchain-enabled markets and the failures of private self-regulation; Part V discusses the need for a formal self-regulatory approach; Part VI builds off the two major proposals on cryptoasset SROs, merges them, and develops a new model capitalizing on the benefits of SROs and targeting the risks of blockchain-enabled cryptoexchanges.

I. ECONOMICS AND BLOCKCHAINS

Traditional capital and commodity markets rely on institutions providing some form of intermediation, reducing transaction costs, and improving coordination among market participants. These typical intermediaries include, among others, trading platforms, broker-dealers, and clearinghouses, all regulated and registered with the SEC and/or the CFTC and relevant SROs.[34] These intermediaries are imperfect, and scholars and regulators periodically voice concerns about SROs' conflicts of interest and relevant transaction costs.[35] In contrast to the conventional institution-based system, the avowed promise of blockchain technology is a disintermediated system, enhancing efficiency, addressing Coasean and Williamsonian transaction costs,[36] and simplifying human interaction[37] and economic coordination.[38]

The relevant oft-cited features of DLT are decentralization and transparency, which reduce adverse selection, improve transaction execution and security, and produce untampered records.[39] The public nature of blockchain-enabled transacting leads to a better distribution of

---

[34] *See*, *e.g.*, Marco Dell'Erba, *Crypto-Trading Platforms as Exchanges,* 2023 MICH. ST. L. REV. (forthcoming 2024), at 12-27, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4405361 (discussing how legacy intermediaries are regulated)

[35] *Infra* Section IV(B).

[36] *See generally* OLIVER E. WILLIAMSON, THE ECONOMIC INSTITUTIONS OF CAPITALISM (1985); Ronald H. Coase, *The Nature of the Firm*, 4 ECONOMICA 386 (1937) (describing the costs of coordinating economic activity in traditional markets). For an explanation of how blockchain technology can reduce transaction costs, see generally Daniil Frolov, *Blockchain and Institutional Complexity: An Extended Institutional Approach*, 17 J. INSTITUTIONAL ECON. 21 (2021); Martino & Ringe, *supra* note 26, at 4 ("In fact, blockchain aims to efficiently allocate entitlements through a decentralised process. In the Coasean framework, this guarantees superior outcomes compared to centralised public policies when it comes to handling externalities. Crucially, this holds true only under the assumptions of very low transaction costs and a clear initial allocation of property rights. As long as these assumptions hold, market participants may exchange property rights, ensuring that these entitlements are allocated to the party who values them the most, thereby internalising the externalities")

[37] Organizationally, blockchain protocols could work as "constitutions" enabling participants to decide how they are governed. *See, e.g.*, Eric Alston, *Blockchain and the Law – Legality, Law-like Characteristics, and Legal Applications*, *in* THE ECONOMICS OF BLOCKCHAIN AND CRYPTOCURRENCY: A TRANSACTION COSTS REVOLUTION 128, 129 (James Lee Caton ed., Edward Elgar Publ'g 2022); Alastair Berg et al., *Blockchains and Constitutional Catallaxy*, 31 CONST. POL. ECON. 188, 193-94 (2018).

[38] *See generally* Sinclair Davidson et al., *Blockchains and the Economic Institutions of Capitalism*, 14 J. INSTITUTIONAL ECON. 639 (2018) (describing how blockchains coordinate economic activity to improve efficiency and reduce transaction costs). For the major institutional theory, see generally DOUGLASS C. NORTH, INSTITUTIONS, INSTITUTIONAL CHANGE AND ECONOMIC PERFORMANCE (Cambridge Univ. Press 1990).

[39] *See* PRIMAVERA DE FILIPPI & AARON WRIGHT, BLOCKCHAIN AND THE LAW: THE RULE OF CODE 2 (Harvard Univ. Press 2018).

knowledge and communication.[40] It thus may tackle the costs associated with searching for prices, negotiating and drafting complex contracts, controlling transactional opportunism, and others.[41] Ultimately, the germane theoretical value of DLT rests on managing trust,[42] a vital component in all economic systems.[43] With better trust and lower costs, firms may be more willing to transact,[44] suggesting that new participants may enter markets previously unavailable due to attendant costs or risky intermediation.[45]

Some of these benefits should be particularly visible in securities markets and finance since "[t]he financial sector is, above all else, about gathering and processing information, on the basis of which capital resources can be efficiently allocated."[46] Specific improvements could accrue in reducing information asymmetry,[47] mitigating counterparty risk,[48] ensuring more open corporate governance,[49] facilitating the traceability of shares,[50] expediting payment of dividends, interest, and other distributions,[51] and minimizing back-office, transfer, and information verification functions of various intermediaries.[52]

The additional value of the technology derives from the potential changes in the market structure and microstructure. For instance, DLT-enabled trading may reduce the information

---

[40] *See* Sinclair, *supra* note 38 at 640, 652-53 (describing how blockchains allow peer-to-peer networks to mutually exploit their specialized knowledge to increase efficiencies). For a theory of decentralization of knowledge, see generally Friedrich A. von Hayek, *The Use of Knowledge in Society*, 35 AMA. ECON. REV. 519, 522 (1945).

[41] On the main transaction costs, see Coase, *supra* note 36, at 390-91.

[42] For a description of how law can be used to promote trust in DLT, see KEVIN WERBACH, THE BLOCKCHAIN AND THE NEW ARCHITECTURE OF TRUST 163 (Mass. Inst. of Tech. Press 2023).

[43] *See, e.g.*, Rafael La Porta et al., *Trust in Large Organizations*, 87 AM. ECON. REV. 333, 336 (1997) (finding that trust is associated with enhanced economic performance); Luigi Guiso et al., *Trusting the Stock Market*, 63 J. FIN. 2557, 2557 (2008) (arguing that the individuals will invest in stocks when they trust that the information is reliable and the system is fair).

[44] *See, e.g.*, Guiso, *supra* note 43; Nicola Gennaioli et al., *Money Doctors*, 70 J. FIN. 91, 93 (2015).

[45] *But see* Cameron Harwick, *Signals and Incentives in Blockchain Applications*, *in* THE ECONOMICS OF BLOCKCHAIN AND CRYPTOCURRENCY: A TRANSACTION COSTS REVOLUTION 158, (James Lee Caton ed., Edward Elgar Publ'g 2022) (discussing relevant incentive hurdles and the need for inalienable identity for some financial transactions to work in blockchain-enabled financial markets).

[46] Joseph E. Stiglitz, *The Revolution of Information Economics: The Past and the Future*, *in* THE STATE OF ECONOMICS, THE STATE OF THE WORLD 102 (Kaushik Basu et al. eds., Mass. Inst. of Tech. Press 2019).

[47] *See, e.g.,* Katrin Schuler et al., *On DeFi and On-Chain CeFi: How (Not) to Regulate Decentralized Finance,* 00 J OF FIN. REG. 1, 10 (2024).

[48] *Id.* at 16.

[49] *See, e.g.,* DE FILIPPI & WRIGHT, *supra* note 39, at 133-35 (describing how blockchain technology can improve the efficiency and transparency of management of corporations).

[50] George S. Geis, *Traceable Shares and Corporate Law*, 113 NW. U. L. REV. 227, 230-31 (2018); Kevin V. Tu, *Blockchain Stock Ledgers*, 96 IND. L.J. 223, 248 (2020).

[51] Raphael Auer, *Embedded Supervision: How to Build Regulation into Decentralized Finance*, BIS Working Paper No. 118 at 8 (Sept. 18, 2019).

[52] Legacy firms have already availed themselves of these benefits by issuing tokenized securities on blockchains. *E.g.,* Press Release, European Investment Bank, EIB Issues Its First Ever Digital Bond on a Public Blockchain (Apr. 28, 2021), https://www.eib.org/en/press/all/2021-141-european-investment-bank-eib-issues-its-first-ever-digital-bond-on-a-public-blockchain. *Digitizing Bonds on the Blockchain*, GOLDMAN SACHS (June 10, 2021), https://www.goldmansachs.com/intelligence/pages/from_briefings_10-june-2021.html. Copies of ledgers could be maintained not by a single intermediary but instead distributed among parties, making them more secure and transparent. Bech et al., *supra* note 4, at 74 ("DLT supports the wider distribution of ownership records and transaction histories.").

monopoly of conventional profit-seeking intermediaries, such as legacy exchanges,[53] and produce more cost-efficient trading platforms.[54] Scholars suggest that code-driven, blockchain-based decentralized exchanges could save U.S. investors billions in trading costs, and capital locked in centralized intermediaries might be used productively through a decentralized institutional design.[55] A blockchain-enabled market could thus produce allocative efficiencies. Purely theoretically, DLT could also turn market participants from integrating into larger firms toward transacting in open markets and thus alter market organization[56] by lowering Coasean transaction costs.[57]

The reality of digital asset markets differs from these theories, and some forms of centralized intermediation and associated risks have returned and remain front and center.[58] The root cause of these trends is the market itself: market actors continue to innovate and experiment while relying on the efficiencies, improved governance, and security of blockchains,[59] particularly the foundational Layer 1 protocols.[60] As market actors capitalize on these benefits and blockchain ecosystems' amenability to customization, they build new assets and services atop that foundational layer. Their initiatives can develop away from pure decentralization and disintermediation, with Layers 2 and 3[61] and various applications allowing different levels of

---

[53] On the central role of exchanges, *see, e.g.,* Onnig H. Dombalagian, *Are Cryptoexchanges the Exchange Act's Trojan Horse?* 21 BER. BUS. L. J. (forthcoming)*,* at 45, 67-68, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4703013.

[54] *See* Katya Malinova & Andreas Park, Learning from DeFi: Would Automated Market Makers Improve Equity Trading? 4 (Aug. 4, 2023) (unpublished manuscript), https://ssrn.com/abstract=4531670 (suggesting that automated market makers, a subtype of DEXs, can increase liquidity and reduce trading costs). *See also* DE FILIPPI & WRIGHT, *supra* note 39, at 99 (arguing that DLT can "facilitate the trading of financial instruments on a global scale" and acknowledging legal risks).

[55] Malinova & Park, *supra* note 54 at 5 ("Currently, a substantial portion of shares remains idle at brokerages, with only a small fraction lent to short sellers. Even this lending activity is often bilateral, making it expensive and cumbersome to arrange. AMMs offer a systematic way for investors to deploy their capital, earning extra income while providing proper risk sharing and compensation for adverse selection.").

[56] Thus, DLT could "provide[] many of the benefits of consolidation – trust [and lower transaction costs] – without the costs in administrative bloat and inefficiency." Chris Berg et al., *Trustless Architecture and the V-Form Organization*, *in* THE ECONOMICS OF BLOCKCHAIN AND CRYPTOCURRENCY: A TRANSACTION COSTS REVOLUTION 174 (James Lee Caton ed., Edward Elgar Publ'g 2022).

[57] Recall that sources of market transaction costs include learning about prices, negotiating and drafting contracts, i.e.*,* activities that can be avoided within a firm. Coase, *supra* note 36.

[58] *See generally* Yesha Yadav, *The Centralization Paradox in Cryptocurrency Markets*, 100 WASH. U.L. REV. 1725 (2023).

[59] *See* Alston, *supra* note 37, at 131, 133; Cesare Fracassi et al., *Decentralized Crypto Governance? Transparency and Concentration in Ethereum Decision-Making*, 41-44, (Jan 2024) (unpublished manuscript), https://www.law.nyu.edu/sites/default/files/paper%20Decentralized%20Crypto%20Governance.pdf (finding that only a group of identifiable developers on Ethereum advance implemented proposals but noting transparency and increasing decentralization). *But see* Angela Walch, *The Bitcoin Blockchain as Financial Market Infrastructure: A Consideration of Operational Risk*, 18 N.Y.U. J. LEGIS. & PUB. POL'Y 837 (2015) (questioning blockchain governance and design).

[60] An example of a Layer 1 blockchain is Ethereum, which validates and finalizes transactions. *See* Cesare Fracassi et al., *Decentralized Crypto Governance? Transparency and Concentration in Ethereum Decision-Making*, 3 n.2, (Jan 2024) (unpublished manuscript).

[61] "Layer 2" is software built to improve the scalability and transaction speed of Layer 1 protocols, and "Level 3" is the application layer. Decentralization, security, and application of Layers 2 and 3 in transacting differs from those in the foundational layer. *See, e.g.,* Carla Reyes, *Law's Detrimental Reliance on Intermediaries,* 92 GEO. WASH. L. REV. 10, 25 (forthcoming 2025), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4692755.

9

centralization.[62] In other words, markets may introduce vectors of centralization into their projects and applications.[63]

One of such vectors is large centralized intermediaries—centralized cryptoexchanges or "CEXs." CEXs bring together buyers and sellers of digital assets, and trading typically takes place on an off-chain limit order book, with bundled transfers thereafter recorded on-chain.[64] The rise of CEXs not only illustrates how financial intermediation remains sticky as it adapts to new technologies,[69] but also risks reintroducing the standard transaction costs, conflicts of interest, and agency costs faced by more conventional financial intermediaries.[70]

Even when digital asset intermediaries, such as decentralized exchanges (DEXs), are built directly on blockchains, centralization valences may remain. On the one hand, as is with all blockchain-based applications, DEX governance and performance depend on the overall security and transparency of the underlying blockchains. On the other hand, questions of DEX operations and design touch upon the quality of the code of the underlying smart contracts[71] and decentralized applications,[72] as well as their developers' influence over governance and protocol operations, which could be on-chain or off-chain.[73] Blockchain-native mechanisms may not control these activities.[74]

---

[62] *Id. See also* Schuler et al., *supra* note 47, at 9, 14 (discussing layers and centralization vectors, particularly in Layer-2 solutions).

[63] *See* Schuler et al., *supra* note 47, at 9.

[64] *See* Reyes, *supra* note 61, at 25 (describing how centralized exchanges record trades throughout the day on an internal record, then upload the day's end positions onto the public blockchain). CEX' centrality in cryptoasset markets is natural because "[f]inding a counterparty [could be] challenging in an environment where identities are obscured behind pseudonymous handles" on blockchains. Yesha Yadav, *Toward Crypto-Exchange Oversight*, VAND. L. RSCH. PAPER SERIES, no. 22–26, 2022, at 8.

[69] *See, e.g.,* Tom C.W. Lin, *Infinite Financial Intermediation,* 50 WAKE FOR. L. REV. 643, at 654 (the evolution of intermediaries "has been one of the most incredible developments in finance over the last few decades" but "the intermediated functions . . . remain unchanged).

[70] For a discussion of transaction costs and conflicts of financial intermediaries, see *infra* Part II(C) and Part III.

[71] Smart contracts are essentially programs executing agreements. *See* PRIMAVERA & WRIGHT, *supra* note 39, at 74-75. One recent court decision described smart contracts as follows:

> There are two kinds of Ethereum accounts: (1) "externally owned" accounts, which are effectively wallets that may be controlled by anyone with the corresponding private keys, and (2) "smart contracts," or "pools" which are software programs deployed directly onto the Ethereum network, and which may be run by Ethereum users who satisfy the program's conditions.

Van Loon v. U.S. Dep't of Treasury, No. 1:23-CV-312-RP, 2023 WL 5313091, at *2 (W.D. Tex. Aug. 17, 2023).

[72] "Decentralised applications (DApps) are software applications that allow users to engage with the functionalities of smart contracts." AMF, *supra* note 12, at 7; *see also* Vanessa Villanueva Collao, *DeFi—A Framework of the Automated Financial Open System*, 26 TUL. J. TECH. & INTELL. PROP. at 21 (forthcoming 2024) (describing how smart contract developers create decentralized applications).

[73] *See* Dombalagian, *Cryptoexchanges*, *supra* note 53, at 15 (describing how DEXs can use a variety of on-chain and off-chain trading mechanisms, such as automated market makers or traditional limit order books). *See also* Kaushal Shah et al., *A Systematic Review of Decentralized Finance Protocols*, 4 INT'L J. INTELLIGENT NETWORKS 171, 172, 176-79 (2023) (discussing protocol designs).

[74] For a comprehensive literature review on the risks of decentralized finance and interconnections, see, e.g., Schuler et al., *supra* note 47, 3-6.

As a result, digital asset trading involves varying levels of intermediary centralization and deals with the insufficiency of blockchain-native control mechanisms. Not all contracts in digital asset markets are self-enforcing and executed on blockchains,[76] and not all applications built on top of blockchains incentivize *all* parties to consistently act cooperatively.[77] In expectation, without blockchain-based or regulatory guardrails, some market actors might *prefer* to act opportunistically (or even fraudulently) in search of profit maximization and rent extraction.[78] In the next Part, our discussion turns to the resulting conflicts, opportunism, and transaction costs and the role of CEXs and DEXs in mitigating or exacerbating these costs.

II.   ASSET AND ISSUER INFORMATION

A. Issuer Disclosure

This Part starts with the costs and verification of information – the lifeblood of all markets, including financial markets.[81] At the basic level, any person may possess considerable information about their own assets, projects, and businesses. If this information is not released, it becomes material and nonpublic, giving insiders an edge in interacting with outsiders. When this information asymmetry is combined with incentives to profit from asset offerings, it triggers considerable conflicts of interest. Some markets, such as conventional commodity markets, may have fewer asymmetries and conflicts at scale, while others, such as securities markets, have more.[82]

U.S. securities law (and some foreign regulations that have adopted a securities-law-like model of disclosure for cryptoasset distributions)[83] deals with these costs by mandating standardized issuer disclosure, with some limited exemptions.[84] Disclosures are achieved through

---

[76] Alston, *supra* note 37, at 132–34.

[77] *See* Sinclair Davidson & Jason Potts, *Institutional Cryptoeconomics*, *in* THE ECONOMICS OF BLOCKCHAIN AND CRYPTOCURRENCY: A TRANSACTION COSTS REVOLUTION 1, 6-7 (James Lee Caton ed., Edward Elgar Publ'g 2022) (describing how smart contracts and distributive ledger technology suppress some, but not all, instances of opportunism).

[78] "Opportunism is a less technical term than adverse selection and moral hazard. It suggests, correctly, that the troublesome behavior in question is not an arcane economic condition but is familiar and pervasive. Not only are the failures to self-disclose true attributes *ex ante* (adverse selection) and true performance *ex post* (moral hazard) both subsumed under opportunism, but the failure to tell the truth, the whole truth and nothing but the truth is implicated by opportunism. . . . The possibility that an economic agent will conform to the letter but violate the spirit of an agreement is admitted." Oliver E. Williamson, *Opportunism and Its Critics*, 14 MANAGERIAL & DECISION ECON. 97, 101 (1993). "Opportunism is a variety of self-interest seeking but extends simple self-interest seeking to include self-interest seeking with guile. . . . [E]ven among the less opportunistic, most have their price." Oliver E. Williamson, *Transaction-Cost Economics: The Governance of Contractual Relations*, 22 J.L. & ECON. 233, 234 n.3 (1979) [hereinafter Williamson, *Transaction-Cost Economics*].

[81] *See* Stiglitz, *supra* note 46 (describing the centrality of information to the financial market).

[82] *See, e.g.,* Dombalagian, *Cryptoexchanges*, *supra* note 53, at 38.

[83] *See, e.g.*, Regulation (EU) 2023/1114 of the European Parliament and of the Council of 31 May 2023 on markets in crypto-assets, and amending Regulations (EU) No 1093/2010 and (EU) No 1095/2010 and Directives 2013/36/EU and (EU) 2019/1937, 2023 O.J. (L 150) 40 [hereinafter MiCA].

[84] 15 U.S.C. §§ 77e, 78m.

11

filing Securities Act registration statements and prospectuses, as well as Exchange Act periodic reports filed after offerings.[85] It is often argued that "consumers" of these documents are mainly institutions, while individual retail investors are less engaged in parsing corporate reports and prospectuses.[86] Retail investors, therefore, benefit from the vigilance of institutions and professionals in efficient markets.[87]

Digital asset offerings differ in several respects in handling this information problem. Some commentators argue that there is no material information advantage because blockchains are public, and smart contract and asset codes are accessible to everyone.[88] Any ownership concentration, which may endow large asset owners with considerable voting power and/or potential trading advantages, could be visible on-chain as wallet addresses are public (albeit pseudonymous). Next, asset valuation and utility may depend primarily on market factors, not the efforts of issuers and promoters.[89] When these propositions hold, information asymmetry is reduced, and outsiders can price asset-related risks. Because of these benefits of the technology, imposing securities-law-like disclosure obligations would be unwarranted, fail to maximize social welfare, and burden markets with unnecessary compliance costs.

The reality of blockchain-enabled markets diverges from these propositions. As mentioned above, projects relying on blockchains as an institutional infrastructure have different levels of centralization.[90] For example, issuers may be selling digital assets via smart contracts (which ensures on-chain transparency of fundraising) to finance off-chain or under-decentralized business projects (which negates transparency).[91] Some issuers thus possess material nonpublic information that is inaccessible either on-chain or from public sources.[92] Even when blockchain-enabled projects are transparent, the "consumers" of this publicly available information are not only well-resourced institutions (a scenario typical of legacy markets) but also (and perhaps mainly) retail investors.[93] Less sophisticated *per definitionem*, retail investors may fail to assay assets and price risks.[94]

---

[85] 15 U.S.C. §§ 77e, 78m.

[86] Frank H. Easterbrook & Daniel R. Fischel, *Mandatory Disclosure and the Protection of Investors*, 70 VA. L. REV. 669, 694 (1984). *But see* Merritt B. Fox, *Regulating Public Offerings of Truly New Securities: First Principles*, 66 DUKE L.J. 673, 719-20 (2016) (explaining the value of mandatory disclosures).

[87] *Id.*

[88] *See, e.g.,* Guseva, *supra* note 20, at 35–37, 55–56. (Note that tokenized shares and other securities would still carry disclosure obligations under securities law.)

[89] *Id.* at 40–41, 51–52 (arguing that asset valuation may depends primarily on factors such as developer activity, network effect, and platform membership, i.e., not securities law disclosures).

[90] *See* notes 64-80 and accompanying text.

[91] Guseva, *supra* note 20, at 36 (discussing the lack of decentralization and need for formal disclosure).

[92] At the very least, they know if they plan to continue supporting their projects and ecosystems, which would align their reputational and/or financial incentives with those of cryptoasset purchasers.

[93] *See, e.g.*, Betsy Vereckey, *How crypto investors behave — and why the industry needs regulation,* December 4, 2023, https://mitsloan.mit.edu/ideas-made-to-matter/how-crypto-investors-behave-and-why-industry-needs-regulation (discussing research on how large institutions and retail investors behave in markets for cryptoassets).

[94] Some investment choices may be too complex to properly value and regulate. *See generally* Steven L. Schwarcz, *Regulating Complexity in Financial Markets,* 87 WASH. U. L. REV. 211 (2009).

The next difference between traditional issuers and cryptoassets issuers is that the latter typically provide information purely voluntarily through whitepapers and code disclosure.[95] Relevant scholarship on legacy markets, however, indicates that without mandatory disclosure, firms may underproduce information, which is a form of public good.[96] This proposition seems to translate to cryptoasset markets where whitepapers exhibited different degrees of accuracy.[97] Moreover, the disclosure incentives of developers may differ from those of traditional firms domiciled in a specific jurisdiction and going public on national securities exchanges. Being transparent and bonding to the U.S. legal regime and its vaunted exchanges may be a meaningful variable for the latter but not the former.[98] Some cryptoasset distributions even deliberately geofenced the United States, suggesting that compliance with its law did not seem important to developers and, perhaps, even investors.[99]

The very term "issuer" in cryptoasset markets could apply fairly loosely.[100] It may encompass not only identifiable entities but also various formal and informal associations of individuals, developers, foundations, and others that launch cryptoasset projects, update the underlying code, and/or have a right to participate in project governance.[101] Their incentive structures and agency costs remain underexplored compared to those of corporate executives, particularly in conventional startups making disclosure and listing decisions.[102]

---

[95] Guseva, *supra* note 20, at 26-27.

[96] Merritt B. Fox, *Retaining Mandatory Securities Disclosure: Why Issuer Choice Is Not Investor Empowerment*, 85 VA. L. REV. 1335, 1344, 1365 (1999) [hereinafter Fox, *Retaining Mandatory Securities Disclosure*] (arguing that, when given the choice, firms will disclose less than the "socially optimal level of disclosure").

[97] *See generally* Shaanan Cohney et al., *Coin-Operated Capitalism*, 119 COLUM. L. REV. 591 (2019).

[98] Crypto-issuers' incentives to disclose remain underexplored, complicating the extrapolation of findings from the scholarship on traditional firms. For example, the prominent bonding theory postulates that foreign corporations offer securities in the United States to "bond" to its high-quality institutions and regulatory regime. John C. Coffee, *Law and the Market: The Impact of Enforcement*, 156 U. PA. L. REV. 229, 285 (2007) (arguing that foreign firms "bonded" to U.S. regulatory regimes by subjecting themselves to enforcement powers and disclosure requirements). For regular startups, initial public offerings and listing on exchanges are considered rites of passage leading to corporate adulthood. *See, e.g.*, Robert B. Thompson & Donald C. Langevoort, *Redrawing the Public-Private Boundaries in Entrepreneurial Capital Raising*, 98 CORNELL L. REV. 1573, 1580 (2013); Donald C. Langevoort & Hillary A. Sale, *Corporate Adolescence: Why Did "We" Not Work?*, 99 TEX. L. REV. 1347, 1349 n.8 (2021).

[99] *See, e.g.*, Moran Ofir & Ido Sadeh, *ICO vs. IPO: Empirical Findings, Information Asymmetry, and the Appropriate Regulatory Framework*, 53 VAND. L. REV. 525, 574-75 (2020) (describing how U.S. investors were excluded from opportunities to receive newly issued digital tokens); Goforth, *Regulation of Crypto*, *supra* note 20, at 646 (explaining how many cryptoasset deals are conducted to prevent U.S. investors from participating).

[100] The new House Bill aims to clarify the term "digital asset issuer" and defines it as follows: "(27) DIGITAL ASSET ISSUER "(A) IN GENERALWith respect to a digital asset, the term 'digital asset issuer' means any person that, in exchange for any consideration--
"(i) issues or causes to be issued a unit of such digital asset to a person; or
"(ii) offers or sells a right to a future issuance of a unit of such digital asset to a person.
"(B) EXCLUSION.--The term 'digital asset issuer' does not include any person solely because such person deploys source code that creates or issues units of a digital asset that are only distributed in end user distributions." House Bill, *supra* note 29, Sec. 101.

[101] *Compare with* 15 U.S.C. § 78c(a)(8) (defining the term "issuer" as "any person who issues or proposes to issue any security," with some exceptions).

[102] *See, e.g.,* Adam Pritchard, *Self-Regulation and Securities Markets,* 26 REGULATION 32, 37 (2003) ("Agency costs are lower for a start-up company because the corporate managers making the listing decision usually own a substantial portion of the company's equity.").

Under these conditions, formalized disclosure guidelines may be needed, provided that the guidelines can capture the benefits of the technology and efficiently supply markets with relevant information. Foreign regulators have already developed tailored disclosure regimes for cryptoassets.[103] In the United States, the much needed and overdue congressional bills, such as the May 2024 U.S. House Bill, that proffer principles of issuer disclosure may stall.[104] Instead, reporting projects mainly originate with private initiatives[105] and scholars, with some experts even suggesting that information reporting could be built on decentralized applications on blockchains.[106] An implicit objective of these projects is optimizing the disclosure regime where blockchain ecosystems support transmission and verification of some information and formal disclosures alleviate remaining information asymmetry.

B. Underwriters

To the extent that issuer disclosures need verification, financial market intermediaries assist with this task. In legacy markets, the first such intermediary is the underwriter serving as a reputational gatekeeper conducting due diligence on issuers.[107] Firms selling securities to the public enter into underwriting agreements with registered broker-dealers, i.e., investment banks.[108] As underwriters, the investment banks would be members of FINRA, an SRO charged with overseeing broker-dealers.[109] Under a typical agreement, underwriters acquire offered securities from the issuer and resell them to investors (which is called "firm commitment" underwriting).[110] In a typical initial public offering, for example, an issuer would retain an investment bank to help advertise the offering and sell a certain number of round lots to institutions before having its shares listed on an exchange.[111] The underwriter would do due diligence on the issuer and disclosures, put its reputation on the line, and face securities law liability alongside the issuer.[112] More recent public offerings, such as "direct listings" in which a

---

[103] *See, e.g.,* MiCA, *supra* note 83.

[104] *See* U.S. House Bill, Sec. 301, Exempted Transactions in Digital Assets; Sec. 303, Enhanced Disclosure Requirements; *supra* note 30.

[105] This author is participating in one such initiative. *See Proposed U.S. Disclosure Guidelines for a Particular Category of Tokens*, Sidley-Rutgers Fintech and Blockchain Symposium, May 3, 2024, https://www.sidley.com/en/-/media/uploads/mn23267-fintech-and-blockchain-symposium--token-standardized-disclosures-document_fnl.pdf?la=en.

[106] For instance, Chris Brummer proposed "Disclosure NFTs" (non-fungible tokens), "Disclosure DAOs" (decentralized autonomous organizations), and other decentralized tools to improve disclosures. Chris Brummer, *Disclosure, Dapps and DeFi*, 5 STAN. J. BLOCKCHAIN L. & POL'Y 137, 140 (2022).

[107] *See* James J. Park, *Investor Protection in an Age of Entrepreneurship*, 12 Harv. Bus. L. Rev. 107, 109-10 (2022) (describing how the underwriter evaluates a new company's future profitability based on due diligence).

[108] *See generally 5100. Securities Offerings, Underwriting and Compensation,* FIN. INDUS. REGUL. AUTH., https://www.finra.org/rules-guidance/rulebooks/finra-rules/5100.

[109] FINRA, for instance, would receive offering-related documentation and sign off on the agreement between an issuer and an underwriter. *5110. Corporate Financing Rule—Underwriting Terms and Arrangements*, FIN. INDUS. REGUL. AUTH., https://www.finra.org/rules-guidance/rulebooks/finra-rules/5110.

[110] Joseph A. Grundfest, *Morrison, the Restricted Scope of Securities Act Section 11 Liability, and Prospects for Regulatory Reform*, 41 J. CORP. L. 1, 8 n.30 (2015).

[111] *Id.* at 3-4. Note that there also other methods, such as direct listings, where the role of traditional intermediaries is limited. *See, e.g.*, Andrew F. Tuch & Joel Seligman, *The Further Erosion of Investor Protection: Expanded Exemptions, SPAC Mergers, and Direct Listings*, 108 IOWA L. REV. 303, 363-65 (2022).

[112] 15 U.S.C. § 77k(a) (providing that underwriters may face civil liability for untrue statements of a material fact and material omissions in a registration statement).

firm "sell[s] shares itself in the opening auction on the first day of trading,"[113] also require some presence of investment banks.[114]

Contrast this approach with the discussed-above potential of blockchain ecosystems where intermediaries become less essential,[115] smart contracts executing programmable transactions distribute assets to investors directly,[116] and issuers advertise their projects online, through code disclosure, and at various community events.[117] Distributions could be borderless and global and be either free ("airdrops")[118] or in exchange for payment.[119] Technology thus seems to directly reduce issuers' offering and information distribution costs.

Yet, a welfare-maximizing outcome does not necessarily follow from these technological benefits and reduced costs because it can only be achieved if issuer disclosures are optimal and not misleading.[120] This first-order condition can be satisfied either within the blockchain ecosystem or off-chain. To date, blockchain-based mechanisms and ecosystems have produced some but not necessarily optimal level of disclosure and information verification[121] and have been supplemented by the new intermediaries—cryptoexchanges. Many of them are CEXs, centralized off-chain entities. CEXs do not function as underwriters, but they do evaluate assets and provide access to trading and liquidity to issuers and asset purchasers.[122] As such, they are the first point of contact and gatekeeper between public investors and digital asset markets.

C. Exchanges and Information Asymmetry

---

[113] Edward F. Greene & Bree Morgan-Davies, *Disintermediation of the US, EU and UK Capital and Financial Markets*, 18 CAP. MKTS. L.J. 457, 477 (2023).

[114] *Id.* 478–79 (describing the role of the underwriter, typically an investment bank, in direct listings).

[115] *See, e.g.*, Tarang Khaitan, *Siemens Issues €60M Digital Bond on Polygon*, DEFIANT (Feb. 16, 2023), https://thedefiant.io/siemens-60m-euro-bond-polygon (describing the sale of a 60M euro digital bond through a blockchain directly to investors, without using an intermediary bank).

[116] *See supra* notes 71-**Error! Bookmark not defined.** and accompanying text (describing the many uses for smart contracts); Guseva, *supra* note 20, at 22.

[117] *See, e.g.*, *In re* Block.one, Securities Act Release No. 10714, 2019 WL 4793292, at * 4 (SEC Sept. 30, 2019) (describing how Block.one published beta versions of its software online and used social media and online message boards to engage potential purchasers).

[118] *See, e.g.*, Joel Agbo, *Top Fourteen Upcoming Crypto Airdrops in 2023*, COINGECKO (Dec. 1, 2023), https://www.coingecko.com/learn/new-crypto-airdrop-rewards.

[119] An example would be "initial coin offerings" (ICOs), which were similar to basic capital raises. SEC v. Coinbase, Inc., 2024 WL 1304037, at *4 (S.D.N.Y. Mar. 27, 2024). "ICOs are generally executed via a combination of direct placements, initial exchange offerings, and simple agreements for future tokens . . . ." *Id.* On the phasing out of ICOs, see Yuliya Guseva, *The SEC, Digital Assets, and Game Theory*, 46 J. CORP. L. 629, 647 (2021).

[120] For a discussion about optimizing disclosure requirements to maximize welfare, see generally Merritt B. Fox, *Retaining Mandatory Securities Disclosure: Why Issuer Choice is Not Investor Empowerment*, 85 VA. L. REV. 1335 (1999).

[121] *See, e.g., supra* Part II(A) (discussing issuer disclosure); Villanueva Collao, *supra* note 72, at 15, 22, 24 (observing that some new mechanisms, such as code audits and oracles, have emerged but may be insufficient).

[122] *See generally,* Yadav, Centralization Paradox, *supra* note 79.

1. CEXs and Listings

Cryptoexchanges differ considerably from traditional derivatives and securities exchanges, which register with the SEC or the CFTC.[123] National securities exchanges impose a set of obligations on issuers; the SEC approves issuers' registration statements[124] and certain products such as "exchange-traded funds";[125] and derivatives exchanges self-certify to the CFTC that a new contract complies with law and regulations or voluntarily submit the contract for approval.[126] Although cryptoassets are routinely listed, their trading venues are often not registered with the Commissions, which has become a subject of enforcement actions.[127]

In their pleadings, unregistered cryptoexchanges (and their amici) argue that cryptoexchanges do not list or intermediate trading in securities,[128] and, consequently, there is no need to register with the SEC.[129] There is equally no need to register with the CFTC if a cryptoexchange does not provide a trading platform for derivatives or leveraged and margined retail transactions in commodities.[130] Instead, some cryptoexchanges (or their subsidiaries) have registered as broker-dealers such as alternative trading systems (ATSs), which are members of FINRA.[131]

In contrast to regulated exchanges and ATS, unregistered digital asset platforms do not face preset regulatory obligations and establish rules voluntarily, with different substantive and procedural quality.[134] For instance, when cryptoasset issuers seek listing on CEXs for trading, as

---

[123] *Infra* Section V(A).

[124] 15 U.S.C § 77h.

[125] *See, e.g.,* Gary Gensler, *Statement on the Approval of Spot Bitcoin Exchange-Traded Products*, U.S. SECURITIES AND EXCHANGE COMMISSION (Jan. 10, 2024), https://www.sec.gov/news/statement/gensler-statement-spot-bitcoin-011023.

[126] 17 C.F.R. §§ 40.2; 40.3; 40.6.

[127] *See, e.g.*, SEC v. Coinbase, Inc., 2024 WL 1304037, at *1 (S.D.N.Y. Mar. 27, 2024) (considering whether Coinbase, which provides a platform for cryptoasset trading, is required to register with the SEC).; Press Release, Commodity Futures Trading Commission, CFTC Orders Tether and Bitfinex to Pay Fines Totaling $42.5 Million (Oct. 15, 2021), https://www.cftc.gov/PressRoom/PressReleases/8450-21 (detailing an order by the CFTC issuing civil penalties against a cryptoasset trading platform for failing to register with the CFTC).

[128] *See, e.g.*, Reply Memorandum of Law in Support of Coinbase's Motion for Judgment on the Pleadings, Securities and Exchange Commission v. Coinbase, Inc., 2023 WL 8173716 (S.D.N.Y.) (arguing that Coinbase does not provide a platform for trading in securities); Coinbase, Inc., 2023 WL 5278033.

[129] On the registration requirements and exemptions, see 17 CFR § 240.3b-16.

[130] 7 U.S.C. § 6(a); 7 U.S.C. § 6c(b); 7 U.S.C. § 7; 7 U.S.C. § 7b-3(a).

[131] 17 C.F.R. §§ 242.300–301; Jason Foye, *An Inside Look into FINRA's Crypto Asset Work,* Aug. 3, 2023, https://www.finra.org/media-center/blog/inside-look-finras-crypto-asset-work (explaining how, as of August 2023, nine firms are approved to operate as ATSs for cryptoasset securities). These intermediaries, however, are not SROs like exchanges and have more limited obligations. *See* 7 U.S.C. § 7(d)(2); 15 U.S.C. §§ 78f(b) & 78o-3(b); 15 U.S.C. § 78s(g); MERRITT B. FOX ET AL., THE NEW STOCK MARKET 32 (Columbia Univ. Press 2019). Note also that some cryptoexchanges may register as futures commission merchants (FCMs). Coinbase Financial Markets, Inc., became an FCM in 2023 and is registered with the NFA; FCMs, similarly to brokers and dealers, do not perform the self-regulatory functions of exchanges. Greg Tusar, *Coinbase Financial Markets, Inc. Secures Approval to Bring Federally Regulated Crypto Futures Trading to Eligible US Customers*, COINBASE (Aug. 16, 2023), https://www.coinbase.com/blog/coinbase-financial-markets-inc-secures-fcm-approval-to-bring-regulated.

[134] Yadav points out that cryptoexchanges have listing rules and rules prohibiting, among others, "[b]ehaviors like manipulation, spoofing, wash trading and fraud." Yadav, *supra* note 64, at 36. Massad and Jackson, however, doubt

16

a matter of practice, the CEXs review issuer questionnaires in making listing decisions.[135] Since this listing review is conducted voluntarily and without uniform guidelines, there is a risk that the quality and integrity of vetting are irregular, particularly if an exchange lacks incentives to maintain a high quality of listings.[136] This voluntary, non-standardized vetting structure may nurture a fertile ground for potential conflicts and operational risks that traditional exchanges are obligated to control by law.[137]

A pertinent feature of CEXs is that they serve as off-chain intermediaries whose interactions with the blockchain ecosystem are limited: listing, trading, and settlement are run through internal operations under exchanges' rules and procedures.[138] Consequently, as unregistered off-chain firms, CEXs simultaneously face less accountability from the Commissions *and* less feedback from blockchain communities.[139] Without these control mechanisms, the capacity and incentives of CEXs to ensure optimal vetting, thus reducing information asymmetry and information costs, are disputable.

2. DEXs

CEXs are not the sole trading venues for digital assets. Instead, they operate in parallel with DLT-enabled, intermediary-less, smart-contract-based, and autonomous mechanisms – decentralized exchanges (DEXs).[140] Do DEXs reduce information costs and verify asset and issuer information better than CEXs do?

On the plus side, DEXs tap the blockchain-based market infrastructure with its promised transparency and public access to the underlying transaction history and code.[141] Many DEXs are automated market makers (AMMs) where buyers and sellers transact against liquidity pools in a decentralized trading environment.[142] A DEX does not have intermediaries but facilitates

---

whether such rulebooks are sufficient. Massad & Jackson, *infra* note 326, at 12, 18. Additionally, there have been limited private attempts at self-regulation. *See, e.g.*, Letter from Michelle Bond, Chief Executive Officer, Ass'n for Digit. Asset Mkts., to Vanessa Countryman, Sec'y, SEC (Apr. 18, 2022), https://www.sec.gov/comments/s7-02-22/s70222-20124008-280142.pdf (discussing a code of conduct addressing the professional standards to which all members of the Association for Digital Asset Markets agree to adhere).

[135] For a description, see *Coinbase, Inc.*, 2024 WL 1304037, at *4 (describing how Coinbase reviews the crypto-asset developer's listing application to identify potential roadblocks and decide whether to list it on its platform). Exchanges also list cryptoassets, such as Bitcoin which has no formal issuer. *See, e.g.*, *Listings Prioritization Process and Standards*, COINBASE (Aug. 8, 2023), https://www.coinbase.com/exchange/asset-listings.

[136] *But see* Yadav, *supra* note 64, at 38-39 (suggesting that there are financial and reputational incentives to ensure proper vetting).

[137] *See infra* Part IV.

[138] *See Coinbase, Inc.*, 2024 WL 1304037, at *4, 6, 26 (describing how Coinbase offers brokerage, trading, and settlement services on its platform and holds its customers' assets in Coinbase-controlled wallets).

[139] Various CEXs, however, are registered money transmitters. *See* Guseva & Hutton, *supra* note 2, at 1569 (describing how some cryptoassets fall within the ambit of money transmitter regulations).

[140] *See supra* Part I, notes 66-68 and accompanying text (discussing the layers of the blockchain protocol).

[141] Dombalagian, *supra* note 53, at 15.

[142] Jiahua Xu et al., *SoK: Decentralized Exchanges (DEX) with Automated Market Maker (AMM) Protocols*, ASS'N FOR COMPUTING MACH. COMPUTING SURVS., Nov. 2023, at 2. Some reports differentiate between DEXs and AMMs, but I will use AMMs as the main subtype of DEXs. For different models (*i.e.,* order-book exchanges and AMMs), see, e.g., AMF, *supra* note 12, at 13–19; FIN. STABILITY BD., THE FINANCIAL STABILITY RISKS OF DECENTRALISED FINANCE 14 (2023).

transactions between users and smart contracts built directly on a blockchain.[143] On AMMs, traders "do not need to be paired to complete a transaction" but "gain immediate access to available liquidity by interacting with the smart contract."[144]

Scholarship points toward a vast economic potential of this intermediary-less technology-enabled system, including reducing trading costs for investors, increasing trade transparency, and mitigating the risk of hacking.[145] Yet, DEXs largely omit traditional listing review, and even though the code of the DEXs and assets is public, traders may fail to properly price DEX-listed cryptoassets and relevant risks. The information costs should remain high.

The District Court for the Southern District of New York described these problems in an order on a motion to dismiss a complaint against the developers and investors of Uniswap Lab, a firm developing the code of Uniswap, a major DEX.[146] Uniswap is a large permissionless automated DEX that serves as a gateway for many cryptoassets (referred to as "tokens" in the opinion).[147] The version of Uniswap at issue did not require specific issuer information.[148] Using the platform, issuers offered their cryptoassets "anonymously, without any sort of conduct verification or background check."[149] Finally, there were only limited options to restrict access to fraudulent assets but not a foolproof route to delist them from the platform, which is based on immutable, autonomous, and decentralized smart contracts.[150]

Traders who transacted with the pools of what the court called "Scam Tokens" apparently lacked the sophistication to understand and value the assets, which were prone to fraud, including "rug pulls," "pump and dump," and Ponzi schemes.[151] These two factors – the inability to understand risks and price the assets and the anonymity of issuers – produced a market failure left unaddressed by the existing legal (and blockchain) architecture. Judge Failla aptly encapsulated this point as follows: "identities of the Scam Token issuers are basically unknown and unknowable, leaving Plaintiffs [i.e., individual traders] with an identifiable injury but no identifiable defendant."[152]

3. Information Costs and Solutions

Both centralized and decentralized exchanges may thus raise issuer review and listing quality concerns. Ideally, CEXs could vet issuer and asset information, while DEXs could rely on blockchain-native solutions. The former, however, may be suboptimal, the latter may be

---

[143] *See, e.g.*, Campbell et al., *supra* note 27, at 26; Agostino Capponi & Ruizhe Jia, The Adoption of Blockchain-based Decentralized Exchanges 7 (June 1, 2022) (unpublished manuscript), https://ssrn.com/abstract=3805095
[144] Capponi & Jia, *supra* note 143, at 2
[145] *See, e.g.,* Malinova & Park, *supra* note 54, and accompanying text; Coinbase, What Is a DEX? (2024), https://www.coinbase.com/learn/crypto-basics/what-is-a-dex (listing the benefits and risks of DEXs).
[146] *See* Risley v. Universal Navigation Inc., No. 22 Civ. 2780 (KPF), 2023 WL 5609200 (S.D.N.Y. Aug. 29, 2023).
[147] *Id.* at *6.
[148] *Id.* at *1, 19 (explaining how the issuers responsible for the fraudulent scheme "are basically unknown and unknowable").
[149] *Id.* at *3 (citing First Amended Complaint, ¶ 59).
[150] *Id.* at *8 (explaining that Uniswap Protocol provides unrestricted access to anyone with Internet connection and cannot fully delist assets).
[151] *Id.* at *5–6.
[152] *Id.* at *1.

18

insufficient, and both externalize the resultant costs to investors and the market at large. Neither centralized nor decentralized exchanges follow preset regulatory principles (except for a few registered as broker-dealers) or operate as conventional registered trading venues.

In the United States, pertinent legislative solutions remain unfinished. One germane development was the May 2024 House Bill. The Bill sought to close the regulatory loopholes allowing cryptoexchanges to dispute registration obligations and introduced a radically improved system under which digital asset platforms would provide trading facilities for the newly defined "digital commodities" (i.e., a type of commodities) and "restricted digital assets" (i.e., securities).[153] Trading of those assets would take place, respectively, on "digital commodity exchanges" within the jurisdiction of the CFTC and "digital asset trading systems" within the ambit of securities law and the SEC registration authority.[154] A fundamental contribution of the Bill was charging the new registrants with making listing determinations, setting operational and governance standards, and providing customer disclosures.[155]

These provisions aimed at the discussed transaction costs that the unregulated cryptoexchanges currently fail to mitigate. Alas, since the Bill will likely founder in the Senate,[156] we can expect that the status quo will endure and the discussed information costs in digital asset trading will be left unresolved.[157]

III. TRADING AND LIQUIDITY PROVISION: RISKS AND CONFLICTS
A. CEXs and Trade Execution

The problem of high transaction costs in blockchain-enabled markets is not limited to asset-level and issuer information. A set of distinct practices entail costs in secondary markets for digital assets, and cryptoexchanges are the locus of these activities. The fundamental purpose of all trading platforms is to provide liquidity (enabling buyers and sellers to find each other promptly and cost-effectively) and price transparency (providing information to buyers and sellers about market prices),[158] maintaining fair and efficient markets. Cryptoexchanges simultaneously contrast with legacy exchanges on these metrics and exhibit some similarities in market microstructure and infrastructure.

---

[153] The terms are defined in Sec. 101. Definitions under the Securities Act of 1933; Sec. 102. Definitions under the Securities Exchange Act of 1934; Sec. 103. Definitions under the Commodity Exchange Act; Sec. 104. Definitions under this Act.

[154] The terms are defined in Sec. 101. Definitions under the Securities Act of 1933; Sec. 102. Definitions under the Securities Exchange Act of 1934; Sec. 103. Definitions under the Commodity Exchange Act; Sec. 104. Definitions under this Act.

[155] House Bill, *supra* note29, Sec. 106, Sec. 107, Sec. 504.

[156] *Supra* note 30.

[157] Note that the Bill was only a starting point and incomplete. Being centered on how identifiable parties should register their trading facilities (to wit, CEXs), the House Bill left DEXs in regulatory limbo, instead directing studies of decentralized finance. House Bill, *supra* note 29, Sec. 106, Sec. 107, Sec. 403, Sec. 504. Sec. 605 Study on decentralized finance.

[158] *See, e.g.,* Dell'Erba, *supra* note 34, at 14 (explaining how traditional stock exchanges provide a platform for issuers to sell stock to buyers and distribute information about stock prices).

For instance, both digital assets and securities are traded on multiple trading platforms,[159] but cryptoexchanges are not only numerous but also globally dispersed. As of November 2023, there were nearly 600 (often unregistered) cryptoexchanges worldwide listing overlapping cryptoassets,[160] sometimes offering derivatives, and competing with one another across borders.[161]

On both legacy and digital asset platforms, traders do not run around trading pits, shouting orders; instead, there is typically an electronic order book of limit orders matched against market orders.[162] Liquidity in these venues is mainly provided by posting limit orders.[163] Legacy exchanges channel broker-dealers towards taking or making liquidity through fees and rebates.[164] In a similar vein, individual cryptoexchanges have introduced liquidity programs rewarding market takers and makers.[165]

After that point, practices diverge on price transparency and reporting. In legacy securities markets, matched and executed trades are reported to a security information processor,[166] and intermediaries have specific obligations to improve pre- and post-trade transparency, price discovery, and public information dissemination.[167] Cryptoexchanges, at least

---

[159] Today's equity securities are traded on numerous platforms. Merritt B. Fox et al., *The New Stock Market: Sense and Nonsense*, 65 DUKE L.J. 191, 198 (2015) [hereinafter Fox et al., *Sense and Nonsense*].

[160] Farran Powell, *Ten Best Crypto Apps & Exchanges of December 2023*, FORBES (Dec. 1, 2023, 10:51 AM), https://www.forbes.com/advisor/investing/cryptocurrency/best-crypto-exchanges/.

[161] Yadav, *supra* note 64, at 32 (explaining that "[u]sers can easily migrate to other venues").

[162] Further Definition of "As a Part of a Regular Business" in the Definition of Dealer and Government Securities Dealer, Exchange Act Release No. 34-94524, 87 Fed. Reg. 23055-56 (proposed Mar. 28, 2022) ("The rise of electronic trading has similarly impacted the market structure of the securities markets generally. . . . [T]echnological advances have enabled significant market participants to take on an increasingly central role as liquidity providers, largely replacing more traditional types of traditional liquidity providers, such as exchange specialists on manual trading floors and over-the-counter ('OTC') market makers. Technological advancements have prompted changes to trading practices, particularly with regard to the way in which orders are generated, routed, and executed."). For a list of crypto-market makers, see PR Newswire, *Top Ten Crypto Market Makers in 2023*, YAHOO! FIN. (June 27, 2023), https://finance.yahoo.com/news/top-10-crypto-market-makers-120500811.html.

[163] Fox et al., *Sense and Nonsense*, *supra* note 159, at 206. A market maker "makes money if on average it sells the shares that it buys for more than the price it paid." *Id.*

[164] *Id.* at 256–58.

[165] *See, e.g.*, *Liquidity Program Overview*, COINBASE 2 (Dec. 1, 2023), https://www.coinbase.com/exchange/liquidity-program (describing Coinbase's Liquidity Program, which grants special benefits to clients that provide liquidity).

[166] Fox et al., *Sense and Nonsense*, *supra* note 159, at 215–16; 269–70.

[167] *See* Regulation NMS, Exchange Act Release No. 34-52196, 70 Fed. Reg. 37496 (June 29, 2005) (codified at 17 C.F.R. pts. 200, 201, 230, 240, 242, 249, 270) (mandating, among other requirements, that trading centers make price quotations accessible and set price transparency standards). *See also* Disclosure of Order Execution Information, Exchange Act. Release No. 96493, 88 Fed. Reg. 3786 (Jan. 20, 2023) (proposing rules to update disclosure requirements for national market system stocks); 17 CFR § 242.603 (establishing rules for dissemination, distribution, and display of information by intermediaries and exchanges).

to date,[168] are not bound by these trade posting and information dissemination rules[169] and, obviously, are domiciled in various jurisdictions with different legal requirements.[170]

Scholarship warns that price transparency may be lacking in digital asset trading,[171] and that international competition may introduce incentives to manipulate information and cook cryptoexchanges' books.[172] Within the global, fragmented, but interconnected digital asset market, trading activity on large foreign exchanges may affect price discovery in U.S. markets.[173]

The other set of differences stems from the oversight of the Commissions and the requirement that legacy exchanges implement operational, fraud and manipulation prevention, risk management, and other standards.[174] To create a fair and efficient trading environment, the SEC and CFTC mandate that exchanges have operational resiliency and ensure a well-regulated market.[175] Conversely, absent reform,[176] cryptoexchanges remain mainly unregulated and have exhibited insufficient operational resilience, poor risk management, low quality of governance, and manipulative practices such as wash trading, which undermine transparent, fair, and efficient markets.[177]

Another set of parallels and distinctions concerns liquidity providers. Much of liquidity in legacy trading, and some in digital-asset trading, comes from a special type of trader—the high-frequency trader (HFT), who attempts to beat the market and "compete to post limit orders

---

[168] Note that the May 2024 House bill covers order display and transaction reporting rules for digital asset trading systems and provides that digital commodity exchanges must comply with the Core Principles, which include trade processing and providing open and efficient market protecting price discovery. House Bill, *supra* note 29, Sec. 404; Sec. 504.

[169] Cryptoexchanges may "volunteer only such data as is cheap to collect, [or] provides basic insights." Yadav, *supra* note 64, at 45. They also have some pre-trade transparency. Agostino Capponi et al., Price Discovery on Decentralized Exchanges 6 (Nov. 7, 2023) [hereinafter Capponi et al., Price Discovery] (unpublished manuscript), https://ssrn.com/abstract=4236993.

[170] Notes 98-99 and accompanying text.

[171] Syren Johnstone, *Secondary Markets in Digital Assets: Rethinking Regulatory Policy in Centralized and Decentralized Environments*, 3 STAN. J. BLOCKCHAIN L. & POL'Y 146, 149–150 (2020).

[172] Dan Amiram et al., Cooking the Order Books: Information Manipulation and Competition Among Crypto Exchanges 25 (Nov. 28, 2022) (unpublished manuscript), https://ssrn.com/abstract=3745617.

[173] *See* Carol Alexander et al., *Price Discovery and Microstructure in Ether Spot and Derivative Markets*, 71 INT'L REV. FIN. ANALYSIS 1, 2-4, 16 (2020) (describing how trading on unregulated foreign exchanges, including trading of derivatives, may dominate spot markets trading and price discovery, including U.S. exchanges such as Coinbase and Kraken).

[174] *See generally* Yadav, *supra* note 64 (describing the role of legacy exchanges in providing oversight in securities trading and arguing that cryptoexchanges could play a similar role).

[175] *Id.* at 22.

[176] The apparently doomed May 2024 House bill offers some governance, conflict of interest, operational, and capital requirements. *See, e.g.,* House Bill, *supra* note 29, Sec. 106, 107, 403, 404, 407, 504,

[177] *See, e.g.,* Kristin N. Johnson, *Decentralized Finance: Regulating Cryptocurrency Exchanges*, 62 WM. & MARY L. REV. 1911, 1954, 1972 (2021); ATT'Y GEN.'S CYBER DIGIT. TASK FORCE, U.S. DEP'T JUST., CRYPTOCURRENCY ENFORCEMENT FRAMEWORK 5–6, 13–16 (2020), https://www.justice.gov/archives/ag/page/file/1326061/download; INT'L ORG. SEC. COMM'NS, POLICY RECOMMENDATIONS FOR CRYPTO AND DIGITAL ASSET MARKETS: FINAL REPORT 39–40; 49–50 (2023), https://www.iosco.org/library/pubdocs/pdf/IOSCOPD747.pdf; Lin William Cong et al., *Crypto Wash Trading*, 69 MGMT. SCI. 6427, 6427-28 (2023).

on venues against which marketable orders can transact."[178] These liquidity providers play against informed traders and try to identify them in "the adverse-selection-driven cat-and-mouse game between liquidity suppliers and informed traders."[179] In 2024, the SEC finally expanded the statutory definition of "dealer" to encompass HFTs as liquidity providers.[180]

The rise of HFTs roughly coincided with dark pools, which emerged "to provide a venue where uninformed buyers and sellers, seeking to trade substantial amounts of stock, can minimize the movement of prices against them and transact at prices potentially much better than the [national best bid and offer, *i.e.*, the best quotes based on the national reporting system]."[181] Dark pools, registered as ATS with the SEC, do not disclose orders and may restrict which parties have access to trading.[182] The order book of dark pools is not public, enabling large orders to be executed without producing a significant price impact.[183]

Dark pools and HFT demonstrate another parallel and emerge largely for the same reasons in cryptoasset trading: Blockchain-enabled venues understand that sizeable orders and block trades can impact prices and that investors may want orders posted and matched without causing a major price change;[184] just like in legacy markets, HFTs have entered CEXs,[185] which encourage these liquidity suppliers.[186] But unlike legacy trading, a comprehensive regulatory regime for these venues and HTF is absent in the digital asset space.

These realities evince the main concerns raised earlier in this Article: If CEX trading does not run blockchains, is not controlled through blockchain-native methods, and is not handled through regulation, why shall the CEXs be trusted with optimally reducing the costs of trading and ensuring price transparency?[187] As such, the current system is built on trust in private firms located both in the United States and abroad, unregulated, competing with one another, and listing identical digital assets. It is unclear if these firms have sufficient incentives to maintain fair and efficient markets and mitigate adverse selection without better regulation, technology-enabled or otherwise.

---

[178] Fox et al., *Sense and Nonsense*, *supra* note 159, at 206.

[179] *Id.* at 207.

[180] Further Definition of "as A Part of A Regular Business" In the Definition of Dealer and Government Securities Dealer In Connection With Certain Liquidity Providers. Exchange Act Release No. 99477. February 6, 2024., Fed. Sec. L. Rep. P 84155.

[181] Fox et al., *Sense and Nonsense*, *supra* note 159, at 251.

[182] For an in-depth analysis of off-exchange trading and transparency of dark pools, see Kevin S. Haeberle, *Discrimination Platforms*, 42 J. CORP. L. 809, 820-24 (2017).

[183] Fox et al., *Sense and Nonsense*, *supra* note 159, at 250–52.

[184] *Cryptocurrency Dark Pool*, LCX (May 23, 2022), https://www.lcx.com/cryptocurrency-dark-pool/; *A Simple Introduction to Dark Pools*, BINANCE ACAD. (Oct. 13, 2023), https://academy.binance.com/en/articles/a-simple-introduction-to-dark-pools.

[185] *See, e.g.,* Johnson, *supra* note 177, at 1966–67; Capponi et al., Price Discovery, *supra* note 169, at 6. On DEXs, HFT is different, however. *See generally* Philip Daian et al., *Flash Boys 2.0: Frontrunning in Decentralized Exchanges, Miner Extractable Value, and Consensus Instability*, 41 INST. ELEC. & ELECS. ENG'RS SYMP. SEC. & PRIV. 910, 910 (2020) (discussing how arbitrage bots on DEXs act similarly to HFT in legacy markets).

[186] *See, e.g.*, Johnson, *supra* note 177, at 1966–67; *What Do Crypto Liquidity Providers Do?*, BINANCE BLOG (July 5, 2023), https://www.binance.com/en/blog/vip/what-do-crypto-liquidity-providers-do-33032845536918508301 (explaining how liquidity suppliers buy and sell cryptocurrency to ensure that the market remains liquid).

[187] The other source of incentives is industry self-regulation, which this Article discussed in *infra* Parts IV-VI.

B. Multifunctional CEXs: Brokers, Trading Platforms, and Clearinghouses

To better illustrate this problem, let us examine the uniquely multifunctional nature of CEXs, which combine trading facilities with brokerage services. Unlike digital asset trades, legacy securities and commodities trading is run through brokerages (and FCMs and other intermediaries in derivatives markets).[188] They either internalize trades (execute them from their inventory), sell them to wholesalers (the practice known under the sobriquet of "payment for order flow"),[189] or route them to trading venues.[190] The brokers, of course, know their customers and the customers' trades and can exploit this information. For this reason, regulations create institutional safeguards against these conflicts.

For instance, brokers have a duty to ensure best execution of orders and must comply with the rules on suitability (as modified by Regulation Best Interest)[191] of securities and derivatives.[192] These rules aim to protect investors by, *inter alia,* requiring that intermediaries understand the risks and customers' investment profile and that customers' orders be executed on the best available terms under prevailing market conditions. [193] Brokers and FCMs also comply with disclosure, net capital, and other obligations ensuring their safety.[194] There is also the SEC Order Protection Rule which prohibits "trade-throughs" at inferior prices.[195] FINRA, NFA, and exchanges enforce compliance of their members and have detailed rulebooks promoting fair

---

[188] *See, e.g.*, 15 U.S.C. § 78f(c);   7 U.S.C. § 1a (28)&(34); 7 U.S.C §§ 6, 7(d)(15).

[189] Payment for order flow (PFOF) is "a wide variety of cash or in-kind compensation structures that a broker may receive for directing its customers' orders to a particular broker-dealer or trading venue." Memorandum from the SEC Div. Trading & Mkts. to Equity Mkt. Structure Advisory Comm. 4 (Jan. 26, 2016), https://www.sec.gov/spotlight/equity-market-structure/issues-affecting-customers-emsac-012616.pdf. *See also* Tomio Geron, *Regulators Are Going After Payments for Stock Orders. What About Crypto?*, PROTOCOL (Sept. 16, 2021), https://www.protocol.com/crypto-trading-pfof-robinhood. PFOF may be coming to crypto. Tracy Wang, *DeFi Protocol DFlow Raises $5.5M to Bring Payment for Order Flow to Crypto*, COINDESK (May 9, 2023, 12:13 AM), https://www.coindesk.com/business/2023/04/25/defi-protocol-dflow-raises-55m-to-bring-purchase-order-flow-to-crypto/.

[190] Memorandum from the SEC Div. Trading & Mkts., *supra* note 189 at 6.

[191] 17 C.F.R. § 240.15l-1.

[192] *5310. Best Execution and Interpositioning*, FIN. INDUS. REGUL. AUTH., https://www.finra.org/rules-guidance/rulebooks/finra-rules/5310 ; *5320. Prohibition Against Trading Ahead of Customer Orders*, FIN. INDUS. REGUL. AUTH., https://www.finra.org/rules-guidance/rulebooks/finra-rules/5320 (last visited Dec. 17, 2023); *Compliance Rules*, NAT'L FUTURES ASS'N, https://www.nfa.futures.org/rulebooksql/rules.aspx?Section=4. The SEC has proposed rules to improve execution and transparency. Regulation Best Execution, Exchange Act Release No. 96496, 88 Fed. Reg. 5440 (Jan. 27, 2023); Disclosure of Order Execution Information, Exchange Act. Release No. 96493, 88 Fed. Reg. 3786 (Jan. 20, 2023).

[193] *See, e.g.*, Press Release, Fin. Indus. Regul. Auth., FINRA Amends Its Suitability, Non-Cash Compensation and Capital Acquisition Broker (CAB) Rules in Response to Regulation Best Interest (June 19, 2020), https://www.finra.org/rules-guidance/notices/20-18 (addressing compliance with Regulation Best Interest and Rule 2111's suitability standard); *5310. Best Execution and Interpositioning*, FIN. INDUS. REGUL. AUTH., https://www.finra.org/rules-guidance/rulebooks/finra-rules/5310.

[194] 17 C.F.R. §§ 240.15c3-1, 240.15l-1(a)(2), 1.17, 1.55 (2023); *Guide to Broker-Dealer Registration*, SEC (Apr. 2008), https://www.sec.gov/about/reports-publications/investor-publications/guide-broker-dealer-registration; Futures Commission Merchants (FCMs), CFTC, https://www.cftc.gov/IndustryOversight/Intermediaries/FCMs/fcmib.html.

[195] 17 CFR § 242.611.

dealing, equitable principles of trade, and investor protection.[196] In short, broker-dealer obligations are voluminous.

In contrast, investors access cryptoexchanges directly.[197] On CEXs such as Binance or Coinbase, an investor would typically open a custodial "wallet" (account) with the exchange and trade by submitting orders to the exchange.[198] The trades would be matched, cleared, and settled by the CEX itself.[199] In addition, cryptoexchanges may also provide margin lending and even stake deposited assets on behalf of users.[200] Despite this variety of services, CEXs are registered neither as broker-dealers (with a few exceptions) nor exchanges, suggesting that many do not need to follow the relevant obligations of legacy intermediaries.[201]

Some CEXs signal their better quality by offering products ensuring better order execution, connecting their clients to several venues via smart contracts, and aggregating liquidity.[202] In other words, CEXs may offer services similar to best execution and other broker duties, but they do so based on *contractual* agreements and voluntary rulebooks. This trading system emphasizes contractual cooperation and voluntary compliance.

Cooperation, however, routinely fails when profits from misbehavior and defection from cooperation are guaranteed whereas the risk of detection and ensuing legal or reputational sanctions are uncertain. Not surprisingly, manipulation and conflicts of interest have been notorious in digital asset markets.[203] Cryptoexchanges have engaged in proprietary trading and operated as unregulated market makers either directly or through affiliated entities.[205] While market making, some CEXs selected assets for listing and invested in them,[206] a scenario uniquely synthesizing conflicts of interest, agency costs, and information asymmetry. Studies

---

[196] Yadav, *supra* note64, at 15–16; 15 U.S.C. § 78f(b).

[197] *Compare* Syren Johnstone, *Secondary Markets in Digital Assets: Rethinking Regulatory Policy in Centralized and Decentralized Environments*, 3 STAN. J. BLOCKCHAIN L. & POL'Y 146, 180 (explaining how investors deal directly with cryptoexchanges) *with* 15 U.S.C. § 78f(b)(2) (providing that registered brokers or dealers may be members of an exchange).

[198] Yadav, *supra* note64, at 40. Exchanges also offer self-custodial wallets. *See, e.g., Coinbase, Inc.*, 2024 WL 1304037, at *5, 33.

[199] *E.g., Coinbase, Inc.*, 2024 WL 1304037, at *26.

[200] Yadav, *supra* note64, at 33, 42.

[201] *See Coinbase, Inc.*, 2024 WL 1304037, at *1 (considering if the SEC adequately alleged that Coinbase, a CEX, operated as an unregistered securities exchange, broker, or clearing agency).

[202] *See, e.g.*, PWC, CRYPTO TRADING REPORT (2022), https://www.pwc.ch/en/publications/2022/crypto-trading-report_2022_EN-webversion.pdf; *Binance Spot Launches "Smart Order Routing (SOR)" Experimental Trading Feature for API Users*, BINANCE SQUARE (Sept. 13, 2023, 3:35 AM), https://www.binance.com/en-NG/feed/post/1137112; *Coinbase, Inc.*, 2024 WL 1304037, at *5, 35; Jeff Curry, *Maintaining a Real-Time Order Book Using the Coinbase Prime API*, COINBASE (May 1, 2023), https://www.coinbase.com/blog/maintaining-a-real-time-order-book-using-the-coinbase-prime-api.

[203] Yadav, *supra* note64, at 35, 54; Andrew Verstein, *Crypto Assets and Insider Trading Law's Domain*, 105 IOWA L. REV. 1, 29–30 (2019); Felix Eigelshoven et al., *Cryptocurrency Market Manipulation: A Systematic Literature Review*, INT'L CONF. ON INFO SYS., Dec. 2021, at 1, 4-11.

[205] Yadav, *supra* note64, at 35.

[206] Werbach, *supra* note 21, at 1261.

indicate that considerable insider trading activity may take place before listing announcements.[207]

The multifunctional nature and combinative business model of unregulated cryptoexchanges may enable them to earn trading profits and beat uninformed outsiders, ultimately raising trading costs.[208] By contrast, born out of the necessity for cooperation among professional broker-dealers, centuries-old trading platforms are just that—trading venues with self-regulatory responsibilities.[210] They do not perform broker-dealer functions.

Finally, distinct risks and benefits emerge in trade settlement. In conventional markets, after a legacy asset trade is matched on an exchange, the next step is its clearance and settlement, which are run through registered clearinghouses where the trade settles over a number of days.[212] Over time, several leading clearinghouses have nearly monopolized post-trade operations in the United States, which has possibly happened without any congressional intent to centralize settlement and clearing.[213]

Compare this with cryptoasset trades, which often settle directly on the multiple CEXs' internal ledgers, with totals recorded thereafter in omnibus wallets on a blockchain.[214] These nearly instantaneous post-trade operations enable traders to receive access to their assets much faster than in legacy markets, producing substantial savings and efficiencies.[215] Acknowledging this potential, experiments with multifunctional digital asset entities are afoot in foreign countries.[216] Yet, despite these potential efficiencies, the unregulated multifunctional CEX model can generate concurrent risks. For instance, since CEXs are custodial, their customers, self-evidently, are exposed to custody risk, including the risk of commingling customer assets with

---

[207] *See generally* Ester F´elez-Vi˜nas et al., Insider Trading in Cryptocurrency Markets, August 8, 2022, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4184367.

[208] *See, e.g.,* Verstein, *supra* note 203, at 54–55; Yadav, *supra* note 64, at 36.

[210] *See, e.g.*, Donna M. Nagy, *Playing Peekaboo with Constitutional Law: The PCAOB and Its Public/Private Status*, 80 NOTRE DAME L. REV. 975, 1023 (2005) ("[T]he NYSE's history is particularly rich, dating back to 1792, when, according to the lore, twenty-four brokers signed an agreement under a buttonwood tree located at what is now 68 Wall Street. The NYSE took its self-regulatory responsibilities seriously . . . . [T]he Exchange Act, and particularly its 1975 amendments, evidence an undeniable respect for the NYSE's self-regulatory authority.").

[212] For a description of the U.S. securities clearing industry, its history, and regulations, see *A Guide to Clearance & Settlement*, DTCC (2021), https://www.dtcc.com/clearance-settlement-guide/#/dashboard/1. Derivatives clearing differs from spot market clearing. *See, e.g.,* Clearing Organizations, CFTC (2024) https://www.cftc.gov/IndustryOversight/ClearingOrganizations/index.htm#:~:text=A%20derivatives%20clearing%20organization%20(DCO,or%20netting%20of%20obligations%3B%20or; *What Is Clearing?*, CME Group (2024), https://www.cmegroup.com/education/courses/clearing/what-is-clearing.html.

[213] *See, e.g.,* Dan Awrey & Joshua Macey, *Open Access, Interoperability, and the DTCC's Unexpected Path to Monopoly,* 132 YALE L. J. 96, 106-108 (2022) (suggesting that Congress and regulators intended to enhance competition); Yuliya Guseva, *Destructive Collectivism: Dodd-Frank Coordination and Clearinghouses*, 37 CARDOZO L. REV. 1693, 1722-30 (2016) (discussing the history of the clearing industry).

[214] *E.g., Coinbase, Inc.*, 2024 WL 1304037, at *26.

[215] George S. Geis, *The Historical Context of Stock Settlement and Blockchain*, 26 CHAP. L. REV. 557, 564, 572, 592–95 (2023) (discussing the pros and cons of blockchain-enabled settlement).

[216] *See, e.g.,* BANK OF ENGLAND, DIGITAL SECURITIES SANDBOX JOINT BANK OF ENGLAND AND FCA CONSULTATION PAPER, Apr. 3, 2024, https://www.bankofengland.co.uk/paper/2024/cp/digital-securities-sandbox-joint-bank-of-england-and-fca-consultation-paper (detailing a regime that will allow firms to use DLT to issue and trade securities and to settle securities transactions).

exchange assets.[217] These problems typically should be controlled through thoughtful regulation, which does not seem to be forthcoming.[218]

C. DEXs: Blockchain-Native Solutions and Risks

Ideally, a future regulatory framework should address the risks of not only CEXs but also DEXs because trading on CEXs affects DEXs (and vice versa), and their trading activity and liquidity interact.[219] DEXs may avoid the discussed above quagmire of conflicts of interest, agency costs, custodial risks, and adverse selection but have sui generis problems.

On the positive side, all orders and transactions on DEXs are transparent and public.[222] Major DEXs (AMMs) do not even have a limit order book.[223] They enable participants to "list" assets by opening liquidity pools with asset pairs against which any person with a blockchain identity can trade, and every order is executed against the pool.[224] The assets are priced in relation to each other by an encoded algorithm.[225] Participants called "liquidity providers" add assets into pools.[226] Traders would then transact against the liquidity pools by sending "the asset they wish to trade into the core contract before calling the 'swap' function that [would] swap their token for the other token in the pool."[227] The core contract would tell the traders the exchange rate so that the trader could decide whether to proceed with the transaction.[228]

Since traders, whether retail or institutional, sell and buy assets from the pools directly, they bypass any centralized intermediaries and do not surrender custody of their assets.[229] In sum, this system gives retail and institutional investors direct access to trading, avoiding any

---

[217] *See* Adam J. Levitin, *Not Your Keys, Not Your Coins: Unpriced Credit Risk in Cryptocurrency*, 101 TEX. L. REV. 877, 892-96 (2023).

[218] The May 2024 House Bill, for example, made considerable strides toward advancing pertinent standards for CEXs, including creating new categories of digital asset and digital commodity brokers and dealers, setting principles for customer fund segregation, mandating conflict-of-interest systems, prohibiting exchanges from trading for their own account, and many others. House Bill, *supra* note 29, Sec. 403-407; Sec. 504-506.

[219] Jun Aoyagi & Yuki Ito, Coexisting Exchange Platforms: Limit Order Books and Automated Market Makers 31 (Jan. 11, 2023) (unpublished manuscript), https://ssrn.com/abstract=3808755.

[222] Mohsen Pourpouneh et al., *Automated Market Makers* 2 (Dep't of Food & Res. Econ. (IFRO), Working Paper No. 08, 2020) (explaining that DEXs are transparent, allow users to maintain custody of their assets, and lack a single point of failure).

[223] *See* Aoyagi & Ito, *supra* note 220 at 2 (comparing CEXs, which use limit order books, with AMMs, which do not).

[224] *Id.* at 3.

[225] A standard formula is K(Invariant)=x(Asset 1)*y(Asset 2). *See How Uniswap Works*, UNISWAP, https://docs.uniswap.org/contracts/v2/concepts/protocol-overview/how-uniswap-works (last visited Dec. 17, 2023).

[226] Aoyagi & Ito, *supra* note 220, at 3.

[227] Risley v. Universal Navigation Inc., No. 22 Civ. 2780 (KPF), 2023 WL 5609200, at *4 (S.D.N.Y. Aug. 29, 2023).

[228] *Id.*

[229] *See generally* Campbell et al., *supra* note 27 (providing a comprehensive overview of DEX AMM design and operations). *See also* Bruno Biais et al., *Advances in Blockchain and Crypto Economics*, 69 MGMT. SCI. 6417, 6421 (2023) (discussing the literature on overcoming moral hazard in decentralized trading platforms); Pourpouneh et al., *supra* note 222, at 2 (summarizing the non-custodial nature and transparency of DEXs); Dombalagian, *Cryptoexchanges*, *supra* note 53, at 15 (discussing DEXs, CEXs, and asset custody).

third-party off-chain intermediaries and reducing the risk of commingling their assets with those of other traders, broker-dealers, or the exchange.

Researchers argue that this DEX design may reduce trading costs, increase price transparency, reduce custodial risk, and ensure simultaneous settlement and execution.[234] In expectation, traders and liquidity providers could benefit from the cost-efficiency and transparency of blockchains: they could make their own trading decisions so long as a protocol operated as promised. To reduce liquidity fragmentation, blockchain-enabled markets also experiment with "aggregators"[236] and inter-exchange routing mechanisms, including "smart order routers" ("a type of trading where an algorithm determines the best price for the requested transaction"),[238] to maximize traders' return.

On the flip side, researchers point out a panoply of problems, warning that AMMs are imperfect,[239] have comparatively fragmented liquidity,[240] generate losses from inefficient prices,[241] and may distort price formation by referencing external data sources ("oracles"), which may be compromised.[242] Separately, DEXs expose traders to the risks of fraud and mistakes in an environment where erroneous or fraudulent interactions with smart contracts powering DEXs are irreversible.[245]

Perhaps the most fundamental challenge of DEX design is ensuring cost-effective liquidity provision. DEX order execution on blockchain "naturally deter[s] a speed-centric competitive environment[]"of HFT, i.e., important professional liquidity suppliers in legacy markets.[247] Instead, liquidity is provided in a way described earlier – by participants depositing

---

[234] Pourpouneh et al., *supra* note 222; Andrea Barbon & Angelo Ranaldo, *On the Quality of Cryptocurrency Markets: Centralized Versus Decentralized Exchanges* 3 (Swiss Fin. Inst., Research Paper No. 22–38, 2023); Agostino Capponi et al., *Can Decentralized Finance Provide More Protection for Crypto Investors?*, LIBERTY ST. ECON. (Dec. 21, 2022) [hereinafter Capponi et al., *Decentralized Finance*], https://libertystreeteconomics.newyorkfed.org/2022/12/can-decentralized-finance-provide-more-protection-for-crypto-investors/.

[236] *Fundamentals: What Is a DEX Aggregator?*, ZEROEX (Apr. 19, 2023), https://0x.org/post/what-is-a-dex-aggregator.

[238] PwC, *supra* note 202, at 16.

[239] *See infra* notes 249–268and accompanying text.

[240] Alfred Lehar et al., Liquidity Fragmentation on Decentralized Exchanges 3 (Dec. 7, 2023) (unpublished manuscript), https://ssrn.com/abstract=4267429; Capponi et al., Price Discovery, *supra* note 169, at 6 n.5 ("Traders' pending orders are fragmented across different private pools . . . .").

[241] Pourpouneh et al., *supra* note 222 at 3.

[242] "An oracle connects a smart contract to off-chain data that may be an input for that smart contract's functionality." INT'L ORG. SEC. COMM'NS, IOSCO DECENTRALIZED FINANCE REPORT 8 (2022), https://www.iosco.org/library/pubdocs/pdf/IOSCOPD699.pdf. On oracles' vulnerabilities, see *id.* at 40.

[245] Traders may not be able to fix mistakes after a transaction has been executed and recorded, even in cases of fraud. *See, e.g.,* Corwin Smith, *Introduction to Smart Contracts*, ETHEREUM (July 31, 2023), https://ethereum.org/en/developers/docs/smart-contracts/. IOSCO DECENTRALIZED FINANCE REPORT, *supra* note 242, at 36-40 (summarizing the risks of decentralized finance).

[247] Capponi et al., Price Discovery, *supra* note 169, at 6.

assets into pools. DEX protocols incentivize this activity by distributing fees to liquidity suppliers.[248]

This "democratized" liquidity provision is marked by several structural flaws. First, because liquidity supply does not depend on professionals such as market makers or HFT, it may be drained as protocol participants exit or submit large trades, which incidentally also causes price slippage (a change between the initial market price and the actual trade price).[249] Second, liquidity costs are uniquely affected by arbitrage. Third, blockchain-specific front-running activities inhere in DEX trading.

Starting with arbitrage, normal arbitrage activities "do not consume any real resources, have positive economic-welfare effects," and equilibrate prices in different markets.[250] But DEX scholarship warns that "arbitrage problems can arise . . . even without any asymmetric information on fundamentals, because arbitrageurs can exploit liquidity providers even on public information."[251] Since AMMs set prices based on asset holdings within liquidity pools, arbitrageurs can trade those assets at off-market prices, causing losses to liquidity suppliers who provide assets to the pools.[252] In an extreme scenario, by shrinking the profits of liquidity suppliers, new arbitrage strategies may lead to a "liquidity freeze" (*i.e.*, a situation when liquidity providers do not deposit assets into trading protocols), which impedes trading.[253]

DEX arbitrage exists in a somewhat aberrant environment because posted trades are publicly visible and on-chain execution and settlement are slightly delayed.[254] Arbitrageurs may openly pay higher fees to get their orders executed promptly and even bid up the fees for transaction execution, willingly divulging their trades to discourage competing trades.[255] Note how these activities are both structurally different from and economically similar to HFT, but entirely unregulated. Arbitrageurs can exploit this system and engage in front-running because all trades are submitted, remain visible for a definable time, then processed, and finally settled on-chain.[256]

---

[248] Risley v. Universal Navigation Inc., No. 22 Civ. 2780 (KPF), 2023 WL 5609200, at *4–5 (S.D.N.Y. Aug. 29, 2023).

[249] *See, e.g.*, AMF, *supra* note 12, at 19 (discussing slippage); Jiahua Xu et al., *SoK: Decentralized Exchanges (DEX) with Automated Market Maker (AMM) Protocols*, ASS'N FOR COMPUTING MACH. COMPUTING SURVS., Nov. 2023, at 5.

[250] Fox et al., *Sense and Nonsense*, *supra* note 159, at 241.

[251] Capponi & Jia, *supra* note 143, at 5.

[252] Campbell et al., *supra* note 27, at 2-3.

[253] Capponi & Jia, *supra* note 144, at 5.This problem is overlayed on top of "excessive leverage due to the repeated use of the same collateral for borrowing and lending." Capponi et al., *Decentralized Finance*, *supra* note 234.

[254] *See* AMF, *supra* note 12, at 19 (explaining how DEXs are vulnerable to price manipulation because a transaction order becomes public before the settlement occurs, giving time for other participants to place their own trades before the settlement); Johnson, *supra* note 177, at 1967–70 (explaining how HFTs can manipulate prices by placing orders immediately before (and also immediately after) a transaction goes through).

[255] Capponi et al., Price Discovery, *supra* note 169, at 2, 35.

[256] *See, e.g., Risley*, 2023 WL 5609200, at *6-7 (explaining how traders can access the Protocol and that the execution and settlement of all trades through Uniswap, a DEX, occur entirely on the Ethereum blockchain).

But traders-arbitrageurs are not the only parties that engage in arbitrage and front-running. Blockchain-native intermediaries, including "validators"[257] and "block builders,"[258] may earn a substantial profit from the same features of DEX design. Namely, these blockchain-native parties may change order execution while putting together blocks to be added to the blockchain to finalize transaction settlement. Similar to the legacy intermediaries such as brokers in legacy markets, block builders and validators can front-run or back-run transacting parties (a "sandwich attack") and reorder submitted transactions to their benefit.[259] Submitted trades, particularly large ones, make attractive front-running targets.[260] Unlike broker-dealers who are prohibited from engaging in front-running (i.e., having received an order, a broker-dealer cannot extract profit from this information by trading ahead of a customer),[261] the blockchain-native parties are entirely unregulated.

As profit maximizers, they naturally tend to pursue higher returns, which may be at the expense of digital asset traders and the integrity of blockchain-enabled ecosystems.[263] These "perks" that validators or block builders opportunistically seek to achieve are called "maximal extractable value" (MEV).[264] They may be illegal in financial markets when broker-dealers are involved, but in blockchain-enabled transactions, these opportunistic activities are curbed

---

[257] For background, validators secure blockchains and record transactions. They verify transactions submitted by users, propose to add them to the ledger, and receive rewards for adding blocks of transactions, resulting in transaction finality and settlement. *Coinbase, Inc.*, 2024 WL 1304037, at *27-28.

[258] Block builders and block proposers are essentially the new types of intermediaries that emerged when Ethereum switched from the Proof of Work to the Proof of Stake protocol. *See, e.g.*, Blocknative, What is Proposer/Builder Separation on Ethereum?, Oct 24, 2022, https://www.blocknative.com/blog/proposer-builder-separation-ethereum ("Block proposal is the action of submitting a block of transactions for the approval of network validators, while block building is the action of transaction ordering."). On the changes and the two protocols, see, e.g., Mason Marcobello, *What Is the Ethereum Merge?*, COINDESK (updated Apr 9, 2024), https://www.coindesk.com/learn/what-is-the-merge-and-why-has-it-taken-so-long/.

[259] *See* MIKOLAJ BARCZENTEWICZ, MEV ON ETHEREUM: A POLICY ANALYSIS 4-8 (Int'l Ctr. for L. & Econ. 2023).

[260] *See, e.g.,* Sirio Aramonte et al., *DeFi Risks and the Decentralisation Illusion*, BANK FOR INT'L SETTLEMENTS Q. REV., Dec. 2021, at 35 ("When submitting orders, liquidity takers are uncertain about the timing of their orders' execution and the execution prices, as these depend on the execution sequence. Importantly, the order quantities become public knowledge before their price impact has materialised – which is easily predictable from the bonding curve…. [T]he bonding curve implies that the malicious trader's sell order will be executed at a higher price than his buy order, thus generating a profit. Such front-running behaviour is particularly attractive to large validators because they have a higher chance to 'win' the next block and time their front-running trades optimally.").

[261] Legacy broker-dealers are prohibited from front-running customer orders. *See 5310. Best Execution and Interpositioning*, Fin. Indus. Regul. Auth., https://www.finra.org/rules-guidance/rulebooks/finra-rules/5310 (requiring FINRA members to use "reasonable diligence" to ensure that the "price to the customer is as favorable as possible" and addressing interpositioning); *5320. Prohibition Against Trading Ahead of Customer Orders*, Fin. Indus. Regul. Auth., https://www.finra.org/rules-guidance/rulebooks/finra-rules/5320 (imposing restrictions o n trading ahead of customers).

[263] For instance, validators may restrict supply of their services to sustain the congestion of blockchains and receive higher transaction fees from users. BANK FOR INT'L SETTLEMENTS, THE CRYPTO ECOSYSTEM: KEY ELEMENTS AND RISKS 5–7 (2023), https://www.bis.org/publ/othp72.pdf.

[264] "Validators' ability to arbitrarily include, exclude, or re-order transactions within the blocks they produce (so called maximal extractable value - MEV) can lead to profits for them and losses to parties involved in the crypto-asset transfers." FINANCIAL STABILITY BOARD, INTERNATIONAL MONETARY FUND, IMF-FSB SYNTHESIS PAPER: POLICIES FOR CRYPTO-ASSETS 15 (2023), https://www.fsb.org/wp-content/uploads/R070923-1.pdf. "MEV arises from 'front' and 'back-running' as well from sandwich trades, all schemes which are illegal under market abuse regulation." *Id.* at 15 n.24.

29

primarily through protocol and application design.[266] The effectiveness of those projects, however, remains debatable.[267]

In general, extracting value from liquidity providers and traders seems to function as a feature, not a bug of much of blockchain-enabled DEX trading.[269] As a result, DEXs may offer the same functions as legacy trading systems do but approach them differently, both creating and managing costs in novel ways. As a result, some regulatory principles may not transfer well to the DEX world, which should give pause to the regulators attempting to replicate the rulebook written for centralized trading venues.

IV. Voluntary Standards
A. CEXs and Private Self-Regulation

The previous Parts reveal why digital asset trading needs some regulatory guardrails. This Section starts with self-regulation and demonstrates that, as a voluntary set of commitments, *private* self-regulation should either flounder or has already failed at adequately controlling the risks and transaction costs of CEXs and DEXs.

Hypothetically, a better-quality CEX could spend more on voluntary compliance and pass it on to the traders in the form of higher fees. But traders might detest these high costs and leave to plentiful other venues, including foreign ones. Those venues could "compensate" themselves through less obvious insider trading schemes that would be unobservable to traders. An honest CEX would thus lose traders and liquidity.

Even if the traders stayed, any benefits from good standards and their enforcement could be partially captured by the trading parties themselves, while the exchange would bear the full costs of improving compliance. Consequently, it would have an incentive to economize on compliance and set suboptimal standards. And even if a CEX set proper standards voluntarily, it

---

[266] Experts explore how the design of DEXs and the underlying blockchains may provide protection against front-running and arbitrage-related losses. *See, e.g.*, Basile Caparros et al., Blockchain Scaling and Liquidity Concentration on Decentralized Exchanges 2 (Oct. 21, 2023) (unpublished manuscript), https://ssrn.com/abstract=4475460 (explaining how lower blockchain gas fees help protect against arbitrage by allowing liquidity providers to change their position frequently without incurring high expenses). They propose dark or private venues where "orders . . . are secret, and can only be reconstructed by nodes matching the orders." MICHAEL BORKOWSKI ET AL., TOWARDS ATOMIC CROSS-CHAIN TOKEN TRANSFERS: STATE OF THE ART AND OPEN QUESTIONS WITHIN TAST (2018). For other examples, see Tiantian Gong & Aniket Kate, *Order But Not Execute in Order*, ARXIV, Feb. 2, 2023, at 12-13 (discussing designs that developers can implement to prevent front-running); *Flashbots*, GitHub, https://github.com/flashbots/pm (describing how Flashbots mitigate the negative effects of MEV).

[267] Research suggests, however, that dark venues may fail to decrease transaction costs and only slightly increase the payoff of traders. Agostino Capponi et al., The Evolution of Blockchain: From Lit to Dark 3 (Feb. 11, 2022) (unpublished manuscript), https://arxiv.org/pdf/2202.05779.pdf. Traders in private pools can be shielded from some risk of front-running, but those initiatives may be unsustainable. Agostino Capponi et al., Maximal Extractable Value and Allocative Inefficiencies in Public Blockchains, 35 (2023), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3997796

[269] *See generally* Campbell et al., *supra* note 27(discussing DEX microstructure and front-running).

(or its insiders) could defect from compliance in the future and whenever such defection happened to be profitable. At this juncture, only mandatory guardrails could nudge the exchange to implement optimal standards, maximizing economic welfare and maintaining compliance.

Many private initiatives illustrate these points: Projects to boost transparency and "prove reserves" appear to have produced incomplete information;[281] rules prohibiting trading on inside material non-public information have also been violated;[282] rules ensuring fair access and trading efficiency have been set aside for affiliated parties.[283] The most notorious case is FTX, whose founder was found guilty on several counts to commit securities and commodity fraud, wire fraud, and money laundering in November 2023.[284] FTX plainly illustrates how agency costs (resulting in extreme corporate mismanagement) and information asymmetry (enabling insider trading and commingling of funds) could destroy a CEX.

B. DEXs: Voluntary Rules and Incentives

By the same token, blockchain-based DEXs are not unerring, self-regulating, cost-effective trading systems. As discussed above, for example, validators and arbitrageurs can front-run other traders and liquidity providers virtually with impunity. As such, blockchain-native systems "ha[d] not rewritten all of economics or human nature"[285] from decentralized finance. Parties on blockchain can and do act opportunistically.

A germane risk is the possible centralization of decentralized applications, which may allow small groups of market participants to take advantage of other traders.[286] For example, groups, including original DEX developers, may amass considerable influence over protocol changes and governance decisions, and the interests of those groups could dictate the changes.[287]

Take the implementation of new DEX versions and changes to existing protocols as an example. These highly valuable activities turn on the incentives of developers and DEX governance structure. Efficient governance is important to many decentralized protocols, which

---

[281] Mark Maurer, *More Crypto Exchanges Verify Reserves, But Questions About Assets Remain*, WALL ST. J. (Dec. 5, 2022, 7:30 AM), https://www.wsj.com/articles/more-crypto-exchanges-verify-reserves-but-questions-about-assets-remain-11670153687.

[282] *Trading Rules, Section 3.3*, COINBASE, https://www.coinbase.com/legal/trading_rules (last visited Dec. 17, 2023); *see also* Press Release, SEC, Former Coinbase Manager and His Brother Agree to Settle Insider Trading Charges Relating to Crypto Asset Securities (May 30, 2023), https://www.sec.gov/news/press-release/2023-98.

[283] FTX and Binance, for example, allowed affiliated accounts to trade on preferred terms or exempted them from the insider trading policies. *See, e.g.*, Complaint at 71, CFTC v. Zhao, No. 1:23CV01887, 2023 WL 2664163 (N.D. Ill. Mar. 27, 2023); Complaint at 3, SEC v. Bankman-Fried, No. 22-cv-10501 (S.D.N.Y. Dec. 13, 2022).

[284] Press Release, Department of Justice, Statement of U.S. Attorney Damian Williams on the Conviction of Samuel Bankman-Fried (Nov. 2, 2023), https://www.justice.gov/usao-sdny/pr/statement-us-attorney-damian-williams-conviction-samuel-bankman-fried.

[285] Statement, Caroline A. Crenshaw, Commissioner, Securities and Exchange Commission, Statement on DeFi Risks, Regulations, and Opportunities (Nov. 9, 2021), https://www.sec.gov/news/statement/crenshaw-defi-20211109. Decentralized finance refers to finance systems based on DLT and operating peer-to-peer. *Id.*

[286] *Id.*; FIN. STABILITY BD., *supra* note 142, at 11-12.

[287] INT'L ORG. SEC. COMM'NS, POLICY RECOMMENDATIONS FOR DECENTRALIZED FINANCE (DEFI): CONSULTATION REPORT 31 (2023) [hereinafter INT'L ORG. SEC. COMM'NS, POLICY RECOMMENDATIONS FOR DEFI], https://www.iosco.org/library/pubdocs/pdf/IOSCOPD744.pdf (underscoring importance of developer incentives).

31

need to evolve and tackle code errors and the incompleteness of smart contracts when necessary.[288] The risk here is not that the developers supporting DEXs would engage in fraud, but that they could simply act opportunistically, with that Williamsonian "self-interest seeking with guile."[289] In doing so, they might externalize the risks of a poor trading environment that they created, particularly if their interests (and reputational risks) were not fully aligned with investors' interests and risks.

The discussed-above *Uniswap Labs* decision provides an apposite illustration. In that class action, plaintiffs alleged, *inter alia,* that the developers and investors behind Uniswap operated an unregistered exchange and broker-dealer,[290] that various pools included "Scam Tokens,"[291] and that those transactions were subject to rescission under the securities statutes.[292]

The court, first, distinguished between a lawful DEX, as a set of smart contracts containing "self-executing, self-enforcing code" that incorporates trade terms and pricing, and the token contracts created by malicious issuers in liquidity pools.[293] The court suggested that in fraudulent transactions over a platform "third-party human intervention causes the harm, not the underlying platform."[294]

The court next dispatched the allegations that the defendants, as statutory sellers, were offering and selling unregistered securities and stated, *inter alia,* that Securities Act Section 12(a)(1) "does not apply to software coders who create an exchange to efficiently facilitate trades."[295] Although the court fully acknowledged that those who had caused harm through fraudulent schemes were anonymous, that the DEX did not have the usual identification protocols and listing review,[296] and that the defendants could have "a degree of governance power," it suggested that these issues were either irrelevant[297] or for Congress to address.[298]

Let us consider how this approach affects developers' incentives. While it would be doctrinally inappropriate to consider the developers behind Uniswap "statutory sellers" under securities law,[299] the decision also points toward a lower private liability risk for DEX developers,[300] and the risk of liability generally affects the incentives of private parties. Reputational benefits alone may fall short of motivating *all* DEX developers to create more efficient and less risky DEXs: some developers will invest in improved trading rules reducing

---

[288] Bank for Int'l Settlements, *supra* note 263, at 9; Fin. Stability Bd., *supra* note 142, at 11-18 (2023); Capponi et al., *Decentralized Finance*, *supra* note 234; AMF, *supra* note 12, at 23.

[289] Williamson, *Transaction-Cost Economics*, *supra* note 75, at 234 n.3.

[290] *Risley*, 2023 WL 5609200, at *11.

[291] *Id.* at *5.

[292] *Id.* at *11.

[293] *Id.* at *12–13.

[294] *Id.* at *14.

[295] *Id.* at *16.

[296] *Id.* at 4-11 (describing the DEX protocol and the interface).

[297] *Id.* at *17.

[298] *Id.* at *19.

[299] *See id.* at *15-19 (dismissing the plaintiffs' theories that defendants can be considered a "statutory seller").

[300] Note that public enforcement is a viable option. For example, the CFTC brought several enforcement actions against DEX operators for failure to register. Press Release, CFTC Issues Orders Against Operators of Three DeFi Protocols, *supra* note 24.

specific investor risks or addressing regulatory concerns; some will not. The code written by both groups will be fully visible to the public due to the transparent nature of blockchain ecosystems.[301] Yet traders may not be adequately informed or sophisticated (or even have contradictory individual preferences) to reward or penalize the developers. As a result, developers may not internalize either their reputational rewards or penalties. In equilibrium, they should under-prioritize projects that do not align with their interests and economize on resources to educate themselves about risks that they externalize.

As an illustration, in October 2023, a new hook deanonymizing transactions through know-your-customer (KYC) programs was reported in the open-source repository for contracts for Uniswap v4.[302] Private parties using that hook would be able to create KYC-compliant trading pools on a new version of Uniswap, a major DEX. Without commenting on the merits and downsides of this proposal, it is obvious that this and similar solutions could help resolve the identification issues discussed in the *Uniswap* decision. Next, in September 2023, the CFTC targeted Deridex for, *inter alia*, failing to establish a KYC program.[303] Note that Deridex was organized concurrently with the *Uniswap* litigation and the rollout of the v4 proposal.[304] Yet, heterogeneous and dispersed groups of developers should be expected to experiment in different directions. In doing so, they may direct their efforts toward better technological design and functionalities, not legal theories that other developers incorporate into their decisions.

The problem here is not that the community of developers does not understand the need for better trade execution or for KYC (that is, KYC in regulated markets).[305] The chief concern is that not every developer would work on the code with the full information and appreciation of the future investor benefits, trading efficiencies, or regulatory compliance. In theory, the scores of such developers should be greater absent readily available recommended best practices or proper incentives.

V. FORMAL SELF-REGULATION FOR DIGITAL ASSETS

A. The Need for Self-Regulation: Hayek Was Right

The previous Parts demonstrate a normative conundrum: Part I describes how technology may present new solutions to reduce costs and improve institutions, and Parts II-IV

---

[301] *Supra* notes 220-242 and accompanying text.

[302] Ana Paula Pereira, *KYC Hook for Uniswap v4 Stirs Community Controversy*, COINTELEGRAPH (Oct. 15, 2023), https://cointelegraph.com/news/kyc-hook-uniswap-v4-stirs-community-controversy.

[303] *In re* Deridex, Inc., CFTC No. 23-42, 2023 WL 5937236, at *1 (Sept. 7, 2023).

[304] *See In re* Deridex, Inc., CFTC No. 23-42, 2023 WL 5937236 at *2 (Sept. 7, 2023) (Deridex began development in mid-2022 and launched on January 1, 2023). *Uniswap* plaintiffs filed a complaint against Uniswap and its developers on April 4, 2022. *Risley*, 2023 WL 5609200, at *9.

[305] Recall that the developer community and scholars experiment with possible solutions. On front-running, *see, e.g.*, Dan Cline et al., *ClockWork: An Exchange Protocol for Proofs of Non Front-Running*, MASS. INST. TECH. MEDIA LAB, Feb. 21, 2020; Matheus Venturyne Xavier Ferreira & David C. Parkes, *Credible Decentralized Exchange Design via Verifiable Sequencing Rules*, SYMP. ON THEORY COMPUTING, June 20; Lioba Heimbach et al., The Potential of Self-Regulation for Front-Running Prevention on DEXes (unpublished manuscript), https://arxiv.org/abs/2306.05756; *supra* notes 266-267.

Electronic copy available at: https://ssrn.com/abstract=4677538

illustrate how DLT-enabled intermediaries recreate old risks and introduce novel ones and why private self-regulation should fail to reduce transaction costs and mitigate opportunism. When a market structure, whether DLT-enabled or otherwise, cannot fully cope with the high costs of organizing transactions, the law routinely steps in.[306]

Governments may "impose regulations which state what people must or must not do and which have to be obeyed."[307] The relevant policy choice is not a dichotomy between regulating digital assets via a self-governing technology or through formal laws.[308] The fundamental inquiry should be how the government can contribute to better markets by creating conditions promoting technologies and institutions that reduce the costs of private transacting and withstand the test of both time and future innovation.[309] This Section explains why the government (namely, the Commissions) should find it difficult to satisfy these conditions alone and needs to rely on a more formal self-regulatory model that offers superior results.[310]

Financial regulation is a regulatory-cum-market system that requires detailed knowledge of markets against a steady stream of innovation.[311] It often brings the regulators and markets into a permanent state of collision caused by the obsolescent information that the regulators possess and the dynamic nature of finance and technology.[312] Market knowledge changes at a blistering pace. This change undermines effective data aggregation and the development of lasting regulations by central planners such as the Commissions.[313]

---

[306] For a discussion of failures of consensus protocols "to provide an infrastructure that allows transacting parties to internalise externalities privately through decentralised contracting and allocative mechanisms," see Martino & Ringe, *supra* note 26, at 17-24.

[307] Ronald H. Coase, *The Problem of Social Cost*, 3 J. L. & ECON. 1, 17 (1960). The problems of incompleteness of information and high transaction costs create conditions calling for government intervention. JOSEPH E. STIGLITZ, WHITHER SOCIALISM? 29 (Mass. Inst. of Tech. Press 1994). A public intervention in finance may address information asymmetries and transaction costs which are not corrected by prices. *See generally* Bruce C. Greenwald & Joseph E. Stiglitz, *Externalities in Economies with Imperfect Information and Incomplete Markets*, 101 Q.J. Econ. 229 (1986); Joseph E. Stiglitz, *The Role of the State in Financial Markets*, 7 WORLD BANK ECON. REV. 19 (1993).

[308] In its extreme forms, a strong focus on technological self-regulation replacing humans has been dubbed "the tech nirvana fallacy." Luca Enriques & Dirk A. Zetzsche, *Corporate Technologies and the Tech Nirvana Fallacy*, 72 Hastings L.J. 55, 62, 95 (2020).

[309] *See, e.g.,* Harold Demsetz, *Information and Efficiency: Another Viewpoint*, 12 J.L. & ECON 1, 20 (1969) (describing as the main policy problem "the design of institutional arrangements that provide incentives to encourage experimentation (including the development of new products, new knowledge, new reputations, and new ways of organizing activities) without overly insulating these experiments from the ultimate test of survival.").

[310] On the evolution of SROs' role, see generally William A. Birdthistle & M. Todd Henderson, *Becoming a Fifth Branch,* 99 CORNELL L. REV. 1 (2013).

[311] *See* Dan Awrey & Kathryn Judge, *Why Financial Regulation Keeps Falling Short*, 61 B.C. L. REV. 2295, 2300 (2020) (discussing the importance of information in regulating financial markets).

[312] *See generally* Dan Awrey & Kathryn Judge, *Why Financial Regulation Keeps Falling Short*, 61 B.C. L. REV. 2295 (2020). Among other factors, timely actions and accurate information are key to better regulation. *See, e.g.,* United States Government Accountability Office, Blockchain in Finance: Legislative and Regulatory Actions Are Needed to Ensure Comprehensive Oversight of Crypto Assets 52-55 (2023).

[313] *See, e.g.,* Hayek, *supra* note40, at 519 ("The reason for this is that the 'data' from which the economic calculus starts are never for the whole society 'given' to a single mind which could work out the implications, and can never be so given.").

34

It follows that DLT-based and other technology-enabled markets naturally challenge pre-existing and long-term regulatory solutions.[314] The expertise and knowledge of the Commissions will always be obtained earlier in time, but effective regulations must impound emerging data points in real-time, and "economic problems arise always and only in consequence of change."[315]

By way of explanation, DEX developers assess trading risks in real time and design new applications through incessant and dynamic experimentation. Uniswap's evolution is an illustrative example: In the short span of a few years, Uniswap Labs has rolled out (or is about to roll out) Uniswap v3, which helps liquidity providers mitigate the price risk by specifying price ranges (i.e., "concentrated liquidity provision");[316] Uniswap X, which allows traders to receive best execution across pools and liquidity providers;[317] and Uniswap v4 with, among other features, cheaper trade fees ("gas costs") and customizable "hooks," which enable developers to design different market and limit orders[318] or even know-your-customer (KYC) procedures.[319]

Applying Hayek's framework, the Commissions, as central planners, lack the requisite knowledge about the ever-changing actions, intentions, and decisions of market participants. That "knowledge . . . is not given to the planner but to somebody else [such as DEX developers, CEX management teams, token project developers, and others], which somehow will have to be conveyed to the planner."[320] The concurrently transnational nature of DLT-enabled markets makes trading global[321] and information inherently decentralized.[322] Only the individual market participants who make decisions across borders based on the information in their possession represent decentralized information generators.[323]

Taking together decentralization and change, it follows "that the ultimate decisions must be left to the people who are familiar with these circumstances, who know directly of the relevant changes…."[324] To the extent that governments need to prescribe regulations for markets, they must incorporate industry inputs into the regulatory structure to approximate decentralized decision-making.

---

[314] Long-term planning is a complicated task. *See id*. at 523 ("[I]f detailed economic plans could be laid down for fairly long periods in advance and then closely adhere to, . . . the task of drawing up a comprehensive plan governing all economic activity would appear much less formidable.").

[315] *Id.*

[316] *Introducing Uniswap v3*, Uniswap, Mar. 23, 2021, https://blog.uniswap.org/uniswap-v3.

[317] Hayden Adams, *Introducing the UniswapX Protocol*, Jul. 17, 2023, https://blog.uniswap.org/uniswapx-protocol.

[318] *Uniswap V4 - Hooks*, Uniswap, https://docs.uniswap.org/contracts/v4/overview; *Uniswap V4 – Architecture*, Uniswap, https://docs.uniswap.org/contracts/v4/concepts/v4-architecture-overview

[319] Pereira, *supra* note 302.

[320] Hayek, *supra* note 40, at 520.

[321] *See* Hossein Nabilou, *How to Regulate Bitcoin? Decentralized Regulation for a Decentralized Cryptocurrency*, 27 INT'L J. OF L. & INFO. TECH. 266, 291 (2019) (describing cryptoassets as, inter alia, global).

[322] In a broader sense, this decentralization raises "the problem of what is the best way of utilizing knowledge initially dispersed among all the people [which] is at least one of the main problems of economic policy—or of designing an efficient economic system." Hayek, *supra* note 40, at 520.

[323] Friedrich A. von Hayek, *Economics and Knowledge*, 4 ECONOMICA 33, 51 (1937); Hayek, *supra* note 40, at 521.

[324] Hayek, *supra* note 40, at 524.

A suitable prototype to achieve these objectives (i.e., to combine industry expertise with regulatory decision-making and do so at speed) is already in place—it is the uniquely U.S.-specific expert SRO model.[325] Throughout their existence, neither Commission functioned without its SRO-helpers in securities and derivatives markets.[326] Digital-asset-focused SROs overseen by the Commissions could approximate decentralized markets by receiving direct inputs from market participants.[327]

The SROs would submit their rules for approval to the regulators and simultaneously relay to them updated and aggregated market information.[328] A positive externality of this rule approval process would be educating the agencies and helping mitigate their limitations, such as bounded rationality and "tunnel vision, sticking to known regulatory schemes."[329] The Commissions would receive current information packaged, assessed, and processed by entities within their jurisdiction.[330]

Provided the new digital-asset SROs had few procedural, design, and incentive problems, they could operate *in concreto* and target cracks in blockchain-enabled institutions and attendant transaction costs. Acting faster than the regulators slowed down by the rulemaking latency under the strictures of the Administrative Procedure Act,[331] the SROs should be in a better position to respond to ongoing change. Thus, by expediting and informing rulemaking, the SROs could overcome a central regulatory challenge—the "allocative inefficiency [resulting from] the necessarily imperfect fit between the coverage of a rule and the conduct sought to be regulated."[332] The SROs could thus reduce "[a]n important cost of legal regulation [which is] the cost of altering rules to keep pace with economic and technological change."[333]

---

[325] Stavros Gadinis & Howell E. Jackson, *Markets as Regulators: A Survey*, 80 SO. CAL. L. REV. 1239, 1330 (2007).

[326] *See, e.g.*, Timothy G. Massad & Howell E. Jackson, *How to Improve Regulation of Crypto Today—Without Congressional Action—and Make the Industry Pay for It* 5 (Hutchins Ctr., Working Paper No. 79, 2022), https://www.brookings.edu/wp-content/uploads/2022/10/WP79-Massad-Jackson-updated-2.pdf.

[327] Birdthistle & Henderson, *supra* note 310, at 55 ("Perhaps the greatest single benefit that self-regulation possesses over other forms of regulation is its access to direct industry expertise.").

[328] *See* 15 U.S.C. §§ 78f(b), 78s(a); 7 U.S.C. § 7a–2; 17 C.F.R. §§ 40.5, 40.6 (2023).

[329] *See,* Stephen J. Choi & Adam C. Pritchard, *Behavioral Economics and the SEC,* 56 STAN. L. REV. 1, 24 (2003).

[330] This may mitigate the problems examined by Awrey and Judge. Awrey & Judge, *supra* note 312, at 2311 *("*The complexity of modern finance makes it prohibitively costly for market participants and regulators to gather, much less analyze, the entire universe of potentially relevant information. As a result, these actors almost invariably operate with only a fraction of the information that may be pertinent to the decisions they are making . . . . Information that is accurate at one point in time may not be accurate at another. . . . Different regulators have different jurisdictions, mandates, and objectives, limiting both the scope of their authority and their field of vision.").

[331] 5 U.S.C. §§ 551–559. On the regulatory delays, see Roberta S. Karmel, *Little Power Struggles Everywhere: Attacks on the Administrative State at the Securities and Exchange Commission*, 72 ADMIN. L. REV. 207, 217–20 (2020). *But see* Roberta Romano, *Does Agency Structure Affect Agency Decisionmaking? Implications of the CFPB's Design for Administrative Governance*, 36 YALE J. ON REG. 273, 278 (2019) ("There is . . . a debate in the administrative law literature over whether these procedural developments have so 'ossified' rulemaking as to hinder federal agencies' ability to formulate policy efficiently or are a worthwhile cost of enhancing agencies' democratic legitimacy and accountability.").

[332] Isaac Ehrlich & Richard A. Posner, *An Economic Analysis of Legal Rulemaking*, 3 J. LEGAL STUD. 257, 268 (1974).

[333] *Id.* at 277.

U.S. SROs typically regulate markets and address relevant transaction costs in two ways: by reducing *ex-ante* costs of developing market-wide solutions through standards and rules and through *ex-post* enforcement.[334] In securities markets, for example, SROs such as securities exchanges regulate the behavior of their members and issuers through financial, governance, and other standards *and* through disciplinary actions and the threat of delisting.[335] Placed in the center of markets, the digital-asset SROs could have a similar ammunition to design and enforce rules, which would be more specific to produce much-valued regulatory certainty.[336] By being closer to decentralized individual sources of information than the regulators, SROs can improve information dissemination and economic coordination.

This better information, in turn, should reduce not only regulatory errors but also challenges against the agencies from the aggrieved market participants, who might otherwise "expend vast resources in checking the actions of the authorities."[337] In fact, the digital asset industry has already initiated complaints and launched an offensive against the SEC's policies.[338] But if a trusted, well-founded self-regulatory model is adopted, both enforcement and opposition should abate to more optimal levels, entailing another corollary: firms are more likely to voluntarily commit to standards of behavior and follow through on their commitments when regulatory oversight is balanced.[339]

B. Concerns and Feasibility

Introducing SROs for digital asset markets is a feasible (and politically acceptable)[340] course of action. The Commissions are already accustomed to relying on legacy intermediaries,

---

[334] Both *ex-ante and ex-post* processes must work simultaneously to reduce the costs of transacting. Davidson & Potts, *supra* note 77, at 3–4 (discussing Williamson's framework).

[335] Yadav, *supra* note 64, at 15–18; Massad & Jackson, *supra* note 326 at 2.

[336] Ehrlich & Posner*, supra* note 332, at 262–64 (arguing that uncertain law chills socially valuable activity and behavior and underscoring the benefits of precision). Scholarship suggests that the best new rules should provide certainty to markets and reduce "bureaucratic load." Yadav & Brummer, *supra* note 28, at 247.

[337] Birdthistle & Henderson, *supra* note 310, at 57.

[338] *E.g.,* Douglas Eakeley & Yuliya Guseva, *Crypto's Counteroffensive Suits Underscore Need for Regulation,* BLOOMBERGLAW (Apr. 16, 2024), https://news.bloomberglaw.com/us-law-week/cryptos-counteroffensive-suits-underscore-need-for-regulation.

[339] *See, e.g.,* Jodi Short & Michael W. Toffel, *Making Self-Regulation More Than Merely Symbolic: The Critical Role of the Legal Environment,* 55 ADMIC. SCI. Q. 361, 386 (2010) ("The findings of this study suggest that the enforcement strategies and relationships of the legal environment play an important role in moderating organizations' implementation of their commitments to self-regulate. Facilities not facing regulatory threats that disclosed regulatory violations and committed to self-regulate exhibited improved regulatory outcomes…. In contrast, facilities that disclosed while facing regulatory threats did not improve their regulatory outcomes compared with their matched controls, suggesting that bald displays of coercive power by the state can undermine more normatively based motivations to self-regulate.").

[340] *See, e.g.,* Lummis-Gillibrand Responsible Financial Innovation Act, S. 4356, 117th Congress, June 7, 2022, https://www.congress.gov/bill/117th-congress/senate-bill/4356/text (Section 807 of the bill proposed an analysis of self-regulation)**.**

such as exchanges that predate the agencies and other SROs, such as FINRA and NFA.[341] Coase himself, for instance, underscored the important contributions of stock exchanges in determining "[w]hat can be traded, when it can be traded, the terms of settlement and so on" and laying out "a private law."[342]

Among the many jurisdictions that have some form of self-regulation, the United States stands apart from others in terms of affording its SROs a panoply of powers backstopped by the well-resourced Commissions with strong enforcement apparatuses.[343] The SROs also provide resource-constrained regulators with additional regulatory funding: the multipurpose SROs are self-funding,[344] while the Commissions are funded by taxpayers and repeatedly ask Congress to approve their annual budgets.[345] On balance, regulatory agencies acknowledge their contributions.[346]

Adding new digital asset SROs should not disrupt the current system of self-regulation, but add to it, ensuring more comprehensive oversight and generating synergies among SROs. The new SROs, for example, may enter into agreements with the legacy SROs to exchange information, assist in enforcement, or provide other material assistance.[347] In the alternative, FINRA and NFA could create a joint task force that would specialize in and work across digital-asset markets, including commodity, securities, and derivatives markets. So long as the new self-regulatory model accumulates the necessary market expertise and processes it into actionable and efficient self-regulation, it is theoretically irrelevant whether there are brand-new SROs or a new joint task force of existing SROs.

At the same time, patterning that new self-regulatory approach on existing models may not be a simple endeavor because the existing SROs are arguably imperfect. Scholarship converges on several fault lines, including the ineffectiveness of the current SROs in setting and/or enforcing standards against members, their conflicts of interest, misaligned incentives, lax supervision, and under-enforcement of listing and other SRO rules.[348] The next set of concerns

---

[341] "Self-regulation in the securities industry is nearly as old as the federal government." Marianne K. Smythe, *Government Supervised Self-Regulation in the Securities Industry and the Antitrust Laws: Suggestions for an Accommodation*, 62 N.C. L. REV. 475, 480 (1984).

[342] Ronald H. Coase, *The Institutional Structure of Production*, Chicago Unbound, Occasional Papers, at 10 (1992), https://chicagounbound.uchicago.edu/cgi/viewcontent.cgi?article=1033&context=occasional_papers.

[343] *See, e.g.,* Gadinis & Jackson, *supra* note 325, at 1329-32.

[344] U.S. Sec. & Exch. Comm'n, Concept Release Concerning Self-Regulation, Exchange Act Release No. 34-50700, 69 Fed. Reg. 71256, 71267 (Dec. 8, 2004).

[345] *See, e.g.*, Testimony, Gary Gensler, Chair, Securities and Exchange Commission, Testimony at Hearing before the Subcommittee on Financial Services and General Government U.S. Senate Appropriations Committee (July 19, 2023), https://www.sec.gov/news/testimony/gensler-testimony-fsgg-subcommittee-senate-appropriations-committee-071923.

[346] *See, e.g.,* 69 Fed. Reg. 71256, 71258 (proposed Dec. 8, 2004) (concluding that despite some conflicts and a possible need for reform, "it is generally considered that the SRO system has functioned effectively and has served government, industry, and investors well.").

[347] FINRA, Rule 8210(b)(2), https://www.finra.org/rules-guidance/rulebooks/finra-rules/8210 (allowing FINRA staff to share information with other self-regulatory organizations for investigation and enforcement purposes).

[348] *See generally* Marcel Kahan, *Some Problems with Stock Exchange-Based Securities Regulation*, 83 VA. L. REV. 1509 (1997) (questioning the claim that SROs are the best-suited tools to regulate the market); Jonathan R. Macey & Maureen O'Hara, *From Markets to Venues: Securities Regulation in an Evolving World*, 58 STAN. L. REV. 563, 581-

centers on the SROs' "increasing government-like functions,"[350] the relevant constitutionality issues,[351] and the excessive deference to SROs from both regulators and courts.[352] There is an implicit trend to become "the fifth branch," arguably turning the original concept of self-regulation into an inefficacious nostrum.[353]

These criticisms are valid, and the regulation of the new SROs will undoubtedly need to take these arguments into account. If Congress authorizes the Commissions to devise a new SRO or a new FINRA-NFA task force for digital-asset markets, a better organizational design will be a sine qua non for its success. Ultimately, however, the question policymakers should be asking is not what is wrong with today's SROs but whether digital asset markets would function better with self-regulation than without self-regulation.[354] The arguments advanced in this Article suggest that proper self-regulation adds considerable value and that the Commissions alone may lack the capacity to ensure adequate regulatory oversight of technology-based digital asset markets.[355]

VI. POLICY PROPOSALS

A. SRO Models

This Part dissects what the new organizational SRO model may look like. Three scholars have proffered two well-calibrated and thoughtful digital-asset SRO models.[356] This Section explains their proposals; Section B suggests merging them and developing a different, embracive model.

First, Professor Yesha Yadav advocates for considering CEXs (i.e., not DEXs) SROs and bringing them "into line with a long-established model of oversight" that would require that they demonstrate "that they are safe, well-governed, and capable of exercising supervision and

---

83 (2005) (discussing conflicts of interest in self-regulation); Geeyoung Min & Kwon-Yong Jin, *Relational Enforcement of Stock Exchange Rules*, 47 BYU L. REV. 149, 183-84 (2021) (describing SROs tendency not to bring formal enforcement actions against companies); Andrew F. Tuch, *The Self-Regulation of Investment Bankers*, 83 GEO. WASH. L. REV. 101, 149 (2014) (arguing that FINRA imposes high costs on the financial industry while being largely ineffective at deterring misconduct); Stephen Craig Pirrong, *The Self-Regulation of Commodity Exchanges: The Case of Market Manipulation,* 38 J. OF L. & ECON. 141(1995) (explaining why, even though enforcement is a powerful deterrent improving market performance, commodity exchanges fail to exercise it).

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

[351] *See id.* at 185 (discussing due process concerns created by SROs).

[352] Emily Hammond, *Double Deference in Administrative Law*, 116 COLUM. L. REV 1705, 1748-57 (2016).

[353] Birdthistle & Henderson, *supra* note 310, at 54.

[354] *See, e.g.,* Pritchard, *supra* note 102, at 35; Pirrong, *supra* note 350, at 143.

[355] *See, e.g.,* Saule T. Omarova, *Wall Street as Community of Fate: Toward Financial Industry Self-Regulation*, 159 U. PA. L. REV. 411, 491 (2011) (observing in conclusion that "without engaging private sector actors in the regulatory process in a new and meaningful way, any efforts to devise an effective system of regulation and supervision in today's increasingly global and complex financial services market will most likely fail, at least in the long run").

[356] *See* Yadav, *supra* note 64; Massad & Jackson, *supra* note 326.

discipline."[357] To Yadav, "[b]y combining position, power and stature, crypto-exchanges present policymakers with a [relatively] lower-cost, high-coverage monitor that can offer a regulators a supportive complement to enhance industry surveillance and market integrity."[358]

Yadav's idea is deeply rooted in securities and derivatives regulation. In securities markets, "national securities exchanges" register with the SEC under Section 6 of the Exchange Act.[359] These institutions monitor trading to prevent fraud and manipulation, disseminate trade information, discipline their participants, create standards, enforce listing standards, and perform other functions.[360] Although they operate under the regulatory purview of the SEC, which approves exchange rule proposals and changes under Section 19 of the Exchange Act,[361] exchanges are purely private entities. The U.S. Court of Appeals for the 5th Circuit described their role as follows:

> Nasdaq[, a registered securities exchange,] is a private entity. It is a private limited liability company wholly owned by Nasdaq, Inc., a publicly traded corporation. Nasdaq's board of directors is selected by its broker-dealer members and by Nasdaq, Inc., and companies wishing to list on Nasdaq do so by entering into contracts with Nasdaq. While Nasdaq must register with and is heavily regulated by the SEC, the Supreme Court has made clear that a private entity does not become a state actor merely by virtue of being regulated. "[T]he 'being heavily regulated makes you a state actor' theory of state action is entirely circular and would significantly endanger individual liberty and private enterprise."[362]

In the commodities and derivatives world, derivatives contract markets (DCMs) are registered with the CFTC and must comply with the Core Principles set forth in the Commodity Exchange Act.[363] Under the Principles, DCMs must have the capacity to detect and prevent manipulation, prohibit abusive practices, disseminate trading information, and discipline their participants, among other obligations.[364] DCMs apparently have more leeway than securities exchanges in rulemaking, product listing, and amending rules, which can be done either by self-certifying compliance with the Commodity Exchange Act and CFTC regulations or by

---

[357] Yadav, *supra* note64, at 46-47.

[358] *Id.* at 10. On the centrality of exchanges, see also Dell'Erba, *supra* note **Error! Bookmark not defined.** at 37. There are also other proposals, including one allowing DEXs to register voluntarily. Jack Solowey & Jennifer J. Schulp, *Regulatory Clarity for Crypto Marketplaces Part I,* CATO BRIEFING PAPER No. 154, May 10, 2023, at 5.

[359] 15 U.S.C. § 78f.

[360] 15 U.S.C. §§ 78f, 78o-3(b)(6).

[361] 15 U.S.C. §§ 78s(a), (b), (g).

[362] Alliance for Fair Board Recruitment v. SEC, 85 F.4th 226, 239–240 (5th Cir. 2023) (quoting *Manhattan Community Access Corp. v. Halleck*, 587 U.S. 802, 816 (2019)).

[363] 7 U.S. Code § 7(d); 7 U.S. Code § 7a–2; 17 C.F.R. §§ 38.100-38.1150. Derivatives exchanges also offer a market for spot or cash products. *See, e.g.*, *CME Dairy Spot Markets*, CHI. MERCANTILE EXCH. GRP., https://www.cmegroup.com/education/courses/introduction-to-dairy/cme-dairy-spot-markets.html.

[364] 7 U.S. Code § 7(d)(1)-(22).

requesting approval.[365] For example, the Chicago Mercantile Exchange listed Bitcoin futures through self-certification.[366]

Just like securities exchanges, DCMs are not state actors. The precedent of the Seventh Circuit, whose seat is in the major commodity and derivatives trading hub, is compelling on these issues.[367] Agreeing with Judge Friendly of the Second Circuit, Judge Posner noted:

> The argument for treating a securities or commodity exchange as an arm of the federal government is that federal law imposes on the exchange a duty of policing its members that makes the exchange in effect a law-enforcement agent of the government. But as Judge Friendly pointed out in the *Solomon* case, the agency analogy is upside down. The exchange is the principal rather than the agent; the purpose of the federal law is to strengthen the power and responsibility of the exchange in performing a policing function that preexisted federal regulation. (citations omitted)[368]

To summarize, exchanges are a central part of the legacy market's institutional infrastructure directly approved by the regulators. Exchanges provide trading venues, create rules, and enforce them, thereby packaging together their trading, listing, *and* self-regulation services.[369] Yadav's proposal models CEX regulation on this legacy approach.

Timothy Massad and Professor Howell Jackson have put forward the second proposal. They propound a FINRA-like SRO for regulating CEXs (i.e., the proposal excludes DEXs), with the SEC and CFTC jointly approving the SRO rules, "direct[ing it] to abrogate, amend or adopt a rule," delegating responsibilities to the SROs, and providing general guidance and oversight while relying on the expertise of market participants.[370]

Similar to exchanges, these SROs are also non-state actors, and "[s]ince 1938, frontline authority over broker-dealers has fallen to *private* entities and *not* the state."[371] At the same time, such SROs are exceptionally powerful private self-governing organizations that have enforcement authority to bring disciplinary actions against their members[372] and set their own

---

[365] 17 C.F.R. §§ 40.2-40.6.

[366] Fact Sheet, Commodity Futures Trading Commission, CFTC Backgrounder on Self-Certified Contracts for Bitcoin Products (Dec. 1, 2017), https://www.cftc.gov/sites/default/files/idc/groups/public/@newsroom/documents/file/bitcoin_factsheet120117.pdf

[367] *See, e.g.*, Rosee v. Board of Trade of Chicago, 311 F.2d 524, 526, 528 (7th Cir. 1963) (holding that the Chicago Board of Trade is not a public utility even though it performs some public services).

[368] Bernstein v. Lind-Waldock & Co., 738 F.2d 179, 186 (7th Cir. 1984).

[369] Chris Brummer, *Stock Exchanges and the New Markets for Securities Laws*, 75 U. CHI. L. REV. 1435, 1455 (2008) ("The dual nature of the services proffered by exchanges" helps them create cumulative competitive advantages).

[370] Massad & Jackson, *supra* note 326, at 2, 5.

[371] Kim v. Fin. Indus. Regul. Auth., No. 1:23-cv-02420 (ACR), 2023 WL 6538544, at *2, 4, 10 (D.D.C. Oct. 6, 2023).

[372] SROs such as FINRA decide "which cases to investigate and when to file a complaint," and their decisions are "not binding on the SEC in any subsequent review." Scottsdale Capital Advisors Corp. v. Fin. Indus. Regul. Auth., No. 23-1506 (BAH), 2023 WL 3864557, at *8 (D.D.C. June 7, 2023). FINRA, however, does not have the authority

rules, which the regulators review.[373] They are professional associations and "quasi-governmental agencies," as one court put it.[374] Ideally, these SROs should act as industry enforcers disciplining rogue participants and as standard setters for market behavior, providing institutional guardrails to boost compliance and resilience of financial markets.

B. A Two-Tiered SRO Proposal

1. Cryptoexchanges as SROs

Each discussed proposal is necessary, but neither is sufficient, and each bolsters the other. This Section suggests merging the two models proposed by Yadav, Jackson, and Massad to create a two-tiered SRO system. The first argument for this embracive approach is that recreating a replica of FINRA or NFA under the joint jurisdiction of the Commissions would not fully fit the examined above trading structure, microstructure, and risks of cryptoexchanges. Recall that cryptoexchanges offer direct access to investors.[375] Broker-dealers, i.e., members of FINRA, are not the typical middlemen in cryptoasset trading.[376] Today, investors bypass broker-dealers and gain direct access to CEXs (and to DEXs).[377] This would make the traditional FINRA membership inapplicable in the current digital asset trading infrastructure.[378]

Next, recall that ATSs are registered broker-dealers and, therefore, members of FINRA.[379] Cryptoexchanges, theoretically, could register under a regime similar to Regulation ATS.[380] Indeed, several member firms are already approved as ATSs for cryptoasset securities trading.[381] This is where Massad and Jackson's proposal could cover CEXs. Nevertheless, there are reasons militating against a direct transplantation of this model.

Cryptoexchanges are essential loci for cryptoasset trading,[382] while ATSs were an addition appended to centuries-old markets with well-established broker-dealers and exchanges.[383] CEXs do not operate in parallel with similar regulated intermediaries. Instead, they

---

to "bring court actions to collect disciplinary fines it has imposed." Fiero v. Fin. Indus. Regul. Auth., 660 F.3d 569, 571 (2d Cir. 2011).

[373] 15 U.S.C. §§ 78s(b)(1)–(2), 78o-3(b)(2), (7), (8).

[374] *See also* Nat'l Ass'n of Sec. Dealers, Inc. v. SEC, 431 F.3d 803, 804 (D.C. Cir. 2005).

[375] *Supra* Parts II-III.

[376] Note that there are several exceptions. For example, at least one firm is registered as a special purpose broker-dealer, a status that allows registered broker-dealers to custody and interact only with cryptoasset securities, and several firms have been approved to operate ATS for cryptoasset securities. Foye, *supra* note 131. For non-security cryptoassets, regulatory and registration-related questions remain open.

[377] *Supra* notes 197-201 and accompanying text.

[378] By the same token, the requirement of the May 2024 House Bill that digital asset and digital commodity broker-dealers be members of FINRA and NFA, respectively, does not fully account for the current trading structure and microstructure in the digital asset markets. House Bill, *supra* note 29, Sec. 405 & Sec. 506.

[379] *Supra* notes 131-133 and accompanying text.

[380] Regulation of Exchanges and Alternative Trading Systems, Exchange Act Release No. 34-40760, 63 Fed. Reg. 70844 (Dec. 22, 1998) (codified at 17 C.F.R. pts. 202, 240, 242, 249).

[381] *See, e.g.,* Foye, *supra* note 131.

[382] *Supra* notes 64-68 and accompanying text.

[383] The SEC formalized its approach to ATS relatively recently. *See* 63 FR 70844-01 (Dec. 22, 1998).

are key trading platforms competing with other cryptoexchanges across borders. The centrality of CEXs suggests that they can and perhaps should bear the costs of self-regulation. Their market position may justify imposing more duties on them as the least-cost providers of market oversight and self-regulation in a mercurially developing digital asset market. ATSs, in contrast, do not have formal self-regulatory obligations.[384] If all CEXs become omnibus SROs, they could be charged (and ideally, trusted) with developing relevant standards for brokerage, trade execution, and settlement services (i.e., functions that they already perform) under the aegis of a regulated entity.

The centrality of CEXs can also alleviate the problem of disclosure. Since the term "issuer" in blockchain-enabled markets may be a distant approximation of typical corporate issuers,[386] assets could be issued in relation to and in support of decentralized projects, and traditional firms could give way to decentralized arrangements as projects develop post-launch. As Part II points out, there are no investment banks conducting issuer due diligence, and listing review is within the remit of CEXs.[387] Theoretically, they are well-positioned and have the wherewithal to monitor initial disclosures in a primary market or even ensure periodic reporting thereafter.

The U.K. is already reviewing similar policies: in October 2023, His Majesty's Treasury restated that trading venues could facilitate disclosures for certain cryptoassets.[388] The (possibly) doomed-to-failure House Bill took a similar approach by imposing listing, product review, and member oversight obligations on cryptoexchanges.[389] Assigning self-regulatory functions to all CEXs would strengthen their disclosure-related and self-regulatory duties to reduce the information asymmetry and other trading risks and costs discussed in this Article.

2. A Policy-Level SRO

Up to this point, the arguments were in favor of converting CEXs into SROs. But this model alone is equally insufficient, which brings us to Massad and Jackson's proposal to form an overarching FINRA-like SRO. According to Massad and Jackson, a new FINRA, "formed and supervised by regulators, whose mission would be to protect investors and financial markets by developing and enforcing much-needed standards for the crypto industry,"[390] could solve many problems facing the regulators and the digital asset markets.

---

[384] Fox et al., THE NEW STOCK MARKET, *supra* note 133, at 32.

[386] *See supra* Part II.A (comparing issuers in blockchain enabled markets to issuers in traditional markets)

[387] *See supra* Part II.

[388] HM TREASURY, FUTURE FINANCIAL SERVICES REGULATORY REGIME FOR CRYPTOASSETS: RESPONSE TO THE CONSULTATION AND CALL FOR EVIDENCE 42-45 (2023). Note that U.S. derivatives regulation also has somewhat similar models for intermediary disclosure. *See* Dombalagian, *Cryptoexchanges*, *supra* note 53, at 38-39, 41.

[389] *See, e.g.,* House Bill, *supra* note 29, Sec. 106 & Sec. 107 (setting conditions for persons filing a notice of intent to register as a digital commodity exchange or a digital asset trading system and requiring, *inter alia*, a description of the listing process and disclosure of other information); Sec. 504 (outlining registration requirements and the core principles for digital commodity exchanges, including operational standards, disciplinary procedures for members and market participants, and others).

[390] Massad & Jackson, *supra* note 326, at 2.

Nothing suggests that this overarching SRO could not have cryptoexchanges-SROs *and* potential other intermediaries as its members.[391] It is also possible that if native cryptoassets become mainstream and as real-world assets are tokenized, broader swaths of investors would enter the market. These non-crypto-native investors might prefer the familiarity of trading through a broker, creating more demand for such brokerage services. As markets respond to the demand, the growing ranks of cryptoasset-brokers would become members of the new SRO. Having CEX-SROs and a new upper-tier SRO thus answers the need for an adaptable intermediary-based approach and a comprehensive, overarching regulatory framework.

Namely, this policy-level SRO could develop the best practices or general guidelines for both exchanges and brokers and function as a central aggregator of decentralized market knowledge from a variety of participants. Establishing this lone standard-setter is supported by scholarship: theory suggests that entities like FINRA need to have a self-regulatory monopoly because "the efficacy of even a monopolist's power to enforce its rules privately . . . is symmetrical with its power to exclude."[392] A single new SRO or a specialized FINRA-NFA task force could fill the bill. Positioning this new entity in the center of information flows would allow it to develop, update, and promote guidelines and educate individual CEXs, other intermediaries, and regulators.

Note that the May 2024 House Bill, animated by similar self-regulatory ideas, requires that digital asset and digital commodity broker-dealers, and even cryptoexchanges, be members of FINRA or NFA.[393] It, however, fails to account for this need to have a set of self-regulatory principles and standards for multifunctional CEXs, as well as potential other intermediaries, such as broker-dealers, bringing them within a coherent, adaptable, and well-informed regulatory regime.

Aggregating best standards and guidelines may lead to cross-pollination among market participants, helping information distribution and setting the baseline for protecting against market manipulation, ensuring fair and orderly markets, establishing safeguards against conflicts of interest, and protecting investors across digital asset markets. Even Yadav, who focuses on CEXs-SROs, acknowledges that "the structure of the cryptocurrency industry raises costly hurdles that impede the creation of common standards of conduct" and that "a multiplicity of venues and their varying models raise the difficulty involved in coordination, information pooling, analysis, and consensus building."[394] An overarching digital-asset SRO could become this information-aggregating, standard-setting mechanism. To recap, either a new SRO or a joint task force of FINRA and NFA would fill this gap.[395]

---

[391] *Id.* at 6. The SRO would "approve who may become a member." *Id.*

[392] Jonathan Macey & Caroline Novogrod, *Enforcing Self-Regulatory Organization's Penalties and the Nature of Self-Regulation,* 40 HOFSTRA L. REV. 1, 5 (2012). Macey and Novogrod's analysis hinges on the absence of a private right of action and court enforcement of FINRA's claims and is applicable to the extent of similar design features of the new SRO.

[393] *Supra* note 378.

[394] Yadav, *supra* note 64, at 42. "These difficulties create fatal setbacks to the coordination game for setting up viable self-regulation where venues cooperatively pursue a collective benefit, forgoing opportunistic, self-interested risk-taking." *Id.* at 44.

[395] *See supra* Part V discussing the prerequisites of a self-regulatory regime.

As Jackson and Massad propose,[396] the SRO could fall under the joint jurisdiction of the SEC and CFTC to mitigate the uniquely American debate about classifying digital assets as securities, commodities, or something else.[397] Regardless of the classifications, these markets may need a better self-regulatory framework, particularly as they continue to grow in size.[398] The scholarship on cryptoassets does not uniformly advocate for making either the SEC or the CFTC the principal regulator and rather points toward the need for a more efficient and modernized regulatory regime.[399]

Having a two-tier SRO structure with trading platforms as SROs and the overarching SRO for information aggregation and standard setting—with both tiers under the watchful eye of the Commissions—could form a regulatory structure that is flexible and comprehensive enough to leverage the benefits of digital asset markets without externalizing the risks of cryptoexchanges. Conversely, without an upper-tier SRO, digital asset trading platforms may fall into the same trap that conventional exchanges struggle with – the fragmentation of trading across multiple trading platforms reduces the effectiveness of exchanges as SROs.[401]

3. DEXs and Self-Regulation

Finally, this need for a general standard setter-SRO is reinforced by the trading on DEXs. Neither Massad and Jackson nor Yadav have addressed decentralized platforms, and for good reason. As discussed earlier in this Article, DEXs have practices and exhibit risks that are different from those of CEXs.[402] Yet, inasmuch as the current market structure is interconnected, it is imperative to incorporate DEXs within a definable regulatory model. Hundreds of DEXs coexist with CEXs within the blockchain-enabled market.[403] Trading, arbitrage activities, and price formation are global, with potential inefficiencies and risks spilling over from unregulated to regulated markets across borders.

Due to insufficient legal knowledge, poor risk assessment, preferences for disintermediation, or intent to commit fraud, individual traders could flock to unregulated DEX, leading to consumer harm. The risks of DEXs could also spill over into global cryptoasset prices

---

[396] *Supra* notes 370-374 and accompanying text.

[397] *See* Guseva & Hutton, *supra* note 2, at 1558-60 (describing the debate over whether cryptoassets should be regulated by the CFTC as commodities or by the SEC as securities). The analysis of the Solana blockchain in the *Coinbase* order provides an example of this critical uncertainty. *Coinbase, Inc.*, 2024 WL 1304037, at *7-8.

[398] The major relevant concern is systemic risk. *See, e.g.,* Birdthistle & Henderson, *supra* note 310, at 51 ("[T]he commodities industry's dramatic increase in size alone might suggest more systemic risks, which may in turn generate more demand for government-like regulation."). Potentially, systemic interconnections may touch upon not only securities, derivatives and commodity regulations, but also banking law. *See, e.g.*, Lee Reiners & Sangita Gazi, *Wanted: A prudential Framework for Crypto Assets,* 76 ARK. L. REV. 311, 318 (2023).

[399] On the one hand, the SEC, as a larger agency, may have some comparative advantages over the CFTC. *See, e.g.,* Arthur E. Wilmarth, *We Must Protect Investors and Our Banking System from the Crypto Industry,* 101 WASH. U. L. REV. 235 303-304 (2023); Dombalagian, *Cryptoexchanges, supra* note 53, at 1-2. On the other hand, it may also be less suitable for innovative markets. *See generally* Guseva & Hutton, *supra* note 2. Additionally, Carol Goforth delivered a strong critique of the SEC's recent rule proposal expanding the definition of "exchange." *See generally* Carol R. Goforth, *Critiquing the SEC's Ongoing Efforts to Regulate Crypto Exchanges*, 14 WM. & MARY BUS. L. REV. 305 (2023) [hereinafter Goforth, *Critiquing the SEC*].

[401] *See generally* Yesha Yadav, *Oversight Failure in Securities Markets,* 104 CORNELL L. REV. 1799 (2019).

[402] *Supra* Parts II-III.

[403] AMF, *supra* note 12, at 9.

through arbitrage, smart contract routers, and aggregators affecting price formation and, ultimately, regulated exchanges. With the increasing tokenization of real-world assets (such as securities and commodities), the real economy could be affected. Under these conditions, the limited enforcement resources of the Commissions would be insufficient without proper self-regulation by the industry itself.

The SEC and CFTC could, of course, attempt to reel in DEXs either through expanding the definition of the terms "exchange"[404] and "dealer,"[405] which could cover DEXs and liquidity providers, or through enforcement.[406] On the first model, some scholars have vehemently criticized such regulatory expansion.[407] Even those who agree that securities law is suitable for regulating cryptoexchanges are concerned that designating cryptoexchanges as securities exchanges could backfire and affect legacy market regulation.[408] A critical policy concern is that by insisting on converting DEXs into "exchanges" and the applicability of the old rulebook, the Commissions miss an opportunity to modify regulations to incorporate the institutional potential of the technology and promote innovation.[409]

Similarly, the current enforcement-focused stance suffers from short-termism and misunderstands global DLT-enabled markets and ecosystems. The recent enforcement actions against DEXs[410] and a Wells notice sent to DEX developers as a potential enforcement target[411] reveal that enforcement is feasible when and if DEX developers are identifiable U.S. domiciliaries. In the 2023 CFTC orders, the DeFi developers were Delaware corporations,[412] and Uniswap Labs, recently served with a Wells notice from the SEC Division of Enforcement, is a New York firm working on improvements to the Uniswap protocol.[413]

---

[404] 88 Fed. Reg. 29448 (May 5, 2023) (proposed rule by the SEC to redefine "exchange").

[405] Further Definition of "As a Part of a Regular Business" in the Definition of Dealer and Government Securities Dealer in Connection with Certain Liquidity Providers, Exchange Act Rel. No. Release No. 34-99477, 89 Fed. Reg 14938 (Feb. 29, 2024).

[406] *See, e.g.,* Press Release, CFTC Issues Orders Against Operators of Three DeFi, *supra* note 24 (describing CFTC enforcement actions against three DEX operators).

[407] Citing the rule's possible application to crypto, Carol Goforth listed, among other factors, the virtual impracticability of effecting transactions in registered cryptoasset securities, the weak fit of exemptions that require exempt platforms to have publicly available information to prevent manipulation in this global market, and international competition concerns. Goforth, *Critiquing the SEC*, *supra* note 399, at 339–42. *See also* Statement, Hester M. Peirce, Commissioner, Securities and Exchange Commission, Rendering Innovation Kaput: Statement on Amending the Definition of Exchange (Apr. 14, 2023), https://www.sec.gov/news/statement/peirce-rendering-inovation-2023-04-12.

[408] *See, e.g.,* Dombalagian, *Cryptoexchanges, supra* note 53, at 3.

[409] *See* Goforth, *Critiquing the SEC*, *supra* note 399, at 339–43 (arguing that imposing existing regulations on cryptoexchanges will stifle innovation).

[410] *See, e.g.,* Press Release, CFTC Issues Orders Against Operators of Three DeFi, *supra* note 24.

[411] Alexander Osipovich, *SEC Warns DeFi Firm Uniswap Labs of Potential Lawsuit*, WSJ (Apr. 10, 2024), https://www.wsj.com/livecoverage/cpi-report-today-inflation-stock-market-04-10-2024/card/sec-warns-defi-firm-uniswap-labs-of-potential-lawsuit-WBbtKQFAkh12I28Ds4fm.

[412] *In re* Deridex, Inc., CFTC No. 23-42, 2023 WL 5937236, at *2 (Sept. 7, 2023); *In re* ZeroEx, Inc., CFTC No. 23-41, 2023 WL 5937239, at *2 (Sept. 7, 2023); *In re* Opyn, Inc., CFTC No. 23-40, 2023 WL 5937238, at 2 (Sept. 7, 2023).

[413] Osipovich, *supra* note 411.

Without identifiable U.S. residents, the bar for successful enforcement may be much higher. For one, when developers (or those who control protocol upgrades) are anonymous and/or foreign, enforcement becomes more difficult, manifestly unrealistic, or prohibitively costly.[414] Furthermore, some developers create new DEXs repurposing the open-source code of other DEXs. In 2020, for instance, pseudonymous developers Chef Nomi and 0xMaki created SushiSwap by copying the open-source code of Uniswap.[415]

Enforcement could become even less feasible if decentralized algorithmic entities emerged without much human participation, and "[b]ecause they lack human bodies, [algorithmic entities] are harder to catch and impossible to punish."[416] Even if human developers remained in the driving seat, they could leave the United States and continue to experiment with code-based solutions from afar.

The two features of technology will further complicate enforcement-focused solutions. First, financial innovations are marked by an unforecastable radical uncertainty[417] with respect to the future state of the technology. Second, any technological evolution is based on "mutually reinforcing developments."[418] Blockchains, smart contracts, cloud computing, and artificial intelligence (AI)[419] can be combined to optimize offerings, trading, and clearing in unpredictable ways.

For example, if we take human coders developing smart contracts and replace them with AI proposing a code to human reviewers and prompt engineers for further improvement, this change could accelerate smart contract deployment, including DEX deployment at a pace potentially beyond the oversight and enforcement capability of public regulators. Most code underlying blockchain ecosystems is publicly available and open source,[420] which means that AI models can import pieces of code and learn fast from these accessible repositories. If (or rather when) real-world assets become progressively tokenized and capable of being transferred on-chain, the synergies between AI and blockchains should generate much faster economic interactions and geographically dispersed activities.

To illustrate this, I ran a simplistic experiment by asking ChatGPT to write a code for the following queries: (1) "Write a code for a decentralized exchange like Uniswap," and (2) "Write a code for the pair USDC and European Investment Bank Bond to launch a liquidity pool on Uniswap," a DEX. The first query showed how quickly ChatGPT imported data from open-

---

[414] For example, anonymous developers or other centralized parties may hold admin keys that enable them "to execute a restricted function" or governance tokens that allow them to affect protocol upgrades. Anonymity would hamstring potential legal actions. Schuler et al., *supra* note 47, at 21-23.

[415] *What is SushiSwap? (SUSHI)*, KRAKEN, https://www.kraken.com/learn/what-is-sushiswap-sushi.

[416] Lynn M. LoPucki, *Algorithmic Entities*, 95 WASH. U.L. REV. 887, 891–92 (2018).

[417] On the overarching analysis of this state of unknown where probability analysis is inapposite, see generally JOHN KAY & MERVYN KING, RADICAL UNCERTAINTY: DECISION-MAKING BEYOND THE NUMBERS (W.W. Norton & Co. 2020).

[418] W. PAUL STRASSMANN, RISK AND TECHNOLOGICAL INNOVATION 218 (Cornell Univ. Press 1959).

[419] "[AI] is used as an umbrella term to designate a broad set of methods that enable problem-solving via a combination of statistics and computer science." Giulio Bagattini et al., *Artificial Intelligence in EU Securities Markets*, EUR. SEC. & MKTS. AUTH., Feb 1, 2023, at 4.

[420] For a discussion of open-source software, see, e.g., Angela Walch, *The Bitcoin Blockchain as Financial Market Infrastructure: A Consideration of Operational Risk,* 18 NYU J. LEGIS. & PUB. POL'Y 873, 874-79 (2015).

source code repositories to propose a code for a decentralized trading platform, and the second illustrated the speed of creating a liquidity pool contract.

In sum, I referenced two assets, one of which is a tokenized bond (*i.e.*, a security) and another one is a digital medium of exchange (a stablecoin).[421] Within seconds of asking ChatGPT to write a code for a liquidity pool against which anyone could trade the EIB bond and the USDC, I received basic instructions. ChatGPT directed me to create tokens "representing each asset, deploying a Uniswap pair contract, and providing liquidity." Then, it gave me the code with a final warning "to deploy these contracts on a test network first and ensure that [I had] the necessary test tokens for USDC and EIB Bond." The code revealed how ChatGPT imported modules of the underlying code from the open-source databases of Uniswap and OpenZeppelin.[422]

Admittedly, this was merely a hypothetical illustration. The query ignored possible encoded restrictions on the transferability of the bonds,[423] the code was imperfect, and trading securities such as EIB bonds is not that simple. However, I did not intend to create a liquidity pool or convert actual tokenized bonds into illegally traded securities.

This simple experiment suggests that with time, trading tokenized assets and creating venues for trading may be fast and open to many participants. Without some uniform regulatory principles, any investor may interact with a DEX, and any entity may deploy one without identifying themselves or staying on to support its operations, exacerbating the risks of the users of that DEX.[424] The composability of blockchain-enabled applications and open-source code disclosure combined with AI will allow code and applications to be reused and repurposed by other applications and by market participants.[425] And the more blockchain-generated data AI models have, the better they will become,[426] strengthening the possible interaction between technologies and expediting transacting.

These realities underscore the need for a coordinated approach concerning DEXs.[427] An efficient legal regime should incentivize the developers, including not only those who make easy enforcement targets but also those who do not, to create DEX protocols that address the risks

---

[421] For background, USDC is a stablecoin, a cryptoasset that has a stable value and is secured by a reserve of cash and cash equivalents. *Fully Backed Digital Dollars*, CIRCLE, https://www.circle.com/en/usdc. The bonds in the query were issued by the European Investment Bank (EIB) on Ethereum. *See* Press Release, European Investment Bank, *supra* note 52.

[422] *Factory*, UNISWAP, https://docs.uniswap.org/contracts/v2/reference/smart-contracts/factory (last visited Dec. 17, 2023); *Build Secure Smart Contracts in Solidity*, OPENZEPPELIN, https://www.openzeppelin.com/contracts (last visited Dec. 17, 2023).

[423] As discussed elsewhere, protocols may enable blacklists and whitelists of addresses; asset contracts may also blacklist a pool's contract address, in which case transactions by the pool would not be executed. Schuler et al., *supra* note 47, at 16-18, 24.

[424] For a relevant discussion, see Campbell et al., *supra* note 27, at 1, 20.

[425] AMF, *supra* note 12, at 8.

[426] The quality of AI and other predictive models is linked to the quality of data. Bagattini et al., *supra* note 419419, at 5, 17–18. Here, blockchains may help because they are essentially high-quality, tamper-resistant data repositories.

[427] *See, e.g.*, INT'L ORG. SEC. COMM'NS, POLICY RECOMMENDATIONS FOR DEFI, *supra* note **Error! Bookmark not defined.**, at 119 (citing the need "for a globally coordinated approach").

discussed in this paper. [428] This is where the policy-level digital asset SRO may develop better standards and even whitelist decentralized venues that follow them. It may also carry out a tailored registration or certification regime for DEXs or some of them. Note, however, that this Article does not argue for imposing a specific regulatory or liability regime on DEXs and their developers. Instead, it suggests that the digital asset SRO should start by focusing on high-level standards and best practices for decentralized platforms and their developers.

Approved by U.S. regulators, these guidelines should send a strong signal to future DEX developers, nudging them through reputational pressure to follow the standards. Whitelists of compliant DEXs, in turn, could produce a verifiable signal concerning the quality of DEXs and their compliance. This should reveal to traders which platforms could be riskier than others. In an ideal scenario, a separating equilibrium could form between the platforms that followed the best practices and those that did not, draining liquidity from bad venues as traders moved to safety.
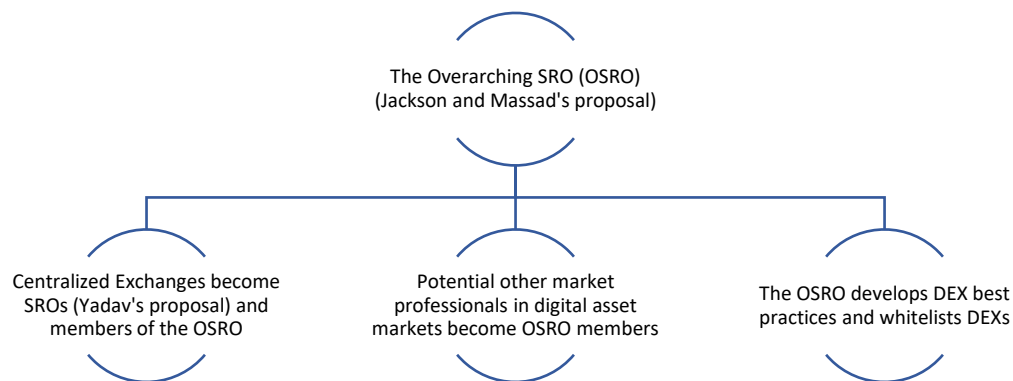
These best practices and principles could also reinforce the efforts of developers and the community to design technological solutions to broader transactional and regulatory problems. [429] As examined elsewhere, developers within the blockchain ecosystem continually work on solutions to various transaction costs. [430] These efforts, however, lack baseline coordination. The coordinating standard-setter-SRO discussed in this Article could address these problems.

In summation, a self-regulatory system for digital-asset markets could synergistically incorporate Massad and Jackson's and Yadav's proposals to address the problems of both CEXs and DEXs in several steps: First, the overarching SRO (OSRO) could focus on developing comprehensive rules and coordination mechanisms for CEXs and digital asset broker-dealers. The OSRO should also develop codes of best practices for DEXs and whitelist DEXs deemed compliant with the codes. Second, CEXs should become standalone SROs and also members of the OSRO to benefit from its activities and reduced coordination costs. Pictorially, the self-regulatory structure may look as follows:

---

[428] Yadav cautions, for example, that "[i]nvesting in oversight pays off when it generates liquidity, reduced scrutiny from a regulator, as well as positive network effects where reputational gains attract business. But it can be loss-making." Yadav, *supra* note 64, at 20–21. If DeFi remains unregulated, this will diminish the developers' payoff from investing in anti-manipulation and anti-fraud efforts.

[429] *See, e.g.,* Omarova, *supra* note 355, at 418-19 (demonstrating the need for effective self-regulation to include broader regulatory values and observing that "the dynamics of the twenty-first-century global financial market demand a new approach to industry self-regulation, which has the potential to be much more comprehensive and systemic in its scope and operation.").

[430] *See supra* Part I.

```
                     ╭──────────╮
                  The Overarching SRO (OSRO)
                  (Jackson and Massad's proposal)
                     ╰──────────╯
                          │
          ┌───────────────┼───────────────┐
          │               │               │
    Centralized Exchanges become   Potential other market    The OSRO develops DEX best
    SROs (Yadav's proposal) and   professionals in digital asset  practices and whitelists DEXs
    members of the OSRO        markets become OSRO members
```

CONCLUSION

This Article starts with the argument that blockchains are beneficial institutional technologies that can be effectively employed in financial markets. The new cryptoasset market infrastructure, however, poses challenges to the Commissions and creates risks for market participants. To resolve these challenges and address the gaps in the institutional benefits of blockchains, this Article advocates for a two-tiered SRO structure, including a policy-level SRO and cryptoexchange-SROs. Together, these SROs could comprehensively oversee the market, discipline bad actors, and improve market integrity. Although DEXs differ from centralized digital-asset trading venues, the same common SRO may develop codes of best practices for DEXs to resolve coordination problems and nudge the community towards compliant solutions. In light of the global interconnections within the centralized and decentralized digital asset infrastructure, the risks of both CEXs and DEXs need to be addressed in a coordinated and coherent manner.